ADVANCED WIRELESS INSTITUTE

WIRELESS AT A CROSSROADS

Future Evolution, 6G, Energy, and Spectrum

Advanced Wireless Forum Report
November 2025

The Marconi Society

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About the Marconi Society

The Marconi Society builds communities of leaders and stakeholders that are at the forefront of emerging technology so that together we can create a more connected and sustainable world.

For over five decades, we have celebrated the innovators, both established and emerging, who have shaped our connected world. The Institutes provide platforms to convene our network of visionaries to collaborate on identifying, assessing, and recommending ways to ensure that emerging technologies benefit society.

About the Institute Forums

The Institute Forums bring together experts in Advanced Wireless, AI, and Internet Resilience to explore emerging opportunities and challenges. Each Forum fosters informed dialogue and actionable insights that strengthen the future of global connectivity.

About the Advanced Wireless Institute

The Advanced Wireless Institute serves as a neutral platform that brings together key stakeholders from across the wireless ecosystem — including equipment vendors, service providers, researchers, policymakers, and regulators — to collaborate on overcoming critical challenges in seamless wireless communication and accelerating global adoption. Building on Guglielmo Marconi's legacy of innovation, the Institute focuses on spectrum management, network optimization, and the integration of AI to enhance wireless performance. Its work culminates annually in the Advanced Wireless Forum, where leaders gather to set priorities and drive collective action.

Executive Summary

The Advanced Wireless Forum took place on November 13 & 14, 2025, at the Luskin Conference Center on the campus of the University of California, Los Angeles. The Forum brought together key stakeholders from across the wireless ecosystem to address the goal of ubiquitous and affordable connectivity. As a program of the Marconi Society, the Forum provided a neutral platform where wireless equipment vendors, service providers, researchers, academia, policymakers, and regulators could come together to discuss critical challenges in delivering seamless wireless communication services.

Program Summary

The inaugural meeting of the Advanced Wireless Institute brought together a diverse and engaged group of industry and academic leaders for two days of focused discussion at UCLA. The agenda, intentionally structured around interactive sessions rather than speaker-led presentations, generated substantive and wide-ranging debate across key technical and strategic topics. Participants responded positively to the collaborative atmosphere, noting that the workshop created an unusually open and productive environment for examining the future of wireless technologies.

Perspectives on the Future of Wireless

The first panel took a broad look at the future of wireless. At the heart of the debate was whether wireless traffic growth would soon level off, or whether there were new applications that would drive a resurgence of growth. This is a critical question with broad range of implications that should have set the basis for the rest of the event. If there is little growth then there is no need for more spectrum, for an expansive 6G, for innovation in generating higher data rates or establishing more capacity. If there is growth, then the converse is true.

The panel and the audience were split, approximately evenly. The hypothesis for little growth was set out in the book “The End of Telecoms History” made available to the participants at the meeting. Those who argued for growth thought it might come from smart glasses on the uplink, robots or autonomous cars, or AI (though some noted that AI might also reduce the data capacity and performance demands), or perhaps from widespread sensors used to build digital twins of public or private spaces. On the opposing side, one attendee noted that the rate of data usage growth had turned negative in a couple of Asian countries. It was suggested that this was due to improved compression algorithms for streaming data, the major consumer of data capacity. The audience accepted that much of the debate was a replay of the 5G era and perhaps even prior to that, that the business cases had not been scoped, and that views were more emotional than logical.

As a result of this split, there were also split views on whether 6G should be implemented and if so whether it would be “software only” or a substantial network change. This split was an important observation, showing a lack of consensus and certainty among the key decision makers, but also meant that the rest of the workshop had multiple scenarios to build on.

Future Wireless Architectures

The second panel looked at what architectures might be appropriate for a future world. The key debate centered around in-building. All accepted that, from an engineering perspective, in-building traffic, which comprises some 80-90% of all traffic, is much better served from within the building. But there was divergence on whether this should be from Wi-Fi or cellular, or some mix of both. To some degree the participants argued from the perspective of the "silo" they were currently in, which is very understandable but hints at a problem for the industry, that became even clearer in later panels. As a result, no clear verdict was reached.

A summary discussion of the morning raised the possibility that the military/government might be a key driver of future needs and architectures, although there was concern that they might not be "good bedfellows". This is particularly so for ISAC, discussed later, and a topic that kept recurring since it bears significantly on the question of whether 6G is needed.

There was an understanding that engineers are poor predictors of applications and that the application "developers" should be in the room. Unfortunately, there was also an acceptance that it was hard to know who the developers were or would be and even if identified to get them to participate in this kind of forum.

Power and Energy Consumption

The panel session on energy consumption raised a stark figure – that something like 23% of opex was spent on electricity. While intelligent software that turned off parts of base stations when traffic levels were low was helping, it was no panacea. It was even noted that some stadium focused base stations that are only used on game days are always kept on due to on-off reliability concerns. The application of AI might improve things a bit further but will also consume power and potentially more than is saved in the optimization.

The operators noted that we were close to a point where power costs impact design choices – 7GHz may be uneconomic because power for the higher order MIMO antennas needed in this band might be too expensive. But this important observation was not reflected in further discussions.

Spectrum Issues

The panel on spectrum issues focused primarily on the U.S. context, where recent legislation calls for the release of 800MHz of spectrum. Participants noted that the 800MHz figure is not clearly aligned with a specific long-term assessment of future demand, and that the bands currently being examined are those that can be made available quickly rather than those that might most strategically support evolving needs.

The discussion occasionally remained at a tactical level (e.g., whether CBRS should be re-auctioned or moved) rather than moving toward broader strategic considerations. Earlier sessions had highlighted that, if additional spectrum were needed, uplink capacity at frequencies below approximately 4GHz would likely be most impactful due to energy-efficiency constraints, while ISAC applications might require higher-frequency bands with larger bandwidths. These points, however, were not fully integrated into the debate. Some participants also acknowledged that innovation-driven applications, defense-related needs,

or new industry use cases could still generate future demand for spectrum, highlighting the uncertainty ahead.

The panel recognized that the federal mandate carries some risk of being based on assumptions that may or may not hold, yet it proved challenging to elevate the conversation fully to this strategic level. As with other panels, the session surfaced a **broad range of perspectives**, each shaped by different roles within the wireless ecosystem.

Operators noted that they were not seeing much traffic growth but that there could be some in future. There was discussion about FWA and a general view that it was only economic where there was spare network capacity that could be used "for free". Deploying additional carriers was too expensive both in capex and in opex (energy costs). Adding the cost of the spectrum on auction, MNOs would likely never seek to procure spectrum for FWA. Hence FWA was naturally limited, and the number of subscribers could be reduced if cellular traffic grew. Finally, it was noted that FWA was purely a U.S. phenomenon and would likely remain that way.

Operators were generally unconvinced about the need for 6G and were more focused on network automation, using ML and applications. If 6G were to occur there was general concurrence that it should be software only to avoid the high cost of new hardware and associated deployment costs. Hence, operators tended somewhat towards the "little growth" view but were keeping an open mind.

Innovation Without Influence: The Standards Challenge for Startups and Academia

The panel on innovation noted that start-ups struggled to influence 3GPP, but that there were other routes, such as Flarion using the IEEE to become established and then being acquired (in this case by Qualcomm) by someone who could take the ideas into 3GPP. Academics felt that they had indirect influence through publication of their research and ideas that would ultimately find their way into standards.

The panel debated what research was still needed in wireless and concluded this was very unclear beyond reliability, coverage and cost. Research on fundamentals was unlikely to yield significant gains and even if it did the gains might not be needed.

ISAC for 6G: Game Changer or Ghost of 5G Past?

The discussion on ISAC was long-awaited. As the only new concept for 6G its development could significantly influence the industry. All agreed that the business case was very unclear and most thought that the only viable business case was for military usage, likely for drone detection. This, of course, depends heavily on government procurement directions not only in the U.S., but on a European and global basis.

There was some debate and discussion about sensing for commercial applications and an acknowledgement that many had been identified. Unfortunately, none of the use cases were deemed to be economically viable, and there are concerns for operators over factors such as liability if the sensing data proved incorrect. The jury is still very much out here.

Future Wireless Applications

Wireless applications have historically required multiple generations to mature. For example, Wireless Application Protocol (WAP) existed before 3G but didn't mature until 4G. Similarly, VoIP started in 3G and matured in 4G. Smooth mobile video upload only arrived in the 5G era. Application development for 6G will be driven in part by unfulfilled 5G promises and external domain disruption.

AI is seen as major factor in 6G application development. AI currently runs primarily in the cloud with limited end device processing. The 6G vision of an integrated communication-compute infrastructure would enable a unified AI context across multiple personal devices, such as glasses, watch, phone, home gateway, car, etc. Technical implementation can be accomplished by combining agentic AI orchestration at the network edge with SIM-based privacy and AI context association to enable automatic mapping of user intent-based services to wireless protocols.

Multi-agent AI interoperability needs to be addressed by the standards community. 3GPP can role in standardizing security functions and network information hierarchy vs. letting AI protocols evolve separately. Business cases for applications vary dramatically by company size as large companies need global deployment scale while small ones are more willing to test niche applications. Privacy concerns around seamless AI context, especially for older demographics must be addressed as well.

Insights and Next Steps

Overall, there was a tendency to focus on specifics, often within silos, rather than attempting to look at the bigger picture. This was exacerbated because many of the participants were, unavoidably, affiliated rather than independent. This meant inconsistencies appeared, particularly on the spectrum side as noted earlier. There were clear differences between operators wanting minimal 6G (e.g., software only upgrades) and manufacturers predicting and defending the value of large changes of hardware and architecture. There was little discussion of whether the scenario of a slowdown in data growth would imply dramatic changes of spectrum and standardization. While there was a lot of discussion of technology, there was virtually none around convincing business cases for candidate future applications. Perhaps a way ahead is another workshop that forces cross-thinking across the silos. For example, there might be 2-3 scenarios set and then a half day devoted to discussing the business case, the logic of the outcomes from the scenario and then a final session trying to decide which scenario was most likely. Scenarios might include:

1. "The End of Telecoms History" – data growth stops and there is little need for new technology or spectrum. But ubiquity remains a challenge.
2. "Robots take over" – widespread deployment of robots, robotaxis, autonomous cars, digital twins and similar lead to the need for very different forms of network.
3. "Smart humans" – we widely adopt smart glasses, biometric sensors, AI personal assistants and more that lead to the need for more uplink, strong connectivity, and direct connection for battery-limited devices.

Underlying all scenarios would be factors like the need to keep energy consumption in check, the availability of spectrum, regulatory requirements, and the ability to raise the funds needed for investment

both for the MNOs and for entrepreneurs and academics to generate breakthrough innovations. Each scenario would be developed in detail beforehand, presented, critiqued and implications clearly drawn.

Summary and Conclusion

The inaugural Advanced Wireless Forum achieved its goal of fostering informed, open, and technically grounded discussion among leading voices shaping the future of wireless systems. The two-day program surfaced critical questions that will influence research priorities, regulatory decisions, and global deployment strategies in the years ahead. The Marconi Society remains committed to convening diverse perspectives, supporting rigorous analysis, and advancing collaborative work that strengthens the resilience, efficiency, and societal value of wireless networks. Building on the momentum of this first gathering, the Marconi Society looks forward to hosting future programs that deepen these conversations and contribute meaningfully to the evolution of advanced wireless technologies.

Advanced Wireless Forum Speakers

Jeffrey Andrews, Professor of ECE, University of Texas at Austin

Randall Berry, Chair and Professor of ECE, Northwestern University

Robert Calderbank, Professor of EE, CS and Mathematics, Duke University

Andrew Clegg, Chief Technology Officer, Valo Analytica

Charles Cooper, Associate Administrator, Office of Spectrum Management, NTIA

Mingxi Fan, Senior General Manager, Wireless Communication Technology and System Design, MediaTek

Ari Fitzgerald, Partner, Communications Group at Hogan Lovells

Sheryl Genco, VP Advanced Technology Group, Ericsson

Andrea Goldsmith, President, Stony Brook University

Ed Knapp, CTO, American Tower

Nick Laneman, Professor of Electrical Engineering, University of Notre Dame

Matti Latva-aho, Professor, Wireless Communications, University of Oulu, Finland

Eric McClanahan, Sr. Director, 5G Solution Architecture, 5G Acceleration, Verizon

Anton Monk, SVP Strategy, Cohere Technologies

Udayan Mukherjee, Senior Fellow, Intel

Thyaga Nandagopal, Head of Emerging Technologies, Samsung Research America

Guglielmo Noya, SVP - Head of Latin America, APWireless

Greg Pelton, CTO, Iridium

Vinay Ravuri, CEO & Founder, EdgeQ

Vicente San Miguel, Partner, Open Vision Partners

John Smee, SVP Engineering, Global Head of Wireless Research, Qualcomm

Robert Soni, VP RAN Technology, AT&T

Malik Tatipamula, CTO, Ericsson Silicon Valley, Ericsson

Yago Tenorio, SVP & CTO, Verizon

Alessandro Vanelli-Coralli, Professor of Electrical, Electronic and Information Engineering, University of Bologna

Peter Vetter, President of Bell Labs Core Research, Nokia

William Webb, CEO, Commcisive

Charlie Zhang, SVP, Samsung Research America

Advanced Wireless Institute Advisory Council

We extend our gratitude to the inaugural Advanced Wireless Institute Advisory Council, whose leadership, vision, and partnership have been instrumental in shaping the Institute's strategic priorities. This distinguished group of leaders and innovators guided the development of the Advanced Wireless Forum by ensuring session topics reflected real-world challenges and opportunities facing global leaders and industry.

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