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Final report on exploitation of knowledge and results

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Abstract

The current deliverable comprises of the final industrial and academic activity report of the RISE-6G. It coincides with the activities of Task 8.3 referring to the industrial exploitation endeavors. Building on top of previous deliverables, this document illustrates the business model and exploitation strategies outlined in the project, considering the different types of Partners involved (academics, industrials, or verticals). Based on those types, overviews of the exploitation landscape are presented, and the exploitation activities throughout the lifecycle of the project conducted by Partner are reported. Besides, the most prominent, individual "exploitation items" have been collected. Such items are standalone outcomes and developments that have the potential of commercialization. Twelve such items are reported (5 patents, 2 knowledge items, 3 field trials & prototypes, 1 product, and 1 startup). They are presented in a way that illustrates the commercialization and business plans relevant to each item, according to the overall RISE-6G exploitation policy. It is noted that such items are developed by academic and vertical partners, as well as industrials. The document concludes with a brief summary of the industrial dissemination activities, that are primarily reported in the accompanying D8.5 of WP8.

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1 Introduction

Reconfigurable Intelligent Surfaces (RIS) represent a revolutionary technology in wireless communication and signal optimisation. RIS involves the use of electronically controllable materials or surfaces to manipulate electromagnetic waves. By changing the properties of these surfaces in real-time, RIS can enhance wireless communication performance, extend coverage, and mitigate interference, making it a promising solution for 6G and beyond.

The European Vision of "Horizon2020???" well describes the motivation of the RISE6G project. RISE6Gis defined by the diversity of its project partners; drawn from the wireless industry and importantly from the academic research that in fact provide the focus for value creation activities. The industry is broadly defined by the themes of two different application for test beds that form the basis of use case trials and demonstrators; rail station in Rennes (France), industrial plant in Torino (Italy). These two use cases applications are paired with the reverberant chamber with radio EnodeB in Ancona (Italy) encompass not only technical platforms and solutions that are under development, but a wider experimental and measurement scenario.

Work Package 8 (WP8), task 3 of RISE6G manages the processes necessary to fulfil the projects objectives of Industrial Communications and Dissemination. This report provides a summary of the outcomes to date towards dissemination, and impact assessment during the project duration. It also provides an opportunity for the project partners to review their exploitation planning and refine their strategic intentions for exploitation of the outcomes of the project. The refreshing of the strategic thinking of the project partners is essential and exactly maps the approach that would be taken in agile developing technology sectors where strategic marketing, technology and business model in-sights will necessitate strategic pivots.

Industrial Communication and Dissemination activities have established all necessary social media channels along with the project website. Content for social media and the website has come from the deliverables as well as blogs from partners and video/social content.

2 Business model context

An important aim of RISE-6Gis to establish a commercial use-case scenario for investment by studying the market appliance in infrastructure sector that is the focus of the project. This contrasts with the traditional commercial drivers for realize coverage of mobile network services which was the focus of current network realization approach.

Task 8.3 is interested to understand when the benefits of the RIS technology can be truly exploited from the industrial point of view in its commercial networks. It provisions the role of the technical and proof-of-concept results of the RISE-6G project in new business opportunities, new services, and new exploitation opportunities. The task aims at the timely commercialisation of the project results and related services by industry, verticals and SMEs, and to subsequently have a positive impact on both social and economic developments in Europe.

Business validation is a process to assess whether a certain system design is appropriate for the purpose and meets the business requirements within given constraints. The requirements in question are the characteristics of the system from the customer's point of view and expressed in the customer's "language" and the constraints are the external factors that impact and limit network system design. These can be technical, financial or regulatory in nature. In RISE-6G the system design is represented by the use case developed and the experience in reverberant chamber and also in the industrial context for Element development and, furthermore, from the customers experience and security level point of view. Each RISE-6G partner

is looking to maximise the economic and commercial impact of the project in their respective market and this will be defined in their respective exploitation plans. WP8.3 will consider these individual exploitation plans and analyse business opportunities for the individual partners.

WP2 will define the use cases for technical and commercial analysis across the entire project. WP2 will provide the "big picture" economic impact of the use cases and will establish which uses cases have the most significant commercial impact. WP8 will take specific scenario inputs from WP2 to carry out a more detailed business assessment of the prioritised use cases. The information from WP2 will include service definitions and demand profiles. WP2 will also provide a high-level, qualitative evaluation of the value generated by each use case within each vertical and hence the willingness to pay. WP8 will use the WP2 qualitative evaluation to develop a more detailed quantitative analysis.

2.1 Business model framework applicable to RISE-6G

A business model framework applicable to innovative RIS involves several key elements. Firstly, it's essential to define the unique value proposition of the RIS, highlighting its advanced features and benefits. Understanding the target market and identifying the most effective distribution channels is crucial. Revenue streams can include device sales, subscriptions, advertising, or content licensing. Analysing the cost structure helps determine the profitability of the model. Core activities like product design, software development, and customer support should be outlined. Key resources, such as personnel and technology infrastructure, must be identified. Strategic partnerships with content providers and broadcasters can enhance the offering. Building strong customer relationships through personalized support and loyalty programs is vital. Competitive advantage lies in the RIS's unique strengths compared to existing solutions. Effective marketing, tracking key metrics, and protecting intellectual property are essential. Compliance with regulatory requirements and scalability for growth should be considered. Risk assessment, sustainability, and social impact are important factors. Gathering customer feedback and adapting the business model accordingly ensures continuous improvement. Finally, a roadmap for future enhancements and expansion sets the vision for the innovative RIS.

The basic business model could be explained as:

1. **RIS Hardware Manufacturers:** Companies in this category design, produce, and sell RIS hardware, which includes the intelligent surfaces and associated control systems. These manufacturers serve the telecommunications and networking industries.
2. **RIS Software and Control Systems:** Businesses may develop and sell the software and control systems necessary to manage RIS configurations. This includes algorithms for optimizing signal performance and interfacing with existing communication networks.
3. **Consulting and Integration Services:** Some companies offer consulting and integration services to help organizations implement RIS solutions into their existing wireless communication infrastructure. They may design custom RIS solutions for specific use cases.

2.2 Stakeholder engagement

Stakeholder engagement is the process of involving and collaborating with various individuals or groups who have a vested interest or influence in RIS development and usage. It is crucial for building positive relationships, addressing concerns, and achieving mutually beneficial outcomes. The key steps in stakeholder engagement include identifying the stakeholders, understanding their interests and needs, and determining the most effective methods of communication and involvement. In this context we conducted surveys, holding meetings, organizing newsletters, utilizing online platforms. Active and transparent communication is essential to

keep stakeholders informed and engaged throughout the process. By actively involving stakeholders, considering their perspectives, and incorporating their feedback into decision-making, organizations can foster trust, mitigate conflicts, and create a sense of ownership among stakeholders. Ultimately, effective stakeholder engagement contributes to more informed and sustainable decision-making, increased support for initiatives, and the long-term success of projects or organizations. This activity has been developed through industrial partner of the project as reported in Table 21.

Table 2-1: Project stakeholder

Group	Company
Academic and Research Organisations	CEA
	CHAL
	AAU
	NKUA
	CNIT
	CNRS
Industrial	NEC
	ORA
	TIM
	GNW
	SNCF
	CRF

External stakeholder could be reported in the following four groups:

1. **Telecommunications Providers:** Telecom companies are major users of RIS technology to improve the efficiency and performance of their networks, particularly for 5G and future wireless standards.
2. **Enterprises and Businesses:** Large enterprises and businesses with complex wireless communication needs can deploy RIS to optimize their in-building and outdoor wireless networks, improving connectivity for employees and customers.
3. **Smart Cities and Infrastructure:** RIS can be applied in smart city initiatives to enhance wireless connectivity in public spaces, transportation networks, and other critical infrastructure.
4. **Government and Defense:** Military and government agencies may employ RIS to enhance secure communication and surveillance networks, improving signal integrity and reducing interference.

2.3 Overview of Academic Exploitation activity

Academic partners have capitalised on the RISE-6G results predominately by exploiting the gained knowledge and developed technologies to increase their Institution's reputation and stimulate further research, collaboration, and funding opportunities. The predominant exploitation actions for academic partners involve the publication of research papers in journals, magazines, and conferences, as well supporting communication activities (lectures, tutorials) as

presented in D8.5. The added value from such efforts, as reported in the following sections, spans along the following directions:

- **Securement of research tenders and funding:** Based on results, knowledge, and technology developed under RISE-6G, follow-up funds have been awarded to most of the academic Institutions. EC-funded projects have been predominately targeted by the Partners. Notably, six of the RISE-6G Institutions (including Industrial Partners) have collaborated in the 6G-DISAC Consortium, under SNS-2023 STREAM B call.

- **Portfolio building and reputation enhancement:** Academic Partners have used the various dissemination efforts carried out throughout the project to communicate RISE-6G outcomes to the wider scientific community, establishing their Institutions as leading experts in the fields. The added value of this endeavor is the potential for future collaborations with leading experts in the field and private sector endeavors.

- **Inter-Partner Collaborations:** The joint work carried out in the WPs of this project has resulted in numerous publications that are already completed, but even more research plans have been identified between partners. Such initiatives will spark future collaboration efforts between the involved institutions that span well-beyond this project.

While the above central axes correspond to general benefits brought for the academics altogether, individual exploitation items are also reported in this deliverable that align with the aims and goals of their respective Partners. RIS protypes have been developed, and a Startup Company has been founded.

2.4 Overview and market analysis of industrial exploitation activity

In the dynamic landscape of global commerce, industrial exploitation activity plays a pivotal role in shaping economies and driving technological advancements. This comprehensive overview and market analysis delve into the intricate facets of industrial exploitation, shedding light on the diverse sectors, key players, and emerging trends that define this crucial domain.
Industrial exploitation activity encompasses a wide spectrum of industries, ranging from manufacturing and energy production to raw material extraction and processing. As businesses worldwide strive for efficiency, sustainability, and innovation, understanding the dynamics of industrial exploitation becomes essential for stakeholders, investors, and policymakers alike.
This analysis will explore the current state of industrial exploitation on a global scale, examining market trends, challenges, and opportunities that influence decision-making within the sector. The evolution of technology, regulatory frameworks, and environmental considerations are integral factors that shape the landscape of industrial exploitation, influencing strategies and investments.
Key elements to be addressed in this overview include:

1. **Sectoral Breakdown:** An examination of diverse industrial sectors such as manufacturing, energy, mining, and more, highlighting the unique challenges and opportunities within each.
2. **Global Market Dynamics:** A detailed exploration of the current market trends, demand-supply dynamics, and factors influencing industrial exploitation activities on a global scale.
3. **Key Players and Innovations:** Identification of major industry players, their market share, and an analysis of technological innovations driving the industrial exploitation landscape forward.
4. **Regulatory Environment:** An assessment of regulatory frameworks impacting industrial exploitation, with a focus on sustainability, environmental regulations, and compliance standards.

5. **Challenges and Opportunities:** Insight into the challenges faced by industries engaged in exploitation activities, alongside the potential opportunities for growth, efficiency improvements, and sustainable practices.
6. **Future Outlook:** A forward-looking perspective on the future of industrial exploitation, considering emerging technologies, geopolitical influences, and societal trends that may shape the landscape in the coming years.

As we navigate the complex interplay of economic, environmental, and technological factors, this overview aims to provide a valuable resource for stakeholders seeking to understand and navigate the ever-evolving realm of industrial exploitation.

2.4.1 Market size, trends, and patterns

In the following figure, we give some insights into the number of mmWave RIS required to cover the same area as small cells would have done.
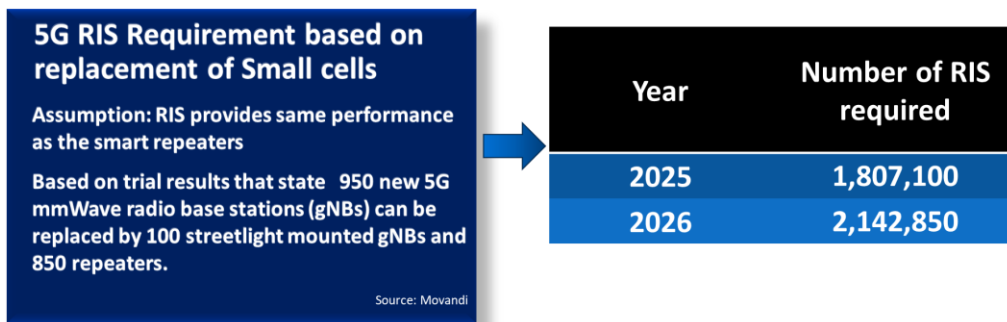
2.4.2 Main competitors

Here is a list of competitors on RIS and the competing NCR technology.

Enterprise	Overall Funding/ Revenue	Country	Technology
ZTE	$2.05 B Overall Revenue	China	Reconfigurable Intelligent Surfaces
NTT Docomo	$33.6 B Overall Revenue	Japan	Reconfigurable Intelligent Surfaces, with Greenerwave
Movandi technologies	$73.4 M	USA	mmWave Smart repeater modules

Metawave	$43 M	USA	5G mmWave Active Repeaters and Passive reflectors
LATYS	$3 M	Canada	Reconfigurable Metasurface/static RIS
Pivotal Commware	$99 M	USA	Outdoor network repeater, Network modelling tool and management system
Airgain	$64 M **Overall Revenue**	USA	Smart repeaters

2.4.3   Means of commercialization

The commercialization of RIS could be done in different forms:

1. Through direct contract with operators, in which the installation of a RIS will be network agnostic. In this case, a stair-rise approach could be used.
2. Licensing to operators and/or vendors.

The standardisation might play a role in this regard. Also, the deployment strategy of each operator would affect the decision in this regard. The core of RIS technology is very important characteristic to be considered in this regard.

2.4.4   Barriers to entry

The threat of New Entry is Medium. It depends on the following factors:

- The presence of large established players.
- Capital and tech restraints.
- Positive Influence of O-RAN.
- Contractual and legal constraints.

3 EXPLOITATION activity

This section outlines the RISE-6G exploitation plans for the necessary functionality associated with business cases, taking into account both the vertical ecosystem and transversal network infrastructure elements.

The specific exploitation strategies of the RISE-6G partners are detailed below, with partners divided based on their contributions to the project ecosystem:

- Network operators;
- RIS vendors;
- Verticals;
- Academics.

3.1 Exploitation activity for Operators

TIM is the incumbent operator in Italy. TIM is implementing, and it will continue in the next years, the so called "Operations TIMe" plan, which significantly impacts the business of the company. Within such multi-year plan, future 6G network will be a cornerstone, enlarging the type and number of markets where the new digital company will be committed and promoting the full deployment of a new type of radio coverage approach. In this context, the experience acquired in the project (from theoretical analysis to in-field trials) will enable the design of use cases where RIS technology will play a significant role in terms of coverage enhancement, localization and sensing features and sustainability (EE, EMFEE, SSE). Furthermore, the knowledge of RIS technology deepened in the project will support TIM's contributions to standardization activities in international bodies (e.g., on network architecture involving RIS devices) and outcomes in terms of IPR.

Orange is one of the most active global network operators on the future 6G, and is one of the leading companies on the concepts of 6G for Sustainability and Sustainable 6G. RIS technology is identified as a very promising enabler for sustainable 6G. Orange is promoting and will continue promoting the results of RISE-6G at several levels : through its direct collaborations with network manufacturers, and network equipement vendors, through its participation to pre-standardisation at ETSI ISG RIS and through its participation to GSMA. Orange focuses on two struggles. Firstly, Orange is exploiting prototyping, experimental and field trial results of RISE-6G to encourage future experimentations of prototypes (possibly from partners of RISE-6G project) by all network manufacturers, to issue competitive products in terms of price, performance, and energy consumption. Secondly, Orange is exploiting RISE-6G fundamental and practical results on the new concept of Bandwidth of Influence and Area of Influence to help the mobile network industry prepare the network planning and the regulation of this new type of device, especially in terms of spectrum coexistence.

3.2 Exploitation activity for RIS vendors

Greenerwave is a leading SME for RIS manufacturing. The project has provided a deep and thoughtful plan for exploitation. First, the project has allowed Greenerwave to realize that power consumption and cost are two key elements for wide deployment by the operators. Hence, Greenerwave is working on a new version of RIS that tackles these two constraints. To this end, we will customize a new component that replaces the conventional PIN-diode. The new design is on the roadmap of the company and should have a first mini-metasurface in Q1-2024.

Second, Greenerwave through its involvement in the different field trials, particularly in Rennes train station in collaboration with Orange and SNCF, has identified the benefit of deploying RIS to improve coverage in white zones. Hence, these trials will be followed-up by other ones with different conditions (outdoor, neutral network, new gNB, etc). Greenerwave will be definitely exploiting the overall RISE-6G results to this end.

Third, the RIS has been used in the project for positioning, among other things. But it can easily be updated and then deployed for integrated sensing and communications. Greenerwave aims at adding these features to its RIS. The roadmap is to have such features in Q3 2024.

NEC has established its major role as a key player in the field of reconfigurable intelligent surfaces (RIS), strategically outlines its exploitation plan to leverage this cutting-edge technology. The primary focus is on patentability, recognizing the significance of protecting intellectual property in the highly competitive landscape of wireless communication and smart infrastructure. NEC aims to secure a robust portfolio of patents covering innovative aspects of RIS, including unique configurations, algorithms, and applications.
Within the RISE-6G context, NEC not only safeguards its research and development investments but also establishes a strong position in the market, deterring potential competitors and enabling the company to capitalize on licensing opportunities.
NEC's exploitation plan has involved a comprehensive analysis of the patent landscape to identify white spaces and potential areas for patent filing. The company places emphasis on a proactive approach to stay ahead of technological advancements, ensuring that its first RIS prototype remains at the forefront of innovation. Collaboration with research institutions, academia, and industry partners is a pivotal aspect of NEC's strategy, fostering an environment for knowledge exchange and joint patent applications. This collaborative approach not only enriches the patent portfolio but also strengthens NEC's position as a thought leader in the RIS domain.
Furthermore, NEC recognizes the importance of aligning its patent strategy with standardization activities in the industry. By actively participating in relevant standardization bodies and contributing to the development of RIS standards, NEC ensures that its patented technologies become integral to the industry's norms. This alignment not only enhances the market acceptance of NEC's RIS solutions but also facilitates interoperability and compatibility, driving broader industry adoption (please refer to D8.5).
In summary, NEC's exploitation plan for RIS revolves around a proactive patent strategy, collaboration with key stakeholders, and alignment with industry standards. By focusing on patentability, NEC aims to secure a leading position in the RIS market, fostering innovation, and contributing to the advancement of wireless communication and smart infrastructure technologies.

3.3   Exploitation activity for verticals/industrials

SNCF is one of the first companies in the world to trial RIS technology, as potential business customer in a B2B2C configuration, as a vertical. SNCF will exploit the results of the RISE-6G trial to prepare the future 6G deployments in several environments. First of all, SNCF will organize internal workshops to share the trails results in a real train station and then, define the target uses cases that might need RIS technology to be implemented. Target uses cases may include industrial environment such as train maintenance warehouses for maintenance operations purposes and public environment such as trains and train stations for client purposes.

CRF is the reference research center of the Stellantis group in Italy with the goal to develop and transfer innovative products, processes and methodologies to the parent company. In the RISE-6G project, CRF, as end-user, provided a use case with the related industrial environment for the application of the RIS technology. The application field of the trial concerned inbound logistics of the assembly process, and the exploitation activity starts with internal presentation of results with key people of plant departments and supply chain management. The following stages will regard the identification of specific production process sections which could benefit from the introduction of RIS technology and the development of industrialization plans in order to move from laboratory level to a real plant application. Implementation sectors can include real-time monitoring of material flows and component handling/transport means (e.g. AGVs) inside kitting/sequencing areas, motion synchronization of different automated actors involved in assembly process and checking of sequences of operations performed by human operators with related working conditions.

3.4   Exploitation activity for Academic

AAU is an academic partner involved in the RISE-6G project. AAU actively engaged in research endeavors throughout the duration of the RISE-6G, and intends to continue exploitation of these insights until the project's completion and beyond, integrating them into ongoing related initiatives. As an academic collaborator, AAU primarily focused on utilizing the research findings from RISE-6G project, disseminating them through publications and presentations at international conferences.The research conducted within RISE-6G significantly bolstered AAU's knowledge base and expertise in this domain. This positions the AAU team to actively contribute to and engage in forthcoming research activities, collaborations, and pursuit of future national and European project calls, particularly those centered around reconfigurable intelligent surfaces and the core aspects of next generation (5G and beyond) technologies.
Specifically, the knowledge about control aspects and signalling will be particularly valuable in the ongoing 6G-GOALS project, while the expertise in RIS modelling might be exploited within CENTRIC project. Finally, participation in the RISE-6G project strengthened our existing research partnerships and facilitated establishment of new collaborations.

CEA: Some of the concrete outcomes/results achieved by CEA in the frame of RISE-6G have already been leveraged for research purposes in the context of on-going and upcoming collaborative projects, addressing RIS-related topics. First, in the frame of 6G-BRICKS project (Horizon Europe SNS-JU, GA no.10109695, Jan. 2023 - Dec. 2025), the RIS hardware prototypes developed in RISE-6G WP3 at mmWave frequencies (incl. reflective RISs with 1- and 2-bit phase control and hybrid RIS with load modulation features enabling orthogonal space-time coding) are currently being considered for further hardware optimization (i.e., in terms of phase synthesis), as well as system-level integration and trials with the Open Air Inteface (OAI) platform. Secondly, in the recently accepted 6G-DISAC project (Horizon Europe SNS-JU, Pending GA no., Jan. 2024 - Dec. 2025), the refined RIS-enabled mmWave multipath channel models from RISE-6G WP3 based on real RIS-enabled channel sounding measurements will be extended into distributed multi-point scenarios, so as to cover the needs of cooperative integrated communication and sensing (ICAS) applications. The RIS-enabled localization algorithms proposed in RISE-6G WP5, which have been addressing mostly static near-field non-line of sight downlink positioning so far, will also be extended in 6G-BRICKS (Horizon Europe SNS-JU, GA no.101096954, Jan. 2023 - Dec. 2025) to cover dynamic localization settings (i.e., coupling snapshot user's position/velocity estimation with dynamic RIS control

and tracking filtering) and passive objects detection. Beyond, decentralized RIS-enabled simultaneous localization and mapping applications will also be considered in 6G-DISAC, thus pursuing the growth of RISE-6G seeds with RISE-6G partners. Finally, the system-level RIS-enabled interference management schemes initially proposed in RISE-6G WP6 are also foreseen for possible extensions in the context of another project proposal addressing physical layer security through improved spatial isolation in complex multi-user multi-BS multi-RIS scenarios. All these novel algorithmic developments, which go beyond RISE-6G WP5 and WP6 results, will not only make use of realistic RIS and channel models from RISE-6G WP3, but are also expected to be validated through experiments based on an upgraded RISE-6G WP3 mmWave channel sounder (used so far in RISE-6G WP7 for offline PoC validations).

Beyond the previous collaborative research initiatives, as a non-profit center devoted to applied research, CEA-Leti also and foremost aims at fostering the competitiveness of its industrial partners through technological innovation transfer of relevant technical and scientific know-how. Accordingly, the two patents filled in the context of RISE-6G (i.e., regarding RIS optimization and RIS-based QoS improvement) may be exploited by CEA with these partners for direct IP transfer and/or for upcoming bilateral research projects.

Chalmers: The results from the RISE-6G projects have been / are being exploited in two main directions. First of all, the work CHAL performed in WP2, WP5, WP6, and WP7 has bolstered CHAL's reputation in the area of RIS-aided communication, localization, and sensing, which in turn has been leveraged in successful funding applications (e.g., 6G-DISAC and ROBUST-6G in the SNS calls), where RIS is among the key technologies. Secondly, CHAL co-founded a startup (RadChat), which commercializes joint sensing and communication with RIS.

NKUA, being an academic institution has plans to capitalize on the advancements made in the context of RISE-6G to stimulate further research tenders and funding opportunities from national, European, and private sector. In particular, NKUA's exploitation plan involves building a portfolio of algorithmic and systemic approaches for RIS control and deployment (based on the contributions on the deliverables of WP3 to WP6, as described under Exploitation Item #1). The gained knowledge and expertise obtained throughout this project is expected to result to multiple research-oriented collaborations and funded projects in the next few years. Specifically, NKUA has already started with the exploitation of its expertise by participating in the funded projects 6G-DISAC (SNS JU), TERRAMETA (SNS JU), and PRISM (ESA NAVISP tender), where RIS-related algorithmic and systemic approaches will be incorporated, extended, and validated toward the wider development of smart reconfigurable wireless environments.

NKUA has also exploited outcomes from RISE-6G via its participation in relevant standards, culminating in them being founding members of ETSI ISG ISAC. In parallel, NKUA's exploitation activities further include the augmentation of the education level offered by the Institution, which is achieved by incorporating scientific advancements made in this project in courses curriculums and other educational material.

CNIT is an academic partner consisting by two universities (Rome and Ancona) in RISE-6G project. CNIT has exploited the research activities conducted in RISE-6G and it will continue to do so at the end of the project with the various related activities that are ongoing. As academic partner, CNIT has mainly exploited the research work conducted in RISE-6G along publications in relevant journals and dissemination at international conferences. The research work performed in RISE-6G reinforced knowledge and expertise gained in this RISE-6G enabled the CNIT team to contribute and participate in the upcoming research activities, collabo-

ration and applying for future national and European projects where metamaterials and 5G/6G will be the core aspects of the topics. Moreover, the RISE-6G project enabled to reinforce the research collaborations with many members of the RISE-6G consortium and to build new network of collaborators with both academic and industrial partners.

CNRS is an academic partner that has widely exploited the research activities conducted in RISE-6G already and will continue to do so at the end of the project. CNRS has already exploited the research work conducted in RISE-6G along the following directions. (1) The research work conducted on RIS and electromagnetic signal and information theory was included in the post-graduate Master SAR on advanced communication systems at CentraleSupélec – Paris-Saclay University. (2) The research work conducted in RISE-6G provided initial results for the project SNS-JU INSTINCT, which was recently accepted and will start in January 2024. (3) The research work conducted in RISE-6G motivated the submission of a doctoral network (MSCA) on metamaterial-based integrated sensing and communication (INTEGRATE), which was accepted and started in March 2023. (4) The research results on channel modeling for RIS motivated the spinoff of a sub-working group in the COST Action INTERACT to further develop the activities in the years to come. (5) The research work conducted in RISE-6G enabled the CNRS team to contribute and play an important role in the submission of a national-wide project of future networks (France 2030, PEPR-NF), where reconfigurable metamaterials are one of the core aspects of the project. In addition, RISE-6G enabled to reinforce the research collaborations with many members of the RISE-6G consortium and to build new collaborations with academic and industrial partners thanks to the new know-how generated.

UNOT is an academic partner that has broadly exploited the research activities conducted in the RISE-6G Project. Further exploitation is envisaged until the end of the Project. UNOT has mainly exploited the research work conducted in RISE-6G through Scientific publications in top tier journals and dissemination at prestigious international conferences. The research work conducted in the fundamental characterization of electromagnetic degrees of freedom of surface-based communications has initiated a new line of research beyond wireless communications, entering the mathematical physics community. The research on physics-based optimization has led UNOT to obtain an NSF-EPSRC research grant on quantum-assisted smart electromagnetic environments for future wireless communications. Furthermore, the research on first principal electromagnetics channel modelling has been included in the ETSI RIS ISG, and provides a basis for the newly established ETSI ISAC ISG.

UNOT has developed on the RISE-6G achievements to introduce the RIS technology as an element to reduce the digital divide within Nottinghamshire, through the Digital Nottingham project funded by the University. Moreover, the RISE-6G project has broadened the UNOT national and international networks of collaborators, in both academia and industry.

The work on channel hardening has attracted the attention of BT Applied Research, which has collaborated with UNOT to achieve the first channel hardening observation in a MIMO digital link operated inside a RIS-assisted reverberation chamber. Further fundamental research on aperiodic meta-surfaces is being funded by BT through an EPSRC iCASE PhD studentship starting in 2024. The British Council has also funded two NKUA students working in the RISE-6G consortium to visit Nottingham and expand the horizon on physics-informed deep learning methods for ISAC.

4 EXPLOITATION ITEMS

This section lists the individual exploitation items developed by the partners within the project. Each item is presented through its respective table in the following subsections where common attributes are listed regarding its description and commercialization plans.

4.1 Description of information regarding the exploitation items

4.1.1 Item type

- **Patent:** A legal protection granted by the government for a novel invention, providing exclusive rights to the inventor for a set period. To obtain a patent, a formal application must be filed, detailing the invention's novelty, non-obviousness, and usefulness. The patent application goes through an examination process by a patent office.

- **Product:** A tangible item resulting from the project, ready for market entry. Development involves a series of stages, including design, prototyping, testing, and manufacturing. A comprehensive market analysis and validation process are essential to ensure the product meets customer needs.

- **Business Case Development:** Involves the creation of a strategic plan outlining the viability and profitability of a business idea. This includes market analysis, financial projections, risk assessment, and a detailed roadmap for implementation. A solid business case helps secure funding, partnerships, and guides decision-making.

- **Prototype and/or field trial:** Involves the creation and testing of an initial model or a real-world trial of a product or system. Prototyping includes iterative design and testing phases to refine the product. Field trials involve deploying the product in a real-world setting to assess its performance, gather user feedback, and identify potential improvements.

- **Software:** Involves the development of programs or applications. This includes coding, testing, and debugging. Software exploitation often involves licensing agreements, subscription models, or direct sales. Regular updates, maintenance, and customer support are crucial components of successful software exploitation.

- **Knowledge**

    o **KPI definition – service refinement:** Focuses on developing a framework or guidelines for Key Performance Indicator (KPI) establishment and service enhancement. This includes defining relevant metrics, measurement methodologies, and refining services based on performance indicators.

    o **Portfolio:** Involves the collection of developed algorithms, methodologies, or intellectual assets. This intellectual property can be leveraged in various ways, such as licensing, collaborations, or incorporation into other products or services.

4.1.2 Partnerships

In case the exploitation item has been developed as a common endeavor between more than one RISE-6G Partners, the Partners may have different commercialisation and exploitation strategies. This is to be explicitly listed.

4.1.3 Relevant WP

Specifies the work packages within the project that are directly related to the development of the exploitation item. This also includes relevant deliverables and milestones.

4.1.4 External Reference

In case that the exploitation item has already been circulated publicly, refer to any electronic documents or other material that are relevant. These references may include industry standards, recognized frameworks, or authoritative publications that support or endorse the developed technologies, **specifically academic publications or patents**. Public webpages, technical datasheets, or catalogues may also be relevant for already developed products or services may be relevant.

4.1.5 Means of exploitation

Defines how the exploitation item will be introduced to the market and generate revenue. This includes:

- **Direct Sales:** Selling the product or service directly to end-users or clients.
- **Licensing:** Granting permission to others to use, modify, or distribute the intellectual property in exchange for fees or royalties.
- **Subscription Models:** Offering the product or service on a subscription basis, where users pay a recurring fee for access.
- **Joint Ventures:** Collaborating with other companies to jointly develop, produce, and market the product or service.

4.1.6 Motivation / Business Opportunity

Identifying a clear market gap serves as the foundational motivation for the development of the exploitation item. This involves recognizing a specific challenge or deficiency within the industry that current solutions fail to address adequately. The market gap may manifest as unmet customer needs, inefficient processes, or emerging trends that demand innovative solutions. By pinpointing and articulating this gap, the motivation for the exploitation item becomes evident. Partners should succinctly outline the problem statement, emphasizing why existing alternatives fall short and how the proposed solution uniquely fills this void. This clarity establishes a compelling narrative for stakeholders, showcasing the project's relevance and its potential to meet market demands effectively. Other potential issues to be addressed are the impact of innovation, a critical assessment of the customers' needs, and the scalability of the business opportunity based on the current exploitation item.

4.1.7 Time-to-market

Estimates the duration required to bring the exploitation item to market readiness. This involves:

- **Research and Development Time:** Time required for designing, developing, and testing the product or solution.
- **Regulatory Approval Time:** If applicable, time needed to obtain regulatory approvals or certifications.
- **Market Validation Time:** Time spent gathering feedback, conducting beta tests, and ensuring the product meets market demands.

4.1.8 Time-plan for use

Provides a timeline indicating the expected duration for the utilization of the exploitation item. This includes:

- **Ramp-Up Period:** Initial phase of adoption, where users become familiar with the product or service.
- **Full Deployment:** The point at which the exploitation item is fully integrated into the market or operational processes.
- **Long-Term Use:** The anticipated duration of ongoing use and relevance.

4.1.9 Target Market

Define the specific audience or customer segment for whom the exploitation item is intended. Provide detailed insights into the industries, businesses, or end-users that exhibit a clear need or interest in the technology or solution. An outline of the characteristics and requirements of the target market may also be inserted. This information aids in tailoring marketing strategies and ensuring that the exploitation item effectively addresses the identified market needs.

4.1.10 Client / Revenue Streams

This attribute refers to client base that will directly benefit from or utilize the exploitation item and how the clients will generate revenue with the current exploitation item. Identify diverse revenue streams, such as direct sales, licensing fees, or subscription models. Other relevant streams may be research/R&D tenders, grants or subcontracting. Finally, indirect revenue streams such as "dissemination", "marketing", "advertising", "improvement of internal procedures" etc. may be more applicable.

4.1.11 Competitive Entities (Businesses or Technologies)

Conduct a brief analysis of businesses or technologies that offer similar solutions or address comparable needs. Provide a list of competitors, potentially by including their strengths and weaknesses. This analysis informs strategic decision-making and helps refine the unique selling points of the exploitation item. The analysis may include:

- **Direct Competitors:** Companies offering similar products or services.
- **Indirect Competitors:** Entities providing alternative solutions that address similar needs.
- **Potential Disruptors:** Emerging technologies or companies that could change the competitive landscape.

4.1.12 Licensing and IPR protection

Outlines the strategy for protecting intellectual property rights (IPR) and whether licensing agreements will be employed. This involves:

- **Trade Secrets:** Keeping critical aspects of the intellectual property confidential.
- **Patent Protection:** Filing for patents to prevent others from making, using, or selling the invention.
- **Copyright:** Protecting original works of authorship, applicable to software, documentation, and other creative assets.
- **Trademark:** Protecting logos, names, or symbols associated with the product or service.

4.1.13 Regulatory Environment (or Relevant Standards)

Specifies any information regarding the adherence of the exploitation item to both industry standards and regulatory requirements. This includes:

- **International Standards (ISO Standards):** Specify compliance with relevant International Organization for Standardization (ISO) standards that are pertinent to the industry. Ensure that the standards are explicitly named and describe how the exploitation item aligns with or contributes to these international benchmarks.
- **Industry-Specific Standards:** Outline adherence to standards set by regulatory bodies or industry associations, with specific emphasis on standards that RISE-6G actively contributes to, as outlined in Task 8.2. Detail the contributions made and how the exploitation item aligns with these industry-specific standards.
- **Compliance Certification:** Describe the process of obtaining certifications to demonstrate adherence to specific legislation, whether on a national or European level. Specify the certifications pursued and attained, highlighting their significance in ensuring the exploitation item complies with regulatory requirements and meets necessary quality and safety standards.

4.2 Overview of RISE-6G Exploitation Items

Having described the types of metadata used to describe the exploitation items and are relevant to the overall exploitation strategy under RISE-6G, the rest of the sections present the individual exploitation items. It is noted, that as described above, Partners have exploited the results of the Project via numerous ways, according to the type of their institution (academic, industrial, or vertical). This section focuses specifically on the main activities and outcomes that offer commercialization potential.

Overall, RISE-6G has produced 12 individual items that have the potential of commercialisation. The types of items and other descriptive information are given in the figures below. The patents correspond to (i) deployment solutions, (ii) methods/algorithms for RIS control, and (iii) RIS manufacturing. Apart from that, industrial partners have developed items relating to products, prototyping, and trials. New pieces of knowledge have been also reported, in the forms of portfolio, as a sizable contribution to standards relating to a new KPI definition, or as software. Finally, results relating to prototyping, trials, and algorithmic advancements have been exploited in the form of a new startup company.

In terms of commercialization plans, the developed methods (either as patents or software) are expected to generate revenues primarily in the form of licensing. The developed product and the company aim for direct sales. This is also the case for one the field trials that is planned for commercialization via subscription models as a newly established service. Other prototypes and trials are designed to be integrated in existing commercialization and revenue generation strategies by the related companies, as well as to allow for research, development,

and improvement of currently offered products and services. The academic portfolio reported, as well as the overall business model o the startup, are expected to be a core asset in securing research tenders and direct research contracts by the private sector. Finally, the KPI definition, while it is not associated with direct revenue streams, has the potential of opening new ways of commercialisation since it offers opportunities for new marketing, pricing, and product development methodologies based on the newly defined concepts.

Most of those items will be ready for market use in 2-5 years, while their exploitation is expected to last mostly around 5-10 years (which coincides with the developments and releases of new standards in wireless communications sectors, such as 6G, WiFi 7, etc. The main markets targeted are network operators and infrastructure owners, in combination with RIS manufacturers and vendors. Given the readiness level of the technology under research, only a small number of the reported items is expected to generate direct revenue streams from end users (specifically, the RIS product and the field trial).
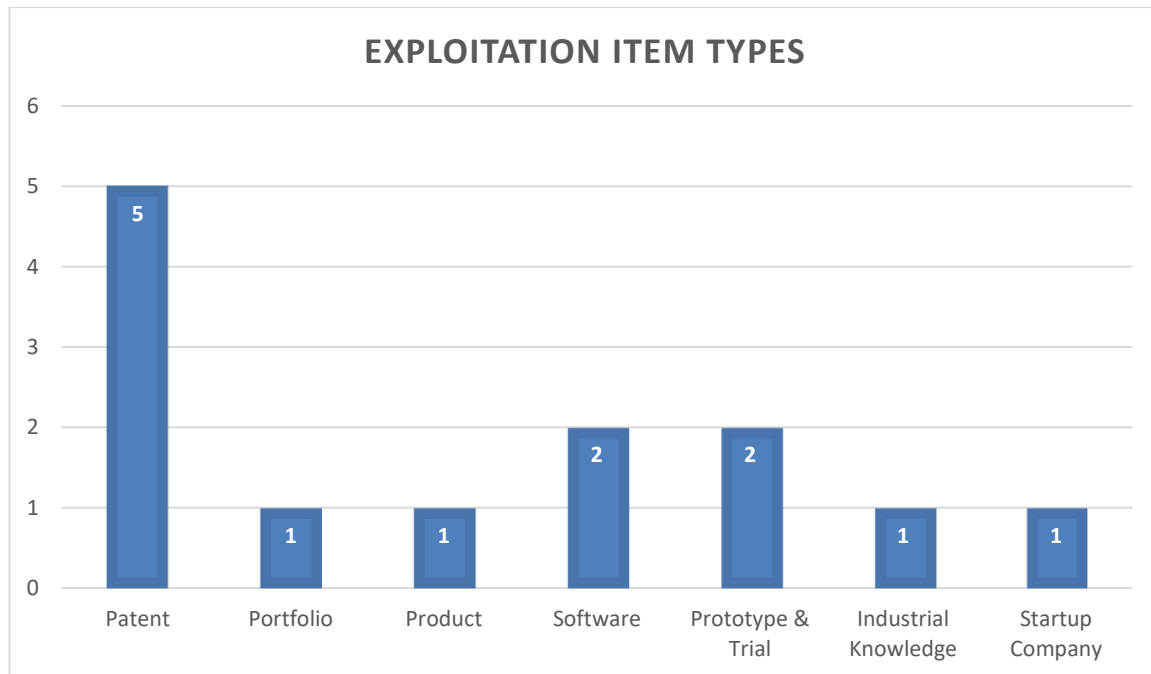

Figure 4-1: Types of exploitable items from RISE-6G.
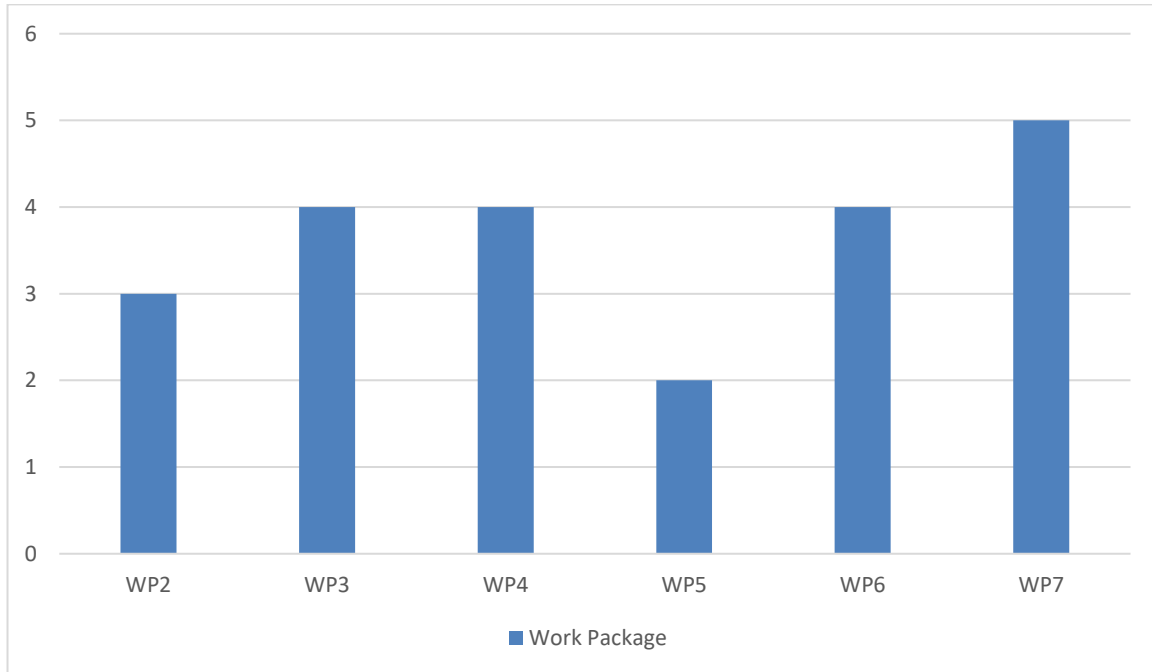
Figure 4-2: Related WPs for exploitation items.
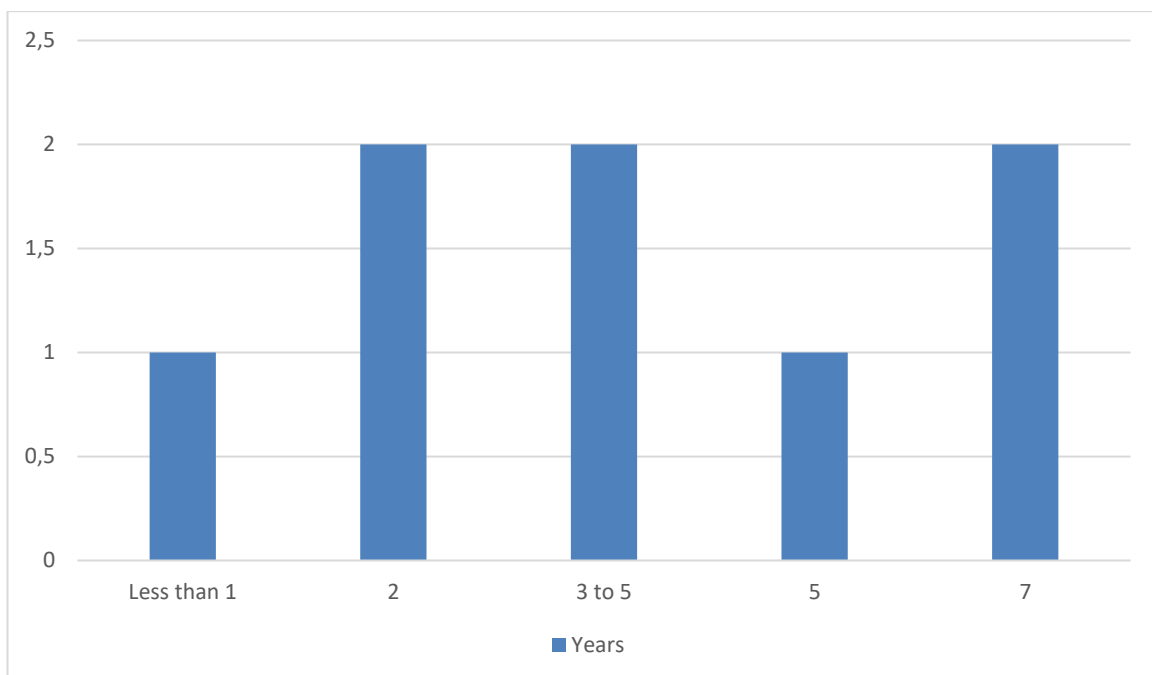
Figure 4-3: Time-to-Market estimations for exploitation items.
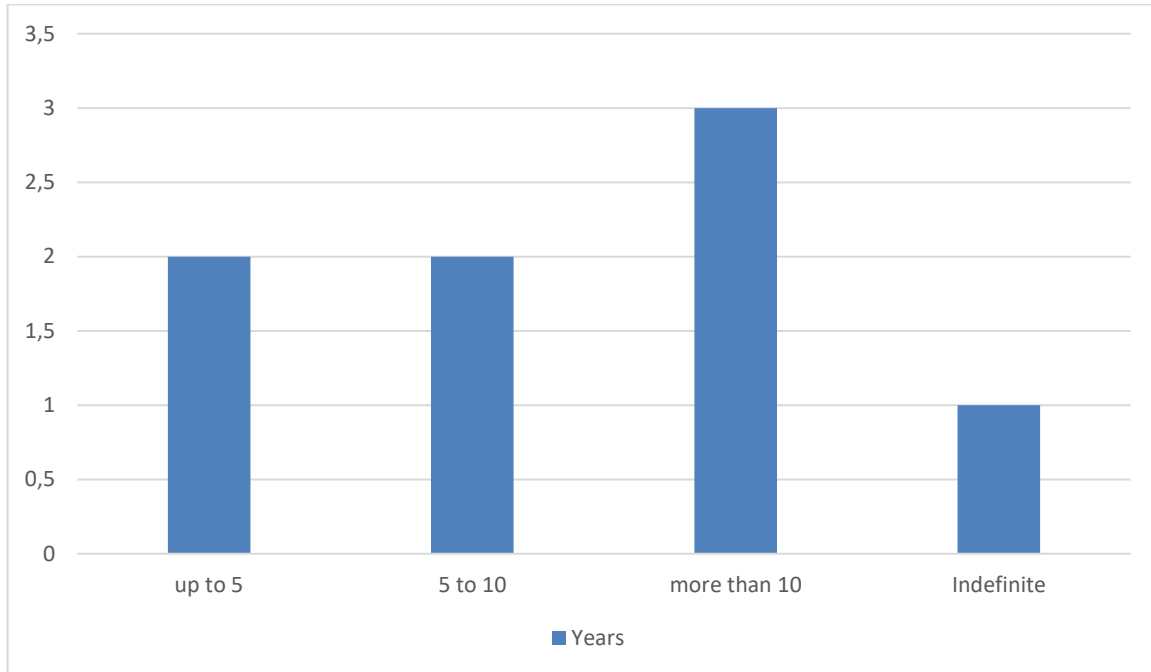
Figure 4-4: Time plan for use of the exploitation items.

4.3 Exploitation Item #1

Table 4-1: Description of Exploitation Item #1

Description	
Involved Partner(s)	NKUA (Academic)
Type of item	Knowledge (Portfolio)
Brief description	Developed a portfolio of algorithmic, systemic, and software tools for optimizing the position and configuration of RISs for KPIs relevant to communication, localization, and energy efficiency.
Relevant Work Package(s)	WP2, WP4, WP5, WP6

Deliverable(s) under which it has been reported	D2.3, D4.2, D4.4, D5.2, D5.4, D6.2, D6.4
External Reference(s)	[JAS22], [ASH22] and other publications from NKUA (listed in D8.5).
Commercialization & market details	
Motivation / Business Opportunity	While there are multiple approaches for RIS configuration in literature, complete end-to-end approaches are not easily applicable in real-life systems.
Means of exploitation	NKUA plans to capitalize on the developed algorithmic and other methodologies from RISE-6G to offer RIS configuration solutions as-a-service.
Time-to-market	3 months
Time-plan for use	5 years
Target Market	RIS owners (or vendors), Research/Academic Institutes, Funding Agencies
Client / Revenue streams	Contracting work, research tenders
Competitive Entities (Businesses / Technologies)	Other Research/Academic teams, RIS vendors.
IPR Protection	Trade secrets
Regulatory Environment	Not applicable

4.4 Exploitation Item #2

Table 4-2: Description of Exploitation Item #2

Description	
Involved Partner(s)	TIM (Network Operator)
Type of item	Patent
Brief description	Technical solution for simplifying RIS deployment especially in the high frequency bands, like mmWave and sub-THz bands, based on the integration of the RIS with the Remote Antenna Unit (RU).
Relevant Work Package(s)	WP2

Deliverable(s) under which it has been reported	Not directly linked
External Reference(s)	Not directly linked
Commercialization & market details	
Motivation / Business Opportunity	TIM considers the adoption of RIS solutions in some contexts as an important enabler for the future networks. The patent investigates one important aspect of this adoption.
Means of exploitation	Future solutions adopting RIS, overall improvement of the channel quality.
Time-to-market	Around 5 years roughly
Time-plan for use	Initial investigations are ongoing. Future choices to be further defined
Target Market	Network deployments
Client / Revenue streams	Still to be evaluated
Competitive Entities (Businesses / Technologies)	Other operators
IPR Protection	Patent under the EU law
Regulatory Environment	Body of European Regulators of Electronic Communications

4.5   Exploitation Item #3

Table 4-3: Description of Exploitation Item #3

Description	
Involved Partner(s)	CEA-Leti (Academic / Research Centre)
Type of item	Patent

Brief description	Patent entitled "Method for improving the quality of service for at least one terminal, corresponding computer program product and device" (incl. RISs) – Submitted to EU Patent Office as EP22305125A, 04/02/2022 / Published as EP4224911A1, 09/08/2023
Relevant Work Package(s)	WP4
Deliverable(s) under which it has been reported	D4.x
External Reference(s)	https://data.epo.org/gpi/EP4224911A1-METHOD-FOR-IMPROVING-THE-QUALITY-OF-SERVICE-FOR-AT-LEAST-ONE-TERMINAL-CORRESPONDING-COMPUTER-PROGRAM-PRODUCT-AND-DEVICE Related papers : [CAS21], [CAW21]
Commercialization & market details	
Motivation / Business Opportunity	Without RIS, UE trajectory optimization, is constrined by a time-varying, uncontrollable propagation environment. With one single RIS, SotA solutions consider optimizing UE trajectory within the area of influence of this unique surface. Hence, the filled gap concerns the joint optimization of multiple RISs and the (controlled) UE trajectory.
Means of exploitation	Licensing
Time-to-market	3-5 years
Time-plan for use	5-10 years
Target Market	Automotive (e.g., autonomous driving), Industry 4.0 (e.g., AGVs), Telecommunications (e.g., Mobile access points)…
Client / Revenue streams	Industrial manufacturers, mobile telecom operators
Competitive Entities (Businesses / Technologies)	Other R&D teams (incl. mobile telecom operators).
IPR Protection	Patent protection
Regulatory Environment	Not applicable

4.6   Exploitation Item #4

Table 4-4: Description of Exploitation Item #4

Description	
Involved Partner(s)	CEA-Leti (Academic / Research Centre)
Type of item	Patent
Brief description	Patent application entitled "Simultaneous Control of received and reflected wave(s) for redundant and/or multi-task computing" (incl. RISs) – Submission pending
Relevant Work Package(s)	WP3, WP4
Deliverable(s) under which it has been reported	D4.2, D4.4
External Reference(s)	None
Commercialization & market details	
Motivation / Business Opportunity	In the literature on STAR (hybrid) RISs, the simultaneous transmission/reception/reflection operations are not optimized with respect to multiple services with heterogeneous requirements (e.g., DNN splitting, multi-task learning…), involving non co-located units.
Means of exploitation	Licensing
Time-to-market	3-5 years
Time-plan for use	5-10 years
Target Market	Industry 4.0 (e.g., AGVs), Telecommunications (e.g., mobile access points)…
Client / Revenue streams	Industrial manufacturers, mobile telecom operators
Competitive Entities (Businesses / Technologies)	Other R&D teams (incl. RIS vendors and mobile telecom operators).
IPR Protection	Patent protection
Regulatory Environment	Not applicable

4.7   Exploitation Item #5

Table 4-5: Description of Exploitation Item #5

Description	
Involved Partner(s)	GNW
Type of item	Product
Brief description	RIS node at 3.6GHz and 27GHz
Relevant Work Package(s)	WP3, WP7
Deliverable(s) under which it has been reported	D3.3 , D7.3
External Reference(s)	[LGG22], [MVG21]
Commercialization & market details	
Motivation / Business Opportunity	Commercialization of a prototype in 5G FR2, field trial in operational 5G network
Means of exploitation	Field trials in 5G networks, development of new RIS in other bands
Time-to-market	Prototype: Commercialization now, final product: 1 year
Time-plan for use	
Target Market	Operators, vendors, 5G private networks
Client / Revenue streams	Revenues will come from mobile operators and/or vendors, the operators will get their revenues from the mobile plans for customers.
Competitive Entities (Businesses / Technologies)	Active relays with following drawbacks : deployment costs and energy consumption costs
IPR Protection	Greenerwave patent office
Regulatory Environment	ITU, 3GPP

4.8 Exploitation Item #6

Table 4-6: Description of Exploitation Item #6

Description	
Involved Partner(s)	NEC
Type of item	Patent
Brief description	Method and system for self-diagnosis of faulty RIS elements
Relevant Work Package(s)	WP3; WP4 and WP7
Deliverable(s) under which it has been reported	D3.4; D4.3; D7.2
External Reference(s)	[GRM23]
Commercialization & market details	
Motivation / Business Opportunity	Software to detect faulty RIS elements. Self-healing of RIS devices.
Means of exploitation	License for controlling RIS devices
Time-to-market	2-5 years
Time-plan for use	Integration within the NEC RIS product
Target Market	Telco operators; 5G/6G players;
Client / Revenue streams	N.A.
Competitive Entities (Businesses / Technologies)	5G/6G vendors
IPR Protection	Europe; Japan, US
Regulatory Environment	3GPP, ETSI, ITU

4.9   Exploitation Item #7

Table 4-7: Description of Exploitation Item #7

Description	
Involved Partner(s)	NEC
Type of item	Patent
Brief description	Unobtrusive, RIS driven UE location method and system
Relevant Work Package(s)	WP5
Deliverable(s) under which it has been reported	D5.4
External Reference(s)	N.A.
Commercialization & market details	
Motivation / Business Opportunity	RIS for sensing, providing communication and localization capabilities
Means of exploitation	License for localizing user devices via RIS
Time-to-market	2-5 years
Time-plan for use	Integration within the NEC RIS product
Target Market	Telco operators; 5G/6G players;
Client / Revenue streams	N.A.
Competitive Entities (Businesses / Technologies)	5G/6G vendors
IPR Protection	Europe; Japan, US
Regulatory Environment	3GPP, ETSI, ITU

4.10 Exploitation Item #8

Table 4-8: Description of Exploitation Item #8

Description	
Involved Partner(s)	ORA
Type of item	Prototype & trial
Brief description	Prototype built at 5.2 GHz and 984 unit cells, live demonstrations to general public and industry to demonstrate feasibility.
Relevant Work Package(s)	4, 6, 7, 8
Deliverable(s) under which it has been reported	D3.3, D7.3.
External Reference(s)	[RSP23]
Commercialization & market details	
Motivation / Business Opportunity	SE, SSE and EMFEU boosting over target small areas, for customers or business customers.
Means of exploitation	Deployment of a new type of node in the network of operators : a passive RIS controlled by the network.
Time-to-market	6G (2030)
Time-plan for use	6G (2030)
Target Market	Individual Customer for indoor/home use, and business customers for indoor/office/commercial areas use.
Client / Revenue streams	Revenues come usual mobile plans for customers, and network deployment offers for business customers. The technology provides a low cost low power attractive solution.
Competitive Entities (Businesses / Technologies)	Active relays with following drawbacks : deployment costs and energy consumption costs.
IPR Protection	Orange patents previous to RISE-6G project.

Regulatory Environment	ITU, 3GPP, Local National Spectrum Regulation

4.11 Exploitation Item #9

Table 4-9: Description of Exploitation Item #9

Description	
Involved Partner(s)	ORA
Type of item	Software
Brief description	Orange Simulator with RIS and Ray Tracing
Relevant Work Package(s)	3 and 6
Deliverable(s) under which it has been reported	D6.3, D6.4 and D3.3.
External Reference(s)	[PBG22], [ADK23]
Commercialization & market details	
Motivation / Business Opportunity	Based on know-how and methods acquired during the RISE-6G project, and concretised into a simulator developped by Orange that inclused ray tracing and RIS, Orange Innovation could potentially, in the future, develop a truely commercial network planning with RIS based on Ray Tracing.
Means of exploitation	Development of RIS aware network planning tool
Time-to-market	6G 2030
Time-plan for use	6G 2030
Target Market	Orange Affiliates, and potentially other network operators
Client / Revenue streams	Licenses to Orange
Competitive Entities (Businesses / Technologies)	Network Planning Tools providers
IPR Protec-	SW

tion	
Regulatory Environment	Same as for commercial network planning tools.

4.12 Exploitation Item #10

Table 4-10: Description of Exploitation Item #10

Description	
Involved Partner(s)	ORA
Type of item	Knowledge / KPI definition
Brief description	Joint creation of new deployment parameters (AoI vs coverage) and BoI (vs. transmission BW).
Relevant Work Package(s)	2, 3, 6 and 8
Deliverable(s) under which it has been reported	D2.5, D3.3, D6.5, D8.5
External Reference(s)	[APK23a], [APK23b], [ETSI23a], [ETSI23b]
Commercialization & market details	
Motivation / Business Opportunity	Deployability of this new technology requires the definition of novel technical requirements and KPIs : Area of Influence instead of the conventional coverage concept and Bandwidth of influece instead of the conventional transmit spectrum concept.
Means of exploitation	Standardisation of target requirements.
Time-to-market	2025+
Time-plan for use	2025+
Target Market	2025+
Client / Revenue streams	All mobile network industry.
Competitive Entities (Businesses / Technologies)	No competition, useful for player in the mobile network industry relying on standardised systems.

IPR Protection	None
Regulatory Environment	ITU, ETSI, 3GPP. Possibly IEEE Wi-Fi

4.13 Exploitation Item #11

Table 4-11: Description of Exploitation Item #11

Description	
Involved Partner(s)	CRF
Type of item	Field trial industrialisation
Brief description	PoC business case development and internal transfer of results to production departments.
Relevant Work Package(s)	WP7-WP8
Deliverable(s) under which it has been reported	D7.3 - D8.4
External Reference(s)	None
Commercialization & market details	
Motivation / Business Opportunity	CRF/Stellantis considers RIS implementation in identified plant applications able to improve production process optimization and efficiency
Means of exploitation	As end-user, CRF-Stellantis wants to benefit from RIS introduction in plants, with direct purchases or subscription models.
Time-to-market	2025+
Time-plan for use	2025+
Target Market	Automotive production plants
Client / Revenue streams	Not applicable (CRF is an end-user itself)
Competitive Entities (Businesses / Technologies)	Other process monitoring and localization products (e.g. ToF cameras)

IPR Protection	Not applicable
Regulatory Environment	Telecommunication and automotive manufacturing (mainly safety and privacy) standard frameworks

4.14 Exploitation Item #12

Table 4-12: Description of Exploitation Item #12

Description	
Involved Partner(s)	CHAL
Type of item	Startup company
Brief description	Researchers from CHAL co-founded a startup (RadChat AB), which develops joint radar and communication technologies that include RIS.
Relevant Work Package(s)	WP3, WP5, WP7
Deliverable(s) under which it has been reported	D84
External Reference(s)	https://www.radchat.tech
Commercialization & market details	
Motivation / Business Opportunity	RadChat aims to make significant and sustainable impact in today's automotive and underground mining industry. RadChat believes that RIS technology can help accomplish vision zero in underground mines, making casualties and serious injuries a phenomenon of the past, all the while contributing to industrial IoT and large scale automation.
Means of exploitation	Direct sales and joint ventures
Time-to-market	2025+
Time-plan for use	2027+
Target Market	Automotive and mining
Client / Revenue streams	OEMs, mining services
Competitive Entities (Businesses /	N/A

Technologies)	
IPR Protection	Patent protection
Regulatory Environment	Compliance certification

5   Industrial communication and dissemination

Industrial communication and dissemination play vital roles in sharing information, knowledge, and innovations within the industrial sector.

Industrial communication involves the effective exchange of information among various stakeholders, such as employees, management, suppliers, and customers, within an industrial setting. It encompasses both internal and external communication channels. Internally, it facilitates the flow of information between departments, teams, and individuals, promoting collaboration. Externally, industrial communication focuses on communicating with stakeholders outside the organization, including clients, partners, regulatory bodies, and the public. This involves conveying the organization's values, products, services, and initiatives to build trust, attract customers, and establish a positive reputation. External industrial communication can encompass marketing campaigns, public relations efforts, advertising, social media engagement, and other forms of outreach to reach target audiences and convey key messages effectively. In the RISE-6G project It involves:

- Journal articles and magazines

- Conference papers

- Presentations, keynote speeches, invited talks

- Industrial workshops

- Website and social media

- Flyers and posters

- Webinars

- Press releases and articles

- Patents

The goal is to ensure that valuable insights and developments are accessible to those who can benefit from them, encouraging collaboration, learning, and the adoption of new practices. Both industrial communication and dissemination are crucial for the progress and success of RISE-6G project. They facilitate effective internal operations, improve relationships with external stakeholders, and contribute to industry-wide knowledge sharing and advancement. By leveraging these processes, organizations can enhance their competitive edge, promote innovation, and create a positive impact within the industrial ecosystem.

The various communication and dissemination activities are described in detail in D8.5, submitted alongside this document.

6 Conclusions

As the demand for faster, more reliable wireless communication continues to grow, the RIS market is expected to expand significantly. The competition among major players and the entry of startups will drive innovation and bring more diverse applications for RIS technology. Additionally, standardization efforts by industry bodies will shape the development of RIS technology and its integration into various wireless communication systems.

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