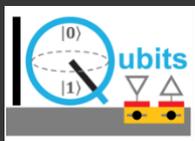


IQubits

D1.3 Dissemination and exploitation plan 1

April 2020



Contact information

PROJECT COORDINATOR

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1 INTRODUCTION	6
1.1 Objectives of IQubits	6
1.2 Dissemination and exploitation in WP1	6
2 OBLIGATIONS AND GUIDELINES FOR DISSEMINATION AND EXPLOITATION	8
2.1 H2020: Definitions and guidelines for dissemination and exploitation activities	8
2.2 Obligation to exploit results	8
2.3 Obligation to disseminate results	8
2.4 Open access to scientific publications and research data	9
2.5 Information on EU funding — Obligation and right to use the EU emblem	9
2.6 Disclaimer excluding the responsibility of the EC-REA	9
2.7 Compliance with general data protection regulation (GDPR)	9
3 DISSEMINATION PLAN	10
3.1 Agreements on dissemination	10
3.2 Stakeholder and impact analyses	10
3.3 Dissemination plan	11
3.4 Monitoring of dissemination activities	13
4 EXPLOITATION PLAN	15
4.1 Agreements on exploitation	15
4.2 Stakeholder and impact analyses	15
4.3 Exploitable results and exploitation activities	17
4.4 Intellectual property right and innovation management	18
4.5 Monitoring of exploitation activities	18
REFERENCES	19



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EXECUTIVE SUMMARY

This deliverable provides the first version of the dissemination and exploitation plan elaborated for IQubits. The document reports the actions taken by the Consortium and the Coordinator to meet the obligations on dissemination and exploitation laid down in the Grant Agreement (GA) and the Consortium Agreement (CA). The dissemination and exploitation plans are reported, along with the stakeholder and impact analyses, the guidelines and monitoring of the dissemination and exploitation activities.

Since the plan is expected to mature during the project lifetime, updated versions of this document will be made available over the project execution.



1 INTRODUCTION

1.1 Objectives of IQubits

Future emerging quantum technologies. Quantum technologies have the potential to solve computational problems that are unsolvable with the classical computers (including supercomputers) of today, such as the synthesis of new drugs to treat incurable diseases, in-depth understanding of the human brain, and many other open complex challenges in all fields of Science and Technology.

The current developments of hardware quantum technologies are primarily limited to integrated qubits fabricated in research laboratories and operating at extreme cryogenic temperatures in the order of tens or hundreds milli-Kelvin, with control and readout circuits external to the chip with the qubits, i.e. the quantum chip.

General objectives. The extreme cryogenic temperatures and the inherent limitations to the integration due to the multi-chip approach requiring bulky interconnections, introduce dramatic barriers to the scalability of hardware technologies necessary to secure the integration, control and readout of hundreds, thousands and even million qubits required for the industrial development and commercial exploitation of future emerging quantum computing (QC) technologies.

The general objective of the interdisciplinary project IQubits is to break through these major scientific and technological barriers by developing integrated qubits, control and readout circuits that can operate at higher cryogenic temperatures and can be integrated together into a same chip in commercial ultra-scaled silicon technologies, so paving the way for moving quantum technologies from research laboratories to semiconductor foundries for large-scale production.

Scientific objectives. In particular, the scientific objectives are:

- Developing and demonstrating experimentally high-temperature (high-T) Si and SiGe electron/hole-spin qubits and qubit integrated circuits (ICs) in commercial 22nm fully-depleted Silicon-on-insulator (FDSOI) complementary metal-oxide-semiconductor (CMOS) foundry technology, as the enabling fundamental building blocks of QC technologies;
- Verifying the scalability of these qubits to 10nm dimensions and their capability to operate at higher temperatures through nanofabrication experiments with Si and III-nitride (III-N) technology processes;
- Proving through atomistic simulations that these qubits, at 2nm dimensions, are suitable for 300K operation.

Expected outputs. The Consortium expects that IQubits will produce scientific breakthroughs and exploitable outcomes, ranging from integrated devices and circuits to nanofabrication processes, from software codes to measurement setups, to the benefit of the scientific and industrial community, as well as the Society as a whole. Details of the specific expected outputs are reported in Sections 3 and 4.

1.2 Dissemination and exploitation in WP1

WP1 includes also the dissemination and exploitation of the research results in compliance with the principles of the European FET OPEN programme, assuring research excellence, as well as scientific and industrial impact. The Consortium adopts key performance indicators (KPIs) according to the well-established international best practices, in order to monitor and steer effectively the dissemination and exploitation activities.

As part of the dissemination and communication activities (T1.2), AU has established the IQubits website (www.iqubits.eu), which includes pages dedicated to the project summary, consortium partner profiles, news, events, videos, publications and presentations. Also, a newsletter service has been established and provided through the website. The website will support the dissemination of the research results, reaching out to the scientific and industrial community, as well as the Society at large. Further details on IQubits website are reported in D1.1 [1]. The collection, storage and usage of data is detailed in D1.2 [2].

T1.2 spans from M5 to M52 and includes the dissemination of the research results in top international journals with high impact factor, key conferences, and industrial and academic organizations through the participation in EU project clusters, technical forums, visits to industry and organization of workshops.



As part of the exploitation activities (T1.3), planned from M5 to M52, the scientific and industrially-relevant results will be shared according to the GA and CA regulations, during and after the end of the Project for a period of four years, with two European foundries, GlobalFoundries, Dresden (Germany), and STMicroelectronics, Crolles (France), as well as all interested stakeholders. IQubits website comprises a private area with file repository and discussion board, allowing the Consortium to share sensitive research results with confidentiality requirements.

The Consortium has appointed the Advisory Board (AB), which is currently made up of two distinguished worldwide academic and industrial experts (see Section 3.2) who will contribute to further maximize the impact of the project through their independent scientific and industrial guidance.

The deliverable is organized as follows. Section 2 summarizes some of the obligations reported in the GA and how these will be addressed by the Consortium, as well as the Horizon 2020 (H2020) definitions and guidelines. Section 3 reports the dissemination plan, comprising the agreements in force, stakeholder and impact analyses, dissemination media and target audience, dissemination activities, and monitoring of the dissemination activities. Section 4 reports the exploitation plan, consisting of the agreements in force, stakeholder and impact analyses, exploitable results and exploitation activities, intellectual property right (IPR) and innovation management, and monitoring of the exploitation activities.



2 OBLIGATIONS AND GUIDELINES FOR DISSEMINATION AND EXPLOITATION

2.1 H2020: Definitions and guidelines for dissemination and exploitation activities

The project is funded by the H2020 research and innovation framework programme of the European Union (EU), under the competitive programme Future Emerging Technologies (FET) Open - Challenging Current Thinking, which supports excellent and ambitious interdisciplinary scientific research projects with radically new vision and breakthrough technological targets. The Consortium will engage in dissemination and exploitation activities, so to maximize the impact of the research to the benefit of the scientific and industrial community, as well as the Society at large.

Even if some overlap between dissemination and exploitation is likely to occur, the EU distinguishes the two activities as follows [3].

Dissemination. *“Dissemination means sharing research results with potential users, such as peers in the research field, industry, other commercial players and policymakers. Sharing the research results with the rest of the scientific community, you are contributing to the progress of science in general.”*

Exploitation. *“Whereas exploitation is the use of results for commercial purposes or in public policymaking.”*

Guidelines. The H2020 online manual [3] provides EU guidelines for dissemination and exploitation plan. The guidelines are not compulsory and target Leadership in Enabling and Industrial Technologies (LEIT) rather than Excellent Science. Nonetheless, in addition to the specific plans elaborated by IQubits to target excellence in science, our dissemination and exploitation plan considers also these EU guidelines, which comprise the identification of:

- expected area of impact
- needs that will be solved/met thanks to the results of the project
- expected outputs
- places where the outputs will be made available during and after the project
- potential users of the results of the project
- means to contact potential users.

Also, the guidelines report recommendations to keep an ongoing dialogue with potential users during the project execution.

2.2 Obligation to exploit results

As reported in Article 28.1 of the GA, the partners are obliged, up to a period of four years after the end of the Project, to take actions ensuring exploitation of the research results. In particular, the exploitation activities are listed in the GA and include, but are not limited to, the application of the results in further research activities outside IQubits; the development, creation and marketing of products or processes; and the exploitation in standardization activities.

If results are incorporated in a European or another international standard, the following statement must be reported in (information related to) the standard, unless the exceptions described in Article 28.2 of GA apply:

“Results incorporated in this standard received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 829005”.

2.3 Obligation to disseminate results

Each Partner is required to disseminate their results as soon as possible, publishing them by appropriate means, including in scientific publications. The intentions to disseminate the results must be notified in advance to the other Partners according to the conditions reported in the GA and CA. The Partners can object within the timing and conditions also established by the GA and CA.



2.4 Open access to scientific publications and research data

In compliance with Article 29 of GA, all peer-reviewed scientific publications disseminating the research results of IQubits must be made available online free of charge to any user (i.e. open access). In particular, an electronic copy of the published version or final peer-reviewed manuscript accepted for publication must be deposited in a repository for scientific publications, as soon as possible and at the latest on publication. The concerned Partner must ensure open access to the deposited publication and the related bibliographic metadata. Also, research data validating the results presented in the scientific publications of IQubits must be deposited in a research data repository and access must be granted free of charge to any users, unless exceptions of Article 29 of GA apply.

The data will be primarily made accessible by the deposition in the IQubits data repository, accurately designed and implemented to accomplish these requirements. The repository allows regulated access according to user rights granted by the Coordinator. Public repositories, such as Cornell's arXiv, will be also adopted for green and open access publications. Further details are reported in D1.2 [2].

2.5 Information on EU funding — Obligation and right to use the EU emblem

As reported in the Article 29.4 of GA, unless it is impossible or otherwise requested by or agreed with European Commission (EC) Research Executive Agency (REA), any dissemination of results (in any form) must display the EU emblem and include information on EU funding.

AU has arranged the templates for slide, poster and e-poster presentations, as well as the templates for the deliverables, including the EU emblem and the information on EU funding. These templates mirror the visual identity that has been designed to create a specific branding for all IQubits communication and dissemination activities. The visual identity will allow the stakeholders to easily identify the communication and dissemination originated by IQubits. AU has regularly recommended all the Partners to use the templates and to comply with the obligations reported in the GA and CA. Also, IQubits website has been designed in compliance with such obligations.

2.6 Disclaimer excluding the responsibility of the EC-REA

Unless EC-REA requests or agrees otherwise or unless it is impossible, any dissemination of results must report a disclaimer indicating that the dissemination reflects only the author's view and excluding any responsibility of EC-REA. This requirement has been implemented and, in particular, all IQubits deliverables include the following disclaimer:

“The contents of this document are the sole responsibility of the IQubits Consortium and can in no way be taken to reflect the views of the European Union.”

AU has added the disclaimer to the template for the deliverables and the Legal notice in IQubits website.

2.7 Compliance with general data protection regulation (GDPR)

The EU GDPR 2016/679 is a regulation in the EU's law on data protection and privacy for all individuals within the EU, entered into force on 25 May 2018. In compliance with the EU GDPR, the Consortium is strongly committed to protect the privacy of the users of IQubits website, according to users' choices and rights. Both personal and non-personal information collected is protected according to the highest privacy and data protection standards and best-practices adopted worldwide.

We use data collection methods and technologies on IQubits website to collect data for the purposes of different transactions with the users, such as sending newsletters, access to some online contents, including those protected by password, registration to events, and gathering analytics on website traffic. All information about data collection, storage, usage and purposes has been established by AU and made available online in the privacy policy of IQubits website.

Further details on data management are reported in D1.2 [2].



3 DISSEMINATION PLAN

3.1 Agreements on dissemination

Prior to reporting the main principles on dissemination that have been agreed by the Partners, it is worth defining the terms Background and Results, beginning with a capital letter, as per GA.

- Any data, know-how or information that is held by a Partner prior to the signature of the GA and needed to implement IQubits or exploit its results is referred to as Background.
- Results refers to any (tangible or intangible) output of IQubits that is produced within IQubits, as well as any rights attached to it, including IPRs.

As reported in the CA, the Partners agreed upon the following principles:

- The Partners have identified and agreed on the Background for the Project and have also, where relevant, informed each other that access to specific Background is subject to legal restrictions or limits.
- A Partner shall not include, in any dissemination activity, the Results or Background of another Partner without obtaining the owning Partner's prior written approval, unless they are already published.
- The Partners undertake to cooperate in order to allow the timely submission, examination, publication and defense of any dissertation or thesis for a degree that includes their Results or Background subject to the confidentiality and publication provisions agreed in the CA.
- The Partners have no rights to use in advertising, publicity or otherwise the name of the other Partners or any of their logos or trademarks without their prior written approval. However, the Partners agreed to make some specific information a matter of public record.

3.2 Stakeholder and impact analyses

For the research results to have an impact, they must create value for the relevant stakeholders, with the ultimate goal of stakeholder satisfaction. Thereby an analysis of the stakeholders and expected impact is in order. A first analysis has been carried out by AU and AMat, and the relevant results are summarized below. This includes a recon of the primary public investments worldwide.

As the quantum technologies have the potential to solve computational problems that are unsolvable with the classical computers (including supercomputers) of today, QC could lead to giant leaps in many fields of Science and Technology. IQubits, with its foundational character, aims to develop and demonstrate innovative hardware and simulation software solutions for the development of QC technologies, and its results could have thereby great value not only for the Partners and the scientific community working on quantum technologies, but the whole international scientific community and the Society at large.

As shown in Fig. 1, the public investments on quantum research programmes worldwide amount to more than \$16B. As stated in the EU Quantum Manifesto [5], Europe wants to take a leading role and making strategic investments in quantum technologies to help creating a relevant competitive industry for long-term economic and social prosperity and security. In April 2016 the EC announced the €1.2B Quantum Technologies Flagship initiative. Also Canada is becoming a major player, with programmes such as the "Quantum Canada" national initiative (2016), supported by the government through the Natural Sciences and Engineering Research Council of Canada (NSERC). In this respect, IQubits is a strategic synergic effort of EU and Canada, joining the forces toward the groundbreaking goal of developing the building blocks of the future quantum technologies.

Another example is the UK's National Quantum Technologies Programme (£270M, 2015). Similar initiatives exist in US, Australia, Russia and other Countries worldwide. Last, but not least, China aims to become the world leader in quantum technologies by 2024, with announced investments of \$10B in 2020. Thereby, the policy makers in and outside Europe are interested in steering the public investments so as to maximize their impact. Direct contact to EU policy makers and relevant stakeholders will be led by the Coordinator assisted by the Steering Board (SB) and the independent AB.



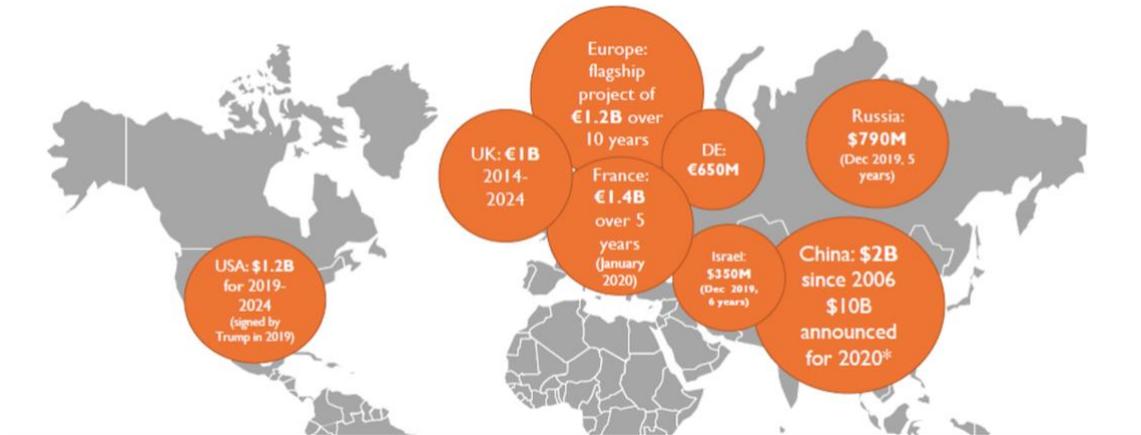


Fig. 1: World map of public investments on quantum technologies (Source: Yole Développement [4]).

IQubits research results are of interest for small-medium enterprises (SMEs), large enterprises (LEs), and start-ups, striving to break through the critical barriers to the development of QC platforms scalable to large numbers of qubits. AMat is an LE and its involvement as a Partner of the Project is a key asset to bridging the gap between the research and business sectors. Direct coordination with two European CMOS foundries, GlobalFoundries and STMicroelectronics, will be an on-going activity, enhancing the impact of the dissemination in the industry.

Despite the Project is only in its early stage, IQubits made already a dramatic impact on the entire international scientific and industrial community worldwide. The main actors, previously pursuing different approaches, have now aligned their research to the approach envisaged by IQubits.

The AB is currently made up of two distinguished worldwide academic and industrial experts from Asia and Europe: Prof. Jim Greer (University of Nottingham, Ningbo, China) and Dr. Thorsten Kammler (GlobalFoundries, Dresden, Germany), who will contribute to further maximize the impact of the Project through their independent scientific and industrial guidance. Prof. Greer is a renowned international expert in ultimate nanoscale devices and coauthor of the book titled “Nanowire Transistors” published by Cambridge University Press, addressing quantum effects in transistors at ultra-scaled dimensions. Dr. Kammler is the Director of the FDSOI technology platform, at GlobalFoundries, and this is of strategic importance for IQubits, whose vision is entirely focused on the unique capabilities offered by FDSOI CMOS technology.

3.3 Dissemination plan

Dissemination targeting the scientific and industrial communities

Scientific results will be published in peer-reviewed, high-impact journals, such as Nature, Science, Scientific Reports, Applied Physics Letters (APL), Physical Review A (PRA), Physical Review B (PRB), Physical Review Letters (PRL), Physical Review X (PRX) Quantum, IEEE Transactions on Electron Devices (TED), IEEE Electron Device Letters (EDL), IEEE Journal of Solid-State Circuits (JSSC), IEEE Transactions on Microwave Theory and Techniques (TMTT), IEEE Transactions on Circuits and Systems I and II (TCAS-I and TCAS-II), IEEE Transactions on Instrumentation and Measurement (TIM), IEEE Microwave and Wireless Components Letters (MWCL), IEEE Access, and other relevant international peer-reviewed journals. We estimate a target number of about 25 journal publications. The results will be also disseminated in the top international conferences, such as the IEEE International Electron Devices Meeting (IEDM), International Solid-State Circuits Conference (ISSCC), European Solid-State Circuits Conference (ESSCIRC), IEEE Radio Frequency Integrated Circuits Symposium (RFIC), IEEE International Symposium on Circuits and Systems (ISCAS), IEEE International Conference on Circuits and Systems (ICECS), IEEE International Semiconductor Conference (CAS), European Microwave Week (EuMW), American Physical Society (APS) Annual, Integrated Communications Navigation and Surveillance (ICNS) Conference, International Workshop on Nitride Semiconductors (IWN), Quantum Europe, and other relevant international conferences and workshops. We estimate a target number of 50 conference, workshop and seminar presentations.

Organization of topical workshops and special conference sessions is also part of the dissemination plan. In particular, our plan includes the organization of three workshops and special sessions within the EuMW, IEEE CAS, and ESSCIRC. We target also the organization of a special issue on a top international journal on

hardware quantum technology. The plan includes also an IQubits Seminar Series addressing the hot topics in quantum technology by hosting invited speakers.

Dissemination targeting public and specialized audiences

Press releases through the most widespread science and technology magazines, such as Electronic Engineering (EE) Times Europe Magazine, Scientia Global, etc., renowned for connecting the electronic engineering and science communities with the Society, will be organized since the early stage to advertise and raise awareness on the Project objectives, in occasion of important milestones, and at the end of the Project in order to highlight the achievements to the target audience. We expect about four press releases.

The IQubits website (www.iqubits.eu) and logo were designed and established by AU in M6. The domain and the hosting service will be maintained for 8 years (4 years of the Project, plus 4 years after the Project) in order to facilitate long-term dissemination, two years beyond the original term reported in the project proposal, so fully matching the dissemination timeline of the GA. IQubits website and social media will support the dissemination targeting the public and specialized audiences. Pages dedicated to latest news, events and videos have been arranged to catalyze the interest of the stakeholders and to be spread through social media, such as Twitter, Facebook, LinkedIn and YouTube.

AU has also set up the IQubits Twitter account (@H2020_IQubits), YouTube channel, and LinkedIn page, as shown in Fig. 2, mirroring the visual identity established for the IQubits website and documents, so contributing to branding and popularizing the IQubits activities. They are managed by the Coordinator (AU), and will be updated on a regular basis.

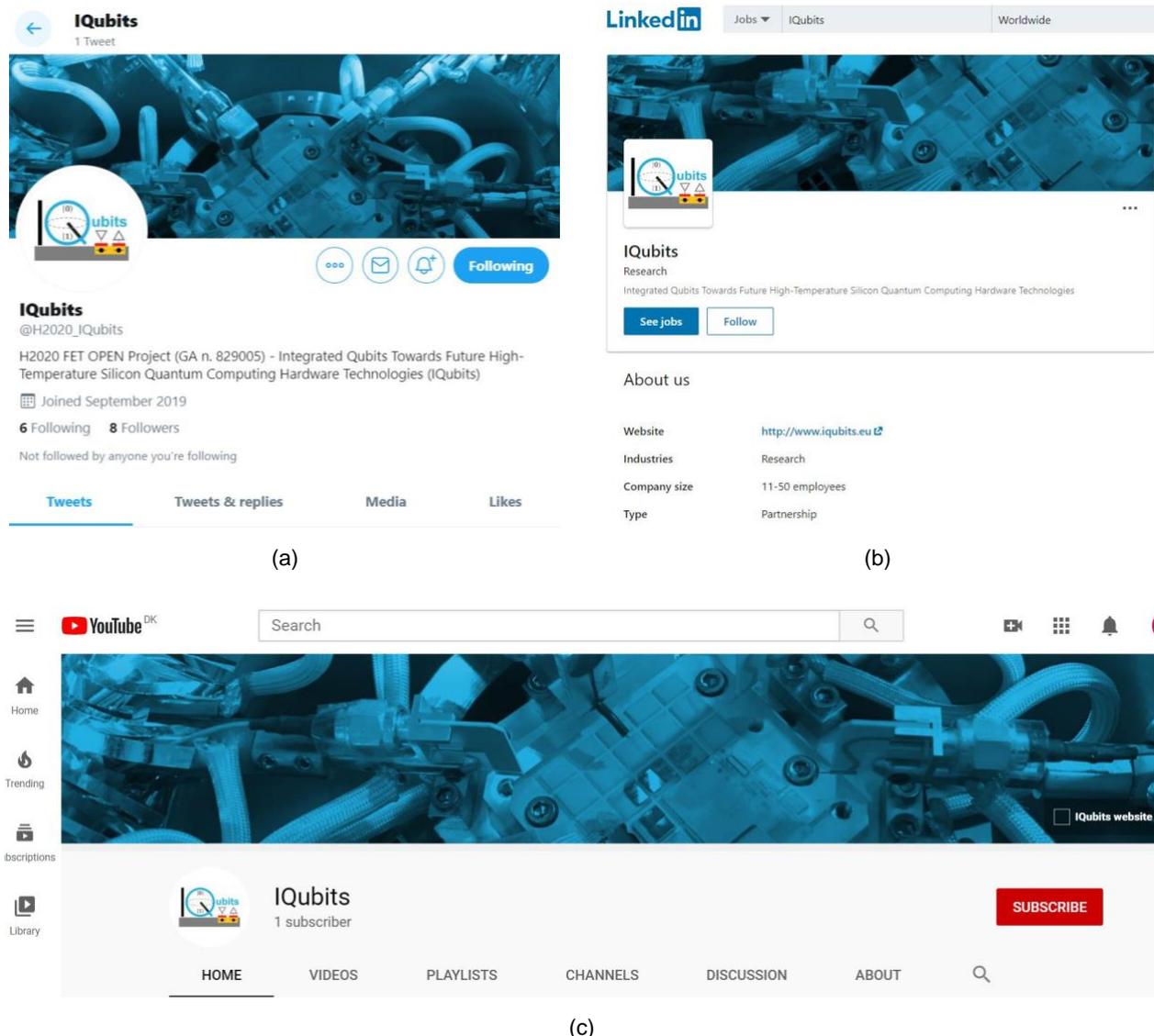


Fig. 2: IQubits social media. (a) Twitter account. (b) LinkedIn page. (c) YouTube channel.



AU has also created a leaflet (Fig. 3), which is available for download from the home page of IQubits website. All the members of the Consortium will circulate the leaflet in IQubits and other international events, so to foster the visibility of the Project and its popularization. As part of the dissemination and communication plan, a newsletter has been also set up in order to allow any stakeholders to receive info and periodic bulletins, and engage with the Project and its latest advances.



Fig. 3: Leaflet downloadable from the IQubits website (www.iqubits.eu).

3.4 Monitoring of dissemination activities

AU, in collaboration with the Partners, will be continuously monitoring dissemination activities, keeping track of the following KPIs: number of international peer-reviewed journal publications, invited journal publications, peer-reviewed publications in conference proceedings, invited conference presentations, plenary and keynote presentations, citations, webinar presentations, TV presentations, videos, visualizations, and last and foremost the impact factor of the journal publications. A list of the primary target journals and their impact factors is reported in Table 1.

The monitoring activity will take advantage of the advance notices from the Partners, who are obliged to inform the Consortium and get the approval (i.e. no objections) before disseminating the Results (Section 3.1), in compliance with the GA and CA.

Each publication, presentation and event will be reported in IQubits website at their occurrence. They will be also reported on the Grant Management System (SyGMA) of Participant Portal (PP), and listed in the periodic reports for the EC-REA.



Table 1: Table of the primary target journals and their impact factors

Journal	Impact factor
Nature	43.070
Nature Nanotechnology	33.407
Science	41.063
Scientific Reports	4.011
APL	3.521
PRA	2.907
PRB	3.736
PRX Quantum	12.211
PRL	9.227
IEEE TED	2.704
IEEE EDL	3.753
IEEE JSSC	5.173
IEEE TMTT	3.756
IEEE TCAS-I	3.934
IEEE TCAS-II	3.25
IEEE TIM	3.067
IEEE MWCL	2.374
IEEE Access	4.098

4 EXPLOITATION PLAN

4.1 Agreements on exploitation

The Partners have achieved an agreement on exploitation, as laid down by the CA and GA. In Attachment 1 to the CA, the Partners have identified and agreed on the Background for the Project and have also, where relevant, informed each other that access rights to specific Background is subject to legal restrictions or limitations. The CA also establishes the procedures for adding, modifying or withdrawing Background.

The CA defines the access rights for implementation and exploitation of IQubits research and innovation results. Also, the CA defines the specific provisions for access rights to software, including the software license and sublicensing rights, and agreed that each sublicense granted according to these provisions shall be made by a traceable agreement specifying and protecting the proprietary rights of the concerned Partners.

The partners also agreed that access rights to Ginestra™, i.e. AMat proprietary software, are limited to commercially-available object-code versions released prior to the end of the Project, granted pursuant to the standard AMat end-user license agreement (“EULA”) and at list pricing in effect at the time of the request.

4.2 Stakeholder and impact analyses

Many SMEs, LEs, and start-ups have decided to bet on the disruptive potential of QC technologies. Initially, only few companies (Fig. 4), such as D-Wave, Google, Intel, Rigetti Computing and Microsoft, pioneered this unexplored field. However, the QC competitive landscape is extremely dynamic, especially in Europe, and the number of companies involved is now considerable, as shown in Fig. 5. In this scenario, the demand for highly-educated and skilled researchers and engineers will increase rapidly in the industry in the next few years. IQubits, with its strongly interdisciplinary and groundbreaking character, will facilitate rapid creation of new knowledge and competencies that will help training new researchers and engineers with advanced and unique skills.

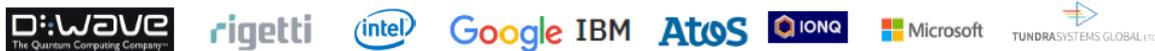


Fig. 4: Quantum pioneers.



Fig. 5: QC competitive landscape (Source: Yole Développement [4]).

Quantum technology market is expected to grow exponentially in the next 10 years, led by QC (1,924 M\$ in 2030), as illustrated by the forecasts in Fig. 6 and Fig. 7. The revenue of the QC segment will increase with a CAGR of 41%. QC hardware and Quantum as a Service (QaaS) are the major revenue stream for this segment.

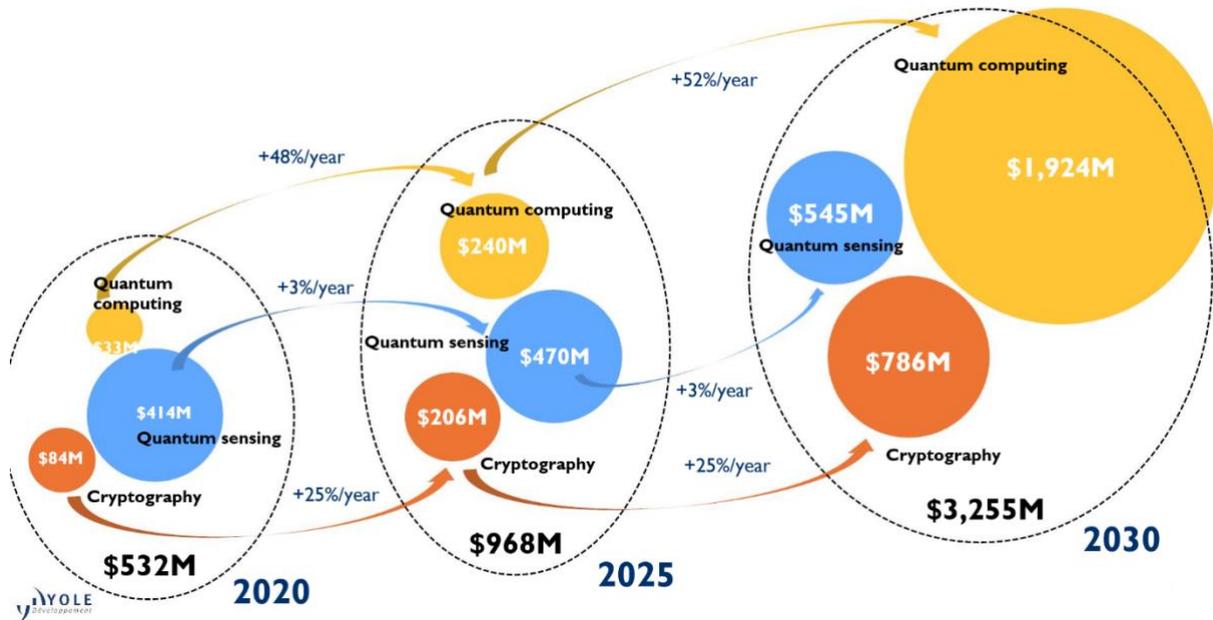


Fig. 6: Forecast for the quantum technology market (Source: Yole Développement [4]).

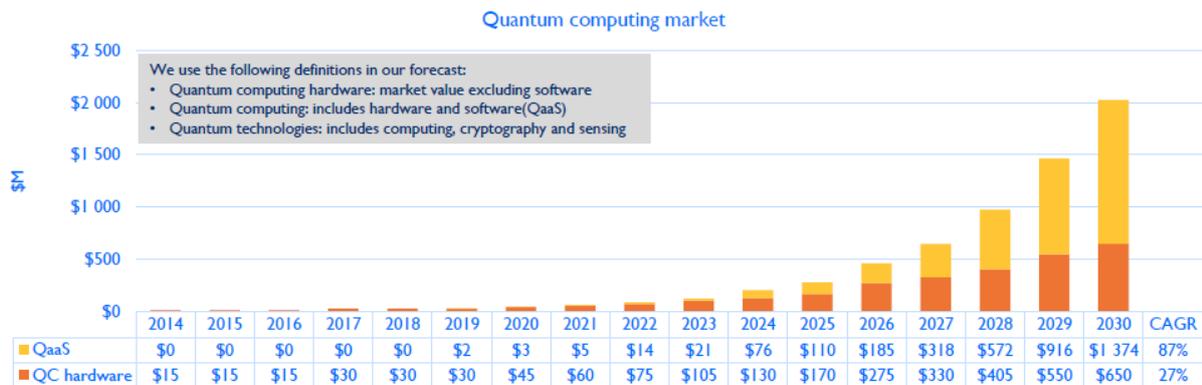


Fig. 7: QC market forecast 2014 – 2030 (Source: Yole Développement [4]).

As with any disruptive technology, the speed at which quantum can move from “lab to fab” will depend on the ability of the quantum ecosystem to work together in order to solve key technology challenges. In this regard, IQubits will strongly contribute addressing the QC technological key challenges for a mass commercialization, as captured by Table 2.



Table 2: Expected IQubits contributions versus QC challenges and needed breakthroughs

QC challenges	Breakthroughs needed	Expected IQubits contributions
Large-scale system integration	<ul style="list-style-type: none"> • Ultra-scaled devices • Arbitrary initialization • Universal gate set • Effective readout • Gates faster than decoherence 	<ul style="list-style-type: none"> • 12/22nm FDSOI integration • Fine control through gate/backgate voltages • Universal gates in coupled-QD qubits • Direct detection of tunneling current • 120/240GHz sources with <20ps pulse and frequency-modulated continuous-wave operation
High gate fidelity	<ul style="list-style-type: none"> • Fault-tolerant gates 	<ul style="list-style-type: none"> • Scaling → higher energy splitting • Integrated qubits with low-noise control/readout electronics
Affordability	<ul style="list-style-type: none"> • Qubits operating at high temperatures 	<ul style="list-style-type: none"> • FDSOI production technology • Future scaling → 12K operation
Reliable models	<ul style="list-style-type: none"> • Complex simulation modeling 	<ul style="list-style-type: none"> • Multistep approach, from ab initio material description to qubit Hamiltonian models and qubit IC compact models

The AB (see Section 3.2) made up of two distinguished academic and industrial experts worldwide, will contribute to further maximize the impact of the project through their independent scientific and industrial guidance.

IQubits has made a significant impact since its early stage. Also owing to its strategic involvement in innovative software development for simulation of quantum effects, MDLab, a SME world leader in multi-scale simulation software originated by a workgroup at University of Modena and Reggio Emilia (Italy), was acquired by Applied Materials, a LE, leader in materials engineering solutions for innovative chip fabrication by modifying materials at atomic levels, on industrial scale.

Applied Materials Worldwide Chief Technology Officer (CTO) Om Nalamasu announced that “Applied Materials wants to help reducing the time from invention to commercialization, and really make innovation and commercialization happen simultaneously.” IQubits is enabling AMat to assume a world-leading role in simulation software for the multiscale (material, device and circuit) modelling of qubits. With IQubits, AMat looks forward to bringing their capabilities in materials engineering and high-volume manufacturing to help accelerate the quantum future - from materials to systems.

4.3 Exploitable results and exploitation activities

The Consortium has identified the unique strengths of the research and innovation carried out by the Partners within the Project, which are the underpinnings to make impact from the radically-new and ground-breaking research and innovation activities addressed by IQubits, in relation to the specific developments of knowledge, competencies, hardware and software products, and their future exploitation. In particular, the Consortium has identified high-potential exploitation opportunities from the developments of: (a) innovative integrated circuits (ICs) addressed by AU and UofT; (b) ultra-scaled device nanofabrication processes addressed by IMT and FORTH; (c) unique measurement setups addressed by IMT and FORTH; (d) and simulation software codes addressed by CNR and AMat. All these are under development and are expected to be made available by the end of the Project.

The Consortium has engaged with the most relevant European semiconductor foundries, GlobalFoundries and STMicroelectronics, and have established a number of confidentiality agreements, which have been fully executed and are now in force. This allows opening fruitful dialogues and cooperation in view of possible future exploitations. Other preliminary interactions were established to explore potential collaborations with CEA-Leti



(Grenoble, France), also engaged in quantum technology research. Other preliminary interactions have been established with the Quantum Technologies Flagship and QuTech at Technical University Delft. All these will allow connecting IQubits to the most relevant ongoing public and private initiatives, and relevant semiconductor industries.

4.4 Intellectual property right and innovation management

At the beginning of the Project, AU, in collaboration with the Partners, has carried out a recon of the Background intellectual properties (IPs) and built a record, with the objective to facilitate the identification of the foreground IPs developed in IQubits (i.e. Results). Then, AU, in collaboration with the Partners, has started building the record for the foreground IP developed in the Project. The IP mapping is expected to facilitate its clearance and industrial exploitation. Such a record will be updated by AU on a regular basis with input notified timely by the Partners, all over the project timeline and for the four years after the completion, as regulated in the GA and CA.

As expected from the description of action (DoA), the Consortium established the specific shared guidelines and principles regulating the exploitation of the results, which were elaborated and reported in the CA and GA. These guidelines and procedures follow the general shared principles of the GA. In particular, they address the procedures for managing the IP of the Results. To facilitate IPR management, the Coordinator will be supported by the staff at Corporate Relations and technology transfer (TT) office at AU. Innovation management will be led from each Unit independently and the Consortium will provide support through the TT office to clear, if needed. The TT offices of the Partners will cooperate on managing the IPRs.

4.5 Monitoring of exploitation activities

The Coordinator will be continuously monitoring the IPs, update the record from the initial recon of the Background and, in collaboration with the Partners, will keep tracking the Results.

The Consortium will also monitor the most relevant IPs developed by third parties outside IQubits.

KPIs like number of patents, confidentiality agreements signed with third parties, licenses, transfer of knowledge to third parties, products and revenues will be used to measure the impact of exploitation, together with the pro-rata figures to monitor the progress of the Project.



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