6GSNS

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SEamless integratioN of efficient 6G WirelesS tEchnologies for Communication and Sensing

D6.2 Preliminary Standardisation, Dissemination, Communication and liaison Activities Report

September 2025

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Executive Summary

The primary aim of 6G-SENSES deliverable **D6.2** is to report dissemination and communication actions performed in the first year of the project. The document provides information regarding the communications aspects of the project, such as the website and social media, and other means of communication and dissemination, such as newsletters. Other dissemination activities, such as scientific publications, workshops, and events during the last 13 months, and those already in plan, are also introduced. Regarding the external liaison, this document presents consortium participation in activities promoted by the Smart Networks and Services Joint Undertaking (SNS JU) and the 6G Infrastructure Association (6G IA) working groups (WGs).

The overall status of the project disseminations compared to the proposed KPIs is provided in the final chapter of this deliverable.

1 Introduction

6G-SENSES is currently developing the architectural blueprint of the project and the technical solutions that will build up an implementation of such architecture. The project benefits from a tight interaction among the consortium partners and leadership, and it is committed to an ambitious international and specifically Europe-wide rollout of results into the 6G ecosystem as the project gets to an end.

The dissemination and communication strategy defined in deliverable **D6.1** [1] set the basis, channels, and guidelines to target specific groups covering a wide range of audience, including industry partners, academia, public authorities, standardisation bodies, and end-users. The purpose is to maximise the project outreach ensuring exploitation activities through and after the project life span. The dissemination, communication and stakeholders' engagement plans included a range of activities, events, dissemination opportunities and guidelines on how to communicate about the project, as well as Key Performance Indicators (KPIs) to monitor the relevance and performance of the activities carried out. These plans include specific activities on national, European, and global levels.

All partners in the consortium are contributing to compile a set of relevant results, showcasing in events, participation in the framework (SNS, 6G-IA) activities, and external projects, and are looking at possible opportunities to present the project and set cooperation agreements with external initiatives and organisations.

Organisation of the document

This document comprises five sections. Following the Executive Summary and Introduction sections:

Chapter 2 summarises the standardization activities performed in the scope of the project targeting different Standard Development Organisations (SDOs) on various domains, and the planned impact for future months is detailed.

Chapter 3 focuses on communication and dissemination activities as a crucial part of innovative projects and as the means of raising awareness and transferring knowledge to interested parties. Relevant activities carried until month 30 are presented in detail including: 6G-SENSES website, social network disseminations, press releases, participation in industry events, participation in and organization of conferences/ workshops/ summits and webinars.

Chapter 4 provides a detailed overview of the 6G-SENSES participation in SNS and 6GIA WGs.

Finally, Chapter 5 summarises the document.

2 Standardisation activities report

2.1 Summary of standardisation activities until month M18

Standardisation activities within the 6G-SENSES framework are both diverse and impactful. The project has actively contributed to the exploration and integration of existing technologies with advanced 5G connectivity and emerging 6G solutions. This includes identifying and addressing the technical requirements and specifications necessary for these innovations. Notably, 6G-SENSES has made significant strides in aligning its research with the work of SDOs, aiming to enhance and extend existing standards. Contributions have included technical reports, participation in WGs, and the submission of proposals to relevant standardisation bodies. These efforts have been disseminated through various channels, with key findings published in scholarly and professional journals, reinforcing the project role in shaping the future of communication standards.

2.1.1 Intel (INT) contributions

The INT contributions are outlined in this subsection, including INT **6G Technology Development**, **Standards Leadership**, **Ecosystem Engagement**, and **Intel Engineering Support and Collaborations**.

INT 6G Technology Development

INT prepared and submitted two contributions to the GSA 6G Joint Working Group (6GIG) Meeting #6:

- One on **6G Day-1 PHY/RAN features**
- One on **IoT for 6G**

INT summarized **AI for PHY use cases** for potential 3GPP specification. Presented the main findings during the Standards and Technology Update session, including AI-driven PHY use cases. A recommendation was issued to focus on the following use cases for further study:

- CSI-RS/DMRS/SRS overhead reduction
- CSI feedback enhancement

INT further investigated **6G AI for PHY use cases** and typical models, with a focus on base station-side models (a draft summary is available). The following use cases were studied:

- PA distortion compensation
- CSI-RS overhead reduction
- CSI feedback overhead reduction
- DMRS/SRS overhead reduction

Use cases 2–4 fall under a common category: **channel denoising/reconstruction** based on partial channel information. This is analogous to image denoising/reconstruction, a well-studied area in AI. Typical AI models explored include:

- Predictive models: MLP and its variants (e.g., MLP-Mixer)
- Convolutional models: CNN and its variants (e.g., ResNet, Autoencoders)
- Generative models: Transformer, VAE/VQVAE, Diffusion

The main challenge identified is **model generalization**. The next step is to further assess the feasibility and performance of these use cases, with a focus on generalization.

Initiated assessment of **AI for radio use cases** emerging from 6G ongoing discussions and the 3GPP 6G Workshop. Two use cases were studied this month:

- AI-based PA distortion compensation.
- AI-based channel estimation/prediction and RS overhead reduction.

Findings on PA distortion compensation highlighted the following limitations:

- Model generalization across various UE PA models and operational variations (e.g., temperature changes).
- Complexity and cost of online training.
- Misalignment between the intended goal (UL cell edge coverage improvement) and the actual focus – Error Vector Magnitude (EVM) reduction for high-order modulations like 256 QAM and above.

The **AI-assisted channel estimation/prediction** use case was identified as more promising. Variants include:

- Channel estimation with reduced RS overhead
- Time-domain channel prediction
- Spatial-domain channel prediction
- Full channel state information estimation/prediction
- Partial channel state information estimation/prediction (e.g., AoA only)

Generative models are considered well-suited for this problem. Performance evaluation has begun to assess the potential of AI in channel estimation and prediction.

Based on a detailed analysis of technical contributions from equipment vendors and network operators to the **GSA 6G Joint Working Group**, **6GIG**, and the **3GPP 6G Workshop**, INT has produced an **initial list of 6G RAN features**. This list will be continuously updated to reflect industry consensus and evolving standards.

INT actively contributes to the **IEEE Wi-Fi IMMW** standardization process through the official IMMW contribution platform. As part of its technical engagement, INT will resubmit a conference paper to support alignment with the evolving **IMMW specifications** and to enhance the visibility of its innovations in this domain. INT is also contributing to the evaluation of **sensing features**, focusing on performance, feasibility, and integration into the standard. In parallel, INT is engaged in discussions on **IMMW waveform** design, aiming to shape the technical direction of **IMMW sensing** capabilities. Through these efforts, INT seeks to influence early decisions on **IMMW sensing design** and ensure that its technology roadmap is well reflected in the **IEEE IMMW standards**.

Standards Leadership

- 3GPP – Puneet Jain (INT) was re-elected as Chairman of 3GPP SA (Services and System Aspects) for a second two-year term.
- IEEE – Cheng Chen (INT) was elected Editor during the IEEE 11bq standardization process.

Ecosystem Engagement

3GPP collaborations

a. 3GPP RAN ecosystem discussions - Held discussions with 3GPP RAN4 Chair (Apple) on the scope of Rel-20 6G study item RAN4 scope providing Intel views on project organizational aspects as well as candidate objectives and prioritization; Engaged with Ericsson on the interim milestones for the 6G study. Compared to prior discussions of these milestones among all the GSA companies, they prefer very early decisions (December 2025) on some of the key physical layer characteristics such as waveform, modulation and channel coding. This may be over optimistic given the study will have been ongoing for only 6 months (3 RAN1 meetings). The milestones are expected to be decided in RAN#108 plenary in June; Engaged with Ericsson on the key characteristics of the lowest capability

IoT devices to be supported in 6G, leading to co-sourcing of an input into the RAN plenary study item on 6G requirements. Understanding these lowest end capabilities will be necessary for many 6G design decisions (e.g. related to initial access); Engaged with Samsung on the scope of Rel-20 5G-Advanced work on MIMO enhancements. As a result, we will support a way forward, along with 20+ other companies, proposing that the Rel-20 work will focus on UL capacity and coverage enhancements, and DL CSI acquisition enhancements for FR1; Engaged with AT&T on 3GPP and O-RAN collaboration during 6G and specifically on the referencing of O-RAN's fronthaul specifications from within the 3GPP specifications. The referencing is expected to be a controversial discussion in the RAN#108 plenary in June. Intel has supported an initiative among the GSA companies to find a way forward acceptable to all parties.

b. INT is collaborating with Apple, Ericsson, Lenovo, and AT&T to address the contentious issues in the Rel-19 AIML_CN specification work related to the user consent and privacy profile check that was postponed from the April SA2 meeting. Specifically, Intel proposed solutions regarding which entity should perform the UE LCS privacy check for the AI/ML monitoring procedure and whether the NWDAF MTLF could store PRU/UE data samples as historical data in the ADRF. Following multiple rounds of discussions during SA2#169, a majority of companies (including Ericsson, AT&T, Lenovo, China Mobile, and Huawei) expressed support for the Intel proposed solution to address LCS privacy concerns. However, there was intense discussion on this issue in SA2 without any outcome and the final decision would be based on SA3 response to SA2 on the user consent requirement for this issue.

c. INT moderated the discussions in 3GPP SA5 on the Rel-20 5G-Advanced study on AI/ML Management Phase 3, which resulted in a SID being submitted to and agreed SA5#161.

d. INT collaborated with Samsung for approval of INT solution to standardize LTM (layer 2 triggered handover mode) between two CUs when dual connectivity is not in use. A two-phase key-derivation chain in which the source-CU supplies key materials to the target-CU was accepted at the SA3#121.

GSA collaborations – System aspects

1. INT organized a GSA meeting hosted by Apple to discuss SA aspects of the 6G study, where member companies shared views on the SA2 6G Study objectives. Key topics included sub-work tasks under the overall 6G architecture, with discussions on scope, alignment with 5G-Advanced, and the need for input from RAN and other WGs on areas like migration, AI, sensing, data framework, computing, IMS, NTN, and Cellular IoT. A tentative study timeline was outlined for Aug–Nov 2025, with TU estimates and SID updates expected by Dec 2025, and alignment with RAN targeted for June 2026. A draft 2025–2026 GSA meeting calendar was also presented, with proposals for broader participation and a potential joint SA-RAN session, with further coordination to continue via email.

<u>Intel Engineering Support and Collaborations</u>

Intel Labs

- 6G TD - Continue to collaborate with IL and CMCC on a paper on 6G communication-computing convergence for potential publication in IEEE.
- 6G TD - Had discussions with IL team on a few AI for radio use cases.

Publications and public events

- INT participated in the Opening Ceremony, Main Forum, and Round Table Discussion at "Global 6G Conference 2025", Nanjing, China hosted by China FuTURE Forum and Purple Mountain Laboratories.
- INT gave an interview to TCCA – The Critical Communications Association – discussing updates from the 6G Workshop and TSG SA#107 meetings, with a focus on public safety and critical communications. The interview is available on the TCCA YouTube channel [LINK].

2.1.2 IHP contributions

The European Telecommunication Standards Institute (ETSI) is a not-for-profit standard-setting organization in the field of telecommunications. Operating under ETSI, ETSI Industry Specification Group (ISG) on Multiple Access Techniques (MAT) provides an opportunity for its members to share their research results and cooperate on building a wider consensus between academia and industry on new multiple access techniques for the upcoming 6G systems based on 3GPP specifications.

The main focus of ISG MAT is downlink multiple access techniques improving the transmission efficiency on the physical layer. Candidate multiple access techniques are Orthogonal Multiple Access (OMA), Non-Orthogonal Multiple Access (NOMA), Space Division Multiple Access (SDMA), and Rate Splitting Multiple Access (RSMA). ISG MAT will produce periodic group reports that can support the 6G standardization activities of 3GPP. Some of the areas of activities can be listed as the study of transmitter and receiver processing, PHY layer procedures, link-level and system-level performance, and potential specification impact.

As a part of ETSI ISG MAT, **IHP** is regularly participating in bi-weekly online conference calls and actively taking part in discussions for the study items. We contribute to the group report and standardization activities by also supporting the cross-check of the results in the literature for comparison of different multiple access techniques in terms of the sum-rate and relevant performance metrics. In addition, we attended the second plenary meeting on May 14-15, where text proposals for the first group report were discussed in detail.

Furthermore, **IHP** will attend the third plenary meeting which will be held in Barcelona on October 8-9, where the text proposals for the candidate multiple access techniques and basic performance evaluation which we directly contribute by the cross-check of the results will be discussed. In this way, the group report is planned to be finalized soon. Besides, the new work items for the ISG MAT Phase 2 will be discussed in the meeting.

2.1.3 The TUBS contributions

The research group at TU Braunschweig (**TUBS**) focuses on PHY layer design for Integrated Sensing and Communication (ISAC) systems, particularly on beamforming strategies that balance sensing accuracy and communication performance. We have developed a joint optimization framework with SINR (for communication) and SNR (for sensing) as objective functions, and conducted small-scale simulations on a computer to achieve globally optimal results.

Currently, we are extending our model to include multiple users and multiple sensing targets, aiming to design an optimal joint beamformer for ISAC scenarios. In parallel, we are preparing a laboratory validation platform using a movable antenna array to demonstrate a small-scale setup. The simulation framework will also be scaled up to evaluate more complex ISAC configurations.

This work directly supports the ongoing 3GPP RAN1 discussions under the Rel-20 ISAC study item.

2.2 Activities per standardisation body and sector

This section will include a dedicated subsection for each standardization body, where 6G-SENSES partners have contributed. Each subsection will highlight the respective contributions and key achievements.

Table 2-1 Targeted SDOs for each of the 6G-SENSES participants to standardisation activities

Partner	Target Domain	Target SDOs
INT	6G Technology Development	6GIG, 3GPP
INT	AI for PHY Use Cases	3GPP
INT	AI for Radio Use Cases	3GPP
INT	6G RAN Features Definition	GSA, 6GIG, 3GPP
INT	Standards Leadership	3GPP SA
INT	RAN Ecosystem Engagement	3GPP RAN, O-RAN
INT	Rel-19 AIML_CN Specification	3GPP SA2, SA3
INT	AI/ML Management Phase 3	3GPP SA5
INT	LTM Standardization	3GPP SA3
INT	SA2 6G Study Coordination	GSA, 3GPP SA2
INT	Publications and Events	Global 6G Conference, TCCA
INT	Publications and Standard contributions	IEEE IMMW

Partner Name	Target SDO	Target SDO WG	Target Study Item/Work Item	Achieved Impact until End of 2021
INT	3GPP	SA	Chairmanship of SA	Puneet Jain from INT re-elected as Chair of 3GPP SA for a second term
INT	3GPP	RAN4	Rel-20 6G Study Item	Provided Intel's views on scope, objectives, and prioritization
INT	3GPP	RAN	6G IoT Requirements	Co-sourced input on lowest capability IoT devices for 6G
INT	3GPP	RAN	Rel-20 MIMO Enhancements	Supported proposal for UL capacity and DL CSI acquisition improvements
INT	3GPP	RAN	O-RAN Fronthaul Referencing	Facilitated consensus-building among GSA companies
INT	3GPP	SA2	Rel-19 AIML_CN	Proposed privacy solutions; gained support from major vendors
INT	3GPP	SA5	AI/ML Management Phase 3	Moderated discussions; SID approved at SA5#161
INT	3GPP	SA3	LTM Standardization	Proposed and gained approval for key derivation chain for LTM
INT	GSA	System Aspects	SA2 6G Study	Organized meeting; defined study scope and timeline
INT	6GIG	-	6G Day-1 PHY/RAN and IoT Contributions	Submitted two contributions and presented AI for PHY use cases
INT	GSA/6GIG/ 3GPP	-	6G RAN Features	Compiled and maintained initial list of 6G RAN features
INT	IEEE	Wi-Fi IMMW	Wi-Fi IMMW Standardization Contributions	resubmit a conference paper to support technical alignment and visibility

2.3 Timeline towards standardization contributions

This section provides the plans of the 6G-SENSES partners for the next period, which are detailed in Table 2-2.

Table 2-2 Expected contributions from INT to SDOs in the next period

INT				
Target SDO	**Target SDO WG**	**Target Work Item**	**Planned activities to be carried out towards standardization contributions after M30**	**Impacts/outcomes to be achieved through the planned activities**
3GPP	RAN1/RAN4	Rel-20 6G Study Item	Contribute to defining PHY/RAN features for 6G Day-1; Engage in discussions on waveform, modulation, and channel coding; Support proposals on UL capacity and DL CSI enhancements.	Influence early decisions on 6G physical layer design; Ensure Intel's technology directions are reflected in 3GPP standards.
3GPP	SA2	Rel-19 AIML_CN Specification	Propose solutions for user consent and privacy profile checks; Engage in consensus building with ecosystem partners.	Establish privacy-compliant AIML monitoring procedures; Enable Intel's leadership in AI/ML standardization.
3GPP	SA5	Rel-20 AI/ML Management Phase 3	Moderate discussions and contribute to SID development; Define management architecture and procedures for AI/ML.	Shape AI/ML management framework in 5G-Advanced and 6G; Promote Intel's architectural proposals.
3GPP	SA3	LTM Standardization	Collaborate on key derivation chain for L2 triggered handover; Support approval of Intel's proposed solution.	Standardize secure handover procedures; Enhance Intel's contributions to mobility management.
GSA	SA2 Architecture	6G Architecture Study	Coordinate study objectives and timelines; Align with RAN and other WGs on key architectural topics.	Drive consensus on 6G architecture; Ensure Intel's strategic alignment with industry direction.
IEEE	Wi-Fi IMMW	-	Contribute to evaluating sensing features for IMMW; Engage in discussions on waveform design.	Influence early decisions on IMMW sensing design; Ensure Intel's technology directions are reflected in IEEE IMMW standards

Table 2-3 Expected contributions from TUBS to SDOs in the next period

TUBS				
Target SDO	**Target SDO WG**	**Target Work Item**	**Planned activities to be carried out towards standardization contributions after M30**	**Impacts/outcomes to be achieved through the planned activities**
3GPP	RAN1	Rel-20/21 ISAC Study	Demonstrate JCS beamforming design in the lab using a movable antenna array	Validate SINR/SNR trade-off and support RAN1 ISAC evaluation framework.
3GPP	RAN1	Rel-20/21 ISAC Study	Extend simulation to large-scale scenario with multiple users and targets.	Support performance evaluation and scalability analysis in RAN1 ISAC study.
IEEE	802.18/802.15 IG Access	-	Initial results on co-channel interference in the 6 GHz band in November.	Support performance evaluation for co-channel interference in the 6 GHz band

Table 2-4 Expected contributions from IHP to SDOs in the next period

Partner X				
Target SDO	**Target SDO WG**	**Target Work Item**	**Planned activities to be carried out towards standardization contributions after M30**	**Impacts/outcomes to be achieved through the planned activities**
ETSI	MAT	DGR/MAT-001	Basic performance evaluation of the candidate multiple access techniques.	Contribute to the group report and validation of the comparison results of RSMA/SDMA/OMA/NOMA.

3 Communication and Dissemination Activities report

Already from the first 6 months of the project, the most effective communication channels were identified along with the target audiences and the messages. These have been already used in a number of project activities and include:

- Publicly accessible Internet web-pages addressing the general public and whoever is interested in the project activities. A 6G-SENSES website was created at the early project stages and is continuously updated and enriched with content, while at the same time information on the project is provided at a number of partners' webpages.
- Social networks addressing the general public and whoever is interested on the project activities. 6G-SENSES maintains a number of social network accounts, namely at LinkedIn, YouTube, for the purposes of reaching out the general public and professional communities.
- Press Releases. A number of press releases have been issued by commercial companies as well as by research institutes, for reaching out their customers and targeted audience.
- EC supported communication mechanisms, its relation to 6G IA, SNS JU and other projects in the same domain.
- Participation in industry events, for the purposes of addressing actors activated in specific vertical industries.
- Participation in and organization of conferences/ workshops/ summits, for the purposes of addressing the research communities.

3.1 Project Website and Dissemination Material

Figure 3-1 shows the history of 6G-SENSES website traffic, on months based, for the last months. The website performance is monitored with Google Analytics, which provides insightful metrics on usage, user engagement and content performance. According to this metrics, the website traffic has steadily increased since the beginning of the project Other relevant indicators, such as number of sessions per user, pages/session, average session duration, and bounce rate, show good results in terms of user's experience and behaviour.

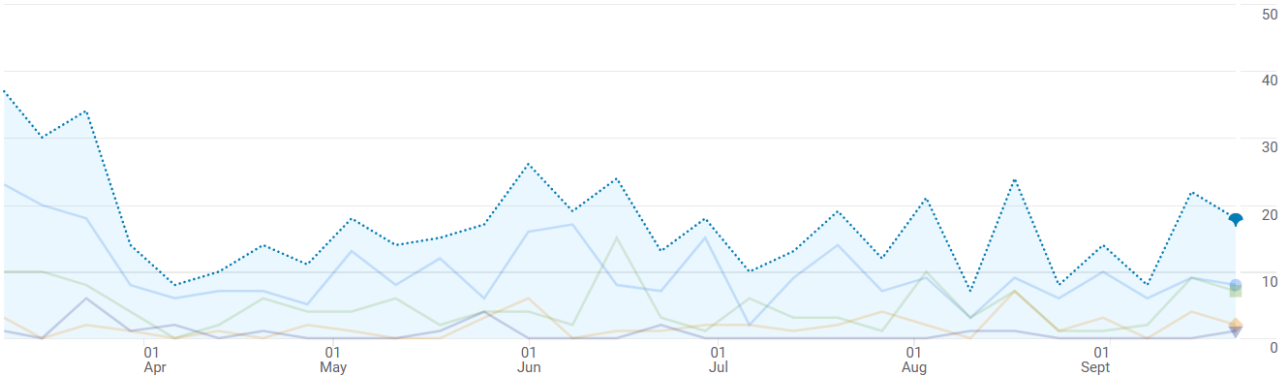

Figure 3-1 6G-SENSES website monthly traffic (sessions)

The website is planned to be updated at least throughout the course of the project and for 3 years beyond that. A plan will be agreed as part of project exploitation activities in how to address interest in the website contents, and the maintenance of it beyond the project end.

3.2 Social Media

Project management keeps track of social media posts and statistics. Social media dedicated channels have been created to disseminate 6G-SENSES among the target audiences and to build an online community around the project. The project's website serves as the main backbone of all communication activities, while social media is used to maintain more often presence and interact with the 6G community.

LinkedIn (URL: https://www.linkedin.com/company/6G-SENSES/): The 6G-SENSES LinkedIn page counts with 163 followers to date. The page is continuously fed with updates on project activities, blog posts and partners' dissemination activities.

Figure 3-2 shows the 6G-SENSES LinkedIn account analytics:

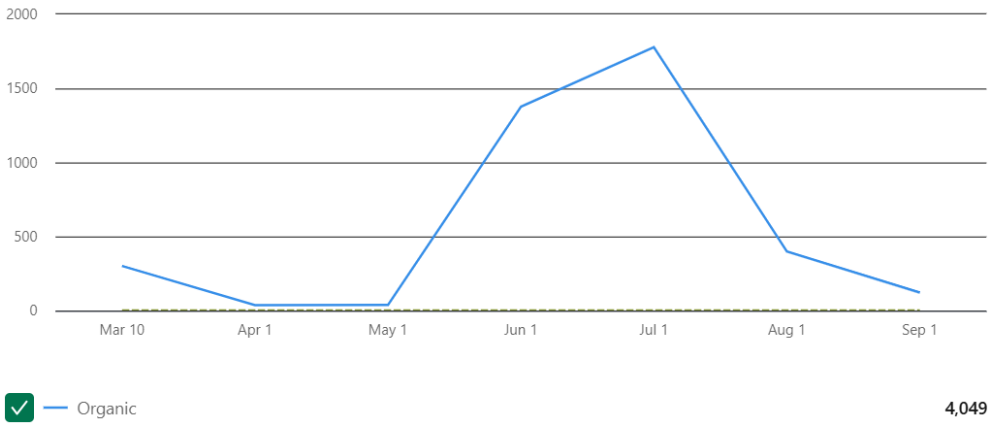

Figure 3-2 Latest Impressions of 6G-SENSES LinkedIn page

3.3 Press Releases

Local press is another significant communication channel to disseminate the project work and outcomes. 6G-SENSES communication activities plan foresees the issuing of a number of press releases by project partners for communicating project activities, especially related to demonstration activities or proof-of-concepts (PoCs). These press releases (see Table 3-1) are planned to be channelled to appear in a number of local electronic and printed media. Until present the following press releases have been issued, related to the initiation of the project and to specific activities:

Table 3-1 Press Releases issued by 6G-SENSES Partners

Partner	Press Release Title & URL	Issued on
UC	*La UC acoge la reunión general del proyecto 6G-SENSES, en el que participan universidades y entidades de 7 países europeos* https://web.unican.es/noticias/Paginas/2024/09/proyecto-6G-SENSES.aspx	2024-09-09
IHP	European 6G-SENSES Project: Research for revolutionary technology advancements in preparation for 6G https://www.ihp-microelectronics.com/fileadmin/user_upload/2024_10_6G_SENSES_English.pdf	2024-10-22

3.4 Participation in 6G-related Events

3.4.1 EuCNC 2025

Our project did have a notable representation at EuCNC 2025 in Poznan, Poland. 6G-SENSES participated in different activities and organized a couple of events therein.

3.4.1.1 WS 10: Integrated Sensing and Communications initiative on the European research framework

The workshop focused on the latest initiatives within the European Union's Horizon Europe (HE) Smart Networks and Services Joint Undertaking (SNS JU) research program, where ISAC serves as a key focus area for several ongoing and future projects. It served as the coordination point between the HE SNS-JU projects involved in developing ISAC technology, providing an overview to the audience on what the key research issues and items that are subject of the focus of European research

This workshop has been organized within the SNS TB and includes most of the research performed within the European Commission Horizon Europe SNS JU on ISAC. The workshop provided a platform to brainstorm about advancements, challenges, and collaborative opportunities in shaping ISAC as a cornerstone of next-generation network capabilities.

The workshop covered initiatives in PHY layer research, system level improvements to the 6G architecture, real life experiences of ISAC in real scenarios, KPIs/KVIs and standardization activities and opportunities.

The 6G-SENSES Project Coordinator, Dr. Jesús Gutiérrez (**IHP**) was one of the workshop organizers and acted as the moderator of Panel 1 on "PHY layer research: research highlights and discussion".

Figure 3-3 Panel on PHY Innovations and system-level enhancements for 6G Architecture

Figure 3-4 Panelists of the Panel, including a 6G-SENSES representative, Dr. Vladica Sark (IHP)

3.4.1.1 6G-SENSES Exhibitor

6G-SENSES joined forces with the peer SNS projects BeGREEN, 6Green, 6G WTIN and EXIGENCE to prepare a joint Exhibitor with the motto of Sustainability, with the title "Sustainability for 6G: from Infrastructure to Services". These projects are explicitly targeting concrete ecological improvements of 6G, going from energy efficiency over carbon footprint reduction to net energy consumption limitation. Hence, each of the participating projects addresses specific challenges, yet the presented solutions are complementary in that they exhibit strong potential for synergetic integration on a system level. Together, these projects therefore could contribute concrete and quantifiable improvements towards an overall more sustainable 6G. Common to all involved projects is the strong shared belief that the technology improvement will have the strongest network effect, therefore positively influencing other aspects, such as economic and societal sustainability, in a longer run.

In this sense, the presented demos covered different aspects, ranging from RAN energy efficiency enhancement by introducing RAN (and network) monitoring and optimisation, over new architectures and enablers for improving energy efficiency of the future network, i.e., Cell-Free MIMO and ISAC a proposed Observability Framework for monitoring energy consumption of the physical and virtual components of the network, to green, live ecolabels for future 6G services, empowering service users and incentivising them to an ecologically-aware usage.

In particular, two 6G-SENSES demonstrators were showcased at the Exhibitor:

- **Sub-6 GHz ISAC Prototype** (**IHP**, **UC**), Developed in the context of the BeGREEN project and with collaboration and extensions coming from 6G-SENSES, this live demo unifies sensing and communication on a single RF platform using software-defined radios (SDRs). Integrated with the O-RAN RIC via a custom service model and a monitoring xApp, it illustrates how intelligent control and orchestration can enable advanced ISAC functionality — all within the Sub-6 GHz band.

Figure 3-5 Sub-6 GHz ISAC Prototype with 6G-SENSES E2SM for sensing

- **Cell-Free Demonstrator by TU Braunschweig** (TUBS), part of Project 6G-SENSES, this interactive simulation offers visitors a hands-on introduction to cell-free network architecture — a promising approach that replaces traditional fixed cells with a dense network of distributed access points working together to serve users. Visitors can explore key optimization steps in real time: 1) User-to-AP assignment, beamforming calculation, and power distribution.

Figure 3-6 Cell-Free Demonstrator at EuCNC'25 by TU Braunschweig (TUBS)

3.4.1 ONDM 2025

Prof. Anna Tzanakaki (IASA) provided an overview of 5G and 6G architectural structures at the Optical Network Design and Modelling (ONDM) Conference 2025[1], with the main focus on how optical networking can support current and upcoming transport network requirements in these environments taking a multilayer approach.

Figure 3-7 Prof. Anna Tzanakaki (IASA) presenting the Tutorial at ONDM 2025

[1] https://ondm2025.santannapisa.it/tutorial_tzanakaki.html

3.4.2 ICC 2025

Our colleagues from the Telematics Group (GIT) of the University of Cantabria (**UC**) presented two 6G-SENSES related works at ICC 2025. Excellent venue to convey the work carried out in the project related to advance scheduling mechanisms for Open RAN.

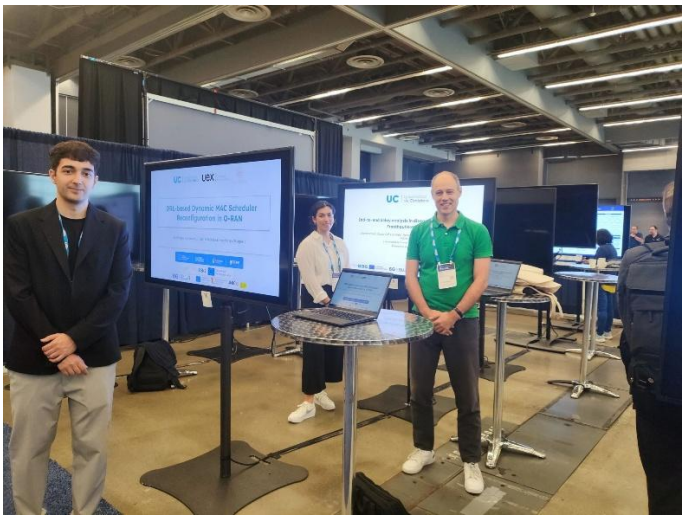

Figure 3-8 Colleagues from UC presenting their work at ICC'25.

3.5 Participation in Industry Events

6G-SENSES participated in a couple of Industry Events up to month 20. These are Mobile World Congress (MWC) 2025 in Barcelona, Spain, and the industrial track at the ICT 2025 conference in Budva, Montenegro.

3.5.1 MWC 2025

The Industrial Technology Research Institute (ITRI) presented a joint demonstration activity together with the 6G-SENSES Partner BubbleRAN (**BR**) highlighting the transformative potential of ISAC, merging sensing and communication capabilities, effectively creating new business opportunities and redefining the role of cellular networks in future industry.

Figure 3-9 ITRI and BubbleRAN demo @ MWC 2025 in Barcelona

3.5.2 6G-SENSES at ICT-2025

Dr. Valerio Frascolla (**INT**), Valerio Frascolla, Director of Research and Innovation at Intel and 6G-SENSES WP6 leader, organized and run the Panel "Determinism and predictability in multi-domain networks for Industrial IoT and Smart cities", together with the projects 6G-SENSES and PREDICT-6G. He as well delivered the keynote speech, entitled: 'Mixed criticality networks in the Industrial Internet of Things'.

Figure 3-10 Dr. Valerio Frascolla introducing the Panel

He as well presented a paper entitled 'Dynamic spectrum management in multi-access systems towards 6G'. This paper provides a survey of key innovations brought in the last ten years in the areas of both dynamic spectrum management and integration of diverse radio access technologies in heterogeneous and multi-access systems, taking into consideration also regulatory and standardisation aspects.

3.6 Other Communication Activities

6G-SENSES Communication activities that will take place in 2025 are the following:

- INFOCOM World 2025, Wednesday Nov. 26. https://infocomworld.gr/en/, where a 6G-SENSES Stand Presentation will be showcased, and a presentation will take place at the **OTE** Innovation Workshop.

3.7 Scientific Dissemination

Even from the early stages of the project partners have seized opportunities to reach out the research community with results of their work performed in the context of 6G-SENSES (see Table 3-2).

Table 3-2 Scientific Paper Publications

Pub #No	Details	Type	Partners involved
1	M. Anastasopoulos, A. Tzanakaki, G. Kaponis, Y. Jian, L. Lopacinski, J. Gutiérrez, "A 6G Transport Network converging THz and Optical network technologies empowered by Federated Learning techniques", ECOC 2024, Frankfurt, Germany.	Conference	IASA, IHP
2	I. Santamaría, M. Soleymani, E. A. Jorswieck, J. Gutiérrez, "MIMO Capacity Maximization with Beyond-Diagonal RIS", Special Session 08 (SS08): Beyond diagonal reconfigurable intelligent surfaces, 25th IEEE International	Conference	UC, TUBS, IHP

	Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2024, Lucca, Italy.		
3	M. Soleymani, I. Santamaría, E. A. Jorswieck, M. di Renzo, J. Gutiérrez, "Energy Efficiency Comparison of RIS Architectures in MISO Broadcast Channels", Special Session 17 (SS17): Energy-efficient resource allocation in wireless communications, SPAWC'24, Lucca, Italy.	Conference	UC, TUBS, IHP
4	M. Nauman, L. Lopacinski; N. Maletic, M. Scheide; J. Gutiérrez; M. Krstic; E. Grass, "Enhancing the WLAN OFDM-PHY by OTFS Precoding", European Conference on Networks and Communications (EuCNC 2024), Antwerp, Belgium.	Conference	IHP
5	H. Cao, S. Garg, S. Mumtaz, M. Alrashoud, L. Yang and G. Kaddoum, "Softwarized Resource Allocation in Digital Twins-Empowered Networks for Future Quantum-Enabled Consumer Applications," in IEEE Transactions on Consumer Electronics, vol. 70, no. 1, pp. 800-810, Feb. 2024.	Journal	NTU
6	J. Huang, S. Mumtaz, V. Frascolla, et al., "Reinforcement Learning based Resource Management for 6G-Enabled mIoT with Hypergraph Interference Model," in IEEE Transactions on Communications.	Journal	NTU, INT
7	K. Zhang, X. -Q. Jiang, H. Hai, R. Qiu and S. Mumtaz, "Enhanced Index Modulation Aided Orthogonal Time Frequency Space with Variable Active Grids and Multiple Constellations," in IEEE Transactions on Vehicular Technology.	Journal	NTU
8	J. Li, Shahid Mumtaz et al., "A Dual-Scale Transformer-Based Remaining Useful Life Prediction Model in Industrial Internet of Things," in IEEE Internet of Things Journal, doi: 10.1109/JIOT.2024.3376706.	Journal	NTU
9	S.A. Busari, N. Correia, F. B. Saghezchi, S. Mumtaz et al. Spectrum sharing for LTE and 5G-NR coexistence. Telecommun Syst 85, 649–664 (2024).	Journal	NTU
10	Y. Yang, H. Hai, X. -Q. Jiang, Y. Wu and S. Mumtaz, "Low-Complexity Detectors for Space-Time Block Coded Differential Spatial Modulation," in IEEE Transactions on Vehicular Technology, doi: 10.1109/TVT.2024.3381863.	Journal	NTU
11	G. Zhang, X. -Q. Jiang, H. Hai, L. Xu and S. Mumtaz, "Intelligent Reflecting Surfaces Based Offset Index Modulation for MIMO Systems," in IEEE Transactions on Vehicular Technology, doi: 10.1109/TVT.2024.3382310.	Journal	NTU
12	S. Kurma, T. A. Lestari, K. Singh, A. Paul and S. Mumtaz, "Active RIS in Digital Twin-based URLLC IoT Networks: Fully-Connected vs. Sub-Connected?," in IEEE Transactions on Wireless Communications.	Journal	NTU
13	Y. Ju, S. Mumtaz, et al., "Energy-Efficient Cooperative Secure Communications in mmWave Vehicular Networks Using Deep Recurrent Reinforcement Learning," in IEEE Transactions on Intelligent Transportation Systems.	Journal	NTU
14	Y. Mao, S. Mumtaz et al., "A High-Capacity MAC Protocol for UAV-Enhanced RIS-Assisted V2X Architecture in 3-D IoT Traffic," in IEEE Internet of Things Journal, vol. 11, no. 13, pp. 23711-23726, 1 July1, 2024.	Journal	NTU
15	Z. Hu, X. Chen, Z. Zhou, S. Mumtaz, "Localization with Cellular Signal RSRP Fingerprint of Multiband and Multicell", IEEE Journal on Selected Areas in Communications, JSAC 2024.	Journal	NTU
16	W. Wei, L Fu, H. Gu, X. Lu, L. Liu, S. Mumtaz, M. Guizani, "Iris: Towards Intelligent Reliable Routing for Software Defined Satellite Networks ", IEEE Transactions on Communication, 2024.	Journal	NTU

17	E. Jorswieck, M. Soleymani, I. Santamaria, and J. Gutiérrez, "URLLC Networks Enabled by STAR-RIS, Rate Splitting, and Multiple Antennas",International Conference on Mobile and Miniaturized Terahertz Systems (ICMMTS 2025), Dubai UAE,Feb. 2025.	Conference	UC, TUBS, IHP
18	M. Soleymani, A. Zappone, E. Jorswieck, M. Di Renzo and I. Santamaria, "Rate Region of RIS-Aided URLLC Broadcast Channels: Diagonal Versus Beyond Diagonal Globally Passive RIS," IEEE Wireless Communications Letters, vol. 14, no. 2, pp. 320-324, Feb. 2025.	Journal	UC, TUBS
19	I. Santamaria, M. Soleymani, E. Jorswieck, J. Gutiérrez, "Interference Minimization in Beyond-Diagonal RIS-assisted MIMO Interference Channels", IEEE Open Journal of Vehicular Technology, vol. 6, pp. 1005-1017, 2025.	Journal	UC, TUBS, IHP
20	M. Soleymani, I. Santamaria, E. Jorswieck, R. Schober, L. Hanzo, "Optimization of the Downlink Spectral and Energy-Efficiency of RIS-aided Multi-user URLCC MIMO Systems", IEEE Transactions on Communications, vol. 73, no. 5, pp. 3497-3513, May 2025.	Journal	UC, TUBS
21	I. Santamaria, J. Gutiérrez M. Soleymani, E. Jorswieck, "Rate Analysis and Optimization of LoS Beyond Diagonal RIS-assisted MIMO Systems" IEEE Communication Letters, vol. 29, no. 6, pp. 1325-1329, June 2025.	Journal	UC, TUBS, IHP
22	M. Soleymani, I. Santamaria, E. Jorswieck, M. Di Renzo, R. Schoeber, L. Hanzo, "Rate Splitting Multiple Access for RIS-aided URLLC MIMO Broadcast Channels, IEEE Transactions on Wireless Communications, 2025.	Journal	UC, TUBS
23	M. Soleymani, I. Santamaria, E. Jorswieck, R. Schober, L. Hanzo, "Energy Efficiency Optimization of Finite Block Length STAR-RIS-aided MU-MIMO Broadcast Channels", IEEE 26th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Surrey,UK, July 2025	Conference	UC, TUBS
24	I. Floudas, M. Anastasopoulos, A. Tzanakaki, J. Gutiérrez, ""Experimental Evaluation of Semantic Communications for 6G Networks in Railway Systems," in IEEE Communications Standards Magazine.	Journal	IASA, IHP
25	J. Gutiérrez, et al., "Seamless Integration of Efficient 6G Wireless Technologies for Communication and Sensing Enabling Ecosystems.", In: Maglogiannis, I., Iliadis, L., Karydis, I., Papaleonidas, A., Chochliouros, I. (eds) Artificial Intelligence Applications and Innovations. AIAI 2024 IFIP WG 12.5 International Workshops. AIAI 2024. IFIP Advances in Information and Communication Technology, vol 715. Springer, Cham.	Conference	OTE, IHP, ALL
26	M. Özates, M. Kazemi, E. Jorswieck, D. Gündüz, "ODMA-Based Cell-Free Unsourced Random Access with Successive Interference Cancellation", IEEE Vehicular Technology Conference (VTC-Spring), 2025.	Conference	IHP, TUBS
27	M. Soleymani, I. Santamaria, E. Jorswieck, R. Schober, L. Hanzo, "Energy Efficiency Optimization of Finite Block Length STAR-RIS-aided MU-MIMO Broadcast Channels", IEEE 26th International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), 2025.	Conference	UC, TUBS
28	V. Frascolla, "Dynamic Spectrum Management in Multi-Access Systems moving towards 6G", Dynamic Spectrum Management in Multi-Access Systems moving towards 6G 31st IEEE International Conference on Telecommunications (ICT 2025).	Conference	INT
29	F. Khan, O. Gil, L. Díez, E. Serna. Luis M. Contreras, R. Agüero, "DRL-based Dynamic MAC Scheduler Reconfiguration in O-RAN", IEEE International Conference on Communications (ICC'25).	Conference	UC
30	N. Villegas, J. L. Herrera, L. Diez, D. Scotece, L. Foschini, R. Agüero, "DRL-based Dynamic MAC Scheduler Reconfiguration in O-RAN", IEEE	Conference	UC

	International Conference on Communications (ICC'25).		
31	N. Villegas, A. Larrañaga, L. Diez, K. Koutlia, S. Lagen, R. Agüero, "Optimizing QoS MAC Scheduling in 5G NR: A Lyapunov Approach Evaluated with XR Traffic", **submitted** to IEEE Transactions on Network and Service Management.	Submitted to Journal	**UC**
32	M. Nauman et al., "Enhancing the WLAN OFDM-PHY by OTFS Precoding," 2024 Joint European Conference on Networks and Communications & 6G Summit (EuCNC/6G Summit), Antwerp, Belgium, 2024	Conference	**IHP**
33	M. Ozates, M. Kazemi, G. Liva and D. Gündüz, "A Fully Asynchronous Unsourced Random Access Scheme," 2025 IEEE 26th International Workshop on Signal Processing and Artificial Intelligence for Wireless Communications (SPAWC), Surrey, United Kingdom, 2025.	Conference	**IHP**
34	B. K. Jung, and T. Kürner, "Impact of Exclusion Zone on Interference Between 5G NR-U and Wi-Fi Under Co-Channel Operation in the 6 GHz Band", 2025 IEEE 36th International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC), Istanbul, Türkiye, 2025, pp. 1-6.	Conference	**TUBS**

3.8 Open Source activities

Barkhausen Institut (**BI**) is the lead developer of the open-source simulation software named Heterogeneous Radio Mobile Simulator Python (HermesPy). The project is intended to support the wireless community with a comprehensive framework to investigate communication, sensing and joint applications on the PHY layer. Its respective source code is published under the GNU Affero General Public License (AGPLv3) on GitHub. On a bi-annual basis, the current source code is compiled and packaged into releases and published in the Python Package Index (PyPi). Since the start of 6G-SENSES, **BI** contributed the following features to three software releases:

- Simulation of arbitrary spatial trajectories of wireless devices.
- Spatially consistent random variable sampling for statistical channel models.
- Full forwards kinematics for kinematic chains.
- OCDM, OTFS and OFDM-Radar signal processing.
- Realtime matplotlib visualizations.
- Multithreaded USRP processing.
- Integration of Sionna raytracing.
- Support for Python 3.12.
- Sparse signal modeling for improved memory management.
- Rework of configuration serialization.

HermesPy is the basis for most of **BI**'s signal processing demonstrations, for example the 26 GHz joint communication and sensing demonstration showcased at the 6G Summit Dresden, Germany and 6G conference Berlin, Germany.

4 Liaison Activities report

6G-SENSES partners and delegates have been active in collaboration with other SNS and 6GIA projects given the framework of collaboration (Collaboration Agreement) that has been signed by the consortium. In such framework the information exchange and other sorts of interactions with peer projects are easily achievable. 6G-SENSES consortium is experienced as they have been active in the community for the past years in 5GPPP projects. Active liaison with SNS and 5G-PPP activities, and the interactions with other projects within this framework is led by the Project Manager from 6G-SENSES side.

The project has representation in the Steering Board (Coordinator and Project Manager), and Technology Board (Technical Coordinator and Project Manager) and contribute fully to the actions emanating from these fora.

4.1 Interactions with SNS JU Work Structures

Table 4-1 lists the participation of 6G-SENSES Project Coordinator and Technical Manager to the main 6G-IA boards. Table 4-2 lists the 6G-SENSES participants that contribute actively to each of the 6G-IA/SNS JU WGs.

Table 4-1 6G-SENSES participation in SB and TB

Board	Partners	Contributors
SNS Steering Board (SB)	**IHP**, **NTU**	Jesús Gutiérrez (**IHP**), Shahid Mumtaz (**NTU**)
SNS Technology Board (TB)	**NTU**, **IHP**	Shahid Mumtaz (**NTU**), Jesús Gutiérrez (**IHP**)

Table 4-2 6G-SENSES Contributors to the different WGs established by the 6G-IA

Group / WG	6G-IA OR SNS JU	Partners	Contributors
SNS Steering Board	N/A	**IHP**, **NTU**	Jesús Gutiérrez (**IHP**), Shahid Mumtaz (**NTU**)
SNS Technology Board	N/A	**NTU**, **IHP**	Shahid Mumtaz (**NTU**), Jesús Gutiérrez (**IHP**)
6G Architecture WG	SNS JU	**IASA**, **INT**, **IHP**	Anna Tzanakaki (**IASA**), Valerio Frascolla (**INT**), Jesús Gutiérrez (**IHP**)
Spectrum WG	6G-IA	**IHP**, **INT**, **TUBS**	Jesús Gutiérrez (**IHP**), Yazhou Zhu (**INT**), Thomas Kürner (**TUBS**) Ioanna Mesogiti (**OTE**)
Trials WG	6G-IA	**INT**, **IHP**	Valerio Frascolla (**INT**), Jesús Gutiérrez (**IHP**)
SNS/ 6G-IA Vision and Societal Challenges WG	6G-IA	**OTE**, **INT**, **IASA**, **IHP**	Ioanna Mesogiti (**OTE**), Valerio Frascolla (**INT**), Anna Tzanakaki (**IASA**), Jesús Gutiérrez (**IHP**)

Societal Needs and Value Creation (SNVC)	6G-IA Sub-WG under Vision WG	OTE	Ioanna Mesogiti (OTE)
Business Validation, Modelling and Ecosystems (BVME-Sub WG)	6G-IA Sub-WG under Vision WG	OTE, INT	Ioanna Mesogiti (OTE), Valerio Frascolla (INT),
Sustainability Task Force	N/A	IHP	Jesús Gutiérrez (IHP)
Hardware Technologies (HT) WG	N/A	IHP, INT	Jesús Gutiérrez (IHP), Jessica Sanson (INT)
Test, Measurement and KPIs Validation	SNS JU	OTE	Ioanna Mesogiti (OTE)
Pre-Standardization	6G-IA	INT	Yazhou Zhu (INT)

4.2 Interaction with other SNS JU Actions

Joint demonstration activities at EuCNC 2025 in Poznan at the Joint Booth (BOOTH#16) with title "Sustainability for 6G: from Infrastructure to Services", where a joint ISAC demonstration activity was showcased between 6G-SENSES and BeGREEN. The joint booth was organized by the projects BeGREEN, 6G-TWIN, EXIGENCE, 6Green and 6G-SENSES.

Figure 4-1 Joint demonstration BeGREEN & 6G-SENSES on providing an E2 Service Model (E2SM) for sensing to a Sub-6 ISAC solution

4.3 Relation of 6G-SENSES with other peer SNS Projects / HE Projects

Several members of the 6G-SENSES consortium can act as links to other SNS actions, which are presented in Table 4-3.

Table 4-3 Relation of 6G-SENSES with peer SNS Projects

Project	Partner	Responsible Person	Role	Synergies
BeGREEN	IHP	Jesús Gutiérrez (IHP)	Technical Manager	ISAC, O-RAN extensions, RIS, etc.
INSTINCT	BI	Padmanava Sen (BI)	Project Coordinator	ISAC
VERGE	INT	Valerio Frascolla (INT)	Partner	AI for edge
5G-TACTIC	IASA	Anna Tzanakaki (IASA)	Project Coordinator	-
Eco-eNET	OTE	Elina Theodoropoulou (OTE)	Consortium Member	Sensing, KPIs, etc.
6G-SANDBOX	OTE	Fofy Setaki (OTE)	Consortium Member	Testbed capabilities, KPIs, etc.
SUNRISE-6G	OTE	Fofy Setaki (OTE)	Consortium Member	Testbed capabilities, KPIs, etc.
TIMES	TUBS	Thomas Kürner (TUBS)	Technical Manager	Use cases in industrial environments
TERRAMETA	TUBS	Thomas Kürner (TUBS)	Dissemination Manager	RIS

4.4 Participation in other relevant initiatives

Table 4-4 lists the mapping of 6G-SENSES partners and their involvement in bodies that the project will pursue for dissemination and engagement.

Table 4-4 Partner involvement in bodies that will be pursued for dissemination and engagement

Relevant Community / Key organisation / Industry Body	Partners involved	Type of relationship
AIOTI - https://aioti.eu/	UC, INT, IHP	Member (UC), (IHP) WG-lead (INT)
6G Smart Networks and Services Industry Association (6G-IA) https://6g-ia.eu/	IHP, IASA, ACC, BR, INT, OTE	Full membership, WG-co-Lead (INT), WG-co-Lead (OTE)
BDVA – https://bdva.eu	INT	VP of industry (INT)
OpenAirInterface Software Alliance (OSA)	BR	Non-profit member of OSA, Member / Co-Founder
FMD - *Forschungsfabrik Mikroelektronik Deutschland*	IHP	Member

4.5 Achievements and Impact

6G-SENSES has declared from the project starting date its degree of involvement in most WGs that are currently running, either triggered by the 6G IA or the SNS JU.

We list in the following tables the activities that have taken place in the WGs and the future plans that are of interest for the project. As mentioned in [1], the criteria for choosing these responsible people stem from their general expertise working at their organisations, together with previous expertise in driving and contributing to the mentioned WGs.

4.5.1 Vision and Societal Challenges

Association:	6G-IA
Working Group:	Vision and Societal Challenges WG
Representatives on behalf of 6G-SENSES	Anna Tzanakaki (IASA), Jesús Gutiérrez (IHP), Ioanna Mesogiti (OTE), Valerio Frascolla (INT)
Activities and Achievements:	
Activities The Societal Needs and Value Creation Sub-WG (SNVC-Sub-WG of the VSC WG) focuses on refining the methodology that has been inherited by 5G-IA WG and Hexa-x II (to be followed by SNS-JU projects) for identifying, defining, measuring and validating the impact of 6G use cases on Key values and deriving KVIs. 6G-SENSES representatives follow up the meetings and the work of the Sub-WG.	
Future Plans:	
The views of 6G-SENSES on the methodology to be followed for the validation and measurement of KVIs will be channelled to the Sub-WG, through the participation of the project representatives in the SNVC meetings and their contribution to the upcoming White Paper.	

4.5.2 WG Vision Business (sub-group of that in 4.5.1)

Association:	6G-IA
Working Group:	WG Vision Business – BVME SG - Business Validation, Models, Ecosystems
Representatives on behalf of 6G-SENSES:	Ioanna Mesogiti (OTE)
Activities and Achievements:	
Activities • The group is working on the business validation of B5G and 6G technologies, and on business modeling and economical aspects of the deployment of B5G and 6G technologies and use cases. 6G-SENSES participates to the meetings of the WG and contributes to the formulation of the views based on the relevant work of the project (i.e. the vision on 6G-Ecosystems, the technoeconomic studies etc.). **Achievements** • The group published the White Paper "Emerging 5G and beyond ecosystem business models"[2], where Ioanna Mesogiti (OTE) was one of the lead editors and Valerio Frascolla (INT) served as review. The main contribution has been the views of 6G-SENSES on how 5G-Ecosystems will evolve to 6G-Ecosystems, and how technoeconomics can influence the business models' formulation.	
Future Plans:	
6G-SENSES will continue to follow up the work of the Sub-WG on and will channel the techno-economic results to the activities of the Sub-WG.	

4.5.3 6G Architecture WG

Association:	SNS JU
Working Group:	6G Architecture WG
Representatives on behalf of 6G-SENSES:	Anna Tzanakaki (IASA), Jesús Gutiérrez (IHP), Simon Pryor (ACC)
Activities and Achievements:	

[2] H. K. Hallingby, R. Frizzell I. Mesogiti, "Emerging 5g and beyond ecosystem business models", January 2025, https://zenodo.org/records/14756405

Activities

- Contributions from the 6G-SENSES architecture concept (deliverable **D2.2** [3]) to the White Paper.
- Inclusion of the generic architecture of 6G-SENSES in Chapter 6, Integrated Sensing and Communication.

Achievements

- Generation of the White Paper "TOWARDS 6G ARCHITECTURE: KEY CONCEPTS, CHALLENGES, AND BUILDING BLOCKS", published on May 2025.

Future Plans:

The plans are to keep the participation in the WG and to present the updated architecture to be included in deliverable D2.3 in the next slot of project presentations. New content will be generated for the next White Paper of the WG.

4.5.4 Test, Measurement and KPIs Validation

Association:	SNS JU
Working Group:	WG Test, Measurement and Validation – KPIs Task Force
Representatives on behalf of 6G-SENSES:	Ioanna Mesogiti (**OTE**)
Activities and Achievements:	

Activities

KPIs Sub-WG:

- Ioanna Mesogiti is leading the Sub-WG. 6G-SENSES participated in the Sub-WG teleconferences, and co-edited and contributed to the latest White Paper by reporting and promoting the view of the project on the definitions and target values of the ITU-R IMT-2030 KPIs for New and Enhanced capabilities.
- 6G-SENSES also contributed to the dissemination activities of the Sub-WG (Presentation of the work on TMV KPIs WG in the Hexa-x II series workshop in EUCNC 2025).

KVIs Sub-WG:

- 6G-SENSES participated to the KVIs Sub-WG telcos and contributed to the latest White Paper by harmonizing with the WG methodology and reporting on the project KVIs.

Achievements

- Contribution and Editorship of a White Paper published on "6G KPIS –DEFINITIONS AND TARGET VALUES", Ioanna (**OTE**) Editor + Contributor, Jesús Gutiérrez (**IHP**), link
- Contribution to KVIs identification from 6G-SENSES, Ioanna (**OTE**) Contributor/Reviewer. White Paper "6G KVIS – SNS PROJECTS INITIAL SURVEY RESULTS 2025", link

Future plans:

The upcoming work of the KPIs Sub-WG will focus on further harmonizing the KPIs definitions, especially for the "New Capabilities" of the IMT-2030 networks, and on collecting and cross-validating the measurement results of the SNS JU projects.

At the same time the work of the KVIs Sub-WG will further focus on the definition and assessment methodologies of the SNS JU projects' KVIs.

6G-SENSES will continue to attend and contribute to the work of the Sub-WG.

4.5.5 Trials Working Group

Association:	6G IA
Working Group:	Trials Working Group
Representatives on behalf of 6G-SENSES:	Valerio Frascolla (**INT**), Jesús Gutiérrez (**IHP**)
Activities and Achievements:	

Activities • Too early to contribute on trials and pilots (T&Ps) given the immature status of the PoCs by the first half of 2025. **Achievements** • SNS T&Ps Brochure Nº1 produced in June 2025.
Future Plans:
• Preparation of a White Paper on Large-Scale Trials and Pilots (LST&Ps), with a planned release date at EuCNC & 6G Summit 2026. • Opt to get accepted our PoC activities in the next release of the Trials & Pilots (T&Ps) document.

4.5.6 Pre-standardisation WG

Association:	6G-IA
Working Group:	Pre-standardisation WG
Representatives on behalf of 6G-SENSES:	Yazhou Zhu (INT)
Activities and Achievements:	
Activities • Feedback to the WG on the standardization activities stemming from 6G-SENSES. **Achievements** • N/A	
Future Plans:	
Continue reporting on 6G-SENSES activities in the WG.	

4.5.7 Spectrum WG

Association:	6G-IA
Working Group:	Spectrum WG
Representatives on behalf of 6G-SENSES:	Yazhou Zhu (INT), Jesús Gutiérrez (IHP), Thomas Kürner (TUBS), Ioanna Mesogiti (OTE)
Activities and Achievements:	
Activities • 6G-SENSES (through the collaborative work of its' representatives) was the major contributor to the definition and target values of the "sensing-related KPIs" which were included (in an abstracted way) in the document contribution of the 6G-IA Spectrum WG to ITU-R. • The WG representatives attended the telcos regularly. **Achievements** • Contribution on "Minimum requirements related to technical performance for IMT 2030 radio interface(s)" submitted to ITU-R (link)	
Future Plans:	
The WG will further work on the definitions of the IMT-2030 Enhanced Capabilities. 6G-SENSES will continue to follow up the work of the WG and provide its views on the Minimum Technical Performance Requirements (TPR).	

4.5.8 Hardware Technologies WG

Association:	6G-IA
Working Group:	Hardware Technologies WG

Representatives on behalf of 6G-SENSES:	Jessica Sanson (INT), Jesús Gutiérrez (IHP)
Activities and Achievements:	
Activities • The WG has recently been formed. **Achievements** • Send out feedback on the Questionnaire that has been shared with the partners.	
Future Plans:	
Check the results of the Questionnaires stemming from partners participating in the WG and continue taking part in the calls.	

4.5.9 Sustainability Task Force (TF)

Association:	6G-IA
Working Group:	1st Kick-Off on 1st October 2025
Representatives on behalf of 6G-SENSES:	Jesús Gutiérrez (IHP)
Activities and Achievements:	
Activities • None so far (as a Working Group). **Achievements** • Editorship and Contribution to a White Paper entitled "Sustainability in SNS JU Projects – Targets, Methodologies, Trade-offs and Implementation Considerations Towards 6G Systems", Jesús Gutiérrez (IHP)	
Future Plans:	
The TF has turned into an SNS JU WG, which kicks-off on October 1st 2025. 6G-SENSES will continue actively participating in the WG.	

5 Conclusions

This document has described the dissemination and communication activities conducted by 6G-SENSES from the start of the project until M20. The final report of actions and achievements will be reported in **D6.3** due in M30.

The comparison of the achievements against the target KPIs is summarised in Table 5-1. Being at M20 and having 10 months ahead 6G-SENSES's own assessment is that communication and dissemination actions are in good track. In those cases that the KPIs lay behind the targets, it is expected that, as the project progresses, and the technological solutions are put together in PoCs, relevant results lead to an increased number of dissemination activities. Regarding publications, it is worth highlighting that, beyond the number of publications, which is in good track to achieve the targets, there are several high impact publications.

Table 5-1 6G-SENSES Achievements Against Targets at the End of M20

Measure	Indicators	Target	Means of verification	Achievements
Posters	Number of posters produced	2 in total	Dissemination reporting activities	**1** Poster produced
High-level materials for policy makers	Number of sets (mission statement, slide-deck, brochure)	At least 1 per year	Dissemination reporting activities	**1** slide deck and **1** brochure produced
6G-SENSES website	Number of unique visitors	> 1000 visitors/year	Google analytics	Achieved
Social networks	Number of followers in: LinkedIn, YouTube	> 500 /> 100/ > 100	Active profiles on such networks via regular posting & monitoring	**163** followers in LinkedIn, N/A YouTube (so far)
6G-SENSES Workshops	Number of workshops and number of participants	3 workshops (100 participants/event)	Attendance proofs (e.g., photos, presentations, videos, interviews)	**1** workshop organized with more than 100 participants
Videos	Number of videos published on the project's YouTube channel and average number of views	2 videos and > 500 views per video	Videos published via the YouTube channel of the project	**No** videos so far
Scientific publications	Number of peer-reviewed papers/articles	At least 25 by the end of 6G-SENSES	Papers/articles published in proceedings & online in premium quality conferences and journals.	**33** accepted publications so far

6 References

[1] 6G-SENSES Deliverable D6.1, “6G-SENSES Standardisation, Dissemination, Communication, and Liaison Activities Plan”, September 2024, https://6g-senses.eu/wp-content/uploads/2025/02/2024-09-30-6G-SENSES_D6_1_vf_pending_EU_review.pdf

[2] 6G-SENSES deliverable D2.1, “Report on 6G-SENSES use cases, network architecture, KPIs and supported RAN functions”, September 2024.

[3] 6G-SENSES deliverable D2.2, “System architecture and preliminary evaluations”, March 2025.

7 Acronyms

Acronym	Description
3GPP	3rd Generation Partnership Project
3GPP SA1	Service and System Aspects WG
6G-IA	6G Infrastructure Association
6GIG	GSA 6G Joint Working Group
BoI	Bodies of Interest
CN	Core Network
EC	European Commission
ENISA	EU Network and Information Security Agency (Cyber-security Agency)
ETSI	European Telecommunication Standardization Institute
EVM	Error Vector Magnitude
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ISA	International Society of Automation
ISAC	Integrated Sensing and Communication
ISG	Industry Specification Group
ISO	International Standard Organization
ITU	International Telecommunication Union
KPI	Key Performance Indicator
LAN	Local Area Network
MAC	Medium Access Control
MAT	Multiple Access Techniques
MEC	Multi-access Edge Computing
NFV	Network Functions Virtualization
NGMN	Next Generation Mobile Networks Alliance
O-RAN	Open Radio Access Network
OSM	Open Source Manual Orchestration
PoC	Proof of Concept

QoS	Quality of Service
QoE	Quality of Experience
RAN	Radio Access Network
RAN / RAN 1 / RAN 2, etc.	Radio Access Network (Layer1….)
SB	Steering Board
SDN	Software Defined Networking
SDO	Standard Development Organisation
SEO	Search Engine Optimization
SNS JU	Smart Networks and Services Joint Undertaking
TF	Task Force
WG	Working Group
WP	Work Package