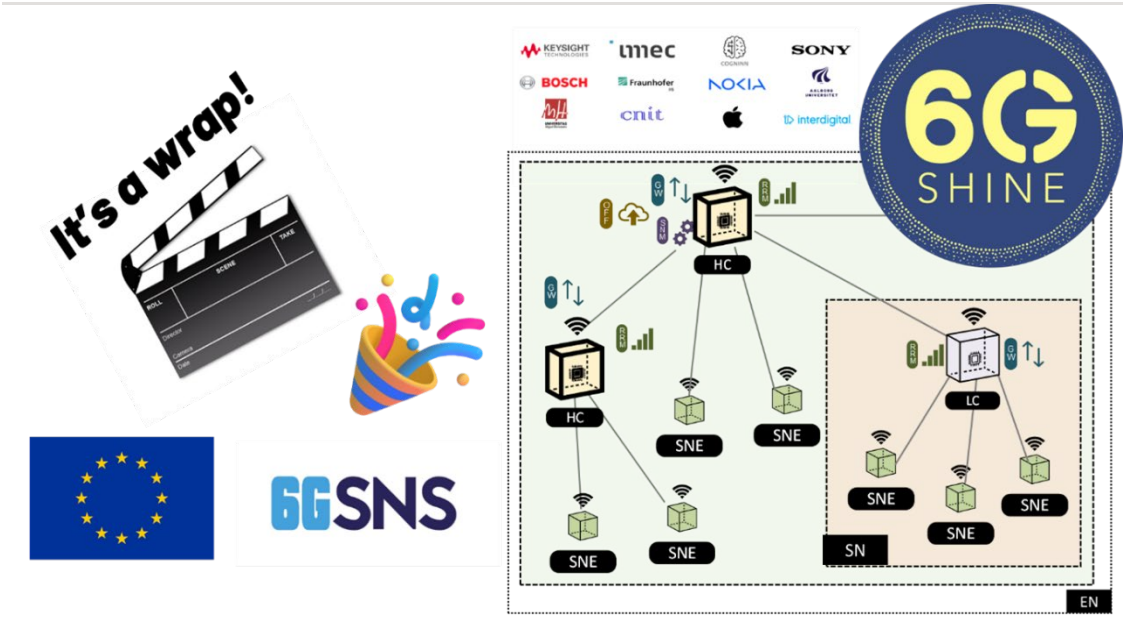
Welcome to the 6G-SHINE Newsletter, where we share the newest updates and insights from the 6G-SHINE Project.



It's a wrap!

Time runs fast… and our project is coming to an end!

Over two and half years of work, 6G-SHINE has delivered on its ambition to pioneer the key technologies enabling in-X subnetworks - a new paradigm for short-range, high-performance wireless cells seamlessly integrated into the 6G “network of networks.” Starting from use case identification and early technical foundations, the project has matured into a rich portfolio of innovations spanning modelling, physical

layer and MAC solutions, radio resource management, architectural enablers, short-range radio channel characterization and proof-of-concept demonstrations.

Among its unique contributions, 6G-SHINE has provided a broad set of measurement campaigns across diverse spectrum bands and environments - including the particularly novel intra-vehicle and outdoor-to-vehicle scenarios -and translated these into refined channel models, and a low-latency emulator. The project has also introduced breakthrough technologies such as smart metasurfaces, resilient PHY/MAC designs tailored to the unique in-X characteristics, energy-aware optimization strategies for RIS-enabled subnetworks, and intelligent centralized and distributed RRM.

We are thrilled by how much 6G-SHINE has accomplished over its lifetime: 22 deliverables, around 60 scientific publications (with many more on the horizon), 26 invention reports, numerous 3GPP and ETSI contributions, and an endless track record of workshops, webinars, events, and keynotes. A highlight we are especially proud of is bringing the concept of in-X subnetworks into 3GPP SA1, and ensured it will be crystallized in the very first wave of 3GPP specifications.

With 6G-SHINE, in-X subnetworks have made an entry into both academia and industry, laying the foundation for one of the potential transformative building blocks of 6G. The project closes with the strong belief that what started here will not only inspire the research of today, but also shape the standards, technologies, and applications that define the connected world of tomorrow. 6G-SHINE has lit the spark - now it is time for the 6G community to carry the flame forward.

A heartfelt thanks to all partners for this incredible journey! …and we are not yet done, more to come in the next months 😉

Check out the 6G-SHINE deliverables

Whitepaper on architectural enablers for 6G subnetworks and integration into 6G network of networks

In-X subnetworks represent a key architectural breakthrough in the evolution of wireless networks. We have written a whitepaper, based on our deliverable D2.4, that provides a concise overview of the main architectural enablers for 6G subnetworks and their integration in the 6G 'network of networks'!

Link to the whitepaper

6G-SHINE at EuCNC 2025

With 6G standardization on the horizon, EuCNC & 6G Summit 2025 offered a timely and valuable platform to align and consolidate the visions and ideas shaped over recent years - particularly around the key challenges of sustainability and monetization.

We were proud to contribute to the event through a variety of activities.

At our project booth, we showcased several proof-of-concept demonstrations developed by our partners, including in-X short-range channel emulation by Keysight Technologies, cross-technology interference mitigation by imec, and graph neural network-enabled interference management by Cogninn.

Our second Workshop on 6G Holistic Radio Design, organized in collaboration with Hexa-X-II, was a resounding success. In this session, project coordinator Gilberto Berardinelli presented innovative approaches to radio resource management for dense in-X subnetworks, developed within the project framework.

We were also pleased to contribute to the special session on “Value Approach of 6G: The Role of Key Value Indicators in Design and Societal Impact,” with a joint presentation focused on the complexities of integrating KVIs in early-stage (low-TRL) research projects.

Final face-to-face 6G-SHINE consortium meeting in Elche, Spain

On May 6 and 7, 2025, we gathered for the final face-to-face consortium meeting of the 6G-SHINE project in the charming city of Elche, Spain, graciously hosted by Universidad Miguel Hernández. As the project draws to a close, this meeting offered a timely moment to review the significant progress made over two and a half years

of dedicated effort, and to align on the final steps required for a successful wrap-up.

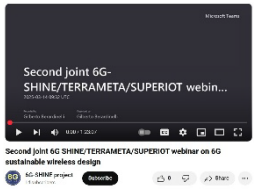
We were proud to witness the impressive work accomplished by the team and are confident that the outcomes of 6G-SHINE will lay the groundwork for establishing in-X subnetworks as a vital element in the emerging 6G ecosystem.

The two-day event was both intense and inspiring, complemented by memorable social activities - including a fantastic guided tour of Elche's historic sights.

A heartfelt thank you to Javier, Baldo, and the university team for their warm hospitality and flawless organization!

Dissemination and Communication:

Second Joint 6G-SHINE/SUPERIOT/TERRAMETA Webinar on 6G Sustainable Wireless Design

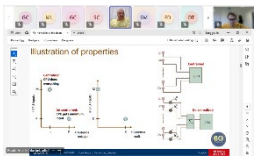


On March 14, 2025, the 6G-SHINE Project once again teamed up with the SUPERIOT and TERRAMETA projects for the second webinar on 6G sustainable wireless design. Hosted by Prof. Marcos Katz (University of Oulu), the event featured insightful presentations from three experts in the field. Representing 6G-SHINE, Hamid Reza Hashempour (Aalborg University) presented on power-efficient cooperative communication within IIoT subnetworks, highlighting the role of relay and RIS technologies in optimizing energy consumption while ensuring reliable and efficient wireless connectivity.

The presentations covered various aspects of sustainable communication design, offering valuable insights into how multiple technologies can work together to meet demanding requirements with minimal energy consumption.

YouTube Link

Joint TIMES/6G-SHINE/TERRAMETA workshop on 6G research



On March 26, 2025, we have held an online workshop on 6G research in collaboration with SNS TIMES and TERRAMETA projects. The workshop featured several forward-looking talks by wireless communication experts, ranging from MAC protocol design in multi-hop THz networks, to Channel Characterization and Beamforming Design for Metasurfaces.

6G-SHINE was represented by Meng Li (imec), and Fredrik Rusek (Sony). Meng gave a talk on Sub-THz transceiver architecture power analysis for an XR indoor gaming scenario as defined in the project, while the talk by Predrik focused on a novel decomposition of the distributed MIMO channel (WAX decomposition), addressing the trade-off between level of

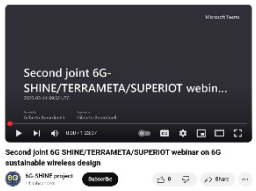
decentralization (inputs to CPU) and decentralized processing complexity (multiplications per antenna).

Joint 6G-SHINE/TIMES Webinar on Electromagnetic Signal Processing for Next-Generation Wireless Networks

On May 19, 2025, Prof. Davide Dardari (CNIT), gave an insightful webinar that explored the emerging paradigm of over-the-air electromagnetic signal processing (ESP) and its transformative potential for 6G wireless networks.

The webinar delved into fundamental limits and theoretical underpinnings for ESP, enabling technologies and architectures, and practical use cases and future directions.

Prof. Dardari presented inspiring perspectives on the integration of electromagnetism, signal processing, communication, and information theory, illustrating how their convergence can unleash new opportunities for high-performance, low-latency, and energy-efficient wireless systems.



Third joint 6G-SHINE/SUPERIOT/TERRAMETA webinar on sustainable wireless design

On June 27, 2025, we teamed up once again with the SNS SUPERIOT and TERRAMETA projects to deliver the third webinar in our ongoing series on sustainable wireless design - a topic of significant interest for both SNS JU and our projects.

The webinar featured three insightful talks. Saeed Hakimi from 6G-SHINE discussed sustainable radio resource management in dense subnetworks. Sean Ahearne from TERRAMETA presented recent advancements in high-performance THz RIS communication. Emanuel Abreu Antunes Carlos from SUPERIOT explored solution-processed materials for printed sensors. Together, the talks showcased cutting-edge research aimed at enabling more energy- and resource-efficient wireless systems.

YouTube Link

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