Inter-Academy International Workshop on

FUTURE & 6G COMMUNICATIONS

Event Digest and Review

Technology and Innovation Centre
University of Strathclyde, Glasgow, Scotland

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Inter-Academy International Workshop on
FUTURE & 6G COMMUNICATIONS
Attending Speakers and Delegates
24/25 June 2024, Glasgow. Scotland, UK

Preface

A very warm welcome to the Inter-Academy International Workshop on 'Future Communications and 6G'.

Telecommunications networks are the lifeline of global economies, and safeguarding their resilience and security in an evolving, interconnected world. In the pursuit of seamless evolution towards future communication networks, it is imperative to align technology, standards, policy, and funding roadmaps right from the outset. Driven by this vision, this workshop aims to bring together key stakeholders from industry, academia, and government to debate and discuss critical issues, address present day concerns, propose effective solutions and explore international collaboration.

The Workshop is organised in partnership with the following National Academies, representing engineering at their respective countries' highest levels; with the aim of discussing global telecommunications for next generation communications:

- US National Academy of Engineering
- Royal Academy of Engineering
- Canadian Academy of Engineering
- Royal Swedish Academy of Engineering Sciences
- Royal Society of Edinburgh
- Indian National Academy of Engineering
- National Academy of Engineering of Korea
- IEEE Future Networks

The objectives of the Workshop are:

- To identify future directions of growth in future wireless systems
- To explore new network architectures, protocols and technologies relevant to the next generation of mobile communication systems
- To document opportunities for international R&D collaboration.

To achieve its objectives, the Workshop is organised into focussed sessions that include keynote presentations, discussion forums and subject specific Panels.

The Workshop Programme opens with warm messages of welcome by the Presidents of the International/National academies. We are grateful to them for their encouragement and their support.

We are enormously grateful to distinguished colleagues from leading industries, academic experts from keynote universities, and eminent policy makers from governments and agencies, who are coming to Glasgow to share with us their wisdom and experience.

To benefit from their presence, the Workshop Programme includes Sessions on:

- UK telecom activities and strategies for 6G,
- International 6G strategies and use cases,
- Industry Influencers' Forums,
- Future policies framework and spectrum requirements,
- Engineering academic influencers panel,
- Standards forum,
- International research funding agencies panel,
- Wrap up to record conclusions and chart future directions and initiatives.

We are enormously immensely thankful for the contributions of the members of the International Organising Committee for the Workshop, whose guidance, support and advice framed the Workshop Programme.

Several colleagues have helped us in putting together this event. In particular the following deserve special mention – James Irvine for oversight with Registration and the Workshop Handbook, Bob Stewart with Operational oversight, Luca Campanalonga for the Exhibitors and Sheila Forbes for Local Arrangements. We would like to thank Alan Williamson for managing the Workshop Website. This Workshop would not have been possible without the generous support of our sponsors. We are indebted to them. These include the Scottish Government, the Lord Provost of Glasgow, the Glasgow Convention Bureau, Ericsson, EPSRC, Scotland 5G Centre, the Universities of Glasgow and Strathclyde and Pulsant.

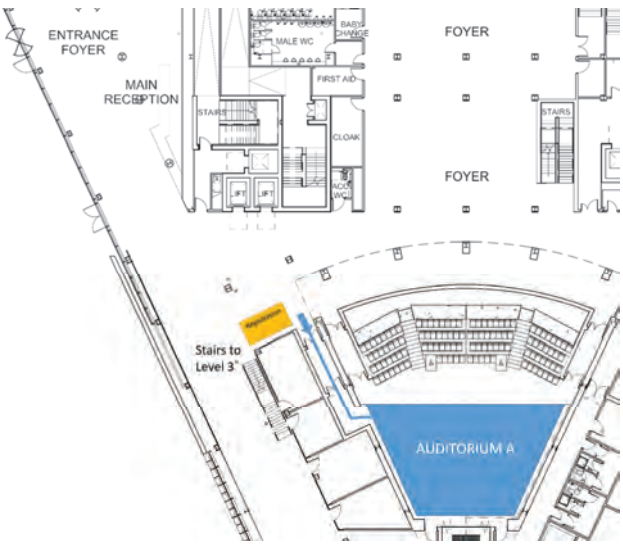
Tariq S Durrani (Chair)
Mallik Tatipamula (Vice Chair)
June 2024

Local Organising Committee

Chair	*Tariq S Durrani*	University of Strathclyde (UK)
Co-Chair	*Mallik Tatipamula*	Member RAEng, Fellow RSE, CTO Ericsson Silicon Valley (USA)
	Muffy Calder	University of Glasgow (UK)
	Luca Campanalonga	Scotland 5G Centre (UK)
	Harald Haas	University of Cambridge (UK)
	Muhammad Imran	University of Glasgow (UK)
	James Irvine	University of Strathclyde (UK)
	Robert Stewart	University of Strathclyde (UK)
	Rahim Tafazolli	University of Surrey (UK)
	Gareth Wells	Scottish Government (UK)

International Members of the Organising Committee

Sunghyun Choi	Representative National Academy of Engineering of Korea and Samsung International (South Korea)
John Cioffi	International Fellow RAEng, Corres Fellow RSE, Member US NAE, Stanford University (USA)
Ashutosh Dutta	Fellow IEEE, Past Chair, IEEE Future Networks, Johns Hopkins University (USA)
Magnus Frodigh	Member IVA, VP and Head of Ericsson Research (Sweden)
Leon Garcia	Member Canadian Academy of Engineering, University of Toronto (Canada)
Guru Madhavan	Member US NAE (USA)
Muriel Medard	Member US NAE, MIT (USA)
Linda Olsson	The Royal Swedish Academy of Engineering Sciences IVA (Sweden)
Argoswami Paulraj	Member US NAE, Stanford University (USA)
Vince Poor	Corres. Fellow RSE, Member US NAE, Princeton University (USA)
Bhaskar Ramamoorti	Key architect Bharat 6G Vision 6G Initiative, Former Director, IIT Chennai (India)
Halim Yanikomeroglu	Member Canadian Academy of Engineering, Carleton University (Canada)



TIC Level 2 (Street Level)

TIC Level 3

Exhibit Stands

1 University of Strathclyde - Strath SDR
2 Neutral Wireless Ltd
3 University of Edinburgh - IDCOM
4 Heriot-Watt University
5 Fraunhofer UK Research Ltd
6 The Scotland 5G Centre
7 University of Glasgow - CSI & ERG
8 University of Glasgow - School of Comp Sci
9 UWS - Digital Connectivity for Sustainable Futures

Event Digest

Future Communications and 6G: Outcomes from the Inter-Academy International Workshop

Authors

- **Professor Muhammad Ali Imran**
- **Professor Robert Stewart**
- **Professor Tariq Durrani**
- **ChatGPT** (Transcriber and Organizer of Information)

1. Introduction

The Inter-Academy International Workshop on Future Communications and 6G, held in Glasgow on 24-25 June 2024, served as a platform to convene global leaders from academia, industry, and government aimed at outlining strategies for next-generation communication systems. The Workshop, organized in partnership with key Academies of Engineering, including:

- Royal Academy of Engineering
- US National Academy of Engineering
- Canadian Academy of Engineering
- Indian National Academy of Engineering
- Swedish Academy of Engineering Sciences
- National Academy of Engineering of Korea
- Royal Society of Edinburgh

In addition the event was supported and co-sponored by the UK Spectrum Policy Forum, IEEE Future Networks, University of Strathclyde, University of Glasgow, and Glasgow City Council and the Scottish Government. Discussions highlighted the alignment of technologies, standards, policy, and funding to address societal challenges, enhance sustainability, and drive economic growth.

Key objectives included identifying future directions for wireless systems, exploring novel architectures and protocols, and fostering international collaboration. With telecommunications as the backbone of modern economies, the Workshop underscored the transformative potential of 6G in fostering global connectivity, addressing climate goals, and enabling disruptive innovations.

2. Introductory Comments: Vision and Benefits of 6G

Opening Remarks

The event opened with a welcome by **Professor Tariq S. Durrani** and **Professor Mallik Tatipamula**, who set the stage by emphasizing the importance of international collaboration. They outlined two pivotal questions: how to align technological, policy, and funding roadmaps

and how to inspire open and scalable international solutions. **Sir Jim McDonald**, Principal of the University of Strathclyde and President of the Royal Academy of Engineering, added that 6G must prioritize sustainability, inclusivity, and cost-efficiency.

Quote: "The convergence of industry, academia, and government—the triple helix—is pivotal for driving innovation in 6G" - **Ms. Jacqueline Redmond**.

Vision for Scotland as a Digital Leader

The Scottish Government's Minister for Employment and Investment, **Tom Arthur MSP**, highlighted Scotland's ambition to become a leader in digital transformation. Investments in programs like the Scotland 5G Centre and initiatives for rural connectivity were presented as examples of proactive measures to enhance digital inclusivity and prepare for 6G.

Quote: "Scotland's legacy as a nation of makers, shapers, and doers makes it an ideal partner for advancing 6G technologies" - **Tom Arthur**.

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3. Specific Areas of Focus

3.1 Technological Innovations

The discussions underscored advancements in spectrum sharing, AI-enabled networks, and seamless integration of computing and communications. **Mallik Tatipamula** discussed the transition from 2G to 6G, emphasizing the convergence of distributed computing, communications, and control systems.

Quote: "The future lies in distributed, autonomous networks where AI drives efficiency and scalability" - **Mallik Tatipamula**.

3.2 Policy Frameworks and Standards

The standards forum, moderated by **Muriel Medard (MIT)** and **John Cioffi (Stanford)**, addressed the interplay between standards and technology. The need for harmonized spectrum policies and agile regulatory processes was highlighted. **David Lister** from Vodafone emphasized lowering annual licensing fees and improving planning frameworks to accelerate 5G and 6G adoption.

3.3 Sustainability and Scalability

Presentations focused on 6G's potential to support environmental goals. Discussions included:

- Integrating renewable energy into communication networks.
- Developing energy-efficient hardware and protocols.
- Expanding the use of Open RAN to democratize technology.

Quote: "Sustainability must be built into 6G from the outset to address climate challenges effectively" - **Abhaya Sumanasena** (UK Spectrum Policy Forum)**.**

3.4 Use Cases and Applications

The Industry Influencers Forum showcased practical applications, such as AR/VR innovations in fashion, precision agriculture, and immersive entertainment. The **University of Strathclyde, University of Glasgow, and University of West of Scotland, University of Edinburgh** and **Scotland 5G Centre** presented examples of 5G transforming industries like media, broadcast healthcare and manufacturing.

Quote: "As we move towards 6G, the promise of ultra-reliable low-latency communication will enable innovations across sectors" - **Professor Muhammad Ali Imran** (University of Glasgow)**.**

Quote: "The true power of 6G lies in its ability to create an intelligent and interconnected ecosystem, where data-driven insights drive societal and economic transformation" - **Professor Muhammad Ali Imran**.

Quote: "The integration of human-centric design into 6G systems will ensure technologies remain accessible and beneficial to all" - **Dame Muffy Calder** (University of Glasgow)**.**

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4. Key Recommendations for the UK and Scotland

4.1 Research Ecosystem Development

Scotland's established 5G ecosystem provides a strong foundation for future research. Collaboration between EPSRC, DSIT, and international institutions is recommended to foster cutting-edge research in 6G technologies.

4.2 Enhancing Digital Inclusion

The adoption of Open RAN and shared spectrum initiatives was advocated to democratize connectivity and address underserved regions. Programs tailored to SMEs were recommended to ensure equitable access.

Quote: "Equity in access to next-generation technologies must be prioritized to ensure no community is left behind" - **Prof Robert Stewart** (University of Strathclyde)**.**

Quote: "Cost-efficient communication systems are critical to overcoming the digital divide, which is the mother of all other divides, including health, education, and employment" - **Professor Muhammad Ali Imran**.

4.3 Agile Policy and Regulation

Government support through simplified planning permissions, harmonized spectrum policies, and reduced licensing fees was identified as a key enabler of rapid deployment.

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5. Future Directions and Global Collaboration

5.1 Building International Testbeds

The creation of a global innovation platform for testing interoperable solutions was discussed. Such platforms could unite testbeds across regions and facilitate large-scale trials.

5.2 Strengthening Industry-Academia Partnerships

Collaborative frameworks between academic institutions and industries were recommended to address complex challenges in 6G development.

5.3 Long-Term Investments

Sustained investments in research, infrastructure, and workforce development will be critical. The Workshop proposed:

- Expanding funding for innovation hubs.
- Encouraging public-private partnerships.
- Supporting Open RAN and AI-driven solutions.

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6. Summary of Comments and Reviews

The Inter-Academy International Workshop fostered an exchange of ideas among experts from diverse domains, providing critical insights into the future of 6G. Key highlights include:

- **Jacqueline Redmond:** Stressed the importance of the "triple helix approach," where collaboration between industry, academia, and government drives innovation and ensures solid business cases. She emphasized the need for an integrated "network of networks" that combines emerging and existing wireless and wired technologies for sustainability and impact.
- **Matthew Baker (NOKIA):** Highlighted the challenge of narrowing the scope of 6G as commercial realities take hold. He predicted that sub-THz bands, sub-ms latency, and non-OFDM-based waveforms may not be central to 6G's launch but acknowledged the workshop's role in broadening perspectives.
- **Muriel Medard (MIT):** Described the complex interplay between standards and technology, noting the constraints and opportunities they create. She emphasized that thoughtful coordination is vital for successful 6G development.
- **Abhaya Sumanasena (UK SPF) and Ashutosh Dutta** (IEEE): Advocated for spectrum independence and advanced sharing strategies, emphasizing international collaboration for harmonized standards.
- **Rahim Tafazolli (University of Surrey):** Praised the workshop for its candid and focused discussions. He emphasized addressing societal challenges, including reducing costs, closing the digital divide, and improving sustainability through intelligent network operations.
- **Guru Madhavan:** Reinforced the necessity of global collaboration, stating that harmonized policies and standards are key to advancing 6G.
- **Industry Leaders:** Provided valuable perspectives on spectrum sharing, economic considerations, and the integration of terrestrial-satellite networks, further underscoring the workshop's comprehensive approach.

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7. Strategic Recommendations for Scotland and the UK

Recommendations for Building Global Leadership in 6G

1. **Invest in Research and Development**
    - Support structured programs focused on components, devices, systems, and software that enable the 6G ecosystem.
    - Prioritize funding for scalable and sustainable solutions to maintain a competitive edge.
2. **Enhance Collaboration**
    - Strengthen ties between academia, industry, and government to foster innovation.
    - Promote international collaborations with leading 6G research hubs to exchange ideas and best practices.
3. **Facilitate Innovation Ecosystems**
    - Establish regional innovation hubs focusing on 6G technologies, similar to the existing 5G Innovation Region.
    - Develop testbeds for interoperability, ensuring UK's readiness for global integration.
4. **Embed Equity and Accessibility**
    - Ensure digital technologies are accessible to all, addressing the digital divide in underserved regions.
    - Provide targeted support for SMEs to adopt and contribute to 6G advancements.

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8. Conclusion

The Inter-Academy International Workshop provided a roadmap for advancing 6G innovation. By aligning policies, fostering collaboration, and leveraging Scotland's unique strengths, the UK can emerge as a global leader in next-generation communications. The outlined recommendations offer actionable strategies to achieve these goals, ensuring that 6G delivers economic growth, sustainability, and societal benefits.

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9. Recommendations for Building Global Leadership in 6G

Is this being repeated from the previous section??

1. **Invest in Research and Development**
    - Support structured programs focused on components, devices, systems, and software that enable the 6G ecosystem.
    - Prioritize funding for scalable and sustainable solutions to maintain a competitive edge.
2. **Enhance Collaboration**
    - Strengthen ties between academia, industry, and government to foster innovation.
    - Promote international collaborations with leading 6G research hubs to exchange ideas and best practices.
3. **Facilitate Innovation Ecosystems**
    - Establish regional innovation hubs focusing on 6G technologies, similar to the existing 5G Innovation Region.

- Develop testbeds for interoperability, ensuring UK's readiness for global integration.

4. **Embed Equity and Accessibility**
   - Ensure digital technologies are accessible to all, addressing the digital divide in underserved regions.
   - Provide targeted support for SMEs to adopt and contribute to 6G advancements.

Insights from Workshop Summary by Professor Rahim Tafazolli and Professor Guru Madhavan

Quote: "To lead in 6G, the UK must create an innovation-driven ecosystem that prioritizes collaboration, sustainability, and inclusivity from the ground up" - **Professor Rahim Tafazolli**.

Quote: "Global collaboration is not just an option but a necessity. A harmonized approach to standards, policies, and technologies will define the future of 6G" – **Professor Guru Madhavan**.

These recommendations reflect the workshop's vision for Scotland and the UK to become global leaders in 6G research and innovation, ensuring a future-ready digital ecosystem.

10. Acknowledgments

Professor Tariq S. Durrani extends heartfelt thanks to all those involved in the organization of this landmark event. The collaboration between the University of Strathclyde and the University of Glasgow was pivotal in making this international Workshop a success. Special appreciation goes to **Professor Robert Stewart**, **Professor Muhammad Ali Imran**, and their teams for their invaluable contributions.

The leadership and support of **Sir Jim McDonald**, Principal of the University of Strathclyde, and **Dame Muffy Calder**, Vice-Principal and Head of the College of Science and Engineering at the University of Glasgow, were instrumental in bringing this event to fruition. Their vision and commitment to advancing global collaboration in 6G research and innovation set the stage for meaningful discussions and actionable outcomes.

Support from the Scottish Government, Glasgow Marketing Bureau and the Universities of Glasgow and Strathclyde is also gratefully acknowledged, along with thanks for Mr Andrew Law for transcribing the meeting.

Sessions

10:00-10:05 Auditorium A

Opening Comments

Tariq S Durrani, *University of Strathclyde (UK)*
Mallik Tatipamula, *Ericsson Silicon Valley (USA)*

10:05-10:10 Auditorium A

Welcome

Jim McDonald, *President, Royal Academy of Engineering, and Principal, University of Strathclyde (UK)*

Professor Sir Jim McDonald is Principal and Vice-Chancellor of the University of Strathclyde.

He was elected President of the Royal Academy of Engineering in September 2019. He currently holds several senior non-executive business appointments with organisations including the Weir Group and Scottish Power plc. He holds the Rolls Royce Chair in Electrical Power Systems. In the Queen's Jubilee Birthday Honours List 2012, Professor McDonald was awarded a Knighthood for services to education, engineering and the economy.

In December 2023 he was appointed a Knight Grand Cross of the Order of the British Empire in the King's New Year's Honours list. The award is for his services to engineering, to education and to energy.

Monday, 24 June 2024 10:10-10:45 Auditorium A

Session 1: Welcome Comments from Academy Presidents

	John Ball	*President, Royal Society of Edinburgh*
	John Anderson	*President, US National Academy of Engineering*
	Catherine Karakatsanis	*President, Canadian Academy of Engineering*
	Indranil Manna	*President, Indian National Academy of Engineering*
	Marcus Wallenberg	*President, Royal Swedish Academy of Engineering Sciences*
Moderator:	**Tariq S Durrani**	*University of Strathclyde (UK)*

Sir John Ball PRSE FRS is President of the Royal Society of Edinburgh, Scotland's National Academy, and Professor of Mathematics at Heriot-Watt University. From 1996-2018 he was the Sedleian Professor of Natural Philosophy at Oxford. He is an active research mathematician working on nonlinear partial differential equations, the calculus of variations and their applications to materials science, liquid crystals and computer vision. He is a former President of the International Mathematical Union.

John L. Anderson is the president of the National Academy of Engineering since July 1, 2019. He served as president of the Illinois Institute of Technology and Distinguished Professor of Chemical Engineering from 2007 – 2015. Before that he was provost and executive vice president at Case Western Reserve University (2004–2007), following 28 years at Carnegie Mellon University. Dr. Anderson was elected to the NAE in 1992 and as an NAE Councillor in 2015.

In addition to his NAE membership, Dr. Anderson is a fellow of the American Academy of Arts and Sciences and the American Association for the Advancement of Science. He was appointed to the National Science Board in 2014. He received the Acrivos Professional Progress Award from the American Institute of Chemical Engineers (AIChE) and he is listed on the Alumni Wall of Fame at the University of Delaware. In 2012 he received the National Engineering Award from the American Association of Engineering Societies.

Catherine Karakatsanis started out as a structural engineer and has had a progressive career in engineering and management and is the Chief Operating Officer of Morrison Hershfield now Stantec, a diversified consulting engineering firm overseeing over 1,000 professionals. Catherine has also had professional public leadership roles including being elected the chair of Engineers Canada. She is currently the president of the Federation of International Consulting Engineers (FIDIC) representing over one million engineering professionals in about 100 countries worldwide and is on the board of the Canadian Council of Academies (CAE). She has consistently been recognized including being inducted into the CAE as a Fellow received the Gold Medal from Engineers Canada inducted into Canada's Top 100 Most Powerful Women Hall of Fame received an Honorary Doctorate from Western University and from the Metropolitan Toronto University to name a few.

Professor Indranil Manna, the 14th President of INAE and Vice Chancellor of BIT Mesra, Ranchi, India is a distinguished academic and materials engineer with teaching and research interests in phase transformation, alloy development, nanometric solids, and laser materials processing. He received PhD from IIT Kharagpur in 1990. He visited and had fruitful collaborations with many renowned universities abroad. He served as the Director of CSIR-CGCRI in Kolkata during 2010-2012 and of IIT Kanpur during 2012-2017. He is a Fellow

of all the national academies in science in India and of TWAS. He is passionate about technology development through translational research, innovation, and entrepreneurship.

Marcus Wallenberg is the Chair of the Board of Directors of Skandinaviska Enskilda Banken (SEB). Marcus also chairs the board of Wallenberg Investments AB, Saab AB, FAM AB, and Patricia Industries. He serves on the boards of Investor AB, AstraZeneca Plc, EQT AB, and the Knut and Alice Wallenberg Foundation.

Marcus serves on several international advisory boards, including Temasek International Panel and Climate Leadership Coalition (CLC). He is also a member of Asia Business Council and Co-chair of Saudi Sweden Joint Business Council and India Sweden Joint Business Round Table.

Tariq Durrani is Research Professor at University of Strathclyde, Glasgow Scotland. From 2000-2006 he was Deputy Principal responsible for Staff Development, Hunter Centre for Entrepreneurship, Centre for Lifelong Learning and the University's IT and computing infrastructure.

His research covers Communications, Signal Processing, Artificial Intelligence and Technology Management. He has authored over 400 publications; supervised 45 PhDs, and has held Visiting appointments at several Universities in the US and China. He is Fellow: IEEE, UK Royal Academy of Engineering, Royal Society of Edinburgh, IET, and The World Academy of Sciences; and an International Member of the US National Academy of Engineering and the Chinese Academy of Sciences.

Monday, 24 June 2024 10:45-11:45 Auditorium A

Session 2: UK Telecom Activities and Strategies for 6G

Welcome:	**Geoff Huggins**	*Director Digital Scotland Scottish Government (UK)*
UK Telecoms Hubs:	**Harald Haas**	*Director of Platform Driving The Ultimate Connectivity (TITAN) - Network of Networks University of Cambridge (UK)*
	Dominic O'Brien	*Director of Hub on All-Spectrum Connectivity (HASC), University of Oxford (UK)*
	Muhammad Imran	*Director of Communications Hub for Empowering Distributed Cloud Computing Applications and Research, University of Glasgow (UK)*
	Rahim Tafazolli	*Director Institute for Communications Systems, University of Surrey (UK)*
Moderators:	**Chris Johnson**	*Pro VC QUB and Chief Scientist Designate DSIT (UK)*
	Jacqueline Redmond	*Chair, CENSIS (UK)*

To present current developments and future directions of communications in the UK.

Welcome To Scotland, Our Vision for a Digital Future

Geoff Huggins

Director Digital Scotland Scottish Government (UK)

Geoff Huggins is Director for Digital at the Scottish Government. Previously he was Director of the NHS Education Scotland Digital Service working to create the NHS National Digital Platform. From 2013 to 2018 he was Director for Health and Social Care Integration and from 2017 to 2018 also Director for Digital Health and Social Care. Prior to that he was Head of Mental Health for nine years. From 1991 to 1998 he worked for the Northern Ireland Office working on security and political development. He holds degrees in law and criminology from Queen's University, Belfast. He is a non-executive director of Cornerstone, Penumbra and the International Initiative for Mental Health Leadership. He runs a little, takes photographs and watches films.

Professor Harald Haas received his PhD degree from The University of Edinburgh in 2001. He is the Van Eck Professor of Engineering and the Director of the LiFi Research and Development Centre (LRDC) at the University of Cambridge. Prof Haas initiated and co-founded pureLiFi Ltd. and currently holds the position of Chief Scientific Officer (CSO). He leads one of three new Telecoms Hubs on 'Network of Networks' in the UK, TITAN, which is a consortium of 16 universities. His main research interests are on optical wireless communications. Prof. Haas has delivered two TED talks and one TEDx talk which have been watched online more than 5.5 million times. Prof Haas was awarded a Royal Society Wolfson Research Merit Award in 2017. In 2019 he received the IEEE Vehicular Society James Evans Avant Garde Award and the Enginuity The Connect Places Innovation Award in 2021, and a Humboldt Research Award in 2022.

Professor Dominic O'Brien is a Professor of Engineering Science at Oxford and leads the optical communications group. He leads the recently funded EPSRC Hub in All-Spectrum Connectivity, and is also Director of the UK National Hub in Quantum Computing and Simulation

The group has a wide range of experience in free space optical communications and optical wireless, demonstrating integrated optical wireless transceivers, full room-scale systems at 300Mbit/s, integrated visible light communications systems, Tbit/s optical wireless links, retro-reflecting communications both indoors and outdoors, novel transmitters and receivers, and indoor quantum key distribution."

Prof. Muhammad Imran and his team, spearhead global advancements in the area of communication systems. His pioneering contributions in self-organized cellular networks and energy-efficient communications are widely cited and adapted in industry. Leading a prominent transnational education initiative, he represents Scottish Higher Education internationally. Honoured as Fellow RSE, IET, RSA, EAI, AIIA, and

HEA Senior Fellow, he guides a 100+ member research group in Scotland. With over 20 years of academic and industry expertise, he holds pivotal roles in technical bodies and multi-million-pound projects. Additionally, he consults for international projects and local firms on self-organized networks and 5G technology applications.

Rahim Tafazolli is the only Regius Professor in Electronic Engineering. He is Fellow of Royal Academy of Engineering (FREng), FIET, Fellow of WWRF a professor of Mobile and Satellite Communications, and is founder/director of the 5/6G Innovation Center since 2012. He is also Director of Institute for Communication Systems (ICS) at the University of Surrey. He has a good relationship with the UK government and local council, and has cooperated with Huawei for many years to support the cooperation and technical research of Huawei and Surrey University in 5/6GIC in public.

Chris Johnson is Professor of Computing Science and Pro Vice Chancellor for Engineering and Physical Sciences at Queen's University, Belfast. From 29th July, he will serve as the first Chief Scientific Advisor in the UK Department for Science, Innovation and Technology. He brings international experience in the Science and Engineering of complex systems; with particular expertise in safety and security. He served as an expert witness to the Grenfell Tower Public Inquiry, is a founding member of the UK National Cyber Advisory Board within the National Security Secretariat and has supported the integration of commercial space operations into NASA's human spaceflight programme. Chris is an advocate of science and engineering as enablers for economic and social prosperity. In particular, he has pioneered the use of ethics to increase confidence in the use of Machine Learning for the highest-risk applications, including for the UK Ministry of Defence.

Jacqueline Redmond is a champion of sustainable innovation and delivering a just net zero transition. She currently chairs CENSIS, the SME Innovation Centre for sensing, imaging and IOT technologies. She is also on the Board of the Scottish National Investment Bank and chairs, it Risk and Conflicts Committee. Previously, she led Strathclyde University's PNDC industrialisation centre delivering decarbonisation solutions through whole energy solutions. Her experience includes roles such as Chief Risk Officer at the Green Investment Bank and executive roles at Shell and Scottish Power. A Chartered Engineer, Jacqueline holds degrees from both Strathclyde University and Paisley College of Technology.

Monday, 24 June 2024 11:45-13:00 Auditorium A

Session 3: International 6G Strategies and Use Cases

Panelists:	**Kiran Kuchi**	*IIT Hyderabad (India)*
	Halim Yanikomeroglu	*Carleton University (Canada)*
	Venki Ramaswamy	*Chief Technologist for Next G, Mitre Corporation (USA)*
	Magnus Frodigh	*Vice President and Head of Research, Ericsson (Sweden)*
	Takehiro Nakamura	*Chief Standardization Officer, DoCoMo (Japan)*
	Ashutosh Dutta	*Past Chair, IEEE Future Networks, Johns Hopkins University (USA)*
Moderators:	**Al P Pisano**	*UC San Diego (USA)*
	Muriel Medard	*MIT (USA)*

Representatives will articulate their national strategies for communications and 6G developments.

Bharat 6G Alliance's Vision and Initiatitives for Transforative 6G Tedchnololgies in India

Kiran Kuchi

IIT Hyderabad (India)

Professor Kiran Kuchi is a Professor in the Department of Electrical Engineering at the Indian Institute of Technology Hyderabad. He leads 5G-advanced and 6G research and standards development efforts at 3GPP (Third Generation Partnership Program), a global body that develops cellular communications specifications. Professor Kuchi is the author of more than 200 international patents, some of them are declared as 5G standards essential patents (SEPs) to TSDSI and 3GPP. Prof. Kuchi founded WiSig Networks Pvt Ltd, at IITH technology incubator. IITH and WiSig jointly developed and commercialized 5G base station and user equipment (UE) IPs and NB-IoT SoC.

Canada's Future Networks Vision

Halim Yanikomeroglu

Carleton University (Canada)

Dr. Halim Yanikomeroglu is a Chancellor's Professor in the Department of Systems and Computer Engineering at Carleton University, Canada. His research group has made substantial contributions to generations of wireless technologies; his group's current focus is the wireless access architecture of the future including non-terrestrial networks (NTN). His extensive collaboration with industry resulted in 40 granted patents. He is a Fellow of CAE (Canadian Academy of Engineering), IEEE, EIC (Engineering Institute of Canada), AAIA (Asia-Pacific Artificial Intelligence Association), and a Distinguished Speaker for both IEEE Communications Society and IEEE Vehicular Technology Society. Dr. Yanikomeroglu received several awards for his research, teaching, and service.

US' Next 6G Initiatives

Venki Ramaswamy

Chief Technologist for Next G, Mitre Corporation (USA)

Dr. Venkatesh "Venki" Ramaswamy is Distinguished Chief Technologist for NextG at MITRE Labs in Bedford, Massachusetts, where he currently leads technical innovation and R&D activities in 5G/6G technologies. He has more than 22 years of experience in the telecommunications industry and has held technical leadership positions at top technology companies, startups, and research labs. Currently he serves as one of the active industry members of the ATIS/Next G Alliance Research Council, working on the development of a comprehensive North American 6G strategy. He is also an industry researcher at the NSF Edge AI Institute, where he explores synergies between networking and AI. He has published more than 50 peer-reviewed publications and holds numerous patents, served as a Technical Program Committee (TPC) member for various conferences, and participated in several technical panels. He received his PhD in Electrical Engineering in 2007.

Europe 6G Vision including the Position of the EU Flagship Project Hexa-X-I

Magnus Frodigh

Vice President and Head of Research, Ericsson (Sweden)

Dr. Magnus Frodigh is Vice President and Head of Ericsson Research. In this role he leads Ericsson's long-term technology research organization, its close collaboration with academia and industry, and its contributions to the Ericsson business and product development. He holds a Master of Science degree from Linköping University of Technology, Sweden, and a Ph.D. in Radio Communication Systems from the Royal Institute of Technology, where he is also adjunct Professor in Wireless Infrastructures. He is a Fellow of the Royal Swedish Academy of Engineering Sciences (IVA)

Magnus Frodigh joined Ericsson in 1994 and has over the past three decades held various key senior positions within Research & Development and Product Management, throughout the generations of mobile technology, from 2G all the way to current research on 6G technologies. He holds 29 patents.

5G Evolution and 6G

Takehiro Nakamura

Chief Standardization Officer, DoCoMo (Japan)

Mr. Takehiro Nakamura joined NTT Laboratories in 1990. He is now Chief Standardization Officer in NTT DOCOMO, Inc. He has been engaged in R&D and the standardization activities for advanced radio and network technologies of W-CDMA, HSPA, LTE/LTE-Advanced, 5G and 6G, and engaged in strengthening inter-industry collaboration.

He has been contributing to standardization activities in ARIB, ITU and 3GPP since 1997, including as vice chair and chair of 3GPP TSG-RAN from 2005 to 2013. Currently, he plays important roles to promote and accelerate 5G and 6G in Japan and globally as the Acting Chairman of Strategy & Planning Committee and the leader of Millimeter wave Promotion Ad Hoc of 5G Mobile Communications Promotion Forum(5GMF), the leader of Cellular System Task Group of ITS Info-communications Forum, the leader of White Paper Subcommittee in Beyond 5G Promotion Consortium in Japan and the Board member of 5G-ACIA.

IEEE 2030 Timeframe

Ashutosh Dutta

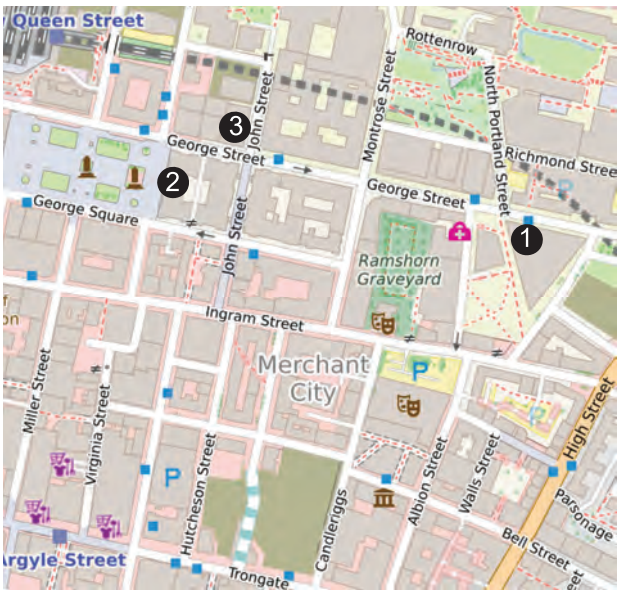
Past Chair, IEEE Future Networks, Johns Hopkins University (USA)

Ashutosh Dutta is Chief 5G Strategist at Johns Hopkins University Applied Physics Labs. He serves as the Director of Doctor of Engineering at JHU and is past Chair of the Engineering Professional Program at JHU's ECE department. Earlier, he served as Director of Technology Security at AT&T, CTO of Wireless at NIKSUN, Senior Scientist in Telcordia Research, Director of Central Research Facility at Columbia University, and Computer Engineer with TATA Motors. Ashutosh is a Distinguished Alumnus of NIT Rourkela with a BS in Electrical Engineering, an MS in Computer Science from NJIT, and a Ph.D. in EE from Columbia University. Ashutosh is an IEEE Fellow and founding co-chair for IEEE Future Networks.

Albert P. Pisano is Dean of the Jacobs School of Engineering at UC San Diego and Special Adviser to the Chancellor for Campus Strategic Initiatives. At UC San Diego, he has held the Walter J. Zable Chair since he joined the campus as engineering dean on September 1, 2013. He was elected to the National Academy of Engineering in 2001. Previously, Pisano served on the UC Berkeley faculty for 30 years where he held the FANUC Chair of Mechanical Systems and was co-director of the Berkeley Sensor & Actuator Center. Since 1983, Pisano has graduated over 70 Ph.D. and 75 M.S. students. From 1997 to 1999, Pisano was a program manager for the MEMS Program at DARPA. He is a co-inventor listed on more than 36 patents in MEMS and has co-authored more than 400 archival publications.

Muriel Médard's bio appears on page 11.

1 TIC **2 City Chambers** **3 AC Marriott**



Monday, 24 June 2024 14:15-15:30 Auditorium A

Session 4: Industry Influencers Forum I

Panelists:	**Mallik Tatipamula**	*CTO, Ericsson Silicon Valley (USA)*
	Maria Cuevas	*Network Infrastructure Research Director BT (UK)*
	Junyi Li	*VP Engineering and Qualcomm Fellow, Qualcomm (USA)*
	Jeff White	*CTO Edge, DELL Computers (USA)*
	Victor Bahl	*CTO Azure Microsoft (USA)*
Moderators:	**Magnus Frodigh**	*Ericsson (Sweden)*
	Monisha Ghosh	*University of Notre Dame (USA)*

Presentations by senior industrialists addressing emerging opportunities, technologies for 6G development and vehicles for greater industry engagement and international collaboration between industry, academe and government agencies.

Over 34 years of working in telecommunications, **Mallik Tatipamula** has made key contributions to advancing network transitions and addressing the digital divide in society. As Chief Technology Officer at Ericsson Silicon Valley, Mallik leads Ericsson's thought leadership in 5G and 6G technologies, leading efforts to bring together industry, academia, and government around the possibilities of future wireless systems.

He has held leadership positions at F5 networks, Juniper networks, Cisco, Motorola, Nortel, and IIT Madras. His work on transition to software-centric 5G networks for Industry 4.0 applications has resulted in landmark innovations such as network-slicing. Awards include CTO of the Year from Silicon Valley Business Journal and IET Chief Engineer of the Year. He is a fellow of the Royal Academy of Engineering, the Royal Society of Edinburgh and the Canadian Academy of Engineering.

Maria Cuevas leads the Networks Infrastructure Research unit in BT's Group's Research and Network Strategy and Research department. Her team's mission is to research and develop technologies to enhance BT's network infrastructure and connectivity services. Maria has worked in BT Group for 24 years, and has played multiple roles across design, architecture, technology strategy and research. During that time, she has been involved in a number of key transformational programmes and projects including all-IP transformation, spectrum acquisition and platform procurement activities amongst many others. She has also played a key role in standards and industry bodies, including ETSI, GSMA, Wireless Broadband Alliance and the Telecom Infrastructure Project amongst others. She has authored over 30 inventions related to telecomms systems, which have generated over 100 granted patents so far. Maria was awarded the "Women in Telecoms" Award by the Institute of Telecoms Professionals in 2017.

Junyi Li is a Vice President of Engineering and Qualcomm Fellow at Qualcomm. Junyi was a key inventor of Flash-OFDM, the first commercially deployed OFDMA-based mobile broadband wireless communications system. He was a co-founder of Flarion Technologies, a startup acquired by Qualcomm in 2006. Prior to that, he was with Bell Labs research. Since joining Qualcomm, Junyi has spearheaded research projects on D2D communications, V2V communications, and mmWave communications. He received a Qualcomm IP Excellence Award in 2020 and currently he holds more than 2,000 U.S. granted patents. He is a Fellow of the IEEE and co-authored the book, "OFDMA Mobile Broadband Communications," published by Cambridge University Press.

Jeff White is the CTO for Edge at Dell Technologies. Jeff's leads the research and development of Edge technologies for Dell's product and operations. His technology focus is on edge application execution characterization and management, edge scheduling/control algorithm design, edge data management, AI/ML edge operations, AI/ML drift detection and mitigation, edge networking optimization, and emerging machine reasoning control for distributed platforms. He holds 10 patents in these areas. Jeff has also held senior roles at early-stage artificial intelligence/machine reasoning-based robotic process automation technology provider and served as CTO of Elefante Group, a stratospheric wireless communications platform. He also held senior positions at Hewlett Packard Enterprise, Ericsson and Alcatel-Lucent where he led technology initiatives, solutions development, business development and services delivery. Prior Jeff worked at Cingular Wireless and BellSouth in technology and operations roles.

Victor Bahl is a technical fellow and chief technology officer in Microsoft's strategic missions and technologies division. Previously, he was the founding director of the networking research group and he served on the leadership team of Microsoft Research. He is the original co-inventor of edge computing and the architect of the strategy that led to the creation of Microsoft's Azure for Operators business. Dr. Bahl has delivered numerous foundational technologies to Azure, XBOX and Windows. He has published over 140 papers with over 75,000 citations, he is the author/co-author of 200+ patents, and for unique research has received four lifetime achievement awards. He is a Fellow of ACM, IEEE, and AAAS.

Dr. Magnus Frodigh's bio appears on page 8.

Monisha Ghosh is a Professor of Electrical Engineering at the University of Notre Dame and a member of the Notre Dame Wireless Institute. She is also the Policy Outreach Director for SpectrumX, the first NSF Center for Spectrum Innovation and the co-chair of the FCC's Technological Advisory Council Working Group on Advanced Spectrum Sharing. Her research interests are in next generation wireless systems: cellular, Wi-Fi and IoT, with an emphasis on spectrum sharing and coexistence. Prior to joining the University of Notre Dame in 2022, she was the Chief Technology Officer at the FCC, a Program Director at the NSF, Research Professor at the University of Chicago and spent 24 years in industry research at Bell Labs, Philips Research and Interdigital working on wireless systems. She obtained her B.Tech from IIT Kharagpur in 1986 and Ph.D. from USC in 1991. She is an IEEE Fellow.

M nday, 24 June 2024 16:00-17:15 Auditorium A

Session 5: Future Policies Framework and Spectrum Requirements Panel

Panelists:	**David Willis**	*Group Director for Spectrum OFCOM (UK)*
	Robert Stewart	*University of Strathclyde (UK)*
	Monisha Ghosh	*University of Notre Dame (USA), Former CTO FCC*
	Mark Waddell	*Lead R&D Engineer, BBC R&D (UK)*
	David Lister	*6G Research Lead Vodafone Group (UK)*
	Ed Tiedemann Jr	*Senior VP Engineering and Qualcomm Fellow, Qualcomm Technologies, Inc (USA)*
Moderators:	**Abhaya Sumanasena**	*UK Spectrum Policy Forum (UK)*
	Ashutosh Dutta	*Johns Hopkins University (USA)*

In a Session organised by the UK Spectrum Policy Forum (SPF), the panelists will consider the spectrum requirements of 6G and consider some of the future policies and frameworks that could support the needs of this next generation. Although 6G will use many of the higher bands including mmWave, and THz and LiFi, the low and mid bands (from 450MHz to 6GHz) will also remain essential for wide area coverage in licensed and unlicensed bands. Further the evolution and growth of shared spectrum strategies will bring new opportunities and opportunities for international collaboration.

David Willis as over 30 years of experience in the telecom industry working in both the private and public sectors in a variety of executive and technical leadership positions, most recently as Group Director Spectrum at Ofcom, President of the Communications Research Centre (Canada), and Senior Director for Spectrum Engineering at Innovation Science and Economic Development (Canada). Prior to that David held significant product leadership roles in BlackBerry's handset business and Nortel's Optical and Network Management business units.

Bob Stewart is a Professor at the University of Strathclyde in the Dept of Electronic Eng, where he leads the 'StrathSDR' team working on software defined radio (SDR) and next generation radio access networks using shared spectrum access. Bob is also a director of the University startup SDR company Neutral Wireless Ltd working on SDR enabled private 5G network solutions in a number countries for broadcast use cases. Currently the StrathSDR team has strategic partnerships with key technology companies, including AMD, Cisco and BBC R&D. Over a 30 year Bob has published 4 books and more than 200 papers.

Monisha Ghosh's bio appears on page 9.

Mark Waddell is currently a Lead Engineer at BBC R&D specialising in wireless technologies. He has worked extensively on RF receiver and FPGA systems design, and more recently he has increasingly focussed on wireless systems and networks for live TV production. He chairs the Programme Making and Special Events (PMSE) group at the Digital Television Group (DTG) and is the Rapporteur for two ETSI standardisation groups. He was involved in pioneering projects developing the first Digital Radio Cameras and diversity receivers at the BBC and has been working on 5G systems for programme making since 2020.

Ashutosh Dutta's bio appears on page 8.

David Lister is a research manager in Vodafone Group responsible for its 6G vision and strategy, and he co-leads NGMN's 6G strategic programme that sets out mobile operators' views and objectives on next generation technology. He joined Vodafone in 1992 and has worked on the introduction of 2G, 3G, 4G, and 5G technologies, including radio propagation, system performance evaluation and spectrum aspects. David holds degrees in electrical engineering, renewable energy, is a Chartered Engineer and Member of the IET.

Dr. Edward G. Tiedemann, Jr. is an IEEE Fellow, a Qualcomm Fellow, and a Senior Vice President of Engineering of Qualcomm Technologies, Inc. He created Qualcomm's worldwide standardization and industry organization activities which he led until he recently stepped back to focus on technical issues. Dr. Tiedemann has been active in every G since his instrumental work in the design and development of the TIA/EIA/IS-95 CDMA system. Dr. Tiedemann has almost 300 granted US patents and has participated in many papers, conference lectures, and industry panels. He is involved with multiple industry organizations. He is also a member of the Boards of Trustees of the Peabody Essex Museum and the Concord Museum. He has received numerous recognitions, including the Robert M. Walp Industry Humanitarian Award from the IEEE Communications Society. Dr. Tiedemann holds the Ph.D. degree from MIT, the MS degree from Purdue University, and the BS degree from Va Tech.

Dr. Abhaya Sumanasena is the Head of Policy and Regulation at Real Wireless, a member of the Ofcom Spectrum Advisory Board (OSAB) and Chairman of the UK Spectrum Policy Forum (UK SPF). Abhaya is a leader renowned for his strategic insight and hands-on expertise in addressing challenges related to spectrum policy, regulation and technology issues within national regulatory authorities, MNOs and vendors. In his previous roles, Abhaya successfully delivered multi-million-pound strategic network capacity programs at Three UK and provided leadership in deploying the UK's first HSDPA network. Abhaya also played an influential role in maintaining UK propositions and developing spectrum policies at Ofcom.

Tuesday, 25 June 2024 9:15-10:30 Auditorium A

Session 6: Engineering Academic Influencers Panel

Panelists:	**Tommy Svensson**	*Chalmers University (Sweden)*
	Alberto Leon-Garcia	*University of Toronto (Canada)*
	Radha Krishna Ganti	*IIT Madras (India)*
	Muriel Medard	*MIT (USA)*
	Dereje Agonafer	*University of Texas, (Arlington, US)*
Moderators:	**Muffy Calder**	*University of Glasgow (UK)*
	Harald Haas	*University of Cambridge (UK)*

Panellists will outline their thoughts on key academic research questions for the next decade, why they have selected them, and which of them will require international collaboration and the nature of that collaboration. The panel will reflect upon what societal needs might be met or current solutions enhanced and new applications enabled; what would represent big breakthroughs in these areas and are they likely to be achieved; and is there a risk of east/west (or other) divide, and mplications. Finally, the panellists will consider how ground-breaking research can be effectively translated.

Tommy Svensson is Full Professor in Communication Systems at Chalmers University of Technology in Gothenburg, Sweden, where he is leading the Wireless Systems research on air interface and wireless backhaul networking technologies for future wireless systems. He received a Ph.D. in Information theory from Chalmers in 2003, and he has worked at Ericsson AB with core networks, radio access networks, and microwave transmission products. He has been involved in top European and international research towards 4G, 5G and currently 6G on physical layer algorithms, multiple access, resource allocation, cooperative/ context-aided/ secure communications, mm-wave/ sub-THz communications, C-V2X, JCAS, satellite networks, sustainable design, and end-to-end architecture. He has been coordinator of MSc program at Chalmers, and is currently board member of the Swedish Post and Telecom Authority (PTS).

Alberto Leon-Garcia is Professor in Electrical and Computer Engineering at the University of Toronto. He is a Fellow of the Royal Society of Canada, the Canadian Academy of Engineering, and a Life Fellow of the IEEE. He authored: Probability and Random Processes for Electrical Engineering, and Communication Networks: Fundamental Concepts and Key Architecture. He led the NSERC Strategic Network for Smart Applications on Virtual Infrastructures (SAVI). SAVI designed and deployed a national testbed in Canada that converges cloud computing and software-defined networking. His research is focussed on intelligent automated management systems for large-scale infrastructures.

Radha Krishna Ganti is a Professor at the Indian Institute of Technology Madras, Chennai, India. He received his B. Tech. and M. Tech. in Electrical Engineering from the Indian Institute of Technology, Madras, and a Masters in Applied Mathematics and a Ph.D. in EE from the University of Notre Dame in 2009. His research interests include digital communications, convex optimisation and building communication systems. He received the 2014 IEEE Stephen O. Rice prize, and the 2014 IEEE Leonard G. Abraham prize and the 2015 IEEE Communications society young author best paper award. He was also awarded the 2016-2017 Institute Research and Development Award (IRDA) by IIT Madras. In 2019, he was awarded the TSDSI fellow for technical excellence in standardisation activities and contribution to LMLC use case in ITU. He was the lead PI from IIT Madras involved in the development of 5G base stations for the 5G testbed project.

Muriel Médard is the NEC Professor of Software Science and Engineering in the Electrical Engineering and Computer Science Department at MIT and is Chief Scientist for Steinwurf, which she co-founded. She is a Member of the German National Academy of Sciences Leopoldina, the American Academy of Arts and Sciences, the US National Academy of Engineering. She was co-winner of the MIT 2004 Harold E. Edgerton Faculty Achievement Award and was named a Gilbreth Lecturer by the US National Academy of Engineering in 2007. Muriel received the 2017 IEEE Communications Society Edwin Howard Armstrong Achievement Award, the 2016 IEEE VTS James Evans Avant Garde Award and the 2022 IEEE Kobayashi Computers and Communications Award. She set up the Women in the Information Theory Society (WithITS) and Information Theory Society Mentoring Program, for which she was recognized with the 2017 IEEE Aaron Wyner Distinguished Service Award. Muriel has over eighty US and international patents awarded.

Dereje Agonafer, Presidential Distinguished Professor, MAE at UT ARLINGTON, is a Member of the National Academy of Engineering, Fellow of AAAS and NAI, and ASME Honorary Member. Funding sources include Google, Intel, META, Microsoft, NVIDIA, TI and government agencies. Awards including: 2020 SemiTherm Lifetime Achievement and 2019 Heat Transfer Memorial Award. Advised 260 graduate students (currently 15 PhDs). He and his wife Carolyn have a son, Dr. Damena Agonafer, Associate Professor & Clark Faculty Fellow, University of Maryland College Park, and a daughter, Dr. Senayet Agonafer, a Regional Chief Radiologist at Lennox Hill Radiology in New York City.

Dame Muffy Calder has been Vice-Principal and Head of College of Science and Engineering, University of Glasgow, since 2015, previously she was the Chief Scientific Adviser for Scotland. She is a computer scientist with research interests in modelling and automated reasoning for complex, interactive, and sensor-driven systems, responsible AI, and privacy intrusion and national security. She is a member of the Prime Minister's Council for Science and Technology and was deputy chair of REF Main Panel B. Previously, she was a member of UKRI-EPSRC council, a Royal Society Leverhulme Research Senior Fellow, and a Suffrage Science award winner in Computing Science and Mathematics.

Harald Haas's bio appears on page 6.

T esday, 25 June 2024 11:00-12:15 Auditorium A

Session 7: Standards Forum

Panelists:	**Luis Jorge Romero**	*Director General, ETSI (France)*
	Ed Tiedemann Jr	*Senior VP Engineering and Qualcomm Fellow Qualcomm Technologies, Inc (USA)*
	Kota Kodai	*ITU-Telecom Standardization Bureau (Switzerland)*
	Iain Sharp	*ATIS (USA)*
	Matthew Baker	*Bell Labs Fellow, Nokia Standards (UK)*
Moderators:	**John Cioffi**	*Stanford University (USA)*
	James Irvine	*University of Strathclyde (UK)*

The panel will address what are the major standards efforts in 6G and more generally wireless today and how do they match with infrastructure costs, efficiency, and the environment's sustainability. Can ubiquitous federated monitoring and measurement become a well-supported standards result that leads to vastly improved stable high-speed, low-latency-where-necessary, and ubiquitous communication to all global interests. How well do we monitor the effectiveness of our standards output today?

Luis Jorge Romero, Director General of ETSI, has 30 years of experience in the telecommunications sector. At ETSI he has initiated a global standardization partnership for IoT communications, oneM2M. He has overseen the rapid development of ETSI's Industry Specification Groups accelerating market penetration of new technologies and has enabled the first Open Source group in ETSI, leading to the new Software Development Groups initiated in 2022.

Previously he has held diverse Director positions in Spain, Morocco and Mexico, predominantly with Telefonica. As Global Director for International Roaming and Standards, and Director of Innovation and Standards, he oversaw Telefonica's participation in global standardization activities, and participated directly in the work of the Next Generation Mobile Networks (NGMN) Alliance and in the GSM Association (GSMA). Before joining ETSI in July 2011, he held the position of Director General of Innosoft and was also a partner and board member of the Madrid-based Innology Ventures.

Ed Tiedemann's bio appear on page 10.

Mr. Kota Kodai is Study Group Engineer of the Study Groups Department at the International Telecommunication Union Standardization Bureau in Geneva Switzerland from Oct 2023, where he is currently engaged in operating the International Numbering Resources and collaborations with other sectors in ITU and external SDOs.

Before joining ITU, he was with Nippon Telegraph and Telephone Corporation (NTT) Group for 16 years where he engaged in mobile network deployment (3G, 4G and 5G), radiocommunication standardization activities, and supporting the NTT Group's standardization activities. He received a B.E. in 2005, and a Master of Informatics in 2007 from Kyoto University, Japan.

Iain Sharp started his career in mobile standards by contributing to the definition of GSM Phase 1. Since then he has been involved with every generation and has served as Vice-Chair of 3GPP CT Plenary. Mr. Sharp is currently Principle Technologist at the North American 3GPP Organizational Partner ATIS and manages the interface between ATIS and 3GPP. Mr. Sharp has a degree in Electronics and Information Sciences from the University of Cambridge.

Matthew Baker is a Nokia Bell Labs Fellow and leads a RAN standardization team at Nokia. Prior to starting to address 6G, he has contributed to the standardization of 3G, 4G, 5G and 5G-Advanced in 3GPP, where he held the posts of Chairman and Vice-Chairman of 3GPP TSG RAN WG1 between 2009 and 2017. He holds degrees in Engineering and Electrical and Information Sciences from the University of Cambridge, UK. He is a Chartered Engineer and a Member of the Institution of Engineering and Technology, and has been a Visiting Professor at the University of Reading, UK. He is co-editor of the book "LTE – The UMTS Long Term Evolution: From Theory to Practice", has authored many papers and holds several hundred patents in the field of mobile communications.

John M. Cioffi – Illinois-BSEE: 1978, Stanford-PhDEE: 1984; Prof. EE, Stanford, 1986-present, now recalled emeritus. Bell Labs 1978-84; IBM Research 84-86. Founder Amati 1991 (1997 purchased by TI); Chairman and CEO ASSIA Inc., 2003-present. Cioffi's specific interests are in the area of high-performance digital transmission. Awards include The US National Medal of Technology (2023), presented by US President J. Biden, IEEE AG Bell (2010), Kirchmayer (2014) and Millennium Medals; Member Internet (2014) and Consumer-Electronics (2018) Halls of Fame; Marconi Fellow (2006); Member, US National (2001) and UK Royal (2009) Engineering Academies; IEEE Kobayashi, Armstrong, and Women-In-Coms-Mentor Awards. Cioffi has served over a dozen boards of directors, presently PhyTunes (Chairman) and Marconi Society. 800+ papers and 150+ heavily licensed patents.

Dr James Irvine is a Reader at the University of Strathclyde in Glasgow. Currently working on security for 5G and CNI, in particular for energy network communications, he has been involved with wireless standards development since the early 1990s, and has testified as an expert witness in standards patent cases in the UK and Netherlands. A past President of the IEEE Vehicular Technology Society, he currently chairs the volunteer committee responsible for overseeing the IEEE product portfolio. Prior to that, he chaired the IEEE Standards Education Committee, and helped develop IEEE standards training workshops which he has delivered in Europe, the US and South America. He is a co-author of two text books, 7 patents, and over 200 research papers.

Tuesday, 25 June 2024 12:15-13:00 Auditorium A

Session 8: Industry Influencers Forum II

Panelists:	**Ben Allen**	*Director, Eutelsat OneWeb (UK)*
	Mo Zoualfaghari	*Global Technology Lead, Amazon Wireless Services Telecom (UK)*
	Dilip Krishnaswamy	*Director Bangalore Centre for Development of Telematics C-DOT (India)*
	Leon Lobo	*Head National Timing Centre, National Physical Laboratory (UK)*
	Yoshi Nakajima	*Tokyo Institute of Technology, Engineering Academy of Japan (Japan)*
Moderators:	**Rahim Tafazolli**	*University of Surrey (UK)*
	Toktam Mahmoodi	*Kings College London (UK)*

This session will focus on the roadmap to 6G in the view of industry experts, and from the perspective of different connectivity solutions (satellite, IoT, indoor, outdoor, fixed, and mobile wireless) as well as different services. The panel will delve into opportunities for global reach in emerging applications, the role AI would play in the roadmap to 6G, and how 6G could catalyse the AI revolution, among other topics.

Professor Ben Allen is Director of Communication Systems Engineering with Eutelsat-OneWeb and Visiting Professor at the University of Surrey. His career has focussed on telecommunications R&D, spanning academia and industry, including as a Royal Society Industry Fellow with the University of Oxford and Network Rail. He has led numerous R&D activities relating to communications engineering, several of which exhibited state-of-the-art advances. Over the years he has published numerous papers, several books and filed several patents relating to telecommunications research developments. He is a Chartered Engineer, Fellow of the Institution of Engineering & Technology, Institute of Telecommunications Professionals, and the Higher Education Academy.

His current responsibilities include air interface definition for 'NextGen' and technical lead for the UK-Space Agency / European Space Agency "5G-piliot" project charged with demonstrating back-hauling of a 5G terrestrial mobile network over the Eutelsat-OneWeb LEO system.

Yoshikazu Nakajima is a professor and the director of Department of Biomedical Informatics, Institute of Biomaterials and Bioengineering, Tokyo Medical and Dental University, TMDU. TMDU will merge with Tokyo Institute of Technology and start a new university, Institute of Science Tokyo, October 2024. He received his PhD from Osaka University in 1997 and worked for Mitsubishi Electric Corporation. He was then an assistant professor at Osaka University Medical School from 2000, and an associate professor at the University of Tokyo from 2005. He then joined to TMDU in 2017.

He is a member of the Engineering Academy of Japan and was a director board member from 2019 to 2022. He is a director board member at Japan Society of Computer Aided Surgery (JSCAS) from 2022. His research interest includes artificial intelligence for medicine, medical image processing, computer integrated surgery, surgical robotics, biomedical informatics and computer vision.

Prof Mohammad Zoualfaghari is the Worldwide Technology Leader for Telco at AWS, leading Telecom initiatives and innovations in 5G, IoT, and Generative AI. He also heads the TM Forum at Amazon and is a visiting professor at the University of Surrey's 5G/6G Innovation Centre. Named the UK's Engineer of the Year in 2021, he invented Zero Touch Onboarding technology. Previously, he was a research manager and IoT architect at BT. Holding a PhD and MEng from the University of Birmingham, he is an active IET and IEEE member with numerous patents and publications.

Dilip Krishnaswamy received a PhD degree in electrical engineering from the University of Illinois at Urbana-Champaign. He has worked as a Platform Architect at Intel, a Senior Staff Researcher in the Office of the Chief Scientist at Qualcomm, as a Senior Scientist at IBM Research, as a Vice President for New and Emerging Technologies R&D at Reliance Jio Platforms. He is an inventor on 70+ granted US patents and 70+ research publications. He is presently serving as the Director for the Center for Development of Telematics in Bangalore, India driving R&D related to 6G and advanced 5G networks, systems, and applications.

Focussed on developing and delivering national timing strategy and policy, **Dr Leon Lobo** is SRO & Head of the National Timing Centre (NTC) programme at the National Physical Laboratory (NPL), developing capability toward resiliency in timing for our expanding digital infrastructure. He led the development of NPLTime®, NPL's certified fibre-delivered time dissemination solution to the City of London for high frequency trading systems and regulatory compliance. Dr Lobo convened and led a cross-government team developing the UK's first Timing Strategy and proposed the concept of the now developing National Timing Centre, recently embedded in UK PNT resilience policy as the source or 'heartbeat' of our critical national infrastructure.

Rahim Tafazolli's bio appears on page 7.

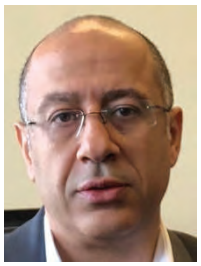
Toktam Mahmoodi is a Professor of Communication Engineering and Director of the Centre for Telecommunications Research (CTR) in King's College London. Toktam is vice-chair of IEEE WICE and IEEE ComSoc Aerial Communication Emerging Tech initiative. Her research focuses on the areas of mobile and cloud networking, and includes network intelligence, edge learning and networking, ultra-low latency networking, and network modelling and optimization. She has contributed to the ETSI, IETF and GPP standards, and has served on number of editorial boards, and the roles include the executive editor of Transactions on Emerging Telecommunications Technologies, series guest editor of JSAC series on network softwarization, area editor of IEEE Communications Standard Magazine, and editor of IEEE Communication Letters. Toktam served as technical committee chair and member of various IEEE ComSoc conferences.

T esday, 25 June 2024 14:00-15:30 Auditorium A

Session 9: International Research Funding Agencies Panel

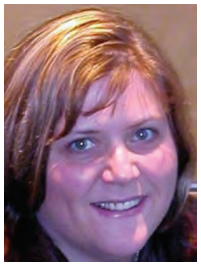
Panelists:	**Abouzeid Alhussein**	*National Science Foundation (USA)*
	Frédéric Pillot	*Vinnova (Sweden)*
	Janette Wark	*EPSRC Head of Regional Engagement Scotland (UK)*
	Tejas Patel	*DARPA (USA)*
	Pekka Rantala	*Head of 6G Bridge Program, Business Finland (Finland)*
Moderators:	**Henrik Almeida**	*Ericsson (UK)*
	Ellen Zegura	*National Science Foundation (USA)*

Many national funding agencies are significantly investing in 6G research. In this panel, we will discuss whether international alignment is necessary, feasible, and if current collaborations are sufficient and efficient, reflecting national and international interests, as well as the expectations on 6G becoming a global standard.

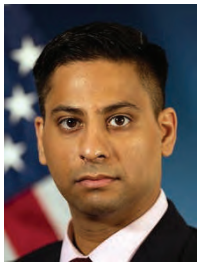


Dr. Alhussein Abouzeid is a Program Director in the Computer and Network Systems division, Computer and Information Science and Engineering directorate of the U.S. National Science Foundation. He is on leave from Rensselaer Polytechnic Institute, Troy, NY, where he is as a Professor of ECSE. He received his Ph.D. and M.S. degrees from University of Washington, Seattle, in 2001 and 1999, respectively, and the B.S. degree from Cairo University, Cairo, Egypt, in 1993, all in electrical engineering. He helped create several NSF national and international research programs. His publications/awards are in the area of wireless networking and mobile computing.

Frédéric Pillot has over twenty-five years of international experience in the public and private sectors working as Manager and Engineer. For the last four years at Vinnova, he has led and managed funding programs for research and innovations within industrial development and international collaboration, mainly focusing on information and communication technologies, digital transformation, and related societal challenges. Previously, he focused on business development processes and product solutions delivery projects to original equipment manufacturers and mobile network operators. Currently Frédéric is responsible for the 6G government assignment at Vinnova.



Dr Janette Wark is EPSRC Head of Regional Engagement for Scotland with responsibility for strengthening the EPSRC's relationships with local stakeholders including academic institutions, research and innovation organisations, local research-intensive industries, the Scottish Government and related bodies. Janette has over 25 years of experience in research and innovation across Scotland, with a strong track record of building impactful collaborative research projects and partnerships with academia, civic partners and industry, including SMEs and global companies. Prior to this Janette completed her PhD in stochastic modelling of the River Clyde Catchment Area in 2000 whilst developing and commercialising a river mapping tool.



Mr. Tejas Patel joined DARPA as a program manager in August 2019 to develop, execute, and transition programs in cyberspace operations and other defense mission areas.

Prior to his position at DARPA, Patel served as a principal investigator for a DARPA I2O program. He also has served as a contractor supporting I2O's portfolio of cyber research and development (R&D) programs, as well as a software engineer in private industry focused on the automation of computer network operations. Patel's prior civil service includes over half a decade of experience in cyber operations, development, and planning within the Department of Defense.

Mr. Pekka Rantala is the Head of Business Finland's 6G Bridge Program. This 4-year national program started in January 2023 with a funding budget of 130 MEUR. The public launch event in February was greeted in-person by Mr. Thierry Breton, European Commissioner for Internal Market and Mr. Pekka Lundmark, CEO, Nokia. The 6G Bridge program focuses on ecosystem-driven collaboration in research and innovation for 5GA/6G and building future business ecosystems in future connectivity. Pekka is also Business Finland's delegate for the European Space Agency's (ESA) Business Incubation Centre in Finland. Previously Pekka acted as National Contact Point for Horizon 2020/Horizon Europe (EU's crown jewel of funding programmes for research and innovation with budgets of €80/€95.5 billion) in digital themes and clusters.

Dr. h.c. Henrik Almeida, Head of Ericsson Research UK, started working at Ericsson in 1990 and joined Ericsson Research in 1998, where he has held various research leader positions over the past 25 years. In 2010, he was awarded a technical honorary doctorate in Lund, for research in broadband access technologies. Initially leading the evolution of fixed broadband access transceiver technologies, including GPON, VDSL2, and G.fast, which eventually led to the ITU-T standard G.9701. Later, into wireless access research, spearheading a new concept and architecture for Ericsson's indoor 'Radio Dot System' and contributing to advanced compression algorithms for the ORAN Low Layer Splits (LLS). In 2018, went on to secure, intelligent, and intent-based management solutions for Smart Industries (I4.0), while establishing a new Ericsson Research site in Istanbul. Since 2023, he started and is leading the new Ericsson Research site in London, which focuses on 6G research.

Dr. Ellen Zegura is Regents and Fleming Chair Professor in the School of Computer Science at Georgia Tech. Since August 2023, she is on loan from Georgia Tech to the National Science Foundation serving as Division Director for Computer and Network Systems (CNS) within the Computer and Information Science and Engineering (CISE) Directorate. Her research interests lie in computer networking, with an emphasis on mobile and wireless networks, and on ethics education in undergraduate computer science. She is a Fellow of the IEEE and a Fellow of the ACM.

Exhibitors

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