European Innovation Council

EIC PATHFINDER PORTFOLIO

INFORMATION PROCESSING, COMMUNICATION AND SENSING PORTFOLIO

Strategic Plan

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Alternative Quantum Information Processing, Communication and Sensing Portfolio – Strategic Plan
European Innovation Council

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1. CONTEXT

Over the past decade, the United States, Canada, the United Kingdom, the Netherlands, Germany, and France have been at the forefront of quantum advancements. To accompany this development and sustain their leadership, several countries have launched dedicated national strategies to enable institutional and legislative coordination, as well as extraordinary means.

One notable milestone in this trajectory is the enactment of the National Quantum Initiative (NQI) Act in 2018 in the United States. The strategic impetus provided by the NQI Act has spurred nations to invest significantly in quantum research and development, establishing quantum technology as a critical frontier in their technological landscape.

In response to the NQI Act, the European Union launched the same year its Quantum Technology Flagship, aiming to propel the development and integration of quantum technologies into various sectors, such as communication, computing, and sensing. The coordinated efforts under these initiatives helped pave the way for a structured European ecosystem of quantum research and innovation. In parallel, from the first national strategy launched in the Netherlands in 2019, national strategies within EU members were progressively established.

Like the NQI Act, the EU's Chips Act on semiconductors was passed in 2023, so as to secure strategic supply and value chains, leverage on investment, and organize financial and political coordination of EU institutions to support the ecosystem.

Despite the varied timelines of national strategies, there is a striking similarity in the challenges faced by leading nations navigating the quantum frontier. Common hurdles include the need for sustained funding, recruitment of top-tier talents, and the establishment of robust infrastructures and supply chains to support quantum research and development. Additionally, the inherently interdisciplinary nature of quantum technologies requires collaborative efforts across academia, industry, and government agencies to overcome daunting scientific, engineering, and regulatory challenges.

From a European standpoint, it is crucial to acknowledge that not all EU nations have established a comprehensive national strategy, and synchronization in certain domains remains a challenge. Despite the overarching framework provided by the EU, individual member states often navigate their own trajectories in developing specific policies and strategies. A fragmented approach to national strategies can impede the EU's collective ability to maximize the potential benefits of emerging technologies, create synergies, and address shared challenges. It can also lead to disparities in research and development capabilities, hindering collaborative efforts and potentially creating technological gaps within the EU.

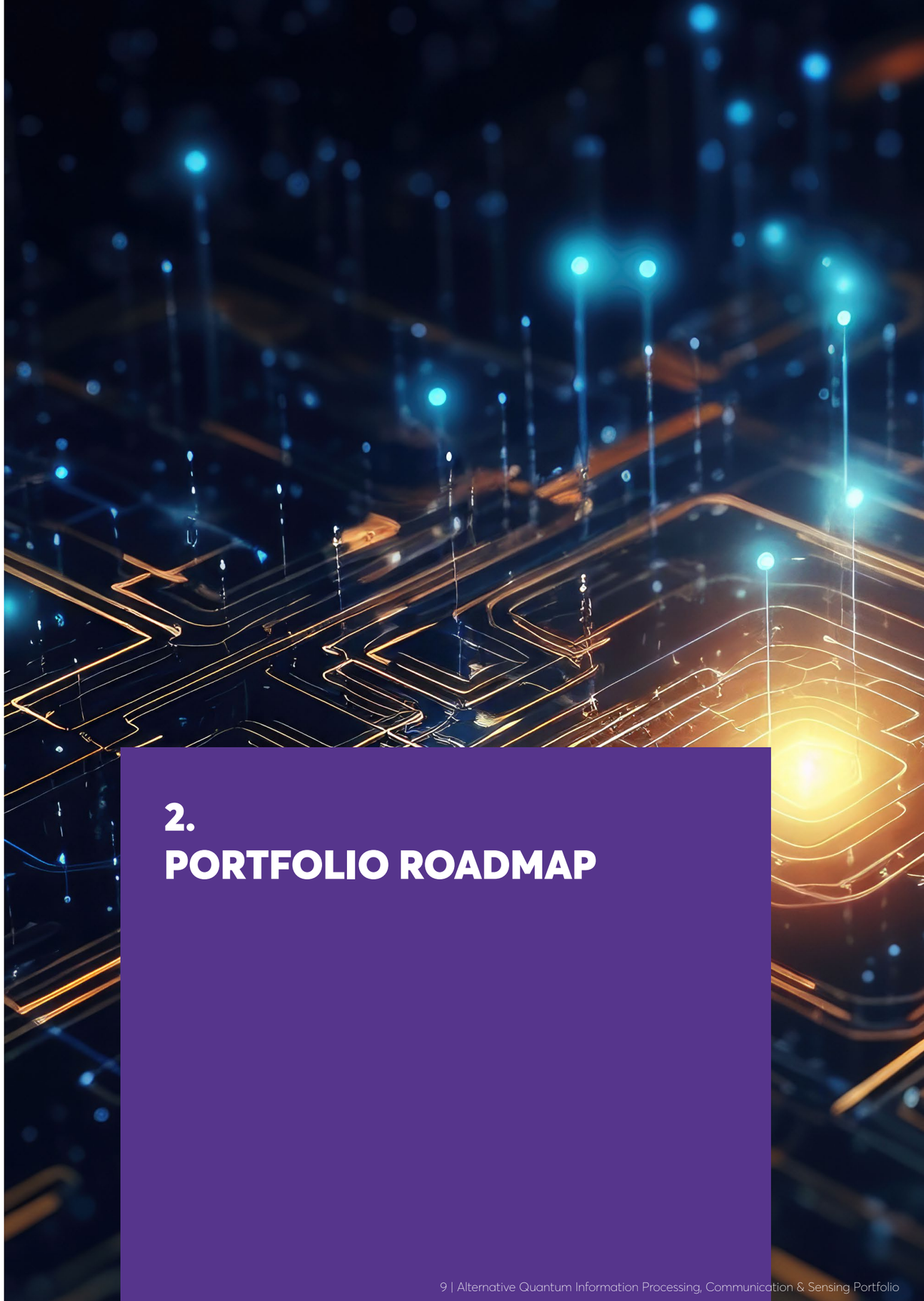
The European Commission and the European Innovation Council (EIC) have strategically aimed therefore to leverage cutting-edge advancements in science and technology to open new markets, and create opportunities through innovative solutions rooted in high-risk, high-reward research and development. With the launch of the EIC Pathfinder Challenge call on Alternative Quantum Information Processing, Communication and Sensing (AQIPCS), the EIC wanted to gather, fund, and develop innovative approaches to encoding, manipulating, or storing information in quantum objects, and/or to exploiting quantum phenomena for information processing, communication, and sensing in a way that differs from the mainstream approaches currently being pursued in quantum research.

The eight projects that were successfully funded via this call were selected because of their capacity to overcome the limits of the current quantum information processing paradigms and to demonstrate a clear and quantifiable advantage of their anticipated results with respect to classical approaches and mainstream quantum technology alternatives.

The coordinators of these EU-funded projects then entered the newly created "AQIPCS Portfolio", a coherent portfolio of projects that can interact, reinforce each other, or compete to increase the overall impact of the AQIPCS challenge. Portfolio projects cover various needs of emerging quantum technologies, from quantum computer benchmarking to quantum platform implementations (e.g., superconducting qubits, trapped ions), data encoding methods (e.g., angle, QRAM, and amplitude encoding), and other applications in quantum computing, simulations, and sensing. A dedicated Programme Manager, Dr Samira Nik, oversees the AQIPCS Challenge and Portfolio by establishing a need-driven plan and encouraging its members to interact and progress together towards common goals, namely to achieve technology breakthroughs that form the basis for future quantum technologies.

Since its inception, the Portfolio is enabling multi-disciplinary collaborations between research projects as well as with existing European platforms and innovation eco-systems in this field. By jointly exploring different perspectives and complementary approaches, project partners within the Portfolio have the potential to address new research paths and even blend results towards innovation.

Beyond its scientific significance, the Portfolio also offers valuable opportunities for field observation and practical feedback from a policy perspective. The innovative approaches being explored within the AQIPCS Portfolio have the potential to drive breakthroughs in the architecture and essential components of next-generation quantum systems. This advancement represents a strategic opportunity for European researchers, innovators, and companies to strengthen their competitive position. Additionally, it equips the EU with critical insights that can inform strategic research policy, while supporting the harmonization of national quantum strategies across Member States.



2.
PORTFOLIO ROADMAP

The AQIPCS Portfolio brings together eight projects covering a total of 56 partner organisations, representing 15 EU member states and 3 non-EU countries. A significant part of the participating organisations are universities or other higher education institutions, but research and technology organisations (RTOs) and private, for-profit entities are also represented.

Figure 1 : Number of portfolio partners per country

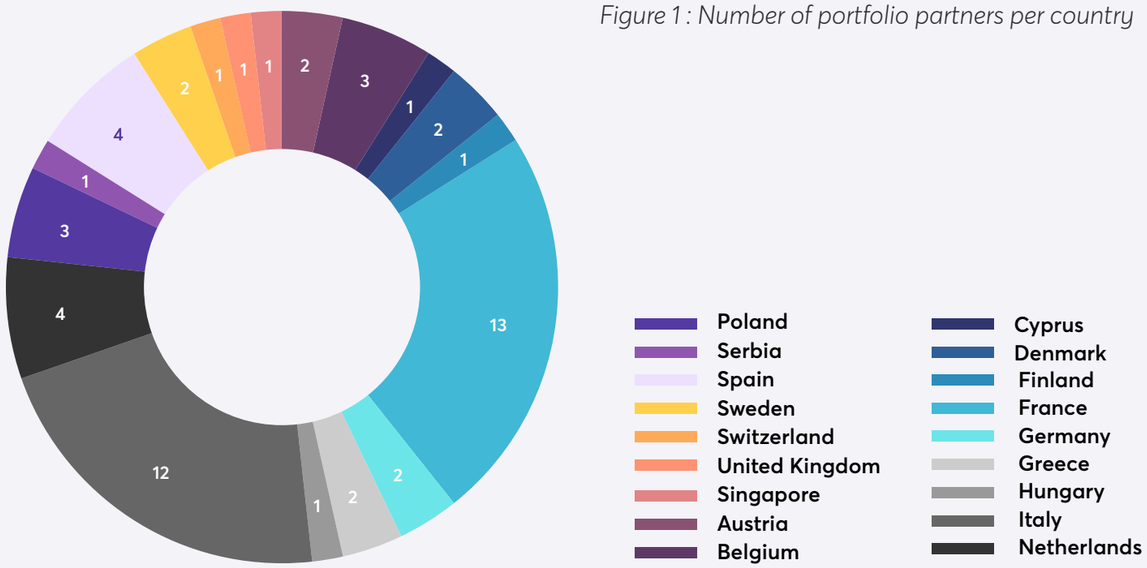
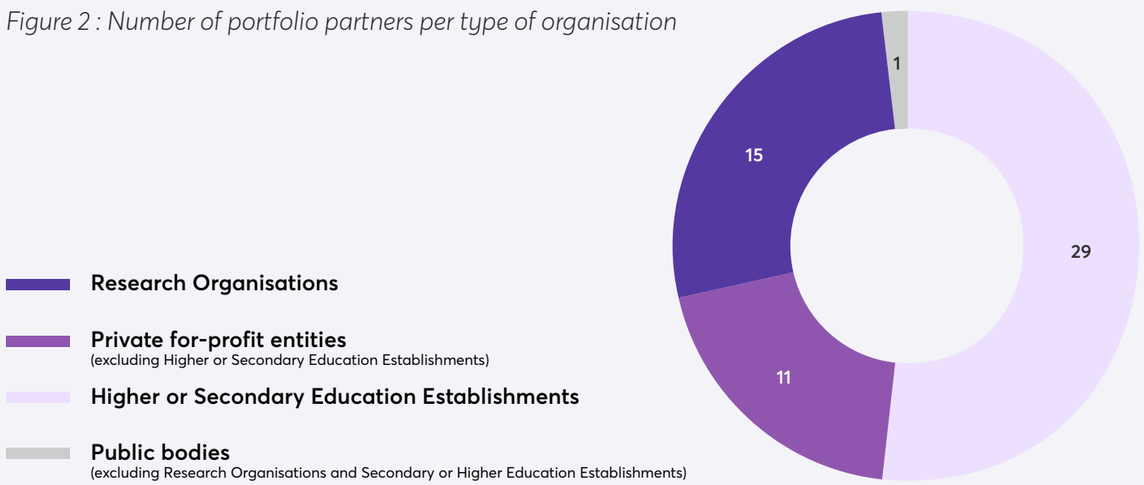


Figure 2 : Number of portfolio partners per type of organisation



The eight projects in the AQIPCS Portfolio are categorized hereafter.

Photonic sub-group:

This sub-group is linked by a focus on quantum optical technologies. All these projects share common quantum optics modelling (Fock states / squeezed states), and common investigation of non-classical quantum states of light and collective effects of light sources.

Composition:

- **PANDA: Photon Atom Non linearities and Deterministic Applications via arrays (Grant number 101115420)**
- **ARTEMIS: moleculAR maTerials for on chip intEgrated quantuM lIght sourceS (Grant number 101115149)**
- **HEISINGBERG: Spatial Quantum Optical Annealer for Spin Hamiltonians (Grant number 101114978)**
- **Q-ONE: Quantum Optical Networks based on Exciton polaritons (Grant number 101115575)**

Superconducting & new qubits sub-group:

This sub-group is linked by a focus on developing advanced qubit architectures and technologies aimed at scaling up quantum systems. All these projects aim to enhance qubit stability, control, and error resistance. They also explore topological protection, superconducting systems, and material science advances to achieve robust qubit designs necessary for larger, more reliable quantum systems.

Composition:

- **FERROMON: Ferrotransmons and Ferrogatemons for Scalable Superconducting Quantum Computers (Grant number 101115548)**
- **IQARO: SpIn orbitronic QuAntum bits in Reconfigurable 2D Oxides (Grant number 101115190)**
- **QuKiT: Quantum bits with Kitaev Transmons (Grant number 101115315)**

Project at the intersection between the two sub-groups:

This project develops verification tools for bosonic architectures, including photonic and superconducting quantum computing architectures.

- **VeriQuB: Efficient Verification of Quantum computing architectures with Bosons (Grant number 101114899)**

2.1

DEVELOPMENT HISTORY

The Portfolio "Alternative Quantum Information Processing, Communication and Sensing" (AQIPCS) has been created to explore and leverage alternative implementations and quantum principles that could become crucial components in future quantum systems.

The overall aim of AQIPCS Portfolio meetings is to maximize scientific achievements, exploit potential opportunities, enhance outreach with key stakeholders, and identify and overcome major barriers to innovation in quantum technologies, including quantum computing, quantum sensing, and quantum communication.

The development of the AQIPCS Strategic Plan was also outlined and included indicative planning set by the EIC:

- Trilateral meetings (October 2023);
- EIC Portfolio Meeting in Brussels (November 2023);
- Brainstorming within project consortia exploring potential collaborations (December 2023 – January 2024);
- Interactions within the sub-portfolio towards the first draft of the AQIPCS Strategic Plan (February 2024);
- Portfolio projects to advance and co-draft the previously agreed collaborations (March-June 2024);
- Portfolio Steering Committee Meeting in Brussels (May 2024);
- Meetings between the EIC Programme Manager, Project Officers, and Portfolio Steering Committee to further advance the Strategic Plan (June 2024);
- The finalization of the Strategic Plan (October 2024).

On this occasion, the main components of the Portfolio governance were established, with the nomination by each project partner of one representative to the AQIPCS Steering Committee, to ensure the Portfolio's long-term impact and implementation of joint activities and collaborations among project partners, ensure that deliverables meet the needs of the EIC, and report to the EIC program manager and project officers.

This initial roadmap experienced a slight delay due to the planning and organization of the first Portfolio meetings, along with preliminary discussions with sister projects, which are still underway. Consequently, the roadmap for Portfolio activities may need to be revised throughout the projects' duration, with periodic updates to ensure alignment with evolving objectives.

Since the inception of the AQIPCS Portfolio activities, project partners met multiple times over the course of the first year to identify common interests, determine complementarity, and explore potential synergies and collaborations:

- 19th of October 2023 - VeriQuB WP6 Portfolio Meeting;
- 27th of October 2023 -IQARO WP7 Portfolio Meeting;
- 27th of November 2023 - Brussels EIC Portfolio Meeting;
- 31st of January 2024 - Bilateral VeriQuB x HEISINGBERG Meeting;
- 15th of February 2024 - AQIPCS Portfolio Steering Committee Meeting;
- 21st of February 2024 - Bilateral IQARO x FERROMON meeting
- 5th of March 2024 - Photonics sub-group meeting;
- 19th of March 2024 - Bilateral VeriQuB x ARTEMIS meeting at the EIC Summit;
- 6th of May 2024 - AQIPCS Portfolio Steering Committee meeting;
- 11th of September 2024: Joint meeting to the occasion of VeriQuB's consortium meeting;
- 7th of October 2024: Joint meeting for drafting the strategic roadmap.

These meetings aim at contributing to the broader EIC roadmap for quantum technologies by leveraging the collective expertise within the selected projects. Joint communication activities and scientific collaborations, joint intellectual property and business licensing strategies, shared access to infrastructure and Open Innovation Testbeds and joint standardization efforts were explored on these occasions, and these initial engagements have laid a solid foundation for ongoing Portfolio activities.

2.2

GENERAL DEVELOPMENT MILESTONES

The AQIPCS Portfolio has outlined four primary goals for its initiatives, aligning closely with the aspirations outlined in the European Declaration on Quantum Technologies:

1. Contributing to the establishment of a sustainable 100% EU-made value chain: the Portfolio prioritizes creating a fully EU-based quantum value chain that spans from invention to market. This goal includes establishing industry collaborations to engage key stakeholders. A survey starting in 2025 will gather input from start-ups to address the specific interests and challenges of quantum sector stakeholders. The goal is to develop a robust network that aids in advancing EU quantum capabilities, reinforced by regular collaborative meetings and an intellectual property (IP) framework to foster industry-wide innovation. Through these efforts, the Portfolio aims to sustain and scale quantum technology within the EU, enhancing self-reliance and reducing dependency on external sources.

2. Stimulating private investment to facilitate technological upscaling: recognizing the need for private investment in quantum technology, the Portfolio seeks to bridge the gap between investors limited technical knowledge and the unique risks of quantum ventures. By connecting with investors and providing insights into the market potential of quantum innovations, the Portfolio will facilitate informed investment. This includes a strategic outreach plan involving case studies, state-of-the-art assessments, and collaboration with the European Investment Bank (EIB). AQIPCS also envisions joint initiatives across Portfolio projects to spotlight the EU's quantum advancements, which will further stimulate investors interest and build capacity for high-impact investments in this sector.

3. Providing support for strategic research policy-making endeavours: the Portfolio will contribute to shape public policy by offering data-driven insights into the quantum industry. Its collaborative approach allows it to collect field observations and advise on strategic R&D directions, building on the EU's broader aim of decentralizing quantum expertise. This includes providing timely feedback on investment, public procurement, and legal frameworks for quantum technologies. Through targeted lobbying and policy briefings, AQIPCS will inform European and national policymakers on how best to support a sustainable, continent-wide quantum strategy, contributing to a resilient quantum ecosystem.

4. Nurturing a highly qualified European workforce: recognizing the need for skilled professionals, Portfolio partners prioritize fostering a robust workforce through educational initiatives and researcher mobility within Europe. The Portfolio will support postdoctoral and doctoral exchanges and create recruitment pathways for early-stage researchers. To retain and develop expertise within the EU, Portfolio members will organize talent-scouting sessions at conferences and work with industry to update training requirements. By investing in human capital and preventing brain drain, AQIPCS projects aim to sustain a network of quantum R&D clusters across Europe, ensuring that the EU maintains a competitive edge in the global quantum race.

Foreseeable milestones of the AQIPCS Portfolio are:

- End of Year 1: potential collaboration areas have been identified by the Portfolio projects.
- End of Year 2: finalization of theoretical foundations, and first experimental validations.
- End of Year 3: resources identified in various types of machines related to AQIPCS projects.
- End of Year 4: potential collaborations between project partners are in place.

Through these objectives and milestones, the AQIPCS Portfolio aligns its mission with the EU's broader vision of technological leadership in quantum, supporting economic growth, strategic independence, and innovation.

2.3 PORTFOLIO ROADMAP: GENERAL STRUCTURE

Participants in Portfolio activities play a pivotal role in identifying paths for product development and market opportunities. Joint activities are structured across 3 main objectives, which may lead to specific working groups (or a sub-group) between members of the Portfolio:

2.3.1 SCIENTIFIC COLLABORATIONS:

Partners will identify the techno-scientific collaborations and synergies with the other Portfolio projects. These synergies may involve adopting methodologies from other projects, comparing alternative approaches, or exploring a different range of applications.

The respective timeline and expected achievements of each collaboration between two or more Portfolio projects should be established and, according to relevance and feasibility, may lead to establishing a Joint Scientific Plan. See section 3 below to discover the first paths identified for potential collaborations among Portfolio partners.

2.3.2 EXPLOITATION ACTIVITIES (INCLUDING IP PROTECTION AND STANDARDIZATION)

- Techno-economic benchmark and comparative assessment: collaboratively comparing the techno-economic performance of proposed solutions with other Portfolio technologies using common metrics and KPIs. This will inform potential standardization efforts and facilitate the sharing of market analysis results across Portfolio projects.
- Producing a comprehensive Portfolio report on competitiveness, business potential in various market segments, and key innovation barriers compared to established benchmarks. This report will also enable an overarching view of potential intersections between national strategies and a full-fledged continental approach to quantum development.
- Comparing project analyses during a final Portfolio joint meeting focusing on innovation and exploitation: the meeting would focus on planning how to turn the outcomes into practical, exploitable results, i.e., upon reviewing and codesigning plans for scaling up, or further research needed to commercialize the innovation, upon assessing project results and related intellectual property, patents, licensing opportunities, or partnerships with industries.

2.3.3 COMMUNICATION AND DISSEMINATION ACTIVITIES

Partners will collectively organize such activities, which include:

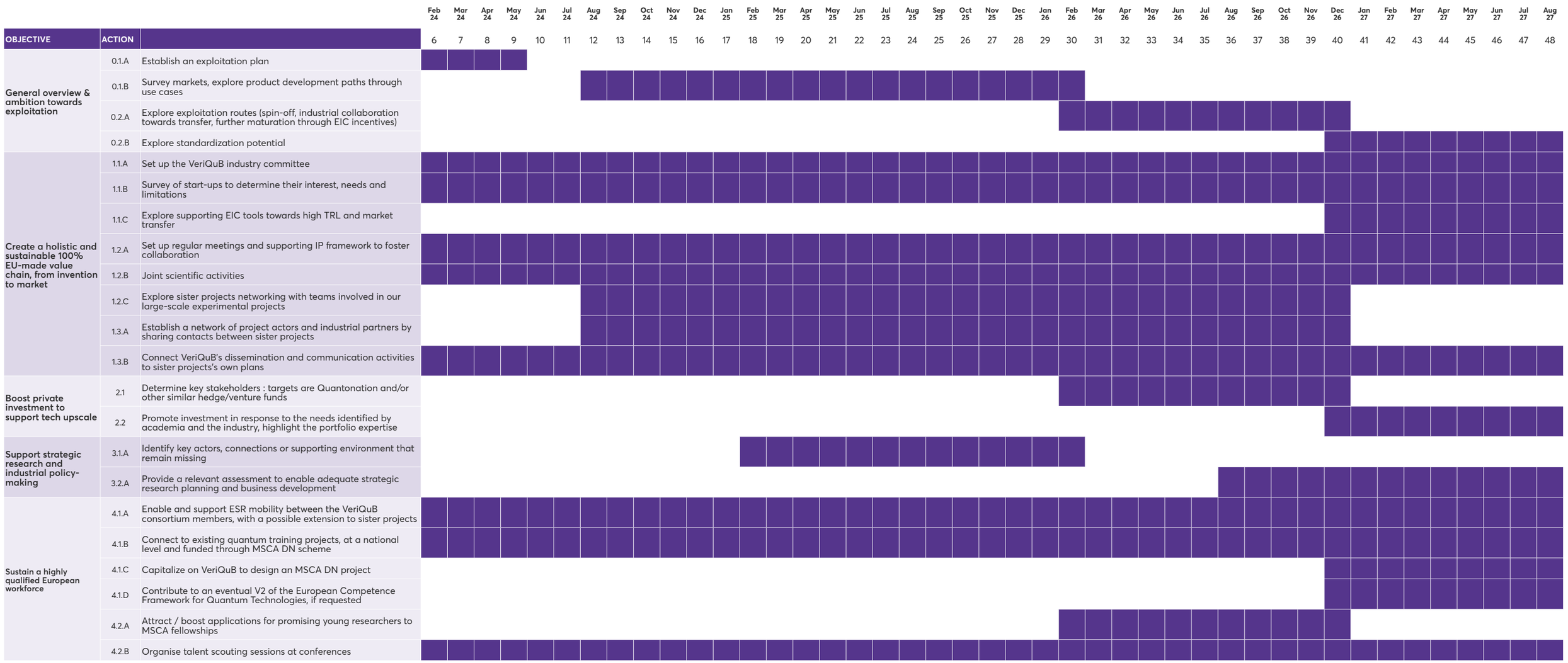
- Co-designing and jointly participating in outreach events at the Portfolio level (e.g., stakeholder matchmaking, industry trade fairs), to foster connections and showcase evolving technologies, supporting the EIC efforts to connect the right actors on all aspects of the value chain. These meetings will involve AQIPCS Portfolio partners to discuss the overall progress of the Portfolio as a whole.
- Policy briefs planned and written by AQIPCS project partners to feed both the strategic research and industrial policymaking and boost private investment to support technology upscale. These will address the Portfolio contribution to the industry, the sustainability of their approach, and the remaining challenges/risks, and will promote investment in response to the needs identified.
- Boosting the emergence of a skilled European workforce: partners will support the promotion of postdoctoral and doctoral mobility among Portfolio projects and initiate actions to attract new generations of researchers in the EU, through personal and knowledge mobility opportunities.

PORTFOLIO COLLABORATIONS OVERVIEW

OBJECTIVE	SUBOBJECTIVE	BENEFITS/SCALE/SIGNIFICANCE	START DATE	END DATE	STATUS
Portfolio actions towards scientific collaborations	**Identify the techno-scientific collaborations and synergies with the other portfolio projects.**	Set up regular meetings and supporting IP framework to foster collaborations within portfolio	**M4**	**M48**	**Active**
		Organize joint scientific meeting activities and link to the dissemination plans	**M4**	**M48**	**Active**
		Explore sister projects networking within our large scale experimental projects	**M4**	**M48**	**Active**
Path towards exploitation	**Map categorization of all the stakeholders and include potentially the establishment of key partnership(s),**	Determine key stakeholders	**M4**	**M48**	**Active**
		Analyze the interests, expectations, and influence of each stakeholder	**M4**	**M48**	**Launched**
		Approach and negotiate with high-priority stakeholders, industries and sister projects consortia to form partnerships.	**M4**	**M48**	**Launched**
	Exchange of the market research analysis results in between the portfolio projects.	Establish a network by sharing contacts between sister projects, including industry	**M4**	**M48**	**Launched**
		Establish a shared platform or repository for storing market research results with sisters projects.	**M6**	**M48**	**Launched**
	Early on and continuous engagement with strategic partners and stakeholders (e.g., investors and corporations)	Create a structured engagement plan outlining how and when to involve key partners and stakeholders.	**M4**	**M48**	**Pending**
		Maintain ongoing communication with stakeholders and sister projects to keep them informed and engaged.	**M6**	**M48**	**Launched**
	Compare techno-economic performance of the proposed solution with the other portfolio technologies using common metrics.	Produce a portfolio report on competitiveness, business potentials in different market segments towards innovation of the portfolio technologies in comparison to benchmarks	**M6**	**M48**	**Launched**
		Compare the analysis of different projects in joint meeting focusing on innovation/exploitation, e.g. providing access to Open Innovation Test Beds.	**M6**	**M48**	**Pending**
		Explore existing EIC tools towards high TRL and market	**M6**	**M48**	**Pending**
Communication, dissemination and outreach	**Elaborate the plan for dissemination of the results.**	Enable and support ESR mobility within consortia, with possible extension to the portfolio sister projects.	**M6**	**M48**	**Pending**
	Design and participate in outreach events (e.g., stakeholder matchmaking, industry trade fairs)	Joint participation with other consortia to general outreach events (on QT, on microelectronics, i.e., the JU Chips, EC global events, etc.) with presentation of posters on the common technological activities.	**M6**	**M48+**	**Pending**
Additional outreach activities foreseen by the photonics subgroup	**Focus on training and attracting ESRs**	Connect to existing quantum training projects, at a national level and funded through MSCA DN scheme	**M6**	**M48**	**Launched**
		Capitalize on existing projects to design an MSCA DN project	**M6**	**M48**	**Active**
		Contribute to an eventual V2 of the European Competence Framework for Quantum Technologies, if requested	**M6**	**M48**	**Pending**
		Attract / boost applications for promising young researchers to MSCA fellowships	**M40**	**M48+**	**Launched**
		Organise talent scouting sessions at conferences	**M40**	**M48+**	**Pending**

RISK OVERVIEW

FORESEEN RISKS	MITIGATION MEASURES	DID THE RISK MATERIALIZE ?
The actions of VeriQuB with EIC portfolio sister project are not fully aligned	Redesign of portfolio roadmap	No
The project development is hindered by unforeseen risks and prevents partners to dedicate time to the portfolio activities	Redesign of activities' planning	No
An unforeseen need in project execution requires reallocation of funding from joint activities to project implementation	Search for additional funding / redesign of activities	No



3.
PROGRESS UPDATES

3.1
SCIENTIFIC COLLABORATIONS: FIRST PATHS IDENTIFIED

This section describes the first joint scientific paths identified, which may lead to individual or mutual working groups, with a regular steering help provided by the EIC, as well as the projects VeriQuB and IQARO.

3.1.1
PHOTONICS SUB-GROUP

Anticipated thematic outputs from the potential scientific collaborations among projects in the photonics projects Portfolio sub-group are:

COLLABORATING PROJECTS	AREA OF COLLABORATION	DETAILS
PANDA and VeriQuB	Theory/Experimental Collaboration: Verification of quantum states	Theory/Experimental Collaboration: Verification of quantum states
VeriQuB and Q-One	Theory Collaboration: Classification of Quantum States of Light	Joint exploration and classification of quantum resources for quantum states of light.
Q-One and Heisingberg	Experimental Best Practices: Nonclassical States of Light	Exchange knowledge on creating nonclassical states of light and injecting them into optical networks.
Q-One and PANDA	Experimental Best Practices: Quantum Neural Networks	Use PANDA's nonclassical light states as data for classification by Q-One's quantum neural network.
VeriQuB and Heisingberg	Theory Collaboration: Computational Complexity Theory	Apply complexity theory for quantum computational advantage to uncover the necessary non-classical quantum states of light, in order to provide rigorous theoretical guarantees.
ARTEMIS and Q-One	Quantum Tomography & Standardization Protocols	Synergy at the conceptual and characterization level to develop new quantum tomography and standardization protocols.

COLLABORATING PROJECTS	AREA OF COLLABORATION	DETAILS
ARTEMIS / PANDA and Photonics projects	Resource Sharing: Single Photon Detectors	ARTEMIS and PANDA may provide access to single photon detectors to AQIPCS partners, especially within the photonic sub-group.
ARTEMIS and Photonics projects	Resource Sharing: Single Photon Sources	ARTEMIS may provide single photon sources to AQIPCS partners, especially within the photonic sub-group.
VeriQuB and Photonics projects	Theory/Experimental Collaboration: Verification of quantum resources	Jointly explore the applicability of VeriQuB's verification toolbox for AQIPCS partners, within the superconducting & new qubits sub-group.

3.1.2

SUPERCONDUCTING & NEW QUBITS SUB-GROUP

Anticipated thematic outputs from potential scientific collaborations within the superconducting & new qubits Portfolio sub-group include:

COLLABORATING PROJECTS	AREA OF COLLABORATION	DETAILS
IQARO, QuKiT and FERROMON	Experimental Best Practices: Flip-Chip Platform Customization	Exchange knowledge on the flip-chip platform, which can be customized for coupling between carrier and qubits.
IQARO and VeriQuB	Joint Fabrication Process: Bump Map Technology and Fabrication Processes	Collaboration on bump map layering and compositing.
IQARO and ARTEMIS	Theory/Experimental Collaboration: Optical Cavity Coupling for Flying Qubits	Jointly explore coupling quantum sources with plasmonic cavities to generate flying qubits.
VeriQuB and Superconducting & new qubits projects	Theory/Experimental Collaboration: Verification of quantum resources	Jointly explore the applicability of VeriQuB's verification toolbox for AQIPCS partners, within the superconducting & new qubits sub-group.

Notably, within the "Superconducting & new qubits" sub-group, the IQARO project has organized work – both scientific and non-scientific – into the following working groups (WG), which align with the overall structure of this roadmap:

- WG1. Technical synergies (subgroups: e.g., simulation, benchmarking, materials, etc.)
- WG2. Outreach and Public Engagement (advisors, shared events, etc.)
- WG3. Metrics (as a foundation to Standards and Road-mapping)
- WG4. Protection and Exploitation (IP, Standardization, etc.)

3.2

POTENTIAL EXPLOITATION ROUTES IDENTIFIED

In both sub-groups of the AQIPCS Portfolio, common activities have already been identified, with potential for significant cross-collaboration:

- Stakeholder mapping and categorization according to interests, expectations, influence, and development priorities, and potentially establishing key partnerships.
- Sharing market research analysis results among the Portfolio projects to foster informed decision-making.
- Early-on and continuous engagement with strategic partners and key stakeholders (e.g., investors and corporations) with the aim to catalyse potential R&D opportunities and to commonly address investment barriers.

Additionally, the creation of an Industry Committee is foreseen by the VeriQuB project at month 18 (February 2025). This Committee will bring together key stakeholders interested in the project's progress, thereby providing expertise, suggesting future directions, and facilitating potential exploitation routes. Although the Committee will primarily focus on VeriQuB's outputs, it could potentially also serve the other projects within the AQIPCS Portfolio. When business interests align between Industry Committee members and Portfolio project members, VeriQuB will facilitate direct communication, following the signing of a Non-Disclosure Agreement. Furthermore, VeriQuB will circulate a survey to Industry Committee members to better understand their needs, development strategies, and potential for engagement across the Portfolio. The survey conclusions will be shared with the AQIPCS Steering Committee and will help gauge their capacity in attracting other industrial stakeholders to the Portfolio's activities and results.

In recent meetings, Portfolio projects partners started to reflect on how to best organize their joint activities, such as sub-dividing tasks into working groups, and exchanging best practices. Discussions have focused on effectively utilizing existing EIC tools, communities and business acceleration services to advance towards higher technology-readiness levels and facilitate market transfer. Additionally, strategies for improving recruitment of skilled researchers and improve visibility of EU quantum research were explored. Partners also considered involving external advisors to guide specific aspects; for instance, spin-off creators from previous EIC quantum projects could explain how to best address joint results' ownership among several institutions, or experts from standardisation committees could provide insight on potential standardisation routes.

As the projects are still in their early stages, it is premature to elaborate a comprehensive exploitation plan. However, exploring technological positioning, market structure, evolution, and needs remains an objective set for the second year and the subsequent phases of the Portfolio.

In this context, several projects associated with IQARO's Working Group nr. 4 already started engaging technology transfer experts and starting discussions with stakeholders' groups about potential results exploitation. This is the case of FERROMON and QuKIT, which already initiated discussions on the exploitation and standardization of flip-chip technology transfer on membranes, while IQARO and VeriQuB are considering the exploitation of 2D materials, layering and composition of bump maps.

In future meetings, partners will further explore potential crossovers and, where appropriate, joint communication and dissemination activities with other Portfolio projects, likely beginning in the third year of the initiative.

3.3

COMMUNICATION, DISSEMINATION, AND OUTREACH

3.3.1

JOINT ACTIVITIES IN COMMUNICATION AND DISSEMINATION

The AQIPCS Portfolio provides additional opportunities for dissemination and communication.

Partners plan to undertake joint communication/dissemination activities; for instance, a discussion between the VeriQuB and Heisingberg projects in January 2024 led to the agreement to share social media posts, expanding their respective networks and enhancing information quality and impact.

In addition, Portfolio partners have participated in various collaborative meetings with other projects, such as the VeriQuB Consortium Meeting on 11–13 September 2024, and will be hosting joint seminars to the occasion of each project's consortium meetings. The Portfolio Steering Committee will also convene four times a year, to drive the EIC's objectives of developing a joint roadmap and advancing innovation and market activities.

AQIPCS partners also agreed on aligning each project's outreach and communication efforts with the planned activities of other projects within the Portfolio. They will jointly participate with other consortia to general events on quantum theory or microelectronics, i.e., the JU Chips, EC global events, etc., with presentations on common technological activities.

The ARTEMIS project will dedicate a page on its website to the AQIPCS Portfolio, relaying the main Portfolio actions, with links to the AQIPCS Portfolio partners' websites. This action can be replicated by each project in turn.

3.3.2

OUTREACH

Partners are exploring opportunities for collaborative events, such as co-organizing or jointly participating in significant gatherings like the EIC Summit and other major national or European events. The EIC has initiated a series of meetings to promote cross-fertilization between projects. These include the EIC Portfolio Meeting in Brussels on 27 November 2023, the Portfolio Steering Committee Meeting on 15 February 2024, the EIC Summit on 19 March 2024, and another Portfolio Steering Committee Meeting on 6 May 2024.

A dedicated forum will be established at the Portfolio level to address technological challenges. Starting with the present AQIPCS Strategic Plan, this forum will also focus on designing and participating in outreach events, such as stakeholder matchmaking and industry trade fairs, and facilitating connections with key stakeholders. The meetings will involve Portfolio beneficiaries, providing a platform to discuss the overall progress of the Portfolio and ensure alignment on common objectives.

The AQIPCS Portfolio also fosters synergies at the theoretical level to support key technological developments. For example, the concept of collective variables is a cross-cutting theme across several Portfolio projects. To leverage this opportunity, a postdoctoral researcher hired within the ARTEMIS consortium to model and study such variables may collaborate with other Portfolio partners, facilitating knowledge exchange and joint progress.

Portfolio sub-group leaders and the EIC will facilitate networking with teams involved in large-scale experimental projects by introducing sister projects to other research teams.

3.3.3
FIRST JOINT ACTIVITIES FORESEEN

An IQARO Seminar series shared with all the other projects of the Portfolio has been organized. The first seminar was held on September 13, 2024, by Prof. Szafran Bartek on Electromagnetic response of a single and double quantum dot in oxides.

On the side of the outreach and public engagement, IQARO has identified the opportunity to organize a school for PhD students on Quantum photonics and quantum materials together with the projects ARTEMIS, FERROMON and Q-ONE, with the main idea to help the creation of a "Pathfinder community" of young students and researchers. This idea will be realized at the Summer PhD School on "Quantum Optics and Quantum Materials" scheduled to take place in Lecce, Italy, from May 26th to 30th, 2025.

Three Portfolio projects – IQARO, Q-One and ARTEMIS – have demonstrated a strong interest in intellectual property protection, a crucial aspect as the projects approach a strategic phase, particularly during tech transfer. The EIC provides a dedicated European IP/Patent Helpdesk, which Portfolio project partners are encouraged to utilize. To facilitate this, the AQIPCS Programme Manager has connected the project coordinators with the relevant stakeholders.A Steering Committee Meeting of the AQIPCS Portfolio will take place on 29 November 2024 in Paris (hybrid format) to discuss common objectives, synergies and next steps.

Annex A Further Reading

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2. Renewing the National Quantum Initiative: Recommendations for Sustaining American Leadership in Quantum Information Science, a report of the National Quantum Initiative Advisory Committee, June 2023: https://www.quantum.gov/wp-content/uploads/2023/06/NQIAC-Report-Renewing-the-National-Quantum-Initiative.pdf

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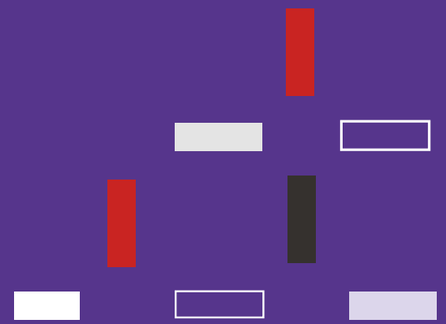
Annex B Overview of Portfolio projects:

PROJECT ACRONYM	PROJECT FULL NAME	PROJECT CORDIS LINK
VeriQuB	Efficient Verification of Quantum computing architectures with Bosons	https://cordis.europa.eu/project/id/101114899
HEISINGBERG	Spatial Quantum Optical Annealer for Spin Hamiltonians	https://cordis.europa.eu/project/id/101114978
ARTEMIS	moleculAR maTerials for on-chip intEgrated quantuM llght sourceS	https://cordis.europa.eu/project/id/101115149
IQARO	SpIn-orbitronic QuAntum bits in Reconfigurable 2D-Oxides	https://cordis.europa.eu/project/id/101115190
QuKiT	Quantum bits with Kitaev Transmons	https://cordis.europa.eu/project/id/101115315
PANDA	Photon-Atom Non-linearities and Deterministic Applications via arrays	https://cordis.europa.eu/project/id/101115420
FERROMON	Ferrotransmons and Ferrogatemons for Scalable Superconducting Quantum Computers	https://cordis.europa.eu/project/id/101115548
Q-ONE	Quantum Optical Networks based on Exciton-polaritons	https://cordis.europa.eu/project/id/101115575

ALTERNATIVE QUANTUM INFORMATION PROCESSING, COMMUNICATION AND SENSING



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