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Author List

Organization	Name	E-Mail address
AIT	M. Kos	Manuela.Kos@ait.ac.at
AIT	S. Ramacher	Sebastian.Ramacher@ait.ac.at
AIT	H. Hübel	Hannes.Huebel@ait.ac.at
AIT	C. Striecks	Christoph.Striecks@ait.ac.at

Reviewer List

Organization	Name	E-Mail address
CANCOM	Tobias Huemer	Tobias.huemer@cancom.com
fragmentiX	Philipp Stanzer	philipp.stanzer@fragmentix.com
AIT	Christoph Striecks	Christoph.Striecks@ait.ac.at
qtlabs	Lukas Mairhofer	lukas.mairhofer@qtlabs.at
X-Net	Wolfgang Eibner	we@x-net.at

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Executive Summary

QCI Days Vienna 2024 was a three day event, held from January 24th to January 26th at the House of the Industry of the Federation of Austrian Industries in Vienna. It was comprised of a national day for Austrian stakeholders, companies and the industry and two European days with European stakeholders, DEP-1 and DEP-2 projects, the PETRUS coordination and support action, and quantum technology flagship projects.

In total, over 50 speakers presented ongoing work on in the area of quantum resistant communication, quantum communication use cases, European initiatives, the intersection with cybersecurity, the needs and requirements of stakeholders, certification, education, risk assessment of quantum technologies and more. The event was attended by around 350 people with roughly 43% of the attendees coming from SMEs and industry, 35% from academia and 19% from public institutions. Over half of the attendees were from Austria, followed by 7% from Germany and others all over Europe. Consequently, the target of about 100 attendees was over achieved even when only considering the Austrian attendees.

QCI Days Vienna 2024 was covered in Austrian media outlets ranging from daily newspapers to periodic IT magazines.



1. Introduction

1.1. Purpose and scope of the document

Establishing the Austrian QCI network requires the involvement of different stakeholders including of course representatives of the Austrian federal ministries, network operators, QKD device suppliers and end users. Hence, QCI-CAT aims at bringing all of them together to discuss use cases, deployment and integration, challenges, etc. to strengthen the understanding of quantum-resistant communication networks. To that extent, the project organized QCI Days Vienna 2024 at the House of the Industry (Haus der Industrie) of the Federation of Austrian Industries (Vereinigung der österreichischen Industrie) from January 24th to January 26th 2024. The first day, January 24th, was explicitly targeting the Austrian stakeholders while the other two days also highlight the European dimension of the EuroQCI initiative with international guests. This document reports on the QCI Days Vienna 2024.

1.2. Target Audience

This deliverable is targeted at the general public.

1.3. Relation to other project work

Beyond reaching the Austrian stakeholders (end users, industry, network operators, suppliers, decision makers, etc.), dissemination of the project results to the wider EuroQCI community is also a central goal. QCI Days Vienna 2024 also serves as an opportunity to present the work carried out in QCI-CAT during the first year of the project. By inviting the representatives of the DEP-1 and DEP-2 projects, the quantum flagship projects, the PETRUS coordination support action and European stakeholders such as the European Commission and the European Space Agency, the Quantum Industry Consortium, and many more, QCI Days Vienna 2024 brings together the relevant parties to shape the future of the pan-European Quantum Communication Infrastructure.

1.4. Structure of the document

The structure of the document is as follows. Section 2 covers the first day of QCI Days Vienna 2024 which is focused on national stakeholders. Section 3 gives an overview of the second and third day of the event which were targeted at the European community consisting of the DEP-1 and DEP-2 projects, QKD suppliers, stakeholders, and decision makers among others. Finally, Section 4 gives an outlook on QCI Days 2025 which will be held in collaboration of HellasQCI, PTQCI, EuroQCI-Spain and QCI-CAT in Athens, Greece.



2. QCI Days Vienna 2024

2.1. National Day

Overall, the national day of QCI Days Vienna 2024 focused on bringing all relevant stakeholders for “AustroQCI” together. In a series of talks and panel discussions, different aspects of QCI have been presented and discussed. As quantum secure communication infrastructure is tightly related to the overall topic of cyber security of networks and systems, a strong focus beyond the possibilities of quantum communication technologies was laid on cyber security challenges from the Austrian Ministry of Defense and Austrian companies. Hence, the program of the national day was structured into topical sessions: quantum communication and the strategy in Europe, use cases implemented in QCI-CAT, Austrian quantum technology and related initiatives. The detailed agenda (in German) is depicted in Figure 3Figure 4Figure 5.

The national day was opened by moderator Stefan Schauer (AIT), welcoming our guests to the national day of QCI Days Vienna 2024. The ceremonial opening was conducted by Secretary General Christoph Neumayer of the Federation of Austrian Industries, Georg Niklfeld of the Federal Funding Agency of Austria (FFG) and Andreas Kugi, managing director of AIT.



Figure 1: Impression from the event.

In the first technical session, Hannes Hübel (AIT) presented the solid foundation of QKD suppliers, quantum communication know-how and pilot networking initiatives, which will soon culminate in a pan-European quantum communication infrastructure. Désirée Ehlers from the Austrian Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology provided the governmental perspective on quantum communication infrastructure. As she elegantly put it, EuroQCI



requires concerted efforts beyond those found on the scientific landscape. It requires *entanglement of humans* as well as *entanglement of science and industry*, both in a joint mission that makes the next chapter of our Quantum age happening. Her colleague Daniel Voigt complemented her view by providing the cyber security context under the umbrella of the IRIS² initiative. Felix Wissel from Deutsche Telekom topped the opening of the QCI Days with the perspective of a network operator. What it takes to transparently provide quantum-secure communication to the end users is an approach that synergetically blends the best of both worlds: QKD and post-quantum cryptography (PQC). The challenge resides on efficiently integrating PQC in the security architecture offered through QKD.

The next session focused on use cases of quantum communication technologies: Werner Strasser (fragmentiX) connected the well-known burden of missing vaccines in biology with the need for similarly powerful countermeasures when it comes to cyber warfare. With classical asymmetric cryptography being already considered as a dead end, quantum-propelled solutions have to jump in as a pain reliever to face emerging and actually nowadays present threats. Thomas Mann (CANCOM) presented a use-case that blends QKD with hardware security models (HSM). Even though companies might find themselves at the very early stage of introducing QKD to real-world implementations, it is the lessons learned while doing so that matter most. Nikolaus Dürk (X-Net), emphasized the importance of technology sovereignty for communication networks. Europe has the tools and products, but does not effectively exploit them.

These two sessions were followed by a panel discussion elaborating on the transformation of the European cyber security landscape through quantum technologies – and the steps required to do so. The panel underpinned the necessity for seamlessly integrating policies, holistic views lean of patchwork thinking, and concerted dissemination efforts. While PQC will live a widespread deployment, QKD is not expected to become a commodity within the next decade. Europe should leverage on its strong quantum technology base.

The afternoon session continued with various aspects of cyber security in the quantum age. First, Sebastian Ramacher (AIT) took a step back and set the stage discussing the risks of quantum computers on the current use of cryptography with an outlook on QKD and PQC. Florian Silnusek presented the view of the Austrian Ministry of Defence to the audience. After two talks focusing on the cryptographic aspects of cyber security, Robert Lamprecht (KPMG) gave an overview of the current challenges that companies face with respect to cyber security and where data security through cryptography fits into the picture. Wolfgang Rosenkranz (CERT.at) continued with a talk on the importance of trust that is central to cyber security in practice. The session continued with a talk by Thomas Rössler (PrimeSign) who stressed the importance of migrating to quantum-resistant cryptography for qualified electronic signatures from the perspective of a trust service provider. Julia Dewitz-Würzelberger (Verbund AG) closed the session with a presentation of initial tests with PQC and QKD to protect their operational technology (OT) carried out by critical infrastructure providers.

The next session on quantum technology initiatives started with Thorsten Schumm (Technical University of Vienna) who presented the Austrian Quantum Fiber Network and its extension to neighboring countries. AQUnet, originally providing frequency/energy references, is available as a trailblazer towards providing further services to the quantum community. Gregor Weihs (University of Innsbruck) highlighted the activities of the excellence cluster Quantum Science Austria, which are key to shape the next generation of top researchers in the field of quantum technologies - concerning space, time, gravitation and more. Somya Rathee, the driving force behind Quantum Society Austria, emphasized the importance of bringing motivated students to the table. Young students are eager to pursue a career in quantum tech, as evident through regular fall events. However, it requires tech organizations to join this table to accomplish this goal. Martin Bohmann (qtlabs) presented the



activities of Photonics Austria on promoting quantum technologies to potential end users and the general public.

The final session started with a presentation of Martin Stierle (AIT) on the project QCI-CAT. He picked up the uses cases presented during the morning session and puts them into the context of the QKD network planned in Vienna and from Vienna to Graz. The talk also highlighted current research challenges that are tackled in QCI-CAT as well as developments around key management systems that play a crucial role in deploying QKD networks in practice. Manuel Erhard (qtlabs) expanded our up-to-now terrestrial-biased agenda with aspects on space-borne quantum technology. Bridging the very wide gaps within a pan-continental quantum communication infrastructure requires a joint effort by space engineers and quantum scientists with respect to both, hardware and software development, as well as mission planning. Towards that direction, he showed impressions from qtlabs' optical ground station. Werner Strasser (fragmentiX) added data storage to the picture. He highlighted several challenges from various fields from medicine to government and military applications, showcasing the findings of a recent field trial in Styria, Austria, involving QKD in combination with secret sharing for securely transferring and storing highly-sensitive medical data. Simon Guggi (Stiftung Secure Information & Communication Technologies) presented the idea and status of post-quantum signatures as a tool for securing trust and providing security at the earliest possible stage. He reported that first customers have already started to use post-quantum signatures, while widespread deployment awaits pending standardization. Wolfgang Dür (University of Innsbruck and Quantum Network Design) showcased the simulation of quantum networks. Completing the session on quantum technologies made in Austria, Anna Spandl (Quantum Exponential) provided the venture capitalist perspective with respect to applied quantum technologies. After all, VC and private investors stem 96% of the total investments in QT enterprises, with a total volume that has been skyrocketing since 2020.

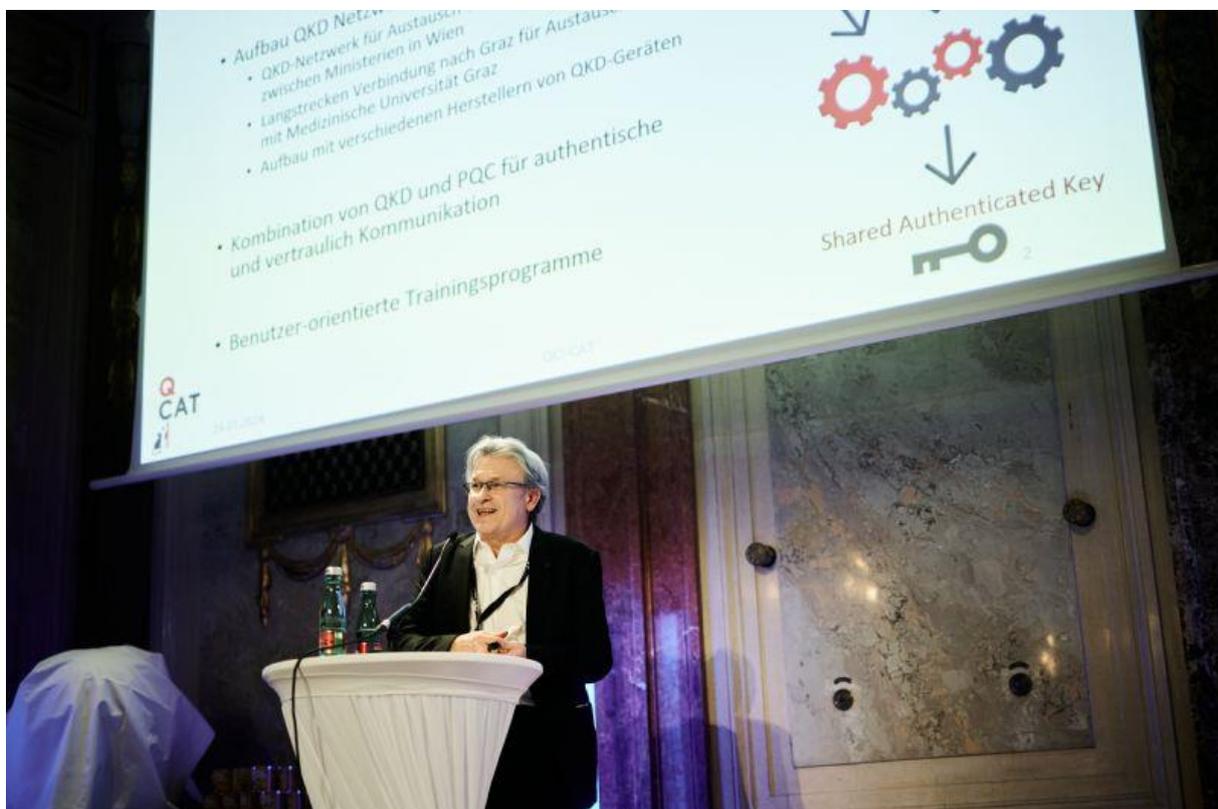
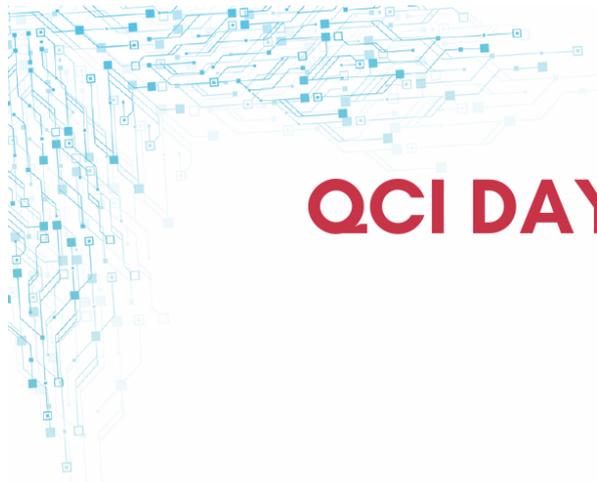


Figure 2: Impression of the event.



During lunch, coffee breaks, and at the evening reception, QKD suppliers and companies were invited to present their solutions in an exhibition. X-Net, fragmentiX, qtlabs, Quantum Industries, QKD – Quantum Network Design took this opportunity and presented their systems and solutions and were met with broad interest from the audience.



QCI DAYS VIENNA 2024

AGENDA

Venue:
Haus der Industrie
(Industriellenvereinigung)
Schwarzenbergplatz 4, Vienna

Mittwoch, 24.01.2024 – Nationaler QCI-Tag

Moderation: Stefan Schauer (AIT Austrian Institute of Technology)

09:00-10:00	Registrierung
10:00-10:20	Eröffnung QCI Days Vienna 2024 Generalsekretär Mag. Christoph Neumayer (Vereinigung der Österreichischen Industrie) DI Georg Niklfeld (FFG Österreichische Forschungsförderungsgesellschaft) Univ.Prof. DI Dr. Andreas Kugi (AIT Austrian Institute of Technology)
10:20-11:10	Quantenkommunikation und die Strategie in Europa <i>Quantenkryptographie: Produkte und Supply Chain in Europa</i> Hannes Hübel (AIT Austrian Institute of Technology) <i>Austrian World of Quantum - EuroQCI & Co</i> Désirée Ehlers (Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie) <i>IRIS² – Secure Connectivity throughout Europe</i> Daniel Voigt (Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie) <i>QKD für sicherheitsrelevante Anwendungen aus Netzbetreibersicht</i> Felix Wissel (Deutsche Telekom)
11:10-11:40	Österreichische Use Cases <i>Sofortige Digitale Souveränität – trotz und gerade wegen neuer Quantencomputer</i> Werner Strasser (fragmentiX Storage Solutions) <i>HSM Backup Using QKD</i> Thomas Mann (CANCOM) <i>QKD and PQC – A Duet Pioneering the Secure Information Exchange via Videoconferencing</i> Nikolaus Dürk (X-Net Services)
11:40-12:10	Paneldiskussion: Umsetzung QKD für den europäischen Markt Moderation: Oliver Rolofs (COMMISSORY) Hannes Hübel (AIT Austrian Institute of Technology) Désirée Ehlers and Daniel Voigt (BMK) Felix Wissel (Deutsche Telekom) Thomas Mann (CANCOM) Werner Strasser (fragmentiX Storage Solutions) Nikolaus Dürk (X-Net Services)



Figure 3: Part 1 of the agenda of the national day (in German)



Mittwoch, 24.01.2024 – Nationaler QCI-Tag

12:10

Ankündigung Multilaterale EUREKA-Ausschreibung für Quantentechnologien

Michael Walch (FFG)

12:10-13:10

Mittagspause & Ausstellung

13:10-14:10

Cyber Security im Quantenzeitalter – Das Bedrohungspotential

Quanten-resistente Kryptographie für sichere Kommunikation
Sebastian Ramacher (AIT Austrian Institute of Technology)

Militärische Kryptographie im 21. Jahrhundert
Florian Silnusek (Bundesministerium für Landesverteidigung)

Quantentechnologie im Kontext von NIS2
Robert Lamprecht (KPMG)

Vertrauliche Daten und Öffentliche Sicherheit: Die Notwendigkeit sicherer Kommunikation in staatlichen Institutionen
Wolfgang Rosenkranz (CERT.at)

Post-Quantum-Ära und Digitale Signaturen: die Zukunft beginnt jetzt
Thomas Rössler (primeSIGN)

Kritische Infrastruktur und erste Schritte Richtung Quantenkryptografie
Julia Dewitz-Würzelberger (Verbund)

14:10-14:40

Paneldiskussion: Cyber Security im Quantenzeitalter

Moderation: Markus Klemen (SBA Research)

Sebastian Ramacher (AIT Austrian Institute of Technology)
Florian Silnusek (Bundesministerium für Landesverteidigung)
Robert Lamprecht (KPMG)
Wolfgang Rosenkranz (CERT.at)
Thomas Rössler (primeSIGN)
Clemens Möslinger (Bundeskanzleramt)
Julia Dewitz-Würzelberger (Verbund)

14:40-15:10

Kaffeepause & Ausstellung

fragmentiX Storage Solutions

qtlabs

Quantum Industries

X-Net

QND - Quantum Network Design



Figure 4: Part 2 of the agenda of the national day (in German)



Mittwoch, 24.01.2024 – Nationaler QCI-Tag

15:10-15:50

Österreichische Quantentechnologie-Initiativen

Austrian Quantum Fiber Network – AQUnet
Thorsten Schumm (Technische Universität Wien)

Exzellenzcluster Quantum Science Austria
Gregor Weihs (Universität Innsbruck)

Quantum Society Austria: Connecting Students, Industry and Research in Austria
Somya Rathee (Quantum Society Austria)

Photonics Austria: Aktivitäten der AG Quanten
Martin Bohmann (Photonics Austria & qtlabs)

15:50-16:50

QKD-Technologien made in Austria

QCI-CAT: QKD-Deployment in Österreich
Martin Stierle (AIT Austrian Institute of Technology)

Technologie für weltraumbasierte Quantenkommunikation
Manuel Erhard (qtlabs)

Beyond Secure Communication: Sichere Speicherung durch Secret Sharing
Werner Strasser (fragmentiX Storage Solutions)

Post-quantum Signaturen für Java Security Provider
Simon Guggi (SIC Stiftung Secure Information & Communication Technologies)

Simulation von Quantennetzwerken
Wolfgang Dür (Institut für Theoretische Physik, Universität Innsbruck & QND – Quantum Network Design)

Quanten Technologien: An Investor's Perspective
Anna Spandl (Quantum Exponential)

16:50-17:20

Paneldiskussion: Österreichisches Quantenökosystem

Moderation: Martin Stierle (AIT Austrian Institute of Technology)

Manuel Erhard (qtlabs)

Werner Strasser (fragmentiX Storage Solutions)

Wolfgang Dür (Quantum Network Design)

Anna Spandl (Quantum Exponential)

Simon Guggi (SIC Stiftung Secure Information & Communication Technologies)

Somya Rathee (Quantum Society Austria)

Martin Bohmann (Photonics Austria, WG Quanten)

Gregor Weihs (Quantum Science Austria)

17:20-17:30

Schlussworte nationaler Tag: We are the Heart of Quantum Europe

17:30

Abendempfang

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Organised by the consortium of the national EuroQCI project "QCI-CAT"



Figure 5: Final part of the agenda of the national day (in German)



2.2. QCI-Days Vienna 2024 – European Days

The two European days of QCI Days Vienna 2024 switched the focus from the Austrian perspective to the European one. As such, the event was designed to bring together the DEP-1 and DEP-2 projects, PETRUS, the Quantum flagship projects and QKD suppliers with stakeholders such as the European Commission and ESA and end users. Similar to the national day, selected speakers presented on initiatives, use cases, and technologies in talks which were followed up with panel discussions with audience participation. Additionally, the national QCI projects were given the opportunity to present posters. All DEP-1 and DEP-2 projects and QKD suppliers were invited to present their work and offering in 90 second elevator pitches to the audience. For suppliers, the exhibition area was extended from Austrian to European and international QKD suppliers. The detailed agenda (in German) is depicted in Figure 11, Figure 12, Figure 13, Figure 14, Figure 15, Figure 16, and Figure 17.

After the opening of the European QCI Days by Helmut Leopold (AIT), Laurent Olislager from the European Commission set the scene. On its mission towards making Europe the world's quantum valley, quantum communication will contribute through a Quantum Internet made in Europe. 340 projects have been funded up to now to master the challenge of bringing quantum tech from the lab to the fab to the market. EuroQCI builds on these efforts. Nicklas Lindman from the European Space Agency provided an overview about the status of SAGA. OGS development and satellite payload based on prepare & measure QKD will be complemented by additional (EPR) satellites in the future - all subject to pen-testing during in-orbit validation. Keith Elder from Deutsche Telekom presented the efforts of the coordination and support action (CSA) Petrus, the CSA central to EuroQCI developments, including aspects of testing & certification. He reported the steady progress of national QCI projects: These have completed their design phase and are now in their implementation and procurement phases.



Figure 6: Impression from the event



Valerio Pruneri (ICFO) started the session on the quantum flagship projects with QSNP, with its multi-faceted approach covering quantum-secure networking, QKD component development and use-case evaluation. The 42 partners look beyond the traditional QKD horizon and investigate further relevant topics such as secure multi-party computation. Stephan Ritter (TOPTICA Photonics) informed about QIA, the Quantum Internet Alliance initiative. It leverages quantum memory networks and entanglement distribution on its mission to provide communication between quantum processors everywhere on earth. QIA's full-stack prototype network in development combines metro-scale segments with a long-distance backbone stretching over 500 kilometers. The QuTest and QuPilot initiatives were presented by Alessandro Trenti (AIT). The two frameworks for open testing, experimentation and fabrication provide one-stop shop solutions for those who need access to a fully-fledged infrastructure with harmonized testing procedures in computation, communication or sensing - or access to pilot lines to produce components for these. Yasser Omar (PQCI) presented QUCATS which brings coherence to several quantum initiatives throughout Europe's QT Flagship, by providing strategic road-mapping, outreach and fostering education/training activities. Simone Capeleto from the European Quantum Industry Consortium (QuIC) highlighted the strong industrial base on European quantum technologies. QuIC comprises of 182 members from all European countries with a healthy mix of start-ups, SMEs and large enterprises. Its supply chain is key to bring EuroQCI to life and to ensure sovereignty. Jesse Robbers (Quantum Delta NL) shed light on how to build a quantum ecosystem. He demonstrated how a joint vision can be turned into a solid „house of quantum“ that helps companies to promote applicable use-cases for successfully serving their end-users, while obtaining the required human capital to do so and eventually create the societal impact we hope for.



Figure 7: Impression from the event.

In the first technical session, Vicente Martin (UPM) elaborated on how we can eventually arrive at large-scale quantum networks. While integrating security ecosystems into telecom infrastructures not just means to overcome physical-layer hurdles such as noise and loss, but further requires to seamlessly integrate and automate the addition of new quantum tech network assets. Christoph



Striecks (AIT) focused on the limitations when deploying long-range QKD links and networks towards the mission of „making the future quantum“. Source-authentication or not-fully-trusted intermediate nodes are examples of what lies ahead at utmost importance when setting up EuroQCI on an architectural level. Continuing on the topic of end-to-end secure communication in large-scale networks, Ludovic Perret (Sorbonne Université) highlighted the opportunities of hybrid post-quantum and QKD protocols for tackling these issues in QKD networks. He also reported on ongoing standardization activities to bring the protocols into applications. Alessandro Zavatta (QTI) went beyond borders as he talked about evaluating real-world use cases in a cross-border quantum communication setting. Extending a field trial between Italian regions and reaching till Slovenia, a link budget of 25dB was successfully bridged in course of a public demo at a G20 meeting. He further reported on a submarine QKD link connecting islands over a reach of 100km. Tara Liebisch (PTB) extended the QKD context of terrestrial fiber networks by introducing the potential benefits of optical time and frequency networks, such as the pan-European network pursued by GÉANT. R&D efforts can greatly benefit from better time and frequency references, as well as the techniques developed to transfer time and frequency signals over long-haul fibers.

The final session of January 25th focused on a diverse range of use cases. Catarina Bastos (Deimos) kicked off the session with a discussion of QKD networks in the context of military applications that are analyzed as part of the Discretion project. Second, Piotr Rydlichowski (Poznan Supercomputing and Networking Center) reported on a QKD network deployed to secure the communication between data centers dedicated to high performance computing. The network started with a connection between data centers in Poznań and was extended to cross-border links between multiple HPC centers. Laura Ortiz (UPM) continued with the computation of phylogenetic trees built from secure multiparty computation (SMPC) enable by quantum oblivious transfer. SMPC enables privacy-sensitive applications working on human genome data without risking the privacy of individuals. The last two presentations of the day focused on applications of quantum-secure cryptography in the context of network operators. Cathy White (BT) presented the deployment of hybrid QKD/PQC networks to provide end-to-end secure communication services to customers in London's metropolitan area. With this test network, customers were enabled to explore the integration of these new services and evaluate the compliance with information security policies. Paul Spooren (HS Nordhausen) closed the session with a talk on securing the Border Gateway Protocol (BGP) which defines the routing between autonomous systems whereas BGP hijacking may lead to manipulated routes on the Internet. After discussing the security issues of the protocol, he went into depth on securing deployments of BGP with QKD and PQC.



Figure 8: Impression of the event.

The last day was kicked off with QKD in space. Paolo Villorosi (Università degli Studi di Padova) discussed QKD on a large scale to link European capitals being 4000 km apart, or remote islands. Besides traditional space-to-ground and inter-satellite links, QKD can serve new applications, as for example Precision Time Facilities. Deirdre Kilbane (Walton Institute) elaborated on the feasibility of satellite QKD and the actual implementation challenges when establishing optical channels. Simulation tools are in development to predict QKD availability based on cloud cover and local weather, paired with satellite visibility, taking into consideration different protocols and specific system architectures such as those building on adaptive optics. George Kanellos (University of Athens) reported on the integration of optical ground stations in the terrestrial HellasQCI segment. He highlighted the findings on optimal OGS sites in the context of EuroQCI, which favor Mediterranean deployment scenarios. Still, he concluded: „we all need more space.“ Thomas Scheidl (qtlabs) provided a space-QKD supplier perspective and discussed the degrees of freedom when choosing the optimal protocol and source implementation for either prepare and measure or entanglement-based schemes. He further highlighted the implications when choosing between fiber-coupled and free-space coupled OGS. Thomas Bäumer (SES) reported on the state-of-play concerning EAGLE-1. Originating from QUARTZ' BB84 decoy-state phase encoded protocol, Europe's first satellite QKD system will conduct in-orbit validation of an end-to-end system. Services are evaluated with member-states in the EuroQCI framework. He invited interested consortia to join the effort. Francesco Vedovato (Università degli Studi di Padova) topped the space-dominated free-space session with a flavor of terrestrial FSO QKD. These „horizontal“ links play a critical role for relocatable or mobile QKD deployments.

The next session focused on aspects of certification of QKD devices. Tobias Hemmert (Bundesamt für Sicherheit in der Informationstechnik (BSI)) presented a report by BSI on implementation attacks and highlights some open challenges for the community including research on further attacks, assessing the effectiveness of countermeasures and gaining more practical attack experience. Guntram Wicke (DT) gave a high-level overview on the certification process including the structure of a protection



profile and the assurance requirements for Common Criteria certification. Notably, Guntram also highlighted current gaps in the evaluation ecosystem for QKD devices. Hannes Gross (SGS Brightsight) went into the details of the certification process. From picking a certification scheme to the evaluation including reviews, vulnerability assessment, developing and executing test plans, QKD suppliers need to be prepared to engage in an extensive multi-stage process for certification. Portuguese Rear-Admiral António Gameiro Marques gave an impressive talk on the importance of a European supply chain. Chips, operating systems, major software components, and cloud services are all essential components in today's digital world. European suppliers are thus essential to regain sovereignty. Finally, Felix Wissel (DT) presented the project Nostradamus. The goal of the project is to provide a blueprint for a testing & validation infrastructure to close the gap in the certification of QKD devices.



Figure 9: Impression from the event

The final session went beyond the technical aspects. Kurt Zatloukal (Medical University of Graz) kicked off this session on cyber-security in the context of biological risk management. Especially when working on highly sensitive pathogen sequence data, secure communication and storage of the data is of utmost importance. Lukas Mairhofer (qtlabs) reported on teaching programs to train quantum engineers at Fachhochschule Technikum Wien and the establishment of a Quantum Academy supported by the QCI-CAT project, aiming both at empowering decision makers and retraining the workforce. Martin Latzenhofer and Stefan Schauer (both AIT) had the honor to close the session and the program with a talk on the risk assessment of quantum communication technologies. Possible scenarios in four risk areas - operation & services, knowledge & experts, components & resources and regulation & policies - need to be evaluated and mitigation and countermeasures should be considered.



Figure 10: Impression from the event

2.3. Pitches, Posters, and Exhibition

All national and industry projects were contacted to present their work at QCI Days. DEP-1 and DEP-2 projects were both invited to present their work, results, and products in 90 second pitches. DEP-2 projects were also invited to present a poster. From the six industrial projects, all were present at QCI Days. From the 26 national projects, Be-QCI (Belgium), CroQCI (Croatia), CZQCI (Czech Republic), EstQCI (Estonia), FranceQCI (France), IrelandQCI (Ireland), Lux4QCI (Luxembourg), NQCIS (Sweden), PIONIER-Q (Poland), PTQCI (Portugal), PRISM (Malta), QCI.DK (Denmark), QUID (Italy), HellasQCI (Greece), QCIned (The Netherlands), RoNaQCI (Romania), QCIHungary (Hungary) and EuroQCI-SPAIN (Spain) were present.

Additionally, we invited QKD suppliers to also pitch their products. QuIC, Q-Bird, PETRUS, Quantum Industries, QND, Quantum Optics Jena, Quside, ThinkQuantum, ID Quantique, Toshiba Europe, QTI, Single Quantum, X-Net, QoolNET, KETS Quantum, fragmentiX, qtlabs, KEEQuant, QuantLR, LuxQuanta, Mercury, CANCOM and dacoso pitched and also manned booths in the exhibition area.

2.4. PETRUS Open Forum

After the closing of the official program of the QCI Days, we invited PETRUS to host an open forum. With many of the projects represented in Vienna with at least one participant, they were able to discuss open issues and ongoing work with Keith Elder and Felix Wissel from PETRUS. About 50 people used this opportunity to engage with PETRUS.

2.5. Interviews and Event Videos



During the QCI-Days Vienna 2024, interviews were conducted that are going to be used for (1) an “event movie” on the actual QCI Days 2024 event and (2) for longer movie on the broader topic of EuroQCI. All interviews were captured by an external film contractor. For the first video, Hannes Hübel (AIT), Ilias Papastamatiou (GRnet), Vicente Martin (UPM), and Catarina Bastos (Deimos) were interviewed and provided short statements related to the QCI Days event series. The second video features interviews with Laurent Olislager (EC), Simone Capeleto (QuiC and ThinkQuantum), Rupert Ursin (qtlabs), Valerio Pruneri (ICFO), Georgos Kanellos (University of Athens), Niklas Lindman (ESA), Felix Wissel (DT), Helmut Leopold (AIT), Deirdre Kilbane (Walton Institute), Ingrid Romjin (Q*Bird), Désirée Ehlers (BMK), and Martin Stierle (AIT) for short statements on the general topic of European QCI.

Both videos are currently in post-production and will be released on QCI-CAT social media channels and the website in Q2 2024.



QCI DAYS VIENNA 2024

AGENDA

Venue:
Haus der Industrie
(Federation of Austrian Industries)
Schwarzenbergplatz 4, Vienna

Thursday, 25.01.2024 – QCI Days | Day 1

Moderation: Stefan Schauer (AIT Austrian Institute of Technology)

09:00-10:00	Registration & Coffee
10:00-10:10	Opening Helmut Leopold (Head of Center for Digital Safety & Security, AIT Austrian Institute of Technology)
10:10-10:40	Overview EuroQCI <i>Quantum communication in the EU – EuroQCI: State of Play</i> Laurent Olislager (European Commission - DG CNECT) <i>SAGA Project Overview and Status</i> Niklas Lindman (ESA European Space Agency) EuroQCI Coordination and Support Action “PETRUS” Keith Elder (Deutsche Telekom)
10:40-11:40	Quantum Communication in the Quantum Flagship <i>QSNP – Quantum Secure Networks Partnership</i> Valerio Pruneri (ICFO The Institute of Photonic Sciences) <i>QIA – Quantum Internet, the next step!</i> Stephan Ritter (TOPTICA Photonics) <i>Qu-Test – Supporting open Testing and Experimentation for Quantum Technologies</i> Alessandro Trenti (AIT Austrian Institute of Technology) <i>Qu-Pilot – Experimental Production Capabilities for Quantum Technologies</i> Mika Prunnila (VTT Technical Research Centre of Finland) <i>QUCATS – Coordinating the European Efforts in Quantum Technologies</i> Yasser Omar (PQI – Portuguese Quantum Institute) <i>QuIC – European Quantum Industry Consortium</i> Simone Capeleto (European Quantum Industry Consortium) <i>How to build a QCI Ecosystem</i> Jesse Robbers (Quantum Delta NL)
11:40-12:10	Panel Discussion: Quantum Communication in Europe Moderation: Hannes Hübel (AIT Austrian Institute of Technology) Laurent Olislager (European Commission - DG CNECT) Niklas Lindmann (ESA European Space Agency) Keith Elder (Deutsche Telekom) Valerio Pruneri (ICFO The Institute of Photonic Sciences) Stephan Ritter (TOPTICA Photonics) Yasser Omar (PQI – Portuguese Quantum Institute) Simone Capeleto (European Quantum Industry Consortium) Jesse Robbers (Quantum Delta NL)



Figure 11: Agenda of the first European day



Thursday, 25.01.2024 – QCI Days | Day 1

12:10-12:35

Supplier Pitches

LuxQuanta (Sergi Vizcaino)
KEEQuant (Ulrich Eismann)
Q-Bird (Ingrid Romijn)
QTI Quantum Telecommunications Italy (Alessandra Matteis)
ThinkQuantum (Simone Capallete)
Quantum Industries (Felix Tiefenbacher)
ID Quantique (Gregoire Ribordy)
Toshiba Europe (Lee Johnson)
QuantLR (Nir Bar Lev)
KETS Quantum (Tom Crabtree)
qtlabs (Manuel Erhard)
fragmentiX Storage Solutions (Werner Strasser)

12:35-14:00

Lunch & Exhibition & Posters

14:00-14:20

Supplier Pitches

Quside (Carlos Abellan)
Single Quantum (Aliko Athanasiadou)
Quantum Optics Jena (Kevin Fuchsel)
QoolNET (Juan Pedro Brito)
Mercury Cybersecurity (André Xuereb)
QND - Quantum Network Design (Wolfgang Dür)
X-Net (Nikolaus Dürk)
CANCOM (Tobias Huemer)
dacoso (Christian Cehovin)
QDynamics (Aida Garcia)

14:20-14:30

Digital Europe Programme Pitches | DEP 1

eCausis (Anna Kaminska)
MDI-QUEEN (Ingrid Romijn)
QKISS (Baptiste Gouraud)
QUARTER (Marco Cofano)
SECRET (Imran Khan)
EQUO (Alessandro Zavatta)

14:30-15:20

QKD Networks and Architecture

Towards Large Scale SDN Quantum Networks
Vicente Martin (UPM Technical University of Madrid)

Exploring Cutting-Edge Architecture Developments for QKD Networks
Christoph Striecks (AIT Austrian Institute of Technology)

Hybrid Post-Quantum and QKD Protocols
Ludovic Perret (Sorbonne University)

Quantum Communications Between Neighbouring Countries for Real-world Use-cases
Alessandro Zavatta (QTI Quantum Telecommunications Italy)

Optical Fiber Backbones for Simultaneous Quantum Communication and Time / Frequency Distribution
Tara Liebisch (PTB Physikalisch-Technische Bundesanstalt)

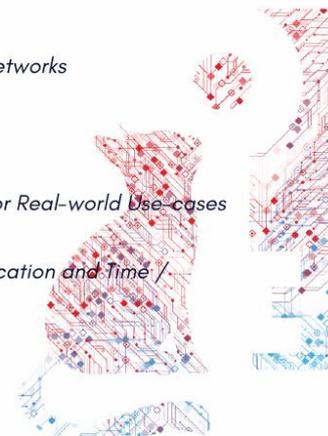


Figure 12: Agenda of the first European day



Thursday, 25.01.2024 – QCI Days | Day 1

15:20-15:50

Panel Discussion: QKD Networks and Architecture

Moderation: Sebastian Ramacher (AIT Austrian Institute of Technology)

Vicente Martin (UPM Technical University of Madrid)
Christoph Striecks (AIT Austrian Institute of Technology)
Ludovic Perret (Sorbonne University)
Tara Liebisch (PTB Physikalisch-Technische Bundesanstalt)
Alessandro Zavatta (Quantum Telecommunications Italy)

15:50-16:00

Digital Europe Programme Pitches | DEP 2

Portugal – PTQCI (Catarina Bastos)
Ireland – IrelandQCI (Deirdre Kilbane)
Sweden – NQCIS (Vashali Adya)
Estonia – EstQCI (Ingrid Linnas)
Romania – RoNaQCI (Bogdan Ciobanu)
Malta – PRISM (Johann Briffa)

16:00-16:30

Coffee Break & Exhibition & Posters

16:30-16:40

Digital Europe Programme Pitches | DEP 2

France – FranceQCI (Julien Leger)
Belgium – Be-QCI (Giacomo Carrara)
Luxembourg – Lux4QCI (Jorge Luis González Rios)
The Netherlands – QCINed (Jesse Robbers)
Denmark – QCI.DK (Dev Null)
Poland – PIONIER-Q (Piotr Rydlichowski)

16:40-17:30

Use Cases and Deployments

DISCRETION: an SDN enabled by QKD for military applications
Catarina Bastos (Deimos)

QKD for High Performance Computing and Datacenter Environments
Piotr Rydlichowski (Poznan Supercomputing and Networking Center)

Quantum Enabled Private Recognition of Composite Signals in Genome
Laura Ortiz (UPM Technical University of Madrid)

Deploying Quantum Networks at BT
Catherine White (BT Group)

Securing Border Gateway Protocol with QKD and PQC
Paul Spooren (HS Nordhausen)

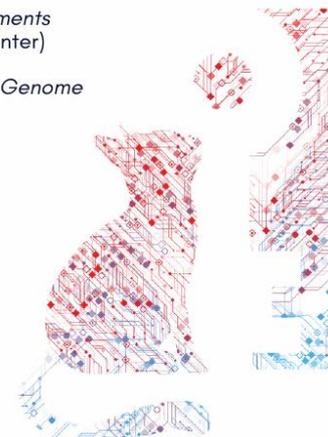


Figure 13: Agenda of the first European day



Figure 14: Agenda of the first European day



QCI DAYS VIENNA 2024

AGENDA

Venue:
Haus der Industrie
(Federation of Austrian Industries)
Schwarzenbergplatz 4, Vienna

Friday, 26.01.2024 – QCI Days | Day 2

Moderation: Stefan Schauer (AIT Austrian Institute of Technology)

09:00-09:30

Registration & Coffee

09:30-10:30

Satellite and Free-Space QKD

History of Quantum Communication in Space
Paolo Villorresi (University of Padua)

Feasibility of Satellite QKD
Deirdre Kilbane (Walton Institute)

Ground Stations and Satellite Payloads
Thomas Scheidl (qtlabs)

OGS Integration in the HellasQCI Terrestrial QKD Segment in the Framework of EUROQCI
George Kanellos (University of Athens)

EAGLE-1 - State of Play
Thomas Bäumer (SES Techcom)

Free-Space QKD over Horizontal Links
Francesco Vedovato (University of Padua)

10:30-11:00

Panel Discussion: Satellite and Free-Space QKD

Moderation: Marie-Christine Slater (AIT Austrian Institute of Technology)

George Kanellos (University of Athens)
Deirdre Kilbane (Walton Institute)
Francesco Vedovato (University of Padua)
Thomas Scheidl (qtlabs)
Paolo Villorresi (University of Padua)
Thomas Bäumer (SES Techcom)

11:00-11:30

Coffee Break & Exhibition & Posters



Figure 15: Agenda of the second European day



Friday, 26.01.2024 – QCI Days | Day 2

11:30-12:20

Certification: From Protection Profiles to Accredited QKD

Technical Report on Implementation Attacks against QKD Systems
Tobias Hemmert (BSI Bundesamt für Sicherheit in der Informationstechnik)

Roadmap for Certification
Guntram Wicke (Deutsche Telekom)

Certification in Practice
Hannes Gross (SGS)

The impact of Quantum Technologies for the Digital Sovereignty of EU
António Gameiro Marques (NSA Portugal)

Nostradamus - EuroQCI Testing and Evaluation Infrastructure
Felix Wissel (Deutsche Telekom)

12:20-12:50

Panel Discussion: Certification

Moderation: Martin Stierle (AIT Austrian Institute of Technology)

Tobias Hemmert (BSI Bundesamt für Sicherheit in der Informationstechnik)
Guntram Wicke (Deutsche Telekom)
Hannes Gross (SGS)
António Gameiro Marques (NSA Portugal)
Felix Wissel (Deutsche Telekom)
Werner Strasser (fragmentiX Storage Solutions)

12:50-13:20

Impact of Quantum Technologies on Society

Cybersecurity meets Biosecurity
Kurt Zatloukal (Medical University of Graz)

Education for Quantum Engineers
Mira Maiwöger (University of Applied Sciences, FH Technikum Wien)

Quantum Technologies - A Risk Assessment Perspective
Stefan Schauer and Martin Latzenhofer (AIT Austrian Institute of Technology)

13:20-13:30

Closing QCI Days Vienna 2024

13:30-14:30

Lunch & Exhibition & Posters

14:30-16:00

PETRUS Open Forum

Exclusively for DEP 1 & DEP 2 Projects

Funded by the European Union and the National Foundation for Research, Technology and Development under the Project Number: 101091642



Organised by the consortium of the national EuroQCI project "QCI-CAT"



Figure 16: Agenda of the second European day



CONFIRMED EXHIBITORS & PROJECT PRESENTATIONS & POSTERS

Confirmed projects from the Digital Europe Programme DEP 1

MDI-QUEEN

SECRET

QKISS

eCausis

EQUO

QUARTER

Confirmed projects from the Digital Europe Programme DEP 2

Be-QCI (Belgium)

EstQCI (Estonia)

Lux4QCI (Luxembourg)

CroQCI (Croatia)

FranceQCI (France)

NQCIS (Sweden)

CZQCI (Czech Republic)

IrelandQCI (Ireland)

PIONIER-Q (Poland)

PTQCI (Portugal)

QCI-CAT (Austria)

QUID (Italy)

PRISM (Malta)

QCI.DK (Denmark)

HellasQCI (Greece)

QCINed (The Netherlands)

RoNaQCI (Romania)

QCIHungary (Hungary)

EuroQCI-SPAIN (Spain)

Confirmed projects from the Quantum Flagship

QSNP

Qu-Test

Qu-Pilot

QUCATS

QIA

Confirmed Exhibitors in the Showroom & Supplier Pitches

QulC

ThinkQuantum

KETS Quantum

Q-Bird

ID Quantique

fragmentiX

PETRUS

Toshiba Europe

qtlabs

Quantum Industries

QTI

KEEQuant

QND

Single Quantum

QuantLR

Quantum Optics Jena

X-Net

LuxQuanta

Quside

QoolNET

Mercury

CANCOM

dacoso

Meet the Coordination and Support Action (DEP 3) project "PETRUS" and join the Open Forum on the third day.



Figure 17: Agenda of the second European day



2.6. Media Coverage

QCI Days Vienna 2024 was covered by various national media outlets and press releases.

- AIT published a press release with statements from Christoph Neumayer, general secretary of the Federation of Austrian Industries, Georg Niklfeld from the Austrian funding agency FFG, Désirée Ehlers from the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, Andreas Kugi and Brigitte Bach, managing directors of AIT, and Helmut Leopold, head of center of Digital Safety & Security at AIT. The press release is available online at [APA OTS](#).



Quantentechnologie: Wie man einen Vorsprung verspielt



Österreich ist bei Quantentechnologie gut aufgestellt. Den Vorsprung durch die starke Grundlagenforschung droht man aber zu verlieren

Von **Patrick Dax** 29.01.24, 05:00

Figure 18: Screenshot from Kurier's article

- Kurier, an Austrian daily newspaper, published an article covering the national day as well as the quantum technology landscape in Austria. It also featured statements from fragmentiX's CEO Werner Strasser. The online version of the article is available on Kurier's [website](#) (behind a paywall). The article was also published in the printed edition on January 29th, 2024.



🕒 19. Februar 2024 👤 Wolfgang Franz ✉️ 👍

Quantenmechanik am AIT: „Wir lassen die Katze lieber in der Box“

Die ITWELT.at sprach im Rahmen des QCI Days Vienna 2024 mit Dr. Hannes Hübel, Senior Scientist und Leiter der Forschungsgruppe "Optical Quantum Technologies" im Center for Digital Safety & Security am AIT Austrian Institute of Technology.

Figure 19: Screenshot from ITWELT.at's article

- ITWELT.at, which is a print and online medium focusing on information technologies and communication, interviewed Hannes Hübel from AIT on the state of quantum technologies and specifically quantum communication in Austria. The article is available [online](#).
- Finally, the Federation of Austrian Industries reported on the event in the magazine for their members. The article is available [online](#).

The talks and panel discussions of the national day have also been covered on QCI-CAT's LinkedIn account. Attendees, speakers and exhibitors also posted some impressions the event. The posts are tagged with the hash tags [#QCIDays](#) and [#QCIDaysVienna2024](#).

2.7. Addressed target groups and attendance

As can be observed from the discussion above, the national and the European event addressed the following target groups (cf. [1]):

- Research community: QCI Days provided a discussion forum to exchange ideas, discuss scientific challenges and results with suppliers, SMEs and the industry.
- SMEs and large industries: The event provided room to present quantum secure communication solutions to authorities, experts from cyber security and representatives from SMEs and large industries that are not specifically working in quantum communication technologies but could be future business-to-business customers.
- Authorities and policy makers: results and ongoing plans of the ongoing EuroQCI initiative and QCI-CAT have been presented to raise awareness of these efforts. Also, stakeholders such as Austrian ministries, the European Commission, ESA, and authorities were invited to present their needs for establishing quantum secure communication and the specific challenges they face.
- Citizens: the media was invited to report on the event.

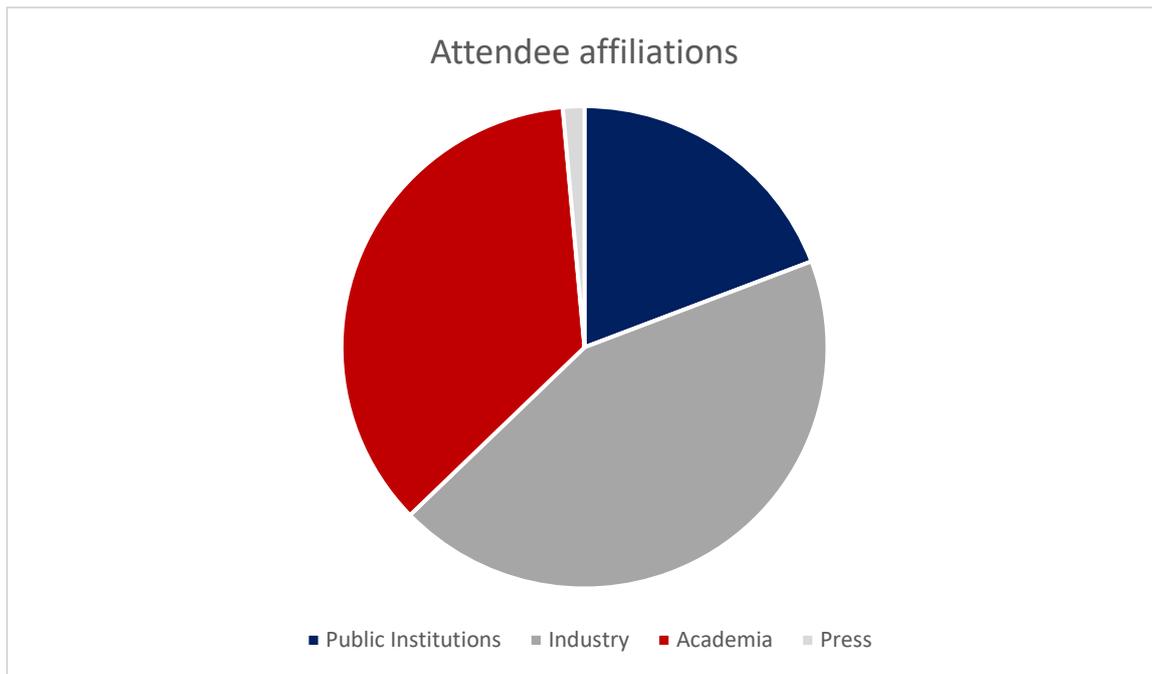


Figure 20: Attendee distribution per affiliation

In total about 350 attendees were registered for QCI Days 2024 in Vienna. About 19.1% of the attendees were from public institutions (ministries, European Commission, ESA, agencies, etc), 43.4% from SMEs and the industry, 35.7% from academia (RTOs and universities) and the remaining attendees were from media and others. 57.1% of the attendees were Austrian, 7.7% from Germany and around 4% from France, Italy, Spain and Netherlands each (cf. Figure 22).

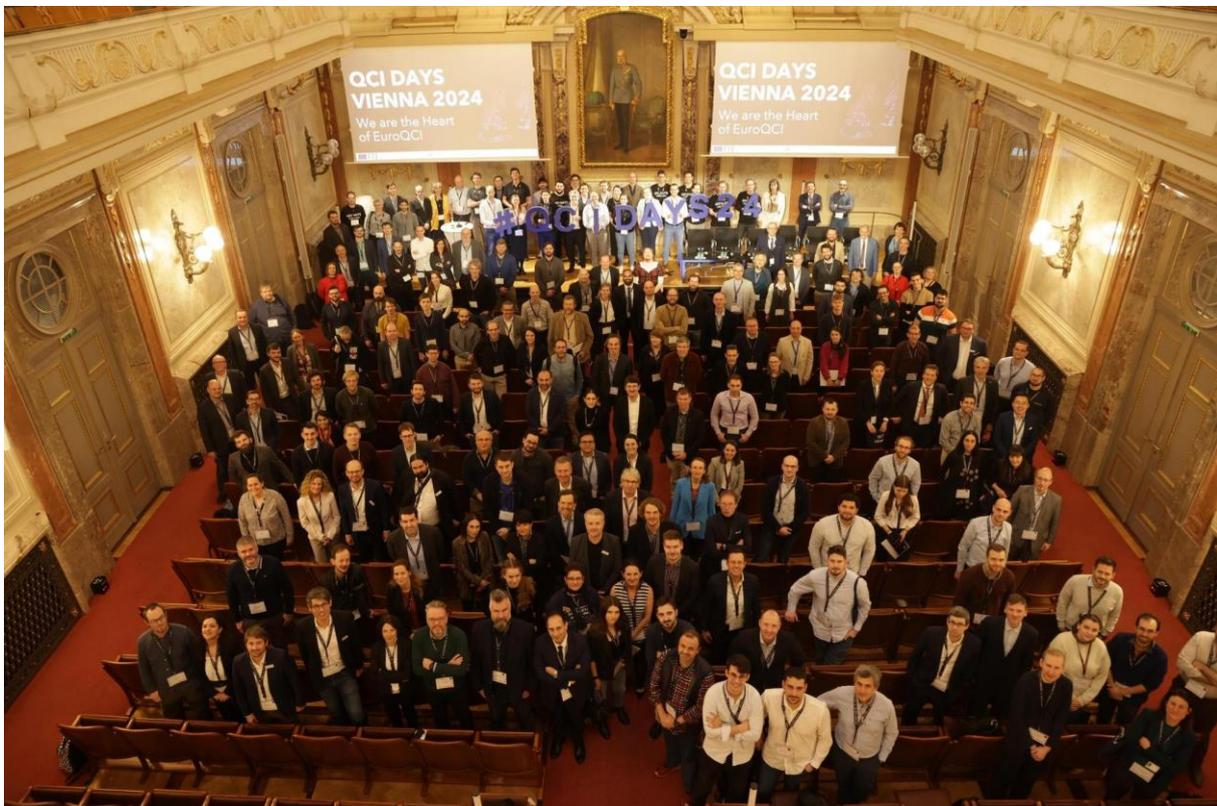


Figure 21: Group picture of the attendees on January 25th, 2024



3. QCI Days Athens 2025

To continue the success of QKD Days Madrid 2022 and QCI Days Vienna 2024, discussions for a follow-up event was started between AIT and the coordinators and dissemination leaders of the national projects in Greece (HellasQCI), Spain (EuroQCI-Spain) and Portugal (PTQCI). The four projects agreed to organize the follow-up event in Athens in May or June 2025. The event will be hosted by HellasQCI and will be held under the auspices of the Hellenic Ministry of Digital Governance. It will serve as a platform for participants – the national and industrial projects of the EuroQCI initiative as well as European QKD suppliers – to showcase their projects and products and to discuss insights from the national QCI deployments and the evaluation of their use cases. Attendees will be able to expect an interesting program that highlights the European achievements in the area of quantum secure communication infrastructures and will also foster the close collaboration between the European partners to work together on tackling the next step in lifting the national networks to an European scale by establishing cross boarder links.

Athens, Greece

QCI DAYS ATHENS 2025

*EuroQCI ConneXions:
The heart of Quantum Communications
beats in Greece!*

Stay tuned

Organised by
HOC CAT PTQCI EUROQCI SPAIN

Under the auspices of
HELLENIC REPUBLIC
Ministry of Digital Governance

Hosted by
grnet AIT ICFO deimos

Figure 24: Promotional figure for QCI Days Athens 2025



The event was announced at QCI Days Vienna 2024 and a [website](#) was set up. The website will serve as main entry point for participants and will provide updates on the organization of the QCI Days Athens 2025. An initial registration form was also added to the website which will be used to inform interested partners on the location, program and more. As of March 2024, 38 people have registered to receive updates.



Appendix A - List of Acronyms

- QKD - Quantum key distribution
- PQC - Post-quantum cryptography



Appendix B – Bibliography

[1] QCI-CAT Consortium, „D10.2: Dissemination, communication and exploitation plan,“ 2023.