⟨EQUAL|TY⟩

Efficient QUantum ALgorithms for IndusTrY

WP6 Impact creation

D6.3 Dissemination & communication reports

Version: 2.0

Submission date: 26/10/2024

Funded by the European Union

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Document control

Project title	Efficient QUantum ALgorithms for IndusTrY
Project acronym	EQUALITY
Call identifier	HORIZON-CL4-2021-DIGITAL-EMERGING-02
Grant agreement	101080142
Starting date	01/11/2022
Duration	36 months
Project URL	http://equality-quantum.eu
Work Package	WP6 Impact creation
Deliverable	D6.3 Dissemination & communication reports
Contractual Delivery Date	M24
Actual Delivery Date	M24
Nature[1]	R
Dissemination level[2]	PU
Lead Beneficiary	Da Vinci Labs
Editor(s)	Renan Picoreti Nakahara
Contributor(s)	-
Reviewer(s)	Pablo-David Rojas, Hendrik Meer
Document description	This deliverable reports on the communication and dissemination activities executed during the first year of the EQUALITY project, including website and social media presence, scientific publications, press releases, organisation of and participation in events, and networking activities with other projects and initiatives. It also evaluates the accomplishment of the key performance indicators (KPIs) define in D6.2.

[1]R: Document, report (excluding the periodic and final reports); DEM: Demonstrator, pilot, prototype, plan designs; DEC: Websites, patents filing, press & media actions, videos, etc.; DATA: Data sets, microdata, etc.; DMP: Data management plan; ETHICS: Deliverables related to ethics issues.; SECURITY: Deliverables related to security issues; OTHER: Software, technical diagram, algorithms, models, etc.

[2]PU – Public, fully open, e.g., web (Deliverables flagged as public will be automatically published in CORDIS project's page); SEN – Sensitive, limited under the conditions of the Grant Agreement; Classified R-UE/EU-R – EU RESTRICTED under the Commission Decision No2015/444; Classified C-UE/EU-C – EU CONFIDENTIAL under the Commission Decision No2015/444; Classified S-UE/EU-S – EU SECRET under the Commission Decision No2015/444

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Version control

Version	Editor(s) Contributor(s) Reviewer(s)	Date	Description
0.4	Renan Picoreti Nakahara	09/10/2023	Intermediate document finished.
0.5	Pablo-David Rojas	21/10/2023	Intermediate document approved by the reviewer.
0.8	Renan Picoreti Nakahara	25/10/2023	Document finished by editor.
0.98	Pablo-David Rojas	26/10/2023	Document approved by reviewer.
1.0	Pablo-David Rojas	26/10/2023	Document released by Technical Project Lead.
1.4	Renan Picoreti Nakahara	04/10/2024	Y2 Intermediate document finished.
1.5	Hendrik Meer	16/10/2024	Y2 Intermediate document approved by the reviewer.
1.8	Renan Picoreti Nakahara	21/10/2024	Y2 Document finished by editor.
1.98	Hendrik Meer	26/10/2024	Y2 Document approved by reviewer.
2.0	Hendrik Meer	26/10/2024	Y2 Document released by Technical Project Lead.

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Abstract

A quantum revolution is unfolding, and European scientists are on the lead. Now, it is time to take decisive action and transform our scientific potential into a competitive advantage. Achieving this goal will be critical to ensuring Europe's technological sovereignty in the coming decades.

EQUALITY brings together scientists, innovators, and prominent industrial players with the mission of developing cutting-edge quantum algorithms to solve strategic industrial problems. The consortium will develop a set of algorithmic primitives which could be used as modules for various industry-specific workflows. These primitives include differential equation solvers, material simulation algorithms, quantum optimisers, etc.

To focus our efforts, we target eight paradigmatic industrial problems. These problems are likely to yield early quantum advantage and pertain to the aerospace and energy storage industries. They include airfoil aerodynamics, battery and fuel cell design, space mission optimisation, etc. Our goal is to develop quantum algorithms for real industrial problems using real quantum hardware. This requires grappling with the limitations of present-day quantum hardware. Thus, we will devote a large portion of our efforts to developing strategies for optimal hardware exploitation. These low-level implementations will account for the effects of noise and topology and will optimise algorithms to run on limited hardware.

EQUALITY will build synergies with Quantum Flagship projects and Europe's thriving ecosystem of quantum start-ups. Use cases will be tested on quantum hardware from three of Europe's leading vendors and two HPC centres. The applications targeted have the potential of creating billions of euros for end-users and technology providers over the coming decades. With EQUALITY, we aim at playing a role in unlocking this value and placing Europe at the centre of this development. The project gathers 9 partners and has a budget of €6M over 3 years.

Consortium

The EQUALITY consortium members are listed below.

Legal Name on Grant Agreement	Short name	Country
CAPGEMINI DEUTSCHLAND GMBH	CAP	DE
PASQAL (former QU & CO AI BV)	QC	FR
AIRBUS OPERATIONS GMBH	AOG	DE
DEUTSCHES ZENTRUM FUR LUFT - UND RAUMFAHRT EV (DLR)	DLR	DE
FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (FHG)	ENAS	DE
INSTITUT NATIONAL DE RECHERCHE EN INFORMATIQUE ET AUTOMATIQUE (INRIA)	INRIA	FR
UNIVERSITEIT LEIDEN (ULEI)	ULEI	NL
DA VINCI LABS	DVL	FR

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Disclaimer

Acknowledgement

This document is a deliverable of the EQUALITY project. This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement Nº 101080142.

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1. Executive Summary

This document is a deliverable of the EQUALITY project, funded under grant agreement number 101080142.

This deliverable “D6.3 Dissemination & communication reports” is part of Work Package 6 (WP6) “Impact creation” which “ensures communication and dissemination of EQUALITY project activities to different stakeholders: from researchers, industry, policymakers to the public”. D6.3 follows from “D6.2 Dissemination & communication plan” which presented the strategy for communication and dissemination of the EQUALITY project’s objectives and results.

This deliverable reports on the communication and dissemination activities executed during the first year of the EQUALITY project, including website and social media presence, scientific publications, press releases, organisation of and participation in events, and networking activities with other projects and initiatives. It also evaluates the accomplishment of the key performance indicators (KPIs) defined in D6.2.

This deliverable updates the previous report submitted on M12. Da Vinci Labs (DVL) is WP6’s lead beneficiary and is responsible for the development of this report. The communication and dissemination activities will continue to be evaluated on M36, also as part of deliverable D6.3.

2. Communication and dissemination activities

EQUALITY’s communication is implemented through several activities, channels, and tools detailed in deliverable D6.2, alongside a timeline for execution and key performance indicators (KPIs). In the next sections, we present results from the following activities executed during the first and second years of the EQUALITY project:

- Website containing public domain information about the project aimed at different stakeholders and target audiences;
- Social media channels to engage and build relationships with different stakeholders and target audiences;
- Scientific publications for dissemination of key results produced during the project, accompanied by layperson summaries published on the project’s website and social media channels;
- Press releases to maximise the dissemination of project’s results and important milestones on the media;
- Promotional materials composing a communication kit with clear and simple language aiming to reach a variety of target audiences;
- Events organisation and participation to raise awareness around the project, its activities and expected results, and disseminate the relevant developments;
- Networking activities with other projects and initiatives to ensure the impact of the project’s results and to ensure the adoption of the project’s outputs.

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2.1. Website

The EQUALITY project website – http://equality-quantum.eu – contains public domain information about the project aimed at different stakeholders and target audiences.

Consortium partner DVL is responsible for keeping the website always up-to-date and functioning properly, solving any issues in a timely manner. The schedule for these updates depends on the specific needs of the website. Relevant website updates are communicated to consortium partners through internal channels and to target audiences through EQUALITY's social media channels.

Google Analytics is used to monitor the performance of the website (number of sessions, users, engagement time, etc.). Table 1 shows selected website statistics.

Table 1: Website selected statistics.

Website statistics	Year 1	Year 2*	Year 3	Total
Users	1,100	1,700	-	2,800
Sessions	1,900	2,800	-	4,700
Pageviews	3,800	4,600	-	8,500
Engagement time	00:00:58	00:00:44	-	00:00:50
Main national origins	FR (240), US (208), DE (200).	US (364), FR (269), DE (259).	-	US (572), FR (509), DE (459).

*Up to Sept. 2024

2.2. Social media

Social media are important communication tools to engage and build relationships with different stakeholders and to increase brand awareness for the project. Social media profiles on the platforms Twitter and LinkedIn were set up by M1:

- Twitter/X: https://x.com/equalityquantum
- LinkedIn: https://www.linkedin.com/company/equality-quantum/

Table 2 shows the social media KPIs for the project. As it can be seen, on both LinkedIn and Twitter/X EQUALITY has surpassed the Y3 follower KPIs at 495 and 578 followers respectively.

To assess their effectiveness, the project's social media accounts are monitored using the analytics provided by each platform. Tables 3 and 4 shows selected social media statistics.

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Table 2: Social media timeline and KPIs.

Activity	KPI	Year 1	Year 2*	Year 3	Total
Social Media Channels	Twitter/X Followers	233 / 50	578 / 200	- / 500	578 / 500
	LinkedIn Followers	220 / 50	495 / 100	- / 200	495 / 200

*Up to Sept. 2024

Table 3: Twitter/X selected statistics.

Twitter/X statistics	Year 1	Year 2*	Year 3	Total
Total Followers	233	578	-	578
Avg. new followers per month	19	31	-	25
Total number of posts	122	241	-	363
Total impressions	6,700	6,600	-	13,300
Total engagement**	360	600	-	960

*Up to Sept. 2024 **Sum of likes, clicks, comments and shares

Table 4: LinkedIn selected statistics.

LinkedIn statistics	Year 1	Year 2*	Year 3	Total
Total Followers	220	495	-	495
Avg. new followers per month	18	25	-	21.5
Total number of posts	69	80	-	149
Total impressions	24,000	35,000 (Organic) 42,000 (Sponsored)	-	59,000 (Organic) 42,000 (Sponsored)
Total engagement**	1,600	2,000 (Organic) 240 (Sponsored)	-	3,600 (Organic) 240 (Sponsored)

*Up to Sept. 2024 **Sum of likes, clicks, comments and shares

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2.3. Press Releases and media coverage

To maximise the project's dissemination to the media, the consortium prepares press releases to promote EQUALITY's results and important milestones.

As of Y2, two press releases have been published. They are presented in Figures 1 and 2.

Table 5 shows the press release and media coverage KPIs for the project.

As of the submission of this deliverable, EQUALITY has been mentioned in the media over 650 times, including paid media (press release distribution service), earned media (regular coverage of the project and its partners), and owned media (by partners themselves).

Earned media coverage are listed on Table 10. Some highlights are presented on Tables 11 – 17 and Figures 7 – 12 in Appendix 3.1.

Table 5: Press releases timeline and KPIs.

Activity	KPI	Year 1	Year 2	Year 3	Total
Press Releases	Number of Press Releases	1 / 1	1 / 1	- / 1	2 / 3
	Total Coverage	289 / 250	362 / 750	- / 1000	651 / 2,000
Mainstream Publications	Number of Articles	5 / 5	2 / 10	- / 16	7 / 30
	Total Readership	>600,000* / 100,000	5,500 / 300,000	- / 600,000	>605,000* / 1,000,000

*Potential audience exposed to the project.

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EQUALITY consortium selected by the EU's Horizon Europe Program to develop quantum algorithms for industrial applications

The project brings together scientists, innovators, and industrial players and will receive a cumulative six-million-euro funding from the European Commission over the next three years.

Berlin, January 30th – The EQUALITY[1] consortium composed of Airbus, Capgemini, Da Vinci Labs, Fraunhofer ENAS, German Aerospace Center, INRIA, Leiden University and PASQAL, has been selected by the EU's key funding program for research and innovation, Horizon Europe, to develop innovative quantum computer algorithms to solve strategic industrial problems.

By transforming current industrial interest into widespread adoption, EQUALITY objective is to solidify the link between strategic European industries and the emerging quantum ecosystem, while also contributing to technologies which are critical to the green transition. The project is one of three projects selected out of 51 submitted. The partners will receive a cumulative six-million-euro funding from the European Commission over the next three years.

The consortium will target eight paradigmatic industrial use cases - computationally complex and faced routinely by the industrial partners - that can benefit from the quantum-enabled speed-up: airfoil aerodynamics, battery design, fluid dynamics, space mission optimization, materials design, multidisciplinary optimization, space data analysis and fuel cell design. The computational requirements are enormous, forcing today engineers to use simplistic models or rely on expensive build-and-test cycles. This is exemplified in aerodynamics, where it is more feasible to test models in a wind tunnel than solving the difficult equations involved in simulations. Similarly complex situations are also found in Li-ion batteries and fuel cell simulations.

The opportunity provided by quantum computers to tackle such questions computationally promises a competitive edge for European industry. Moreover, energy-efficient aerodynamics and more durable and affordable batteries are critical to propelling these industries towards zero emissions.

Born in Europe over 100 years ago, quantum physics brought forth a technological revolution, enabling inventions such as semiconductors, lasers, fibre optics, and other technologies that are today ubiquitous in our lives. Now, during the second quantum revolution, Europe can take the lead once more in quantum science and technology.

Quantum computers, the exponents of this second revolution, can perform several operations that are too difficult, or even impossible, for regular processors. And as they approach widespread commercial application, they open up market opportunities in several sectors.

The use of today's quantum hardware, however, requires grappling with the limitations of this nascent technology. These bottlenecks limit the application of quantum computers to solve industrial problems. Therefore, it is important to create strategies and software approaches that maximize the hardware capabilities of available quantum computers from providers such as PASQAL.

[1] EQUALITY stands for Efficient 'QUAntum ALgorithms for IndusTrY'

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Figure 1: EQUALITY first press release.

Horizon Europe's EQUALITY project advances towards quantum algorithms for industrial applications

The project's goal is to develop a full stack of technologies aimed at bringing practical advantage of quantum computing to the industry in the near term

Berlin, July 19, 2024 – Quantum computing is one of the frontiers of research and innovation due to its potential to outperform classical computers in solving certain tasks. However, using current quantum hardware requires grappling with the limitations of this nascent technology.

The EQUALITY project's objective is to develop a full stack of technologies comprised of core quantum algorithms and hardware; a set of enabling technologies (mid-ware and APIs, efficient resource utilization strategies, etc) to make the most of the imperfect Noisy Intermediate-Scale Quantum (NISQ) hardware; and a set of use cases where the quantum computing is expected to bring the largest impact.

During the project's first 18 months, the consortium has developed novel quantum approaches to optimisation, analysis of noise in quantum bits and its impact on applied computations, and tailoring of quantum circuits.

Project partners have also had notable scientific advances aimed at the efficient utilisation of quantum resources, which is very important in the context of near-term quantum computing applications. Among them are efficient approaches to circuit cutting, analog approaches for solving partial differential equations, efficient estimations of quantum noise with blind quantum computation, and hardware-oriented compilation of quantum circuits.

Finally, an API for a quantum routine used for partial differential equation systems has been put in place, enabling further research and potentially experimental testing of the routine for applications relevant to the aerospace industry, one of EQUALITY's target use cases. This is a cornerstone for the anticipated full-stack application-specific quantum computing envisioned by the consortium.

Learn more about the EQUALITY Project and its achievements on the website: https://equality-quantum.eu/

About the EQUALITY project

The EQUALITY (QUAntum ALgorithms for IndusTrY) consortium comprising Airbus, Capgemini, Da Vinci Labs, Fraunhofer ENAS, German Aerospace Center, INRIA, Leiden University and PASQAL, was selected by the EU's key funding program for research and innovation, Horizon Europe, to develop innovative quantum computer algorithms that are aimed to solve strategic industrial problems. The partners will receive a cumulative six-million-euro funding from the European Commission between 2022 and 2025.

EQUALITY targets industrial use cases that can benefit from the quantum-enabled speed-up in the near and medium terms. These are computational fluid dynamics for aerospace and energy applications, the design of batteries and fuel cells, the development of new materials for energy applications, multidisciplinary optimization, space mission optimization, and space data analysis. Each of these tasks, faced routinely by the industrial partners, is highly demanding on computational resources, forcing engineers to either use simplistic models or rely on expensive build-and-test cycles. The opportunity provided by quantum computers to tackle such questions promises a competitive edge for the European industry.

By transforming current industrial interest into widespread adoption, EQUALITY solidifies the link between strategic European industries and the emerging quantum ecosystem while contributing to technologies critical to the green transition.

Figure 2: EQUALITY second press release.

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2.4. Scientific publications

Key results produced throughout the project duration are disseminated in the form of article pre-prints, peer-reviewed articles in scholarly journals, articles in conference proceedings, monographs, patents, and research data (data underlying publications, curated data and/or raw data).

Table 6 shows the scientific publication KPIs for the project.

Details of EQUALITY's publications are presented on Tables 18 – 28 in Appendix 3.2. They are also available on the project website and on the project's Zenodo community (https://zenodo.org/communities/equality-quantum/).

Following the review committee recommendation, the consortium has also made publicly available through the project website the first algorithm and software repository on GitHub (https://equality-quantum.eu/resources/repositories). More will be made available at later stages of the project.

Table 6: Scientific publications timeline and KPIs.

Activity	KPI	Year 1	Year 2	Year 3	Total
Scientific Publications	Number of Publications	2 / 2	9 / 5	- / 5	11 / 12
	Total Readership	8,300 / -	21,050 / -	- / -	29,350 / 250,000

Readership numbers are composed of Journal accesses/downloads, ArXiv downloads, and social media impressions of posts about the each paper. Some journals do not provide readership metrics. In this case, readership is estimated from a function of the CiteScore metric and the (conservatively) lowest readership journal data available. Additionally, since ArXiv.org don't provide individual paper statistics, lifetime readership is estimated from average download to submission rate as 1300 (using numbers up to Nov. 2013 as available in https://arxiv.org/stats/monthly_downloads). Readership counts on ResearchGate and Mendeley records (when available) were investigated but are negligible in comparison to other metrics.

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2.5. Communication kit

A communication kit containing several resources are being developed as promotional material for the project, aiming to reach a variety of target audiences with clear and simple language, avoiding technical content as much as possible. includes It includes: a leaflet (Figure 3), a poster (Figure 4), a slide deck (Figure 5), and a video abstract (Figure 6).

Other videos will be developed later in the project to showcase its results as shown on Table 7. Additional resources may be developed throughout the project as deemed necessary.

Table 7: Communication kit timeline and KPIs.

Activity	KPI	Year 1	Year 2	Year 3	Total
Project Videos	Number of Videos	1 / -	- / -	- / 2	1 / 2
	Total Viewership	644 / -	150 / -	- / 10,000	794 / 10,000

Figure 3: Screen captures of the project's leaflet.

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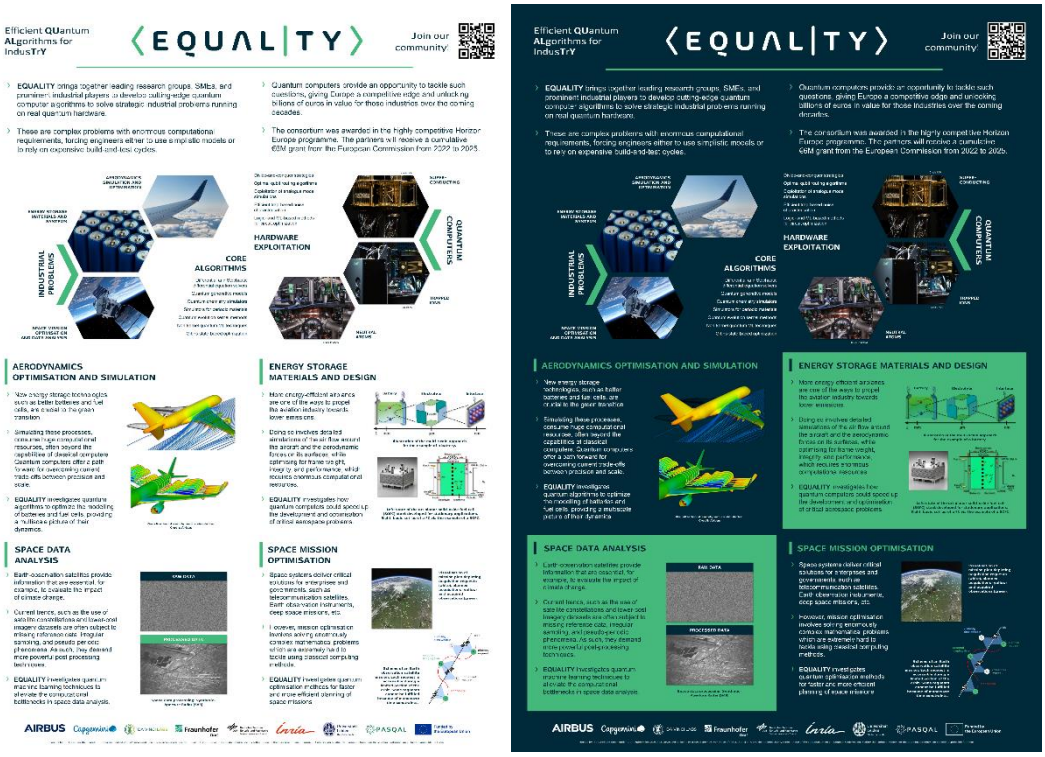

Figure 4: Screen captures of the project's poster.

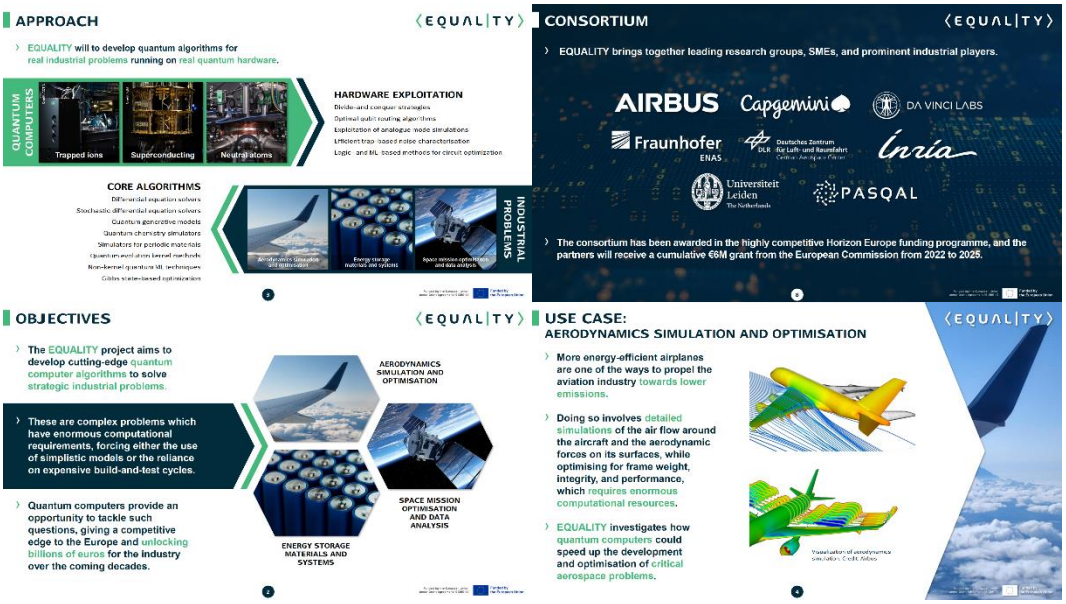

Figure 5: Screen captures of the project's slide deck.

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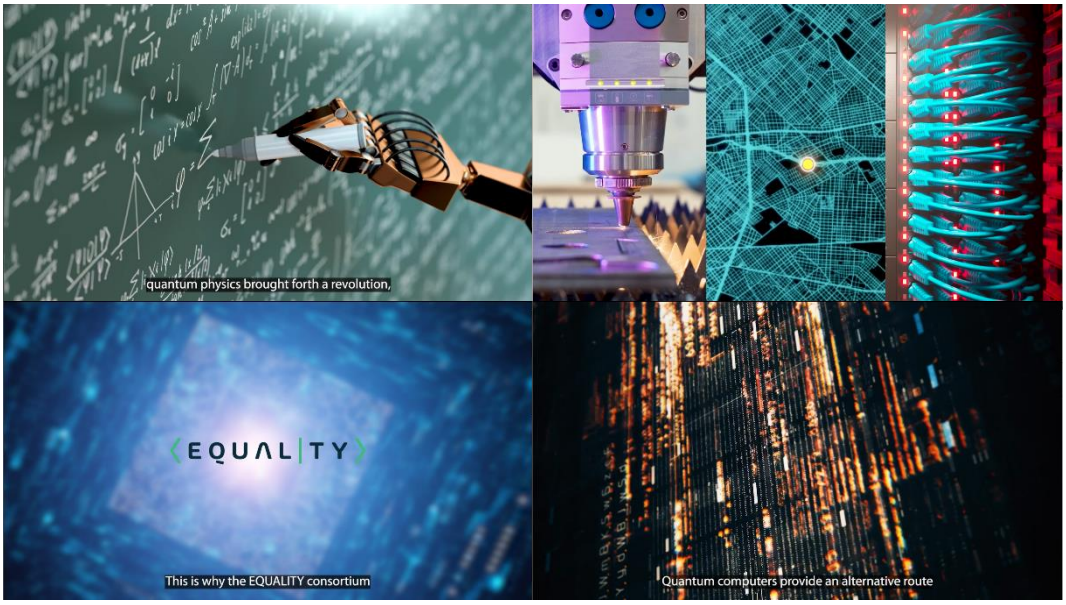

Figure 6: Screen captures of the project's video abstract.

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2.6. Event participation and organization

Events, including scientific and industry conferences, trade shows, workshops, and seminars, both virtual and physical, related to the partners' or the project's field of expertise, are prime opportunities to raise awareness around the project, its activities and expected results, and disseminate the relevant developments. Additionally, they provide partners with networking opportunities with researchers and stakeholders and establish and deepen ties with other EU-funded projects and initiatives and other groups in the scientific and industrial community.

Key performance indicators are shown in Table 8. Details of the events organized and/or attended by EQUALITY partners at the local, national, EU and international levels are presented on Tables 29 – 65 in Appendix 3.3.

Table 8: Event participation and organisation KPIs.

Activity	KPI	Year 1	Year 2	Year 3	Total
Event Participation	Poster Submissions	14* / 2	11** / 4	- / 10	25 / 16
Webinar Organisation	Number of Webinars	-	-	- / 3	- / 3
	Number of Attendees	-	-	- / 240	- / 240

*Includes 4 poster, 10 oral presentations (contributed or invited) in conferences. **Includes 2 poster, 9 oral presentations (contributed or invited) in conferences. Presentations in internal workshops and similar events are not counted.

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2.7. Networking

EQUALITY takes advantage of synergies and build networks with relevant stakeholders, local, national, European, and international communities, associations, initiatives, and projects to ensure the impact of the project's results and to ensure the adoption of the project's outputs.

Table 9: Information on networking activity #1.

Networking Activity #1	
Title	**Stablishing Unitary Fund activities in Europe**
Date	May 2nd, 2023
Description	Unitary Fund will open its first European office in Tours, France. Project partner DVL acted as an incubator for Unitary Fund's European operations, providing incorporation and fundraising advisory services. The non-profit's mission is to foster the quantum ecosystem with a microgrant program funding explorers worldwide to work on quantum projects like open-source quantum software, educational materials and workshops, a new quantum sensor prototype, and more.
Involved partners	DVL: Xavier Aubry
Additional information	Website: https://unitary.fund/ Press Release: https://unitary.fund/posts/2023_eu/

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3. Appendices

3.1. Press Releases and media coverage

As of the submission of this deliverable, EQUALITY has been mentioned in the media over 650 times, including paid media (press release distribution service), earned media (regular coverage of the project and its partners), and owned media (by partners themselves).

Earned media coverage are listed on Table 10. Some highlights are presented on Tables 11 – 17 and Figures 7 – 12 below.

Table 10: Media coverage highlights.

Date	Title	Origin	Link
30 November 2022	Avec le Da Vinci Labs, la deeptech fait son nid en Centre-Val de Loire	La Tribune	LINK
23 February 2023	EQUALITY consortium selected by the EU's Horizon Europe Program to develop quantum algorithms for industrial applications	Capgemini	LINK
23 February 2023	EQUALITY consortium selected by the EU's Horizon Europe Program to develop quantum algorithms for industrial applications	Sogeti / Capgemini	LINK
01 March 2023	Technologies quantiques : 6 M€ d'Horizon Europe à un consortium de recherche piloté par Capgemini	Newstank	LINK
07 March 2023	Le projet européen Equality veut mettre l'algorithmie quantique au service de l'industrie	L'Usine Nouvelle	LINK
18 March 2023	IA, quantique et biologie synthétique se développent au Da Vinci Labs	BFMTV	LINK
01 May 2023	La nouvelle génération d'algorithme quantique bientôt sur le marché	DataScientest	LINK
01 May 2023	Un consortium pour ouvrir des débouchés industriels au quantique	IT For Business	LINK
01 April 2023	Le projet européen au service de l'industrie	IT Industries and Technology	LINK
24 July 2024	The EQUALITY project: Advancing towards quantum algorithms	Innovation News Network	LINK
09 September 2024	EQUALITY project advances towards quantum algorithms for industrial applications	Quantum Flagship	LINK

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3.1.1. List of Mainstream Publications - Year 1

Table 11: Information on mainstream publication #1.

Mainstream Publication #1	
Vehicle	La Tribune
Type	Online
Date	Nov. 30th, 2022
Title	With Da Vinci Labs, deeptech makes its home in Centre-Val de Loire (Translated from French)
Excerpt	"Da Vinci Labs, which plans to incubate around twenty startups specializing in quantum technology, AI and synthetic biology, has already won four collaborative research projects funded by the European Union. (...) Quantum algorithms developed by the EQUALITY program are simulating replacement materials for rare metals in the batteries of the future." (Translated from French)
Vehicle audience	> 180,000 avg. daily visitors in Nov. 2022*
URL	https://www.latribune.fr/technos-medias/innovation-et-start-up/avec-le-da-vinci-labs-la-deeptech-fait-son-nid-en-centre-val-de-loire-942741.html (Full article under subscription access)

* Source: https://www.acpm.fr/Support-Numerique/site/latribune-fr

Figure 7: Screen capture of mainstream publication #1.

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Table 12: Information on mainstream publication #2.

Mainstream Publication #2	
Vehicle	L'Usine Nouvelle
Type	Online
Date	Mar. 7th, 2023
Title	The European project EQUALITY aims to put quantum algorithms to work for industry (Translated from French)
Excerpt	"Funded to the tune of €6 million by Europe, the Equality project aims to design quantum algorithms to speed up the resolution of problems in aerodynamic simulation, materials modelling and fluid mechanics. The French contributors are Inria, Airbus and Pasqal, which will provide quantum computers to support the development of these algorithms." (Translated from French)
Vehicle audience	> 80,000 avg. daily visitors in Mar. 2023*
URL	https://www.usinenouvelle.com/article/le-projet-europeen-equality-veut-mettre-l-algorithmie-quantique-au-service-de-l-industrie.N2108311 (Full article under subscription access)

* Source: https://www.acpm.fr/Support-Numerique/site/usinenouvelle-com

Figure 8: Screen capture of mainstream publication #2.

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Table 13: Information on mainstream publication #3.

Mainstream Publication #3	
Vehicle	IT Industrie & Technologies, N°1060
Type	Print Magazine
Date	Apr. 1st, 2023
Title	The European project EQUALITY at the service of industry (Translated from French)
Excerpt	"Equality (Efficient quantum algorithms for industry): this is the name of the project selected in February by the European Commission as part of Horizon Europe. Endowed with 6.05 million euros, it will run until the end of 2025. These algorithms will accelerate fluid dynamics equations, fuel cell design and space data analysis." (Translated from French)
Vehicle audience	12,580 avg. print copies*
URL	NA

*Source: https://www.infopro-digital-media.fr/marque/industrie-et-technologie/

ALGORITHMIE QUANTIQUE

Le projet européen Equality au service de l'industrie

Equality (Efficient quantum algorithms for industry, ou algorithmes quantiques efficaces pour l'industrie) : voici le nom du projet sélectionné en février par la Commission européenne, dans le cadre d'Horizon Europe. Doté de 6,05 millions d'euros, il s'achèvera fin 2025. Ces algorithmes accéléreront les équations de la dynamique des fluides, la conception de piles à combustible ou encore l'analyse de données spatiales.

« Equality mobilisera 55 personnes dont 60 % de chercheurs, précise Wael Yahyaoui, le responsable des innovations technologiques de Capgemini Engineering et coordinateur du projet. Les trois partenaires académiques sont l'Inria en France, l'Institut Franhofer Enas en Allemagne [dédié à la nanoélectronique, ndlr] et l'université de Leiden aux Pays-Bas. » Côté institutionnel, l'Agence spatiale allemande (DLR) y participe également. Parmi les partenaires industriels et acteurs privés figurent Airbus, Daimler et le Da Vinci Labs, qui construit un bâtiment de 4 000 m² pour héberger des deeptechs à Reugny, en Touraine. Le français Pasqal, le néerlandais Qu&Co (qui a fusionné avec Pasqal en 2022), le finlandais IQM et l'autrichien AQT fourniront les calculateurs et logiciels quantiques.

Huit cas d'usage seront traités, dont l'optimisation de la planification des missions satellitaires, qui intéresse Airbus. Il est aussi question d'accélérer l'analyse des données spatiales acquises par satellite. La thématique du stockage d'énergie prend en compte l'étude de matériaux composant les batteries et la modélisation de batteries électriques lithium-ion et de piles à combustible. Equality devrait aussi se solder par des jeux d'algorithmes quantiques de base et polyvalents : solveur d'équations différentielles (stochastiques ou non), simulateur de chimie quantique… Le premier point d'étape et la feuille de route technologique sont prévus en avril. **Frédéric Monflier**

Figure 9: Screen capture of mainstream publication #3.

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Table 14: Information on mainstream publication #4.

Mainstream Publication #4	
Vehicle	BFM Business
Type	TV, Radio, Online
Date	Mar. 18th, 2023
Title	AI, quantum and synthetic biology under development at Da Vinci Labs (Translated from French)
Excerpt	"We're now in the second generation of quantum technology. We've already got some very well-developed companies like Pasqal, Qandela, Alice & Bob, who are going to develop the hardware, and on top of that we need to develop the algorithms. Pasqal is part of this EQUALITY consortium with INRIA in France, Capgemini and Airbus in Germany, and the idea is to use these quantum algorithms to simulate complex molecular systems (…), and for that to happen, classical simulations aren't enough, we need to have quantum first." (Xavier Aubry, Da Vinci Labs, Translated from French)
Vehicle audience	> 100,000 avg. daily visitors on the website* > 200,000 avg. daily watchers/listeners on TV/Radio*
URL	[1] https://www.bfmtv.com/economie/replay-emissions/01-business/ia-quantique-et-biologie-synthetique-se-developpent-au-da-vinci-labs-18-03_VN-202303180262.html [2] https://www.bfmtv.com/economie/replay-emissions/01-business/l-integrale-de-tech-co-business-du-samedi-18-mars_EN-202303180432.html

*Source: https://www.alticemedia-adsconnect.fr/nos-marques/bfm-business.html

Figure 10: Screen capture of mainstream publication #4.

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Table 15: Information on mainstream publication #5.

Mainstream Publication #5	
Vehicle	IT for Business
Type	Print/Digital Magazine (N°2283), Online Article
Date	May 1st, 2023 / May 24th, 2023
Title	A consortium to open up industrial opportunities for quantum technology (Translated from French)
Excerpt	"In a forest on the outskirts of Amboise (and near Le Clos Lucé, where Leonardo da Vinci lived), the Da Vinci Labs building will be completed in 2024, and will house the Equality consortium, among several other major public/private research projects. Members include Airbus, Capgemini, Fraunhofer ENAS (Electronic nano systems), German Aerospace Center (DLR), Inria, Leiden University, and French quantum computer manufacturer Pasqal." (Translated from French)
Vehicle audience	13,750 avg. copies, print and digital* >3,000 avg. daily visitors on the website*
URL	https://www.itforbusiness.fr/un-consortium-pour-ouvrir-des-debouches-industriels-au-quantique-62693 (Open Access)

*Source: https://www.itforbusiness.fr/publicite

Figure 11: Screen capture of mainstream publication #5, online version.

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radar r&d

Un consortium pour ouvrir des débouchés industriels au quantique

La start-up Pasqal, cofondée par le prix Nobel de Physique 2022 Alain Aspect, est l'un des fournisseurs d'ordinateurs quantiques du consortium.

Regroupant huit organismes publics et privés, Equality prépare activement les futures applications industrielles de l'informatique quantique. En particulier celles qui vont favoriser la transition verte.

C'est dans une forêt aux alentours d'Amboise (et près du Clos Lucé, où résida Léonard de Vinci) que sera achevée en 2024 la construction du bâtiment du Da Vinci Labs qui va notamment héberger, parmi plusieurs autres projets public/privé de recherche majeurs, le consortium Equality. Parmi ses membres figurent Airbus, Capgemini, Fraunhofer ENAS (Electronic nano systems), German Aerospace Center (DLR), l'Inria, Leiden University, et le constructeur français d'ordinateurs quantiques Pasqal.

Le consortium s'est donné pour objectif de développer des algorithmes quantiques pour des applications industrielles dans plusieurs disciplines, présentant toutes un intérêt pour la protection de l'environnement. Equality vise logiquement celles qui pourraient tirer bénéfice de la vitesse de l'informatique quantique : profilage aérodynamique, conception de batteries, dynamique des fluides, optimisation des missions spatiales, conception de nouveaux matériaux, etc. À l'heure actuelle, pour traiter ces problématiques, les scientifiques doivent simplifier les équations mises en jeu, employer des supercalculateurs ou construire de coûteux simulateurs physiques – par exemple des souffleries de plus en plus sophistiquées dans le domaine de l'aréodynamique.

Equality propose de développer des logiciels quantiques de pointe pour répondre à des problèmes industriels cruciaux, à la fois en termes de performances, mais aussi, et tout simplement si l'on ose dire, pour les résoudre. En effet, certaines équations mathématiques, comme l'équation de Navier-Stokes rencontrée dans la mécanique des fluides, n'ont tout bonnement pas de solutions mathématiquement exactes. Plus précisément, on ignore s'il en existe une et on ne fait qu'approcher des solutions à l'aide d'ordinateurs exigeant beaucoup de puissance. Sur cet exemple comme sur beaucoup d'autres, un ordinateur quantique serait bien plus efficace.

Il faut cependant préciser, comme le fait Xavier Aubry, fondateur et directeur de Da Vinci Labs, que *«le consortium ne cherche pas à produire des programmes quantiques généralistes pour résoudre tous les problèmes. Nous développons plutôt ce qu'il faudrait appeler des primitives quantiques qui seront réutilisables»*. Il cite l'exemple des méthodes de Monte Carlo quantiques – méthodes de simulation probabiliste de l'équation de Schroedinger – , utilisées notamment en physique nucléaire et dans tous les domaines où les spins jouent un rôle déterminant. *«Nos routines seront donc capables d'exploiter différentes techniques suivant le hardware auquel elles sont destinées.»*

Ajoutons que l'ordinateur du futur est toujours en construction. Les chercheurs effectuent donc des simulations de calcul quantique sur des superordinateurs classiques, en faisant appel à 20 ou 30 qbits de puissance dans un premier temps, puis en montant jusqu'à 100 qubits virtuels si les résultats sont satisfaisants. À ce stade des tests, un modèle simulant le bruit quantique spécifique à chaque matériel est intégré au simulateur, avant que l'ensemble ne soit testé sur un véritable ordinateur quantique.

Enfin, rappelons qu'il n'existe à ce jour pas de langage de programmation standard, et encore peu de compétences humaines dans ce domaine encore récent. Les scientifiques choisissent donc les ordinateurs quantiques qui engendrent le moins d'erreurs en fonction des problématiques et des équations qu'ils cherchent à résoudre. Pour l'heure, ceux d'Equality sont fournis par Pasqal (qui exploite notamment l'interaction de van der Waals entre atomes de Rydberg), IQM (supraconducteurs) et DLR (technologie des ions piégés), entre autres. La dotation du programme européen Horizon Europe, à hauteur de 6 M€/an pendant trois ans, est donc bienvenue pour financer ces investissements.

PIERRE BERLEMONT

Figure 12: Screen capture of mainstream publication #5, print version.

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3.1.2. List of Mainstream Publications - Year 2

Table 16: Information on mainstream publication #6.

Mainstream Publication #6	
Vehicle	Innovation News Network
Type	Online
Date	24 July 2024
Title	The EQUALITY project: Advancing towards quantum algorithms
Excerpt	Uptake of the Press Release
Vehicle audience	>2,000 avg. daily visitors on the website*
URL	https://www.innovationnewsnetwork.com/the-equality-project-advancing-towards-quantum-algorithms/49547/

*Source: https://www.innovationnewsnetwork.com/latest-statistics/

Table 17: Information on mainstream publication #7.

Mainstream Publication #7	
Vehicle	Quantum Flagship
Type	Online
Date	09 September 2024
Title	EQUALITY project advances towards quantum algorithms for industrial applications
Excerpt	Uptake of the Press Release
Vehicle audience	>3,500 Newsletter subscribers*
URL	https://qt.eu/news/2024/2024-09-09_equality-project-advances-towards-quantum-algorithms-for-industrial-applications

*Source: https://cordis.europa.eu/project/id/101070193/results/fr

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3.2. Scientific publications

Details of EQUALITY's publications are presented on Tables 18 – 28 below. They are also available on the project website and on the project's Zenodo community (https://zenodo.org/communities/equality-quantum/).

3.2.1. List of Scientific Publications - Year 1

Table 18: Information on scientific publication #1.

Scientific Publication #1	
Lead partner	Leiden University
Type	Peer-reviewed Journal Paper
Title	Equivariant quantum circuits for learning on weighted graphs
Authors	Andrea Skolik, Michele Cattelan, Sheir Yarkoni, Thomas Bäck, Vedran Dunjko
Journal	npj Quantum Information, Volume 9, Article 47
Publication date	13 May 2023
URL	https://doi.org/10.1038/s41534-023-00710-y
Readership	4000 (Journal); 1300* (ArXiv); 500 (Social Media)

*Estimated.

Table 19: Information on scientific publication #2.

Scientific Publication #2	
Lead partner	Leiden University
Type	Peer-reviewed Journal Paper
Title	Shallow circuits for deeper problems
Authors	Adrián Pérez-Salinas, Radoica Draškić, Jordi Tura, Vedran Dunjko
Journal	Physical Review A, Volume 108, Page 062423
Publication date	22 December 2023
URL	https://doi.org/10.1103/PhysRevA.108.062423
Readership	800* (Journal); 1300* (ArXiv); 400 (Social Media)

*Estimated.

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3.2.2. List of Scientific Publications - Year 2

Table 20: Information on scientific publication #3.

Scientific Publication #3	
Lead partner	Pasqal
Type	Peer-reviewed Journal Paper
Title	A hybrid quantum algorithm to detect conical intersections
Authors	Emiel Koridon, Joana Fraxanet, Alexandre Dauphin, Lucas Visscher, Thomas E. O'Brien, Stefano Polla
Journal	Quantum, Volume 8, Page 1259
Publication date	20 February 2024
URL	https://quantum-journal.org/papers/q-2024-02-20-1259/
Readership	1300* (Journal); 1300* (ArXiv); 450 (Social Media)

*Estimated.

Table 21: Information on scientific publication #4.

Scientific Publication #4	
Lead partner	Inria
Type	Pre-print
Title	Efficient thermalization and universal quantum computing with quantum Gibbs samplers
Authors	Cambyse Rouzé, Daniel Stilck França, Álvaro M. Alhambra
Journal	arXiv e-prints, arXiv:2403.12691
Publication date	19 March 2024
URL	https://doi.org/10.48550/arXiv.2403.12691
Readership	NA (Journal); 1300* (ArXiv); 300 (Social Media)

*Estimated.

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Table 22: Information on scientific publication #5.

Scientific Publication #5	
Lead partner	Inria
Type	Pre-print
Title	Noise-induced shallow circuits and absence of barren plateaus
Authors	Antonio Anna Mele, Armando Angrisani, Soumik Ghosh, Sumeet Khatri, Jens Eisert, Daniel Stilck França, Yihui Quek
Journal	arXiv e-prints, arXiv:2403.13927
Publication date	20 March 2024
URL	https://doi.org/10.48550/arXiv.2403.13927
Readership	NA (Journal); 1300* (ArXiv); 600 (Social Media)

*Estimated.

Table 23: Information on scientific publication #6.

Scientific Publication #6	
Lead partner	Leiden University
Type	Peer-reviewed Journal Paper
Title	On the expressivity of embedding quantum kernels
Authors	Elies Gil-Fuster, Jens Eisert, Vedran Dunjko
Journal	Machine Learning: Science and Technology, Volume 5, Article 025003
Publication date	2 April 2024
URL	https://doi.org/10.1088/2632-2153/ad2f51
Readership	1300 (Journal); 1300* (ArXiv); 150 (Social Media)

*Estimated.

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Table 24: Information on scientific publication #7.

Scientific Publication #7	
Lead partner	Leiden University
Type	Peer-reviewed Conference Proceedings Paper
Title	Enriching Diagrams with Algebraic Operations
Authors	Alejandro Villoria, Henning Basold, Alfons Laarman
Journal	Foundations of Software Science and Computation Structures. FoSSaCS 2024. Lecture Notes in Computer Science, Volume 14574
Publication date	05 April 2024
URL	https://doi.org/10.1007/978-3-031-57228-9_7
Readership	600 (Journal); 1300 (ArXiv); 450 (Social Media)

*Estimated.

Table 25: Information on scientific publication #8.

Scientific Publication #8	
Lead partner	Pasqal
Type	Pre-print
Title	Optimization of Quantum Systems Emulation via a Variant of the Bandwidth Minimization Problem
Authors	M. Yassine Naghmouchi, Joseph Vovrosh, Wesley da Silva Coelho, Alexandre Dauphin
Journal	arXiv e-prints, arXiv:2404.15165
Publication date	23 April 2024
URL	https://doi.org/10.48550/arXiv.2404.15165
Readership	NA (Journal); 1300* (ArXiv); 500 (Social Media)

*Estimated.

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Table 26: Information on scientific publication #9.

Scientific Publication #9	
Lead partner	Pasqal
Type	Peer-reviewed Journal Paper
Title	Variational protocols for emulating digital gates using analog control with always-on interactions
Authors	Claire Chevallier, Joseph Vovrosh, Julius de Hond, Mario Dagrada, Alexandre Dauphin, Vincent E. Elfving
Journal	Physical Review A, Volume 109, Number 062604
Publication date	10 June 2024
URL	https://doi.org/10.1103/PhysRevA.109.062604
Readership	800* (Journal); 1300* (ArXiv); 300 (Social Media)

*Estimated.

Table 27: Information on scientific publication #10.

Scientific Publication #10	
Lead partner	Pasqal
Type	Peer-reviewed Journal Paper
Title	Amorphous quantum magnets in a two-dimensional Rydberg atom array
Authors	Sergi Julià-Farré, Joseph Vovrosh, Alexandre Dauphin
Journal	Physical Review A, Volume 110, Number 012602
Publication date	1 July 2024
URL	https://doi.org/10.1103/PhysRevA.110.012602
Readership	800* (Journal); 1300* (ArXiv); 750 (Social Media)

*Estimated.

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Table 28: Information on scientific publication #11.

Scientific Publication #11	
Lead partner	Pasqal
Type	Peer-reviewed Journal Paper
Title	Quantized Thouless pumps protected by interactions in dimerized Rydberg tweezer arrays
Authors	Sergi Julià-Farré, Javier Argüello-Luengo, Loïc Henriet, Alexandre Dauphin
Journal	Physical Review A, Volume 110, Number 023328
Publication date	27 August 2024
URL	https://doi.org/10.1103/PhysRevA.110.023328
Readership	800* (Journal); 1300* (ArXiv); 250 (Social Media)

*Estimated.

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3.3. Event participation and organization

Details of the events organized and/or attended by EQUALITY partners at the local, national, EU and international levels are presented on Tables 29 – 65 below.

3.3.1. List of Events - Year 1

Table 29: Information on event participation #1.

Event #1	
Event	Quantum Techniques in Machine Learning (QTML)
Location	Naples, Italy
Date	7–12 November 2022
Description	The conference Quantum Techniques in Machine Learning (QTML) is an annual international event that focuses on quantum machine learning, an interdisciplinary field that bridges quantum technology and machine learning.
Website	https://quasar.unina.it/qtml2022.html
Event type	Conference
Audience size	180 attendees
Involved partners	ULIE: Andrea Skolik
Additional information	Poster presentation: Equivariant quantum circuits for learning on weighted graphs

Table 30: Information on event participation #2.

Event #2	
Event	Q2B 2022
Location	Silicon Valley, USA
Date	6–8 December 2022
Description	Q2B is the premier conference on quantum technologies, defining the roadmap to quantum value. Celebrating its seventh year of bringing the quantum community together to share knowledge, assess technologies, identify business value, and develop essential skill sets.
Website	https://q2b.qcware.com/2022-conferences/silicon-valley/
Event type	Trade Show
Audience size	800+ attendees
Involved partners	AOG: Jasper Krauser
Additional information	Oral Presentation: Quantum Technologies at Airbus – Bringing Aerospace into the Quantum Era (https://www.youtube.com/watch?v=yRDcTO3oMuA)

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Figure 13: Image of event #2.

Table 31: Information on event participation #3.

Event #3	
Event	APS March Meeting
Location	Las Vegas, USA
Date	5–10 March 2023
Description	The APS March Meeting brings together scientists and students from around the world to connect and collaborate across academia, industry, and major labs. Students, early-career physicists, and experienced professionals will benefit from the networking and learning at March Meeting.
Website	https://march.aps.org/ https://meetings.aps.org/Meeting/MAR23/APS_epitome
Event type	Conference
Audience size	13,000+ attendees
Involved partners	QC: Panagiotis Barkoutsos
Additional information	Oral Presentation: Quantum Scientific Machine Learning for Multiphysics simulations (https://meetings.aps.org/Meeting/MAR23/Session/M64.1).

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Table 32: Information on event participation #4.

Event #4	
Event	ModVal 2023
Location	Duisburg, Germany
Date	21–23 March 2023
Description	ModVal 2023 is the 19th edition of an annual inter-national symposium on modeling and experimental validation in the field of fuel cells and batteries. The focus of ModVal is on the presentation and discussion of the latest research results, advances in modelling and experimental work on model validation for fuel cells, batteries and electrolysis.
Website	https://zbt.de/modval-2023/
Event type	Symposium
Audience size	200 attendees
Involved partners	ENAS: Andreas Zienert
Additional information	Participation without presentation for attendance and networking.

Table 33: Information on event participation #5.

Event #5	
Event	Quantum World Day
Location	Hamburg, Germany
Date	13–14 April 2023
Description	"For the exchange of information on activities in the Hamburg area DESY, UHH, TUHH, DLR and HQIC are organising jointly the annual World Quantum Day in Hamburg."
Website	https://indico.desy.de/event/38586/
Event type	Conference
Audience size	100+ attendees
Involved partners	CAP: Kirill Shiianov
Additional information	Participation without presentation for attendance and networking. Presentations were focused on the research activities happening in the Hamburg area, while networking activities were focused on different startups and industrial opportunities.

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Table 34: Information on event participation #6.

Event #6	
Event	Congress on Ionic Liquids (COIL-9)
Location	Lyon, France
Date	24–28 April 2023
Description	"COIL-9 showcases the latest, exciting developments in ionic liquids and related fields. COIL expects to gather balanced and diverse contributions from both established and new actors working in fundamental science and applications involving ionic liquids. Because ionic liquids are unique and offer immense possibilities, they gather an interdisciplinary community concerned with materials and processes at the core of a broad range of technologies. COIL aims to gather researchers from all areas where ionic liquids enable discovery and innovation guiding scientists and engineers from theory to reality."
Website	https://www.coil-9.congres-scientifique.com/
Event type	Conference
Audience size	280+ attendees
Involved partners	DLR: Max Schammer
Additional information	Oral Presentation: From bulk thermodynamics to Nano-structuring near electrified interfaces: a continuum transport theory for ionic liquids incorporating solvation effects.

Table 35: Information on event participation #7.

Event #7	
Event	Airbus Digital Innovation Summit
Location	Munich, Germany and Toulouse, France
Date	10–11 May 2023
Description	Airbus internal gathering to promote Digital Innovation within Airbus community.
Website	NA
Event type	Internal Conference
Audience size	400+ attendees
Involved partners	AOG: Jasper Krauser; CAP: Wael Yahyaoui
Additional information	Presence in Booth with presentation of a EQUALITY poster (See Figure 12).

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Figure 14: Image of event #7.

Table 36: Information on event participation #8.

Event #8	
Event	International Supercomputing Conference
Location	Hamburg, Germany
Date	21–25 May 2023
Description	The 24.07.2024 High Performance conference and exhibition is an annual global gathering for HPC technology providers and users. It aims to foster the growth of a thriving community that now includes practitioners of machine learning, data analytics, and quantum computing.
Website	https://www.isc-hpc.com/
Event type	Conference
Audience size	3,000+ attendees
Involved partners	AOG: Gerd Büttner
Additional information	Oral Presentation: Quantum Computing@Airbus, Bring Aerospace into the Quantum Era.

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Table 37: Information on event participation #9.

Event #9	
Event	ENAS Technology Workshop
Location	Leisnig, Germany
Date	1 June 2023
Description	NA
Website	NA
Event type	Workshop
Audience size	40+ attendees
Involved partners	ENAS: Andreas Zienert, Jörg Schuster, Xiao Hu
Additional information	Internal workshop, participation as speakers.

Table 38: Information on event participation #10.

Event #10	
Event	EQUALITY Project @Capgemini Webinar
Location	Online
Date	1 June 2023
Description	Make sure you join our webinar about the EQUALITY project, in which we are developing cutting-edge quantum computer algorithms and exploring hardware strategies to solve strategic industrial problems. We target eight use cases: airfoil aerodynamics, battery design, fluid dynamics, space mission optimisation, materials design, multidisciplinary optimisation, space data analysis and fuel cell design. EQUALITY is a consortium of industry partners comprising Airbus, Capgemini, Da Vinci Labs, Fraunhofer ENAS, German Aerospace Center, INRIA, Leiden University and PASQAL, selected by the EU's key funding program for research and innovation, Horizon Europe.
Website	NA
Event type	Webinar
Audience size	60+ attendees
Involved partners	AOG: Gerd Büttner; CAP: Wael Yahyaoui; DLR: Birger Horstmann; ULEI: Alfons Laarman; QC: Panagiotis Barkoutsos
Additional information	Partner's internal dissemination of the project.

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Table 39: Information on event participation #11.

Event #11	
Event	France Quantum
Location	Paris, France
Date	13 June 2023
Description	France Quantum was launched on November 17, 2021 at Station F when realizing that it's time to create a strong French ecosystem around quantum with the mission to gather and highlight the actors of the quantum sector. The initiative espouses an ecosystem philosophy, with the desire to be as inclusive as possible from Research labs, Startups, and Large corporations or anybody involved in quantum sector : By the ecosystem, For the ecosystem.
Website	https://www.francequantum.fr/
Event type	Conference
Audience size	700+ attendees
Involved partners	CAP: Wael Yahyaoui; DVL: Xavier Aubry, Farhang Hadad Farshi
Additional information	Participation without presentation for attendance and networking.

Table 40: Information on event participation #12.

Event #12	
Event	VivaTech 2023
Location	Paris, France
Date	14–17 June 2023
Description	Viva Technology, or VivaTech, is an annual technology conference, dedicated to innovation and startups, held in Paris, France. VivaTech was founded in 2016 by Publicis Groupe and Groupe Les Echos. The first two days of VivaTech are for startups, investors, executives, students and academics, and it is open to the general public on the third day.
Website	https://vivatechnology.com/
Event type	Conference
Audience size	150,000+ attendees
Involved partners	CAP: Wael Yahyaoui
Additional information	Participation without presentation for attendance and networking.

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Table 41: Information on event participation #13.

Event #13	
Event	EQUALITY Project - ALGO @Capgemini Webinar
Location	Online
Date	15 June 2023
Description	Make sure you join our webinar about the EQUALITY project, in which we are developing cutting-edge quantum computer algorithms and exploring hardware strategies to solve strategic industrial problems. This session will be dedicated to the quantum algorithms developed within the project
Website	NA
Event type	Webinar
Audience size	45 attendees
Involved partners	CAP: Kirill Shiianov, Wael Yahyaoui; QC: Lorenzo Cardarelli, Panagiotis Barkoutsos
Additional information	Partner's internal dissemination of the project.

Table 42: Information on event participation #14.

Event #14	
Event	EQUALITY Project @Capgemini ba.Connect event
Location	Online
Date	16 June 2023
Description	ba.Connect is a unique global online learning experience brought to you by the Business Analysis Community and Capgemini University: designed to help you develop the right skills to get the future you want. This will be a unique opportunity to connect with peers from our community, get inspired, and learn how you can develop. Whether you are new to our community or an experienced Business Analyst, there is something for everyone and we want you to feel welcome. This conference gives each participant an opportunity to create their own personalized schedule, blending cross-disciplined and community specific content.
Website	https://www.airmeet.com/e/ce611c90-f56b-11ed-8566-afb66ebaf6f5
Event type	Webinar
Audience size	1,400 attendees
Involved partners	CAP: Andreas Kötter, Wael Yahyaoui, Kirill Shiianov
Additional information	Panel Presentation: Quantum from 0 to 1, and what's in between.

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Table 43: Information on event participation #15.

Event #15	
Event	EQUALITY Project - HARD @Capgemini Webinar
Location	Online
Date	20 June 2023
Description	This session will be dedicated to the techniques of efficient utilisation of quantum hardware, developed within the EQUALITY project by University of Leiden and partners. Quantum Computers of nowadays are not sufficiently large and prone to errors (which is referred to as Near-term Intermediate Scale Quantum devices, or NISQ), so to achieve any practical benefits using them in the near-term perspective, various approaches to efficient hardware utilisation are being developed.
Website	NA
Event type	Webinar
Audience size	45 attendees
Involved partners	CAP: Franziska Wolff, Kirill Shiianov; ULEI: Alfons Laarman; QC: Alexander Dauphin
Additional information	Partner's internal dissemination of the project.

Table 44: Information on event participation #16.

Event #16	
Event	EQUALITY Project - ENERGY @Capgemini Webinar
Location	Online
Date	29 June 2023
Description	Make sure you join our webinar about the EQUALITY project, in which we are developing cutting-edge quantum computer algorithms and exploring hardware strategies to solve strategic industrial problems. Following the previous webinar, this session will be dedicated to strategic industrial problems in the energy storage domain.
Website	NA
Event type	Webinar
Audience size	30 attendees
Involved partners	CAP: Wael Yahyaoui, Franziska Wolff; DLR: Birger Horstmann, Max Schammer
Additional information	Partner's internal dissemination of the project.

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Table 45: Information on event participation #17.

Event #17	
Event	EQUALITY Project @Airbus Webinar iTalk
Location	Online
Date	29 June 2023
Description	Make sure you join our webinar about the EQUALITY project, in which we are developing cutting-edge quantum computer algorithms and exploring hardware strategies to solve strategic industrial problems. We target eight use cases: airfoil aerodynamics, battery design, fluid dynamics, space mission optimisation, materials design, multidisciplinary optimisation, space data analysis and fuel cell design. EQUALITY is a consortium of industry partners comprising Airbus, Capgemini, Da Vinci Labs, Fraunhofer ENAS, German Aerospace Center, INRIA, Leiden University and PASQAL, selected by the EU's key funding program for research and innovation, Horizon Europe.
Website	NA
Event type	Webinar
Audience size	100+ attendees
Involved partners	AOG: Gerd Büttner; CAP: Wael Yahyaoui; DLR: Max Schammer; ULEI: Alfons Laarman; QC: Panagiotis Barkoutsos
Additional information	Partner's internal dissemination of the project.

Figure 15: Image of event #17.

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Table 46: Information on event participation #18.

Event #18	
Event	Chiral Matter: from quarks to quantum computers
Location	Tours, France
Date	5–7 July 2023
Description	Chirality plays a key role in modern science and technology, from particle physics to pharmacology. With the recent advent of quantum computing, the studies of real-time quantum phenomena in chiral matter have become accessible. In this context, the conference aims to bring together scientists interested in various aspects of chiral matter and in applications of quantum computing to the description of real-time phenomena.
Website	https://www.lestudium-ias.com/events/chiral-matter-quarks-quantum-computers
Event type	Conference
Audience size	30 attendees
Involved partners	DVL: Xavier Aubry [1], Renan Picoreti, Farhang Hadad
Additional information	[1] Oral Presentation: EQUALITY: Efficient Quantum Algorithms for Industry.

Figure 16: Image of event #18.

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Table 47: Information on event participation #19.

Event #19	
Event	International Conference on Statistical Physics
Location	Chania, Greece
Date	10–14 July 2023
Description	The conference is organized in the following three areas to cover all the topics of statistical physics: foundations and theoretical aspects of classical, quantum and relativistic statistical physics and thermodynamics, applications to physical systems, and applications to non-physical systems.
Website	http://www.sigmaphi.polito.it/
Event type	Conference
Audience size	500 attendees
Involved partners	QC: Panagiotis Barkoutsos
Additional information	Invited oral presentation: Quantum Scientific Machine Learning for Multiphysics simulations.

Table 48: Information on event participation #20.

Event #20	
Event	EQUALITY Project - Market analysis @Capgemini Webinar
Location	Online
Date	12 July 2023
Description	This session aims to present Quantum Solutions' potential in the real business context and explore how to commercialise such deep technologies correctly. For that, we studied the potential outcomes of the EQUALITY project from the business perspective.
Website	NA
Event type	Webinar
Audience size	38 attendees
Involved partners	CAP: Wael Yahyaoui, Franziska Wolff, Kirill Shiianov
Additional information	Partner's internal dissemination of the project.

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Table 49: Information on event participation #21.

Event #21	
Event	Quantum Physics and Logic (QPL) 2023
Location	Paris, France
Date	17–21 July 2023
Description	Quantum Physics and Logic is an annual conference that brings together academic and industry researchers working on mathematical foundations of quantum computation, quantum physics, and related areas. The main focus is on the use of algebraic and categorical structures, formal languages, type systems, semantic methods, as well as other mathematical and computer scientific techniques applicable to the study of physical systems, physical processes, and their composition. Work applying quantum-inspired techniques and structures to other fields (such as linguistics, artificial intelligence, and causality) is also welcome.
Website	https://qpl2023.github.io/
Event type	Conference
Audience size	220+ attendees
Involved partners	ULEI: Alejandro Villoria, Alfons Laarman
Additional information	Poster presentation**:** A graphical notation of convex sums of unitaries for the ZX-calculus.

Table 50: Information on event participation #22.

Event #22	
Event	Workshop Frontiers of near-term quantum computing
Location	Gothenburg, Sweden
Date	29 August – 1 September 2023
Description	The workshop aims to bring together researchers from the fields of computer science, quantum information and chemistry to discuss theoretical and computational aspects of near-term quantum computing, the capabilities and limitations of current approaches, and strategies towards utilizing near-term hardware for solving practical problems.
Website	https://www.chalmers.se/en/conference/frontiers-of-near-term-quantum-computing/
Event type	Workshop
Audience size	60+ attendees
Involved partners	QC: Panagiotis Barkoutsos
Additional information	Invited oral presentation: Quantum Scientific Machine Learning as pathway towards practical quantum advantage.

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Table 51: Information on event participation #23.

Event #23	
Event	EASN International Conference
Location	Salerno, Italy
Date	5–8 September 2023
Description	13th EASN International Conference will include several Plenary Talks by distinguished personalities of the European Aviation and Space sectors from the academia, industry, research community, and policymakers. The event will also give the opportunity to scientists and researchers from all over the world to present their recent achievements in a series of thematic sessions, organized by internationally recognized scientists.
Website	https://easnconference.eu
Event type	Conference
Audience size	470+ attendees
Involved partners	AOG: Gerd Büttner [1]; CAP: Andreas Kötter
Additional information	[1] Oral Presentation: Quantum@Airbus: Bring Aerospace into the Quantum Era.

Table 52: Information on event participation #24.

Event #24	
Event	Workshop & Autumn School: Quantum Computing and Simulations for Energy Materials
Location	Jülich, Germany
Date	25–29 September 2023
Description	Emerging computational infrastructures of the future, such as quantum computing, will play a pivotal role in the research on materials for the energy transition. Quantum computing is specifically suited for the computational modelling of materials and chemical processes at an accurate quantum-mechanical level. This event will gather present and future pioneers of the application of quantum computing to the research on materials and chemistry for the energy transition.
Website	https://www.fz-juelich.de/en/jsa/events/workshop-autumn-school
Event type	Workshop / School
Audience size	30 attendees
Involved partners	AOG: Jasper Krauser; DLR: Birger Horstmann [1]; QC: Panagiotis Barkoutsos
Additional information	[1] Oral Presentation: Quantum Computing at Airbus – The Quantum Quest Towards Low-Carbon Aviation.

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Table 53: Information on event participation #25.

Event #24	
Event	European Quantum Technologies Conference
Location	Hannover, Germany
Date	16–20 October 2023
Description	Every two years, the Quantum Flagship gathers the major European research and innovation networks at the European Quantum Technology Conference (EQTC). As the largest quantum event of its kind, we celebrate breakthroughs, highlight the pioneering work of European organisations and connect the dots within the community.
Website	https://eqtc2023.qvls.de
Event type	Conference
Audience size	700+ attendees
Involved partners	CAP: Andreas Kötter, Pablo-David Rojas
Additional information	[1] Poster presentation: EQUALITY - Efficient 'QUAntum ALgorithms for IndusTrY.

3.3.2. List of Events - Year 2

Table 54: Information on event participation #26.

Event #26	
Event	(Second) HPC Project Days @DLR
Location	Cologne, Germany
Date	23–24 January 2024
Description	Internal workshop
Website	NA
Event type	Internal Meeting
Audience size	NA
Involved partners	DLR: Michael Epping, Linus Scholz (DLR)
Additional information	Poster presentation: Projects ALQU and EQUALITY

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Table 55: Information on event participation #27.

Event #27	
Event	Seminar on Selection and Evaluation of Models in Artificial Intelligence (Original title: Yapay Zekada Modellerin Seçilmesi ve Değerlendirilmesi)
Location	Izmir, Turkiye
Date	2 February 2024
Description	Cem Ünsal will share current developments and practical applications in the world of Artificial Intelligence and offer participants strategic perspectives on how to select and evaluate models.
Website	https://karsiyakakolektif.com/duyuru-%26-etkinlikler/f/yapay-zekada-modellerin-se%C3%A7ilmesi-ve-de%C4%9Ferlendirilmesi
Event type	Seminar
Audience size	70 attendees
Involved partners	ULEI: Cem Ünsal

Table 56: Information on event participation #28.

Event #28	
Event	Workshop on Quantum Simulators
Location	Paris, France
Date	5–9 February 2024
Description	Quantum many-body systems have a formidable complexity, which grows exponentially with system sizes. Current classical computers can only afford the simulation of small systems, and mainly in reduced dimensions. In this conference we will focus on the simulation of quantum dynamics of both closed and open quantum many-body systems.
Website	https://www.ihp.fr/fr/actualites-activites-de-recherche/t1-2024-quantum-many-body-systems-out-equilibrium
Event type	Workshop
Audience size	NA
Involved partners	QC: Joseph Vovrosh
Additional information	Oral Presentation: Amorphous quantum magnets in a two-dimensional Rydberg atom array

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Table 57: Information on event participation #29.

Event #29	
Event	The ZX-seminar
Location	Online
Date	6 March 2024
Description	Initiated at University of Oxford, the weekly ZX seminar provides a virtual venue for researchers to share their work related to the ZX calculus.
Website	https://zxcalculus.com/zxseminar.html
Event type	Webinar
Audience size	30 attendees
Involved partners	ULEI: Alejandro Villoria
Additional information	Oral presentation: Enriching Diagrams with Algebraic Operations

Table 58: Information on event participation #30.

Event #30	
Event	Q2B Paris
Location	Paris, France
Date	7–8 March 2024
Description	Q2B, the premier conference on quantum technologies defining the roadmap to quantum value, is thrilled to return to Paris for the second consecutive year, showcasing the excitement and dramatic progress of Europe's quantum ecosystem.
Website	https://q2b.qcware.com/2024-conferences/paris/
Event type	Conference
Audience size	400+ attendees
Involved partners	Many partners attended
Additional information	Pasqal (QC) was a sponsor of the event. Capgemini (CAP) had speakers and moderators in Noise Correction and Pharma

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Table 59: Information on event participation #31.

Event #31	
Event	27th International Conference on Foundations of Software Science and Computation Structures (FOSSACS 2024)
Location	Luxembourg City, Luxembourg
Date	6–11 April 2024
Description	The conference invites submissions on theories and methods to support the analysis, integration, synthesis, transformation, and verification of programs and software systems.
Website	https://etaps.org/2024/conferences/fossacs/
Event type	Conference
Audience size	NA
Involved partners	ULEI: Alejandro Villoria
Additional information	Oral Presentation: Enriching Diagrams with Algebraic Operations

Table 60: Information on event participation #32.

Event #32	
Event	30th International Symposium on Model Checking Software (SPIN 2024)
Location	Luxembourg City, Luxembourg
Date	10–11 April 2024
Description	SPIN 2024 is the latest in a successful series of workshops and symposia for practitioners and researchers interested in symbolic and state space-based techniques for the validation and analysis of software systems. Techniques and empirical evaluations based on explicit representations of state spaces, as implemented in the SPIN model checker or other tools, or techniques based on the combination of explicit representations with other representations, are the focus of this symposium.
Website	https://spin-web.github.io/SPIN2024/
Event type	Conference
Audience size	50 attendees
Involved partners	ULEI: Alfons Laarman, Alejandro Villoria
Additional information	Oral Presentation: Automated Reasoning in Quantum Circuit Compilation

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Table 61: Information on event participation #33.

Event #33	
Event	QuSoft Internal Meeting
Location	Amsterdam, Netherlands
Date	1 May 2024
Description	NA
Website	NA
Event type	Internal Meeting
Audience size	30 attendees
Involved partners	ULEI: Alfons Laarman
Additional information	Invited presentation: The Unreasonable Effectiveness of Classical Automated Reasoning for Quantum Computing

Table 62: Information on event participation #34.

Event #34	
Event	European Space Agency's Advanced Concepts Team Science Coffee
Location	Noordwijk, Nedetherlands
Date	15 May 2024
Description	The Science Coffee is an informal event where invited speakers present their innovative view on a topic chosen by the Advanced Concepts Team researchers and discuss its implications on the future of space missions as well as possible collaboration ideas.
Website	https://www.esa.int/gsp/ACT/coffee/2024-05-15%20-%20Alfons%20Laarman/
Event type	Webinar
Audience size	20 attendees
Involved partners	ULEI: Alfons Laarman
Additional information	Invited presentation: The Unreasonable Effectiveness of Classical Automated Reasoning for Quantum Computing

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Table 63: Information on event participation #35.

Event #35	
Event	Adiabatic Quantum Computing (AQC) 2024
Location	Glasgow, Scotland
Date	10–14 June 2024
Description	The thirteenth International Conference, AQC 2024 will bring together researchers from different communities to explore adiabatic and diabatic approaches to quantum computing, including quantum annealing, quantum walks, quantum-inspired algorithms and hardware, and quantum simulation of many-body quantum systems.
Website	https://iop.eventsair.com/aqc2024/
Event type	Conference
Audience size	NA
Involved partners	QC: Joseph Vovrosh
Additional information	Oral Presentation: 'Amorphous quantum magnets in a two-dimensional Rydberg atom array'

Table 64: Information on event participation #36.

Event #36	
Event	6th International Workshop on Quantum Compilation (IWQC)
Location	Berlin, Germany
Date	11-12 September 2024
Description	The workshop aims to bring together researchers from quantum computing, electronic design automation, and compiler construction. Open questions that we anticipate this group to tackle include new methods for circuit synthesis, optimization, and rewriting, techniques for verifying the correctness of quantum programs, and new techniques for compiling efficient circuits and protocols regarding fault-tolerant and architecture constraints.
Website	https://quantum-compilers.github.io/iwqc2024/
Event type	Workshop
Audience size	60+ attendees
Involved partners	ULEI: Alejandro Villoria
Additional information	Poster presentation: "Optimization and Synthesis of Quantum Circuits with Global Gates"

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Table 65: Information on event participation #37.

Event #37	
Event	Bitkom Quantum Summit
Location	Berlin, Germany
Date	25 September 2024
Description	Quantum computing is rapidly progressing from a theoretical concept to a near-term reality – but how to become quantum-ready and unlock the full potential of the technology for your business?
Website	https://aidaq.berlin/quantum-summit
Event type	Conference
Audience size	50 attendees (1800+ for the whole event)
Involved partners	QC: Daniel Garcia Guijo
Additional information	Oral presentation: EQUALITY: Advancing the European Quantum Industry (https://www.youtube.com/watch?v=NY4FWUDNdWc)

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