# Webinar

 $| \underline{\text{research}} \rangle \otimes | \underline{\text{innovation}} \rangle + | \underline{\text{innovation}} \rangle \otimes | \underline{\text{research}} \rangle$ 

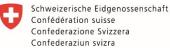
# Swiss-Danish Matchmaking in Quantum

6 May 2025



#### Organised by





Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI



#### **Partners**













#### **Status of Switzerland in Horizon Europe 2021–2027**

Swiss-EU relations: Federal Council approves definitive negotiating mandate

Press release, 08.03.2024

President Amherd and European Commission president Ursula von der Leyen open negotiations between

Switzerland and the EU

Press releases, 18.03.2024

Federal Council takes note of substantive conclusion of Swiss–EU negotiations

Press release, 20.12.2024

#### Switzerland and EU initial agreement on programmes

Press release, 02.04.2025



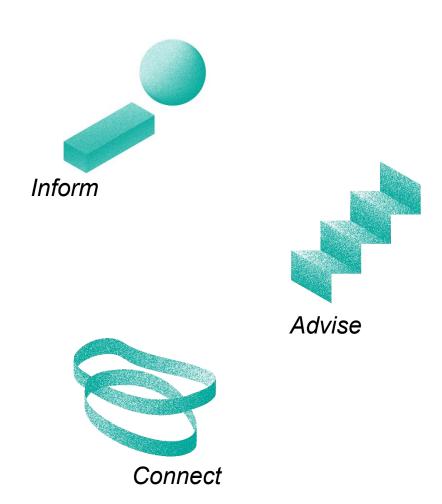
#### Switzerland–EU: Federal Council approves EU Programmes Agreement

Bern, 10.4.2025 - At its meeting on 9 April 2025, the Federal Council approved the EU Programmes Agreement (EUPA) along with the associated protocols on education, research, innovation and health. It also authorised Federal Councillor Guy Parmelin to sign the agreement. Signature of the EUPA will enable Swiss association in Horizon Europe, the Euratom programme and the Digital Europe Programme to be applied retroactively from 1 January 2025. The agreement will come into effect following ratification of the Switzerland-EU package

#### **Euresearch Network**



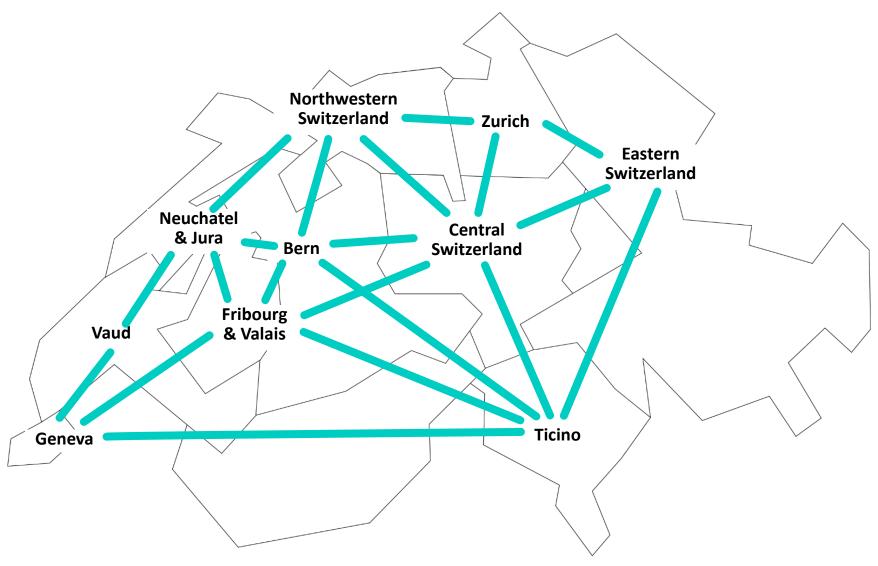




4 <u>www.euresearch.ch</u>







## Participation Possibilities for Swiss Organisations





Regular updates from State Secretariat for Education Research Innovation (SERI)

Associated to be to Horizon Europe

Swiss entities can apply as

Beneficiaries in all 2025 calls

Status check / shift at Grant Agreement signature

Funding guaranteed

(either from EC or SERI)

27-02-2025







6 27-02-2025





Role	Beneficiary	Associated Partner
Active role in the project	X	X
Leading Work Packages	Х	X
Sign the Grant Agreement with the EC	Х	
Sign the Consortium Agreement	Х	Х
Tasks and activities clearly described in the proposal and project description	X	Х
Project coordination	Х	

27-02-2025

#### Euresearch Network Is Here to Support You





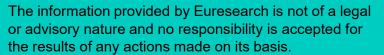
Free services

Offices in all the Swiss regions Subscribe to stay informed on the latest R&I opportunities

8 27-02-2025

# Contact the Specialists on Swiss Participation in Horizon Europe!

info@euresearch.ch



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# Marie Skłodowska-Curie Actions (MSCA)

**Doctoral Networks & Staff Exchanges** 

'Let's entangle '-6th May 2025

Lea Motzfeldt – MSCA National Contact Point (NCP)



#### **Horizon Europe**

Budget: € 95.5 billion (2021-2027)



Exclusive focus on civil applications



**European Research Council** 

Marie Skłodowska-Curie

€ 6.6 billion

Research Infrastructures



Clusters

#### Pillar II

GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS

- Health
- Culture, Creativity & Inclusive Society
- · Civil Security for Society
- Digital, Industry & Space
- · Climate, Energy & Mobility
- Food, <u>Bioeconomy</u>, Natural Resources, Agriculture & Environment

Joint Research Centre



European Innovation Council

European Innovation Ecosystems

European Institute of Innovation & Technology\*

#### WIDENING PARTICIPATION AND STRENGTHENING THE EUROPEAN RESEARCH AREA

Widening participation & spreading excellence

Reforming & Enhancing the European R&I system

<sup>\*</sup> The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

# **Types of MSCA actions**

#### Doctoral Networks

Doctoral programmes in and outside academia incl. joint & industrial doctorates

# Postdoctoral Fellowships

Support to excellent postdoctoral researchers

#### Staff Exchanges

Support for research and innovation staff exchanges

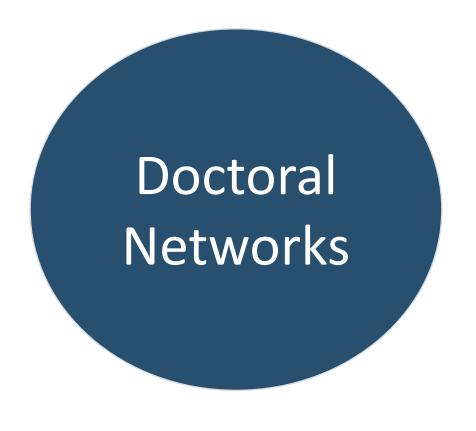
#### COFUND

Co-funding doctoral and postdoctoral programmes

# MSCA and Citizens

Public outreach events (Night)





#### **Call 2025**

Opened: 28 May 2025

Deadline: 25 November 2025

Budget: 458.66 million Euro

A research training programme for PhDs set up by partnerships of organisations

International, intersectoral, interdisciplinary.

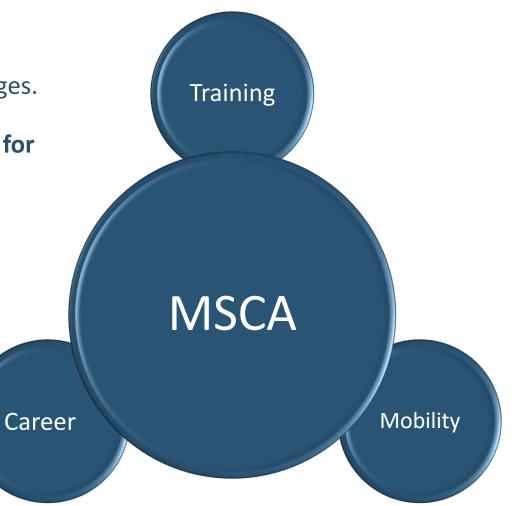
# **Objectives of Doctoral Networks**

• To train creative, entrepreneurial, innovative and resilient doctoral candidates, able to face current and future challenges.

 To convert knowledge and ideas into products and services for economic and social benefit.

 Developing new knowledge and skills through research and mobility across borders, sectors and disciplines.

• Supporting excellent **bottom-up** research and innovation projects.



# Participation criteria - beneficiaries

- Minimum three organisations from three different Member States (MS) or Associated Countries (AC). Min. one from a MS.
- Participation from third countries possible
  - If from low/middle income countries automatically eligible for funding (general annexes) as beneficiaries
- Other participants as Associated Partners

# Participation criteria – PhDs

- Doctoral candidates i.e. not already in possession of a doctoral degree at the date of the recruitment.
- Can be of any nationality, but...
- Mobility criteria: candidates must not have resided or carried out their main activity (work, studies, etc.) in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their recruitment date.

# **Funding**

# A country correction coefficient of 132,8 % applies to the living allowance for DK Gross amount and 163,8% for CH

MSCA Doctoral Networks	Contributions for recruited researchers  per person-month			Institutional unit contributions  per person-month			
	Living allowance	Mobility allowance	Family allowance (if applicable)	Long- term leave allowance (if applicable)	Special needs allowance (if applicable)	Research, training and networking contribution	Management and indirect contribution
	EUR 4010	EUR 710	EUR 660	EUR 4720 x % covered by the beneficiary	requested unit <sup>125</sup> x (1/number of months)	EUR 1600	EUR 1200

# Important documents

European Commissions's information event on Doctoral Networks 2025 call - 24.06.2025

- MSCA Work Programme
- <u>Funding & Tenders</u> (guide for applicants, application, evaluation form etc.)
- Guidelines on Supervision
- MSCA Green Charter
- MSCA Library | Horizon Europe NCP Portal Doctoral Networks Handbook by the NCP RADIANCE project





#### **Call 2025**

Opened: 27 March 2025

Deadline: 8 October 2025

Budget: 97.71 million Euro

A consortium of organizations from different countries and sectors proposes a joint exchange project, based on a common, existing, or upcoming research project.

# **Objectives of Staff Exchanges**

- International, inter-sectoral and interdisciplinary mobility of R&I staff
- Knowledge transfer between participating organisations
- Collaboration between the academic and non-academic sectors (including SMEs)
- Cooperation across the globe

## **Participation criteria**

- Consortium of min. 3 legal entities in 3 different countries
  - 2 of which in a different EU Member State or HE Associated Country
  - The maximum duration of the project is 48 months from the starting date set out in the grant agreement (maximum 360 person months per project)
  - Staff who are already employed in the organisations can be sent on exchange for 1 month to 12 months.

#### Eligibility for EU funding of secondments between organisations

"SENDING"

members

#### "HOSTING" (receiving seconded staff members)

Academic organisation Non-academic organisation Associated Partners Associated Partners in MS/AC (1) in MS/AC (2) eligible for funding non-eligible for funding Academic organisation in MS/AC (1) Non-academic organisation (sending staff in MS/AC (2) from organization) Associated Partners\* eligible for funding Associated Partners non-eligible for funding

This symbol refers to same sector secondments up to 1/3 of the total implemented secondments funded by the EU as long as they are demonstrated to be interdisciplinary.

Associated Partners eligible for funding (see List of Participating Countries in Horizon Europe)

# **Funding**

MSCA Staff Exchanges	Contributions for seconded staff members  per person-month		Institutional contributions  per person-month	
	Top-up allowance	Special needs allowance (if applicable)	Research, training and networking contribution	Management and indirect contribution
	EUR 2710	requested unit <sup>147</sup> x (1/number of months)	EUR 1300	EUR 1000

# **Important documents**

**European Commissions' information event on Staff Exchange** 

- MSCA Work Programme
- <u>Funding & Tenders</u> (guide for applicants, application, evaluation form etc.)
- MSCA Library | Horizon Europe NCP Portal Staff exchange Handbook by the NCP RADIANCE project

# **EuroCenter – DK Contact Points (NCPs) for Horizon Europe**

- Guidance on opportunities, rules and procedures in Horizon Europe, incl. Guidance on application and project implementation
- Webinars, information meetings etc.
- Publications and data analyses
- 'EU-DK Support', a national network of EU advisors
- Website: <u>Horizon Europe</u> <u>English</u>
- National Contact Points for MSCA in Denmark

#### **NCP Services**

In general, the following basic services are available in accordance with the NCP Guiding Principles agreed by all countries:

- Guidance on choosing relevant Horizon Europe topics and types of action
- 2. Advice on administrative procedures and contractual issues
- Training and assistance on proposal writing
- Distribution of documentation (forms, guidelines, manuals etc.)
- Assistance in partner search

As the NCPs are national structures, the type and level of services offered may differ from country to country.

#### National Contact Points for MSCA in Switzerland

msca@euresearch.ch www.euresearch.ch/msca



Dr Marco Cavallaro
Dr Isabelle Spühler
Dr Manuel Bianco



# Horizon Europe: EIC Pathfinder and Transition Programme

Cornelia Spycher

National Contact Point for EIC Pathfinder & Transition

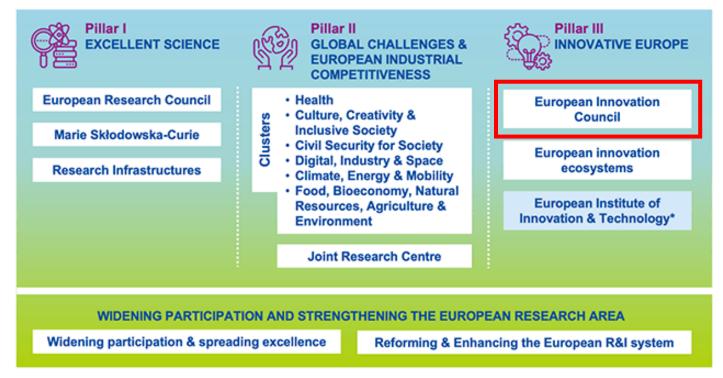
**Euresearch Switzerland** 

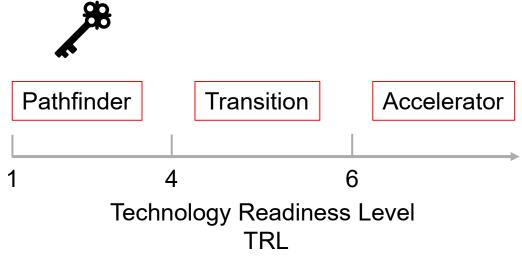
#### euresearch

Swiss guide to European research and innovation



#### 2021-2027



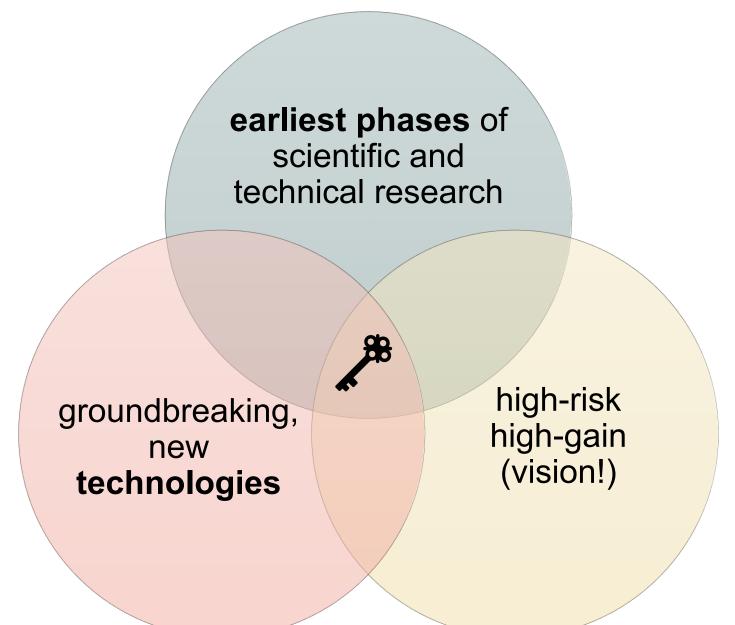


EIC Work programme 2025 [link]

28 19.05.2025











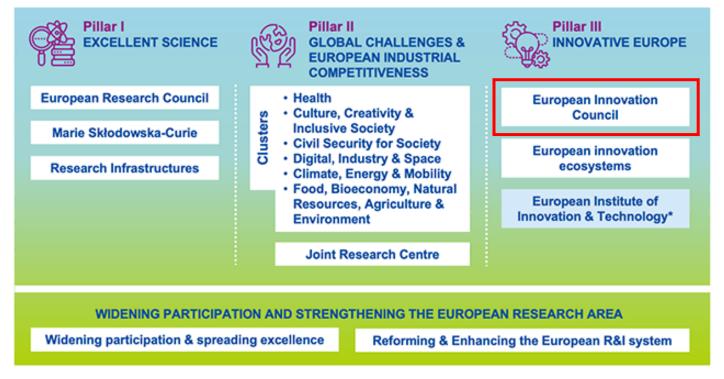


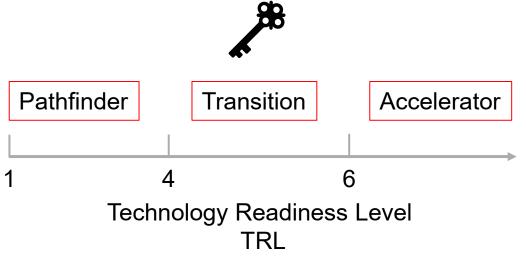


	Open [link to call] Challenges [link]		
	any field of science, technology or application	predefined thematic areas	
TRL mio EUR	<b>1-4</b> 3	1-4	
Consortium	or more	i ii or more	
Deadline	21 May 2025	29 October 2025	
Application	20 pages	30 pages 19.05	



#### 2021-2027





32

## **EIC Transition Programme**



- EU-funded project result(s) with promising commercial potential?
   See <u>here</u> the list of eligible projects for EIC Transition call 2025
  - technology ready for "next steps"?
  - done preliminary market research?
  - envisage building motivated and entrepreneurial team ?

4x YES? EIC Transition!

33

# How To Apply



	Open [link to call]	
	projects in <b>any field of science</b> , technology or application	
TRL	3/4 - 5/6	
mio EUR	2.5	
Consortium	max 5	
Deadline	17 September 2025	
Application	22 pages	

34 19.05.2025

Got Questions?

CH: pathfinder@euresearch.ch

transition@euresearch.ch

DK: Emma Emilie Højer Winther ehw@ufm.dk

35



Federal Department of Economic Affairs, Education and Research EAER State Secretariat for Education, Research and Innovation SERI

Swiss Confederation

#### Horizon Europe funding opportunities for

⟨ quantum ⟩

Danish – Swiss Matchmaking on Quantum in Horizon Europe 6 May 2025

martin.kern@sbfi.admin.ch

## $let's \ entangle \ | \underline{{}^{||}} \underline{{}^{||}}$







## HORIZON-2025-CL4 ...with some quantum dots

#### **Outline**

- 1. The CL4 work programme 2025
- 2. (almost) all accessible for CH: caveats
- Beyond HEU
- 4. DK-CH entanglement has a long tradition

#### The CL4 work programme 2025





#### The CL4 work programme 2024

 $\langle \text{ quantum} \rangle$  as a «strategic» topic: how it looked 2021 –2024

HORIZON-CL4-2023-DIGITAL-EMERGING-01-40: Quantum Photonic Integrated Circuit technologies (RIA)

The Commission estimates that an EU contribution of between EUF		
4.00 and 6.00 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.		
The total indicative budget for the topic is EUR 12.00 million.		
Research and Innovation Actions		
The conditions are described in General Annex B. The following exceptions apply:		
In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important avoid a situation of technological dependency on a non-EU source, in global context that requires the EU to take action to build on it strengths, and to carefully assess and address any strategic weaknesses vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. For this reason, participation is limited it legal entities established in Member States, Iceland and Norway and the following additional associated country. Israel <sup>279</sup>		
For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests on the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by non-eligible country or by a non-eligible country entity, may participate in the action unless it can be demonstrated, by means o		



#### The CL4 work programme 2025

 $\langle \ \mathtt{quantum} \ \rangle$  as a «strategic» topic: how it looks 2025

Type of Action	Research and Innovation Actions				
Eligibility conditions	The conditions are described in General Annex B. The following exceptions apply:				
	In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important to avoic a situation of technological dependency on a non-EU source, in a globa context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities an high-risk dependencies which put at risk the attainment of its ambitions For this reason, participation is limited to legal entities established in Member States, Iceland and Norway and the following additiona associated countries; Canada, Israel, the Republic of Korea, New Zealand Switzerland, and the United Kingdom.				
	For the duly justified and exceptional reasons listed in the paragraph above, in order to guarantee the protection of the strategic interests of the Union and its Member States, entities established in an eligible country listed above, but which are directly or indirectly controlled by a non-eligible country or by a non-eligible country entity, may not participate in the action unless it can be demonstrated, by means of guarantee positively assessed by their eligible country of establishment, that their participation to the action would not negatively impact the Union's strategic assess, interests, autonomy, or security. Entities assessed as high risk suppliers of mobile network communication equipment within the meaning of 'restrictions for the protection of European communication networks' (or entities fully or partially owned or controlled by a high-risk supplier) cannot submit guarantees. 194				
Technology Readiness Level	Activities are expected to start at TRL 3-4 and achieve TRL 5-6 by the end of the project – see General Annex B.				



#### IMPORTANT NOTICE:

This draft has not been adopted or endorsed by the European Commission. Any views expressed are the views of the Commission services and may not in any circumstances be regarded as stating an official position of the Commission.

This draft is made public before the adoption of the work programme to provide potential participants with the currently expected main lines of this work programme. Only the adopted work programme will have legal value.

The adoption of the work programme will be announced on the Horizon Europe website and on the Funding and Tenders Portal.

Information and topic descriptions indicated in this draft may not appear in the final work programme; and likewise, new elements may be introduced at a later stage. Any information disclosed by any other party shall not be construed as having been endorsed by or affiliated to the Commission.

The Commission expressly disclaims liability for any future changes of the content of this document.

#### caveat 2

#### Switzerland is neither an EU nor an EEA member

Successful validation of CH wrt Art 22(5) remedies *almost* all restrictions

Horizon Europe - Work Programme 2025 Digital, Industry and Space

The conditions are described in General Annex B. The following exceptions apply: In order to achieve the expected outcomes, and safeguard the Union's strategic assets, interests, autonomy, and security, it is important to avoid a situation of technological dependency on a non-EU source, in a global context that requires the EU to take action to build on its strengths, and to carefully assess and address any strategic weaknesses, vulnerabilities and high-risk dependencies which put at risk the attainment of its ambitions. For this reason, participation is limited to legal entities established in Member States, Iceland and Norway, and Israel.

#### (re-) entangling with HEU

EC validated CH eligibilty for strategic topics: Swiss partners eligible as beneficiaries or even coordinators in 2025 calls





#### Horizon Europe CL4 and beyond

( quantum ), AI, HPC, DEP, HPC JU, FP10 (?), new instruments...

22 (5) - Fragen-Themen im HORIZON-2024-CL4 draft WP

(NB: Die Thereen sind eng mit call (topica) korreliert, bei denen die eligibility criteria noch nicht definiert oder mit einem (TBC/TBD versehen sind)

#### Quentum computing - technology-agnostic software

RORLEON-CL4-2025-03-DEGTEAL-INVERGING-02: Quantum Computing — complementing the quantum computing PNA with the development of a technology agnostic software stack (RIA) 10-MEUR, TRL 34-6-5-6.

Ouentum chings (Dos int dus virulge (Donynifonde Therna, das nicht auf konkonk galls zieh). Declarion (1 Aufliering gene strangs) autenum; in digital and enemging enabling technologies "Middelbil. Aus er der in der Denynifond Chipa Auf, de bey privities aus to il strengthen processes understäms it critical stages in the reniconfector and quantum chips value chini, including chip design and transferring enchalogies, and il stades och are of new startely and green.

#### Advancing General purpose Artificial Intelligence

45 MEUR, TRL 3 -> 6

HOBLIZON CLA-2025-04-DOGITAL-EMERGING-04: Assessment methodologies for General Purpose Al capabilities and misk (IJA) (Al Data Robotics Partnership) MHHR THE 2 to 5

HORIZON-CL4-2025-04-DOGITAL EMERGING-07: Enhanced Learning Stategies for General Purpose Al: Advancing GenAHU. (RIA) (Al'Data/Robotics Partaenkip)

#### Generative Artificial Intelligence solutions in robotics and industrial automation 1008/20N-CL4-2005-44-DATA-02: Empowering Aligenerative Al along the Cognitive Computing continuum (EAL) (ALTDAIN/DOSHO) Partnership.

30 MBUR, TRL 5 = 6-7

BOMEON-CLA-2025-04-DATA-03: Software Engineering for A1 and generative A1 (RIA)
(All Data Robotics Partnership)

35 MBUR, TRL 4 = 6-6

#### Generative Artificial Intelligence solutions in aerospace, pharma, and drug discovery ISORIZON-CL4-2025-94-DXXIIIAL-EMERGING-99: Challenge-Driven GenAI4EU Booster (RIA) (AUThur-Davice Remarked)

Generative Artificial Intelligence for virtual worlds

HORIZON-CL4-(N2S-03-HUMAN-15: Genal/IEU: Generative AI for Virtual Worlds: Advanced technologies for better performance and hyper personalised and immersive experience (IA) (AIDsta Robotics & Virtual Worlds Pertoculates)

20 MEUR, TRL 4 => 6 HOURZON-CL4-2025-03-HUMAN-17: Specific support for the Virtual Worlds Partnership and the Web 4.0 indicates (CSA) (Virtual Worlds Partnership)

#### Coordinating the uptake of GenAl in industry and the public sector

HOREZON-CLA-2025-05-HUMAN-19: GenAI4EU central Hab (CSA) (Al-Data Robotics Partnerskip) MARITE

#### Communication and network technologies and devices, including telco edge cloud deployment

infinistractures integrating desion, network computing and communication capabilities for Toleo Edge Claud deployments, so a basis for Connected Collaborative Computing Networks (FC networks) (RIA) 75 MEUR, TRL 3 → 7

High-Performance Computing (NB: das <u>tuzzeron</u> 14PC+ ist comprisent;))
1000ZOIN-CL4-2025-09-DIGITAL-EMERGING-04: Post-cuscula IRC (CSA)
1900ZOIN-CL4-2025-09-DATA-10: Routing for next generation computing technologies from LeT
circle level to deep to find to IRC (CSA)

#### Digital enablers and building blocks for autonomy for space transportation systems. This is about PSI on advanced technologies and digital sensors for non-space transportation, such as small soldinity and resulbility direct, health insoldinity gather and transit sensors, and structural halfs manifoling additionally made manafoling additionage devices, opening and infigit soldness for data.

HORIZON-CL4-3025-62-SFACE-12 Digital solutions for entonency for space transportation systems, design and simulation tools - Digital combines and building blocks.

MMTPS - 73 Pd. 4-5

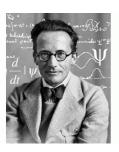
#### Towards demonstration of digital solutions for autonomy for space transportation systems.

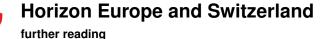
This is about the manustion of a co-design software souls with an explanation proceeding until by in orbit and about the manuscrient of design-belogene changing in destrologene related in design-belogene changes in design and orbital section of proceedings and strendships to be interested in the contract of the proceedings of the proc

#### DK-CH entaglement tradition

just one 100-year old example







all we know about it is on our website: www.horizon-europe.ch, and exactly <u>here</u> are the specifities for the Swiss participation in HORIZON-2025 calls.

#### Many thanks

...for listening...



...and, just in case: martin.kern@sbfi.admin.ch



## Swiss-Danish Matchmaking event

ID Quantique presentation

Gianluca Boso, Senior Engineering Manager



## ID Quantique





Founded in 2001



Geneva, Switzerland Seoul, South Korea Boston, USA



By 4 quantum physicists from the University of Geneva



130+ employees, including 50 engineers/scientists



**T**...

Investments in 2018 by SK Telecom & Deutsche Telekom



Develops technologies and products based on quantum physics within 2 business units:

Quantum-Safe Security Quantum Sensing



Performs R&D, production, professional services, integration, support



Clients: Governments / Banks / Gaming Industry / Universities / IT Security

## Quantum. Trust enabled for the future.







## **Our Mission**

IDQ harnesses light to develop and industrialize advanced quantum products and technologies for organizations to ensure long-term protection for data and public safety.

## **Performance beyond classical techniques**

Securing data & communication

Quantum-safe communication & unbreakable encryption

Quantum photonics for Optical Sensing

#### **Industries**



Government



Financial services and Banks



Telco and MSP



Automotive



IoT



Gaming



Critical Infrastructure



Academia & Research

## Two divisions & activities



## **Quantum-Safe Security**

Protecting mission-critical data for the long-term future.



## **Quantum Sensing**

Optical sensing performance beyond conventional techniques, creating the building blocks of the Quantum Internet.



## **Innovation activities at IDQ**



IDQ actively participates since its early days in many European projects to support its innovation activities.

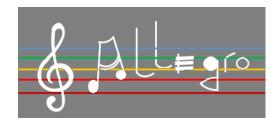
## Latest projects:

- 2 ITN in Horizon 2020
- 2 DN in Horizon Europe
- + many more including: Eurostars, CoFOUND, MSCA etc.











## **QSI: Quantum-Safe Internet**



QSI aims at training a world-class cohort of doctoral candidates (DCs) capable of taking the next essential steps in the highly demanding area of cybersecurity.

#### Some info:

- Duration from Oct 2022 to Sept 2026
- Coordinated by Uni. Vigo in Spain
- 15 doctoral candidates (DN)
- 2 Swiss Associate Partner (IDQ and Uni Geneva)
- 1 DN at IDQ and 1 DN at Uni Geneva
- 1 Danish Beneficiary (DTU Christian Majenz)

#### Objective

QSI aims at training a world-class cohort of doctoral candidates (DCs) capable of taking the next essential steps in the highly demanding area of cybersecurity. We aim to build strong lasting links between strategically selected industry and academic partners, in different disciplines, via the development of novel technologies for practical applications in data security. In parallel, we will also combine, via a collaborative long-term interdisciplinary approach, expertise in all relevant communities to address key fundamental problems in secure communications in the quantum era, and the important applications therein. The planned training network will provide research and training opportunities to a new generation of DCs, who, in the long-run, shall address the Grand Challenge of providing Quantum-Safe Internet, i.e. a communication infrastructure that is secure against not only classical attacks but also those enabled by quantum technologies. Todays Internet security heavily relies on computational complexity assumptions, and as such is seriously threatened by advancements in quantum computing technologies Indeed, we have recently witnessed a wave of key developments in this direction by a number of IT giants, e.g. Google, IBM, Microsoft, and Intel. This particularly jeopardizes applications that require long-term security. The number of such applications is continuously growing as more and more of our private information is stored and communicated in a digital way, e.g. electronic health records, which are now required by European legislation to remain secure for a long time. This requires us to urgently develop and implement new solutions, as we plan to do in this Doctoral Network (DN).

# Fields of science (EuroSciVoc) natural sciences > computer and information sciences > internet natural sciences > computer and information sciences > computer security Suggest new fields of science

Quantum-Safe-Internet

#### Keywords

Project Information						
<b>QSI</b> Grant agreement l	D: 101	1072637				
DOI 10.3030/101072637 [	2					
EC signature date 22 June 2022						
Start date 1 October 2022	ind date per 2026					
Funded under Marie Skłodowska-Cu Total cost No data  EU contribution € 2 157 141,60	urie Ac	tions (MSCA)				
Investment in EU policy priorities						
Digital agenda	0	Clean air	0			
Artificial Intelligence	0	Climate action	0			
Biodiversity	0					
Coordinated by UNIVERSIDAD DE VIGO  Spain						

## **Our Doctoral Candidate**



Architecture and hardware for a high-performance
Quantum-Safe internet



#### Loïc Millet

Develop a future-proof and practical architecture and hardware components for a QS Internet that optimally address the needs for security, functionality, and usability.





Co-supervision with the University of Geneva Planned secondments in Spain (Uni. Vigo) and France (Uni. Sorbonne)

## Latest QSI workshop will be held in Copenhagen



About Projects Partners QSI Green Chapter People Dissemination - Documentation Funded by the European Union



#### **QSI Workshop**

The MSCA Doctoral Network "Quantum Safe Internet" is happy to invite to a focused workshop on techniques for a quantum-safe network infrastructure, including both post-quantum cryptography and quantum key distribution. The workshop will be held at the Technical University of Denmark in the Copenhagen area. We invite external participation and submissions for contributed talks.

#### **Important Dates**

- ## Submission deadline -> 14/03/2025. Before 01/03/2025
- m Notification, registration opens -> 15/03/2025.
- ## Workshop -> 12/05/2025-14/05/2025.

## **QuNEST: Quantum-Enhanced Optical Communication Network Security**



QuNEST aims at training a world-class cohort of doctoral candidates (DCs) capable of taking the next essential steps in the highly demanding area of cybersecurity.

## Some info:

- Duration from Oct 2023 to Sept 2027
- Coordinated by TUE in the Netherlands
- 11 doctoral candidates (DN)
- 2 Swiss Associate Partner (IDQ and Uni Geneva)
- 1 DN at IDQ
- 1 Danish Beneficiary (DTU Darko Zibar)



## Doctoral Training Network for Quantum Enhanced Optical Communication Network Security

Fact Sheet

Results

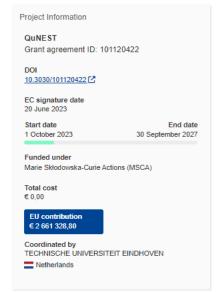
#### Objective

The security of data has never been more valuable. Today, cryptography is critical to the safe operation of digital infrastructures. However, yearly advances in quantum computing present new threats. Quantum Key Distribution (QKD) may provide the best protection, an approach designed to ensure privacy using quantum information encoded on photons. In theory, QKD is proven secure. In practice, QKD systems deviate from this theoretical behaviour due to implementation. Currently, QKD requires a separate dark fibre due to its susceptibility to classical channel effects (e.g. noise, Kerr non-linear interference, and scattering effects). Separating QKD from classical optical signals is costly and impractical, keeping QKD a niche product. Therefore, network providers seek quantum security to coexist in existing classical optical infrastructure. A better understanding of a quantum/classical optical channel is needed to develop improved channel coding, robust error-correcting schemes, digital signal processing, and optoelectronic components for the transceivers. In addition, a study on network topologies and integrating classical to quantum signals on implementation security is needed. The doctoral research network - QuNEST aims to gather diverse industrial and academic partners with strong scientific and technical expertise in QKD technology and optical communications to establish a new, innovative, multi-disciplinary, training network for doctoral researchers (DR). With the high-level objective of training experts to design, develop, and drive the future quantum secure optical infrastructure forward. This doctoral network will train 11 DR fellows, leaning on the expertise of 17 partners: 6 universities, and 11 Industrial partners (i.e. 1 Simulation software provider, 2 Telecom operators, 2 SMEs and 6 hardware vendors). From 7 European countries, QuNEST provides a unique and timely opportunity to train students in quantum physics and optical communications

#### Fields of science

natural sciences > physical sciences > quantum physics

<u>engineering and technology</u> > <u>electrical engineering</u>, <u>electronic engineering</u> > <u>information engineering</u> > <u>electronic engineering</u> > <u>signal processing</u>



## **Our Doctoral Candidate**







Q

- **Project title:** Real-time reconfigurable QKD systems from seamless integration in a modern network architecture
- Host institution: ID Quantique
- PhD enrolment: University of Geneva
- **Supervisors:** Gianluca Boso (ID Quantique); Félix Bussières (ID Quantique); Rob Thew (University of Geneva); Mentor: T. Bradley (Eindhoven University of Technology).

Co-supervision with the University of Geneva Planned secondments in Germany (VPI Photonics and ADVA)

in 8

## The importance of Doctoral Networks. The experience of IDQ



#### For the DN:

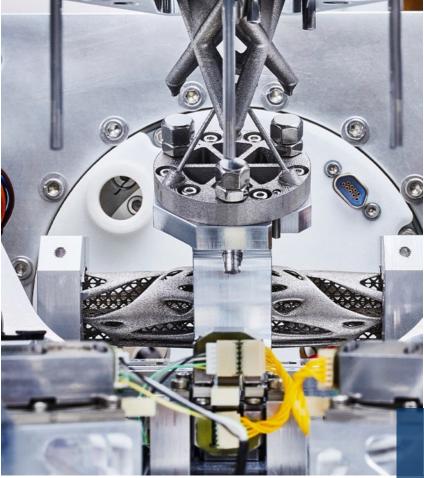
- Exposure to a large network of industry and academic partners
- Training opportunities at a pan-European level (schools, secondments, training programs, mobility programs)
- Competitive salary and working conditions

#### For the host institution (IDQ):

- Consolidate our network of industry and academic partners in some of tour core activities (e.g. quantum communication, detection systems etc)
- Work on innovation activities with some specific partners (through secondments for example)
- Funding of a young researcher to be integrated in our R&D department









06/05/2025

# SWISS-DANISH QUANTUM COOPERATION FROM CSEM'S PERSPECTIVES



## **CSEM AT A GLANCE**

We are a non-profit public-private, Swiss technology innovation center

We enable competitiveness by developing and transferring world-class technologies

to the industrial sector

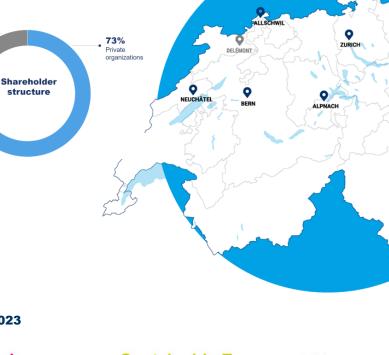


14%

1984 **FOUNDED** 

**SPECIALISTS** 

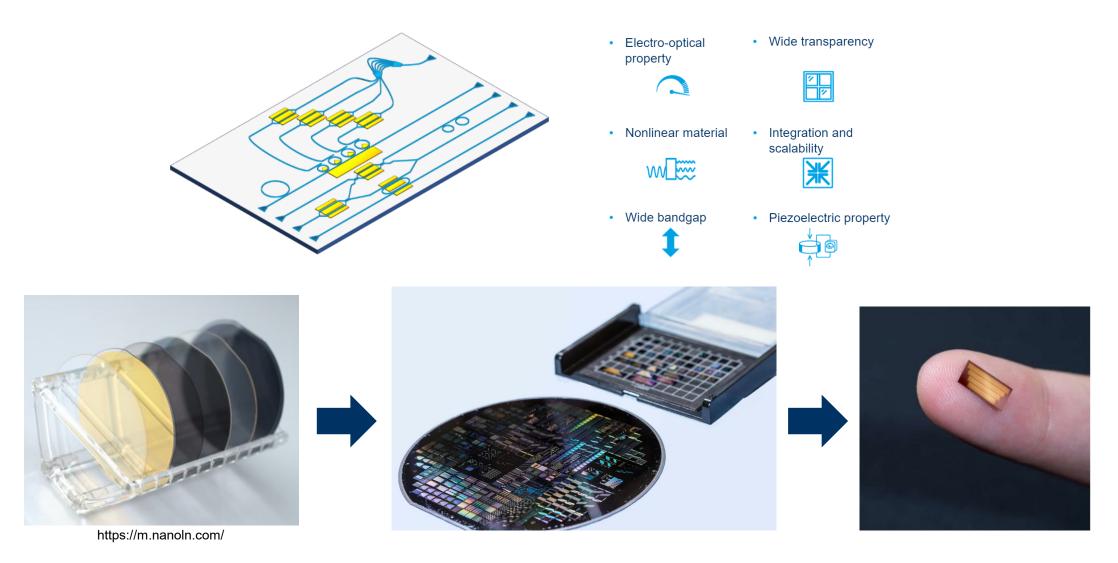
M TURNOVER in 2023



## **Digital Technologies Precision Manufacturing Sustainable Energy** Data & A/ vanufacturina Tools for Industry 4.0

## WHAT DO WE DO IN OUR TEAM?

Wafer-level Thin-Film Lithium Niobate (TFLN) photonic integrated circuits (PICs) fabrication



## WE ARE INVOLVED IN MANY EUROPEAN PROJECTS

TFLN PIC platform development





Co-integration of TFLN and SiN PIC platfoms



PICs for mmWave communication systems



A versatile quantum photonic integrated platform





Quantum-enhanced photonic integrated sensors



Scalable continuous variable cluster state quantum technologies



## WHY WE LIKE TO JOIN EUROPEAN PROJECTS

Partnering with high profile institutions is crucial to develop tomorrow's technology
 Especially for a young field like PICs



Create an ecosystem at European level around a technology
 Create a critical mass for maturing the technology and create an industry



There is a lot to learn from partner's skills
 Ex. from personal experience: face challenges with
 RF testing of chips



• Share resources e.g. costly experimental infrastructures



Helps to build an extended network





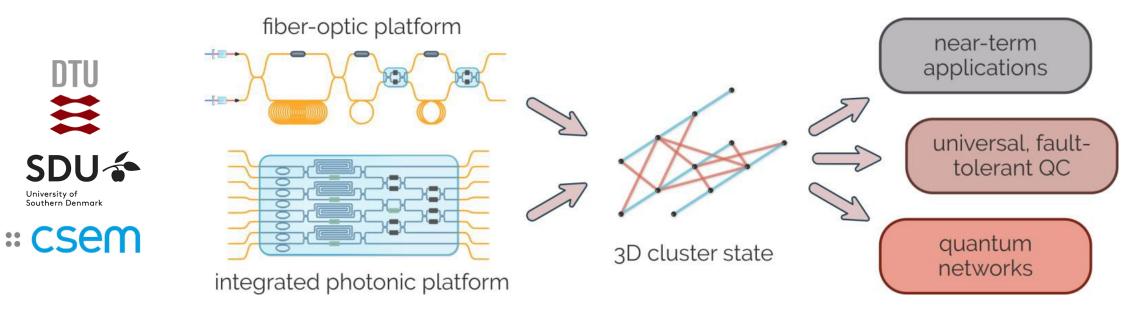
## THE CLUSTEC PROJECT





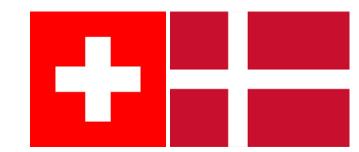


Use photonics to generate and study application-specific complex cluster states for near-term quantum computational applications, fault-tolerant quantum computing and quantum networks



# SWISS-DANISH QUANTUM COOPERATION - BENEFITS AND CHALLENGES FROM CSEM'S PERSPECTIVE

- Denmark and Switzerland are among the leaders in Quantum Technology
  Keeping existing collaborations with the big players in this domain and expanding collaborations with
  new players is beneficial for both sides
- Complementary expertise
   Danmark is at the forefront of research in quantum computing
   CSEM offers a unique integrated photonic platform
- Demanding requirements for quantum integrated photonics
   Helps to push the performances of our platform
- Helps to develop new technology, which is CSEM's mission
- Talent mobility
   DTU PhD student visiting CSEM for a few weeks





FACING THE CHALLENGES OF OUR TIME



## Who is DQC

- Founded in 2021
- Build on grass root initiated by Danish academic Institutions
- Non-profit
- Non-political

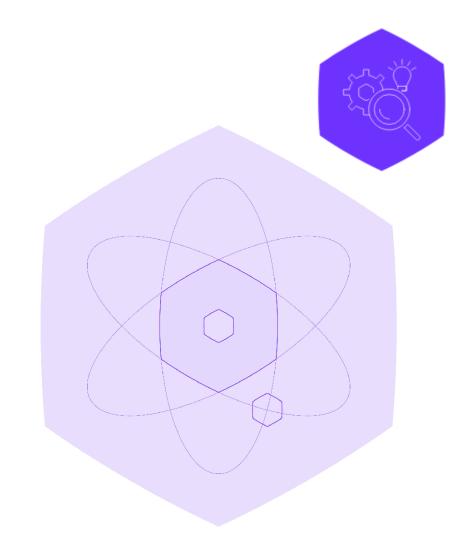
## **Funding**

- Membership fee's
- Consultancy services
- Grants

#### **Team**

- 3 FTEs
- 12 boardmembers from industry and academia





## Key milestones

#### **DQC** is founded

In the world-famous Auditorium A at Niels Bohr Institute, DQC's 15 founding members gather to found a new organization to strengthen the Danish quantum ecosystem.

### **Danish Quantum Agenda**

DQC publishes our vision for a Danish quantum agenda to support growth, innovation and talents in Denmark.

#### **Novo Nordic Foundation**

DQC receives a generous grant to advance the Danish quantum ecosystem for the years 2024-2026

Aug 2021 June 2022

Aug 2023













Nov 2021

June 2023

# Now

## **Inaugural GQ**

The first DQC Board of Directors are announced to build a new Danish quantum ecosystem of excellence.

#### **IQT Nordics**

DQC gathers 200+ quantum enthusiasts from all over the world for the first ever IQT Nordics conference in Copenhagen.

#### **57 DQC Partners**

Today we are proud to represent 53 partners from the entire Danish quantum ecosystem



## DQC's purpose is fourfold:

- To increase awareness of QT
- 2. To improve the opportunities for research and innovation in QT
- 3. To illustrate the potential applications of QT for the benefit of Danish society
- 4. To build a strong Danish ecosystem that can fulfil the commercial potential of quantum technology

## DQC works to fulfil it's purposes by ensuring the best condition:

- Research & Innovation
- Education
- External funding



#### **Strategic Focus Areas**



Research & Innovation



Application & Commercialisation



Education & Talent

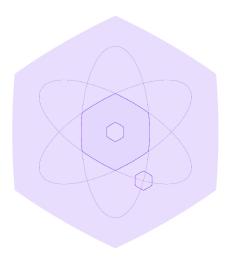


International Collaboration & globalisation

DQC is focusing on 4 key strategic areas in the period 2023-2026 aligned with our purpose statement. Our efforts are supported with funding from the NNF.

The goal is coordination of Danish activities across stakeholders: government, universities, foundations, industrial branches etc. including coordination with the goals and activities in The National Danish Quantum Strategy





#### **Success parameters**

- Increased quantum awareness in industry and society in general
- Higher number of collaboration projects between universities and industries
- Increased awareness of the potential of QT in other scientific fields than physics, such as chemistry, biology, computer science, mathematics, medicine etc.
- Higher number of quantum startups
- More foreign investments (FdI) in the Danish quantum ecosystem
- More soft funding and capital for Danish quantum startups
- More jobs in the Danish quantum ecosystem

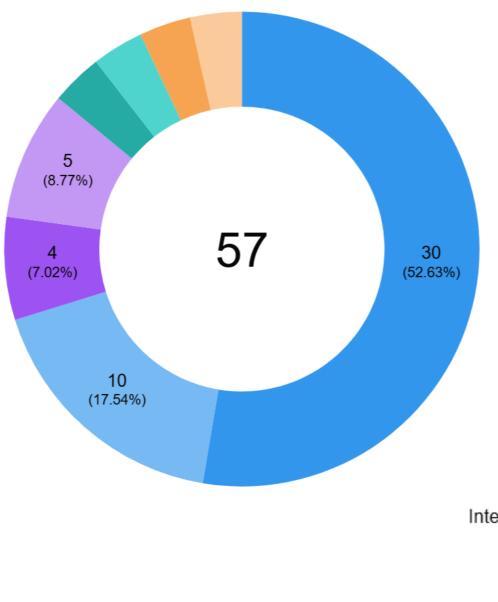






#### **Partners in DQC**

- DQC admit companies, interest organisations, research organisation and other stakeholders who contribute to fulfilling DQC's purposes
- Must have a Danish entity and CVR number
- Today we represent 57 partners and we are growing:
  - Academia and industry
  - QT companies & Endusers
  - Startups and Corperates
  - Consultants
  - Clusters and startups hubs
  - Investors
- The board will propose to also accept Associate Partners in DQC on the next General Assembly



Type

Company

Educational Organisation

GTS/RTO

Interest Organisation or NGO

Consultancy

Other

Others (Combined)



#### **Universities and RTOs**





















Danish National Metrology Institute

#### **Consultancy**







#### **Innovation hubs and clusters**

novo nordisk foundation







DigitalLead.

#### **Endusers**









tdc net

#### **Interest organisations**



**IT-BRANCHEN** 

























#### QT Companies (Computers + enabling)



























**QT** enabled Security













# **Ecosystem Development**Intelligence and knowledge

**Opportunities Challenges** 

**Neutral Collaboration Platform** 

# Strong Partner Base

#### **Knowledge Sharing and Awareness Building**

Application &
Commercialisation

Internationalisation & Globalisation

Research & Innovation

Education & Talent

#### **Communication**

Strong presence on SoMe
Strong Brand
Effective communication to partners (Newsletters, homepage, events)

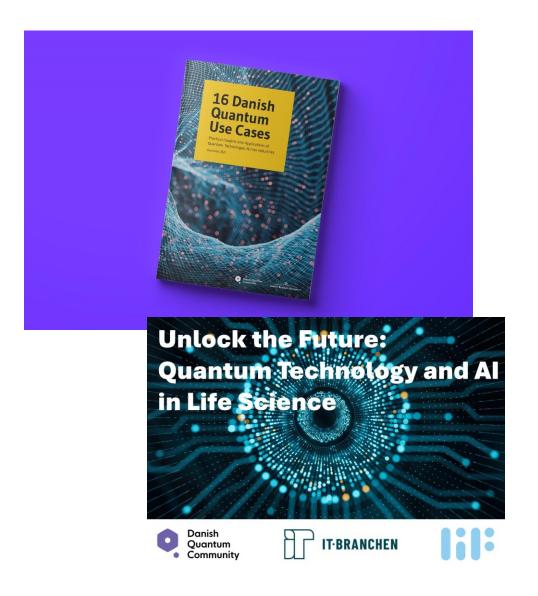
DQC unites the DK Ecosystem with one voice

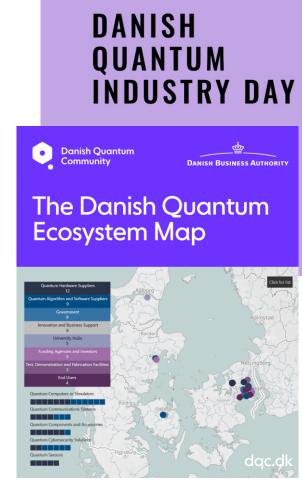


International stakeholders

E.g. QuIC, QED-C, OECD, QSIP, VTT, QuantumDelta, QuantumUK

### Awareness building for quantum readiness





Official opening

Natasha Friis Saxberg, DQC Vicechairpe

### Large DQC events



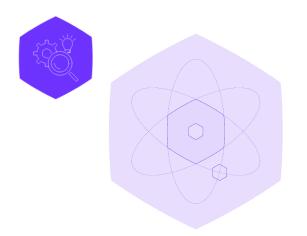
APRIL 8-9<sup>th</sup> 2025

2nd Annual DQC Scientific Quantum Conference



MAY 28<sup>th</sup> 2025 Quantum Industry Day





### Thank you!

For more information please contact: Kristine Helen Falgren, Managing Director, krf@dqc.dk





### **Swiss Quantum Agenda**

Private and Public Approaches Jointly at Work

Webinar: Swiss-Danish Matchmaking on Quantum

May 6, 2025

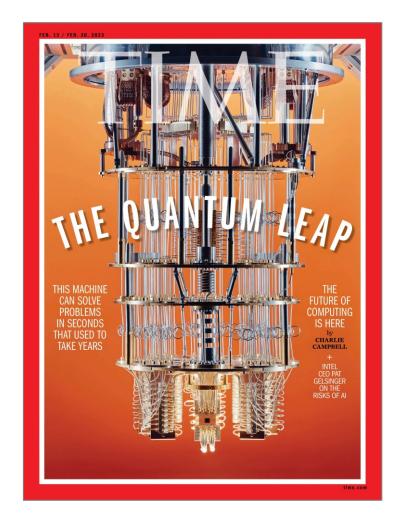
#### Dr. Rebekka Garreis

Swiss Academy of Sciences (SCNAT) Swiss Quantum Initiative (SQI)



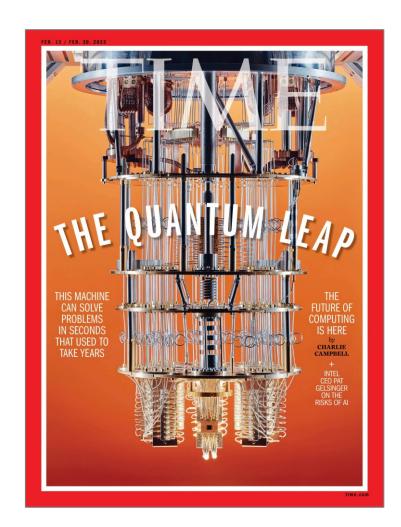


### The so-called 2<sup>nd</sup> quantum revolution





### The so-called 2<sup>nd</sup> quantum revolution



... partially "hype"



### The so-called 2<sup>nd</sup> quantum revolution

**SQI** working definition

"Mastering quantum systems on the individual quanta level and engineered entanglement"





#### The Swiss Quantum Initiative (SQI) is

Swiss Quantum Initiative

- mandated by the Swiss Confederation via SERI,
- hosted by the Swiss Academy of Sciences SCNAT and
- coordinated and led by the Swiss Quantum Commission (SQC) on a voluntary basis

Cooperation with the Swiss National Science Foundation SNSF and Innosuisse





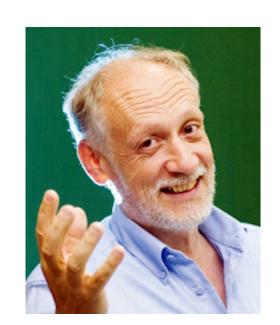


Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra

Swiss Confederation

Innosuisse – Swiss Innovation Agency

# The SQC is in charge of identifying most important needs and crafting the national quantum strategy



Nicolas **Gisin** (president) University of Geneva and CIT





Patrick **Maletinsky** University of Basel



Alexandre **Pauchard** CSEM, Neuchâtel



Kirsten **Moselund**PSI Villingen



Thomas Vidick
FPFI



Wolfgang **Tittel**University of Geneva and CIT



Esther **Hänggi**Lucerne University of
Applied Sciences and Arts

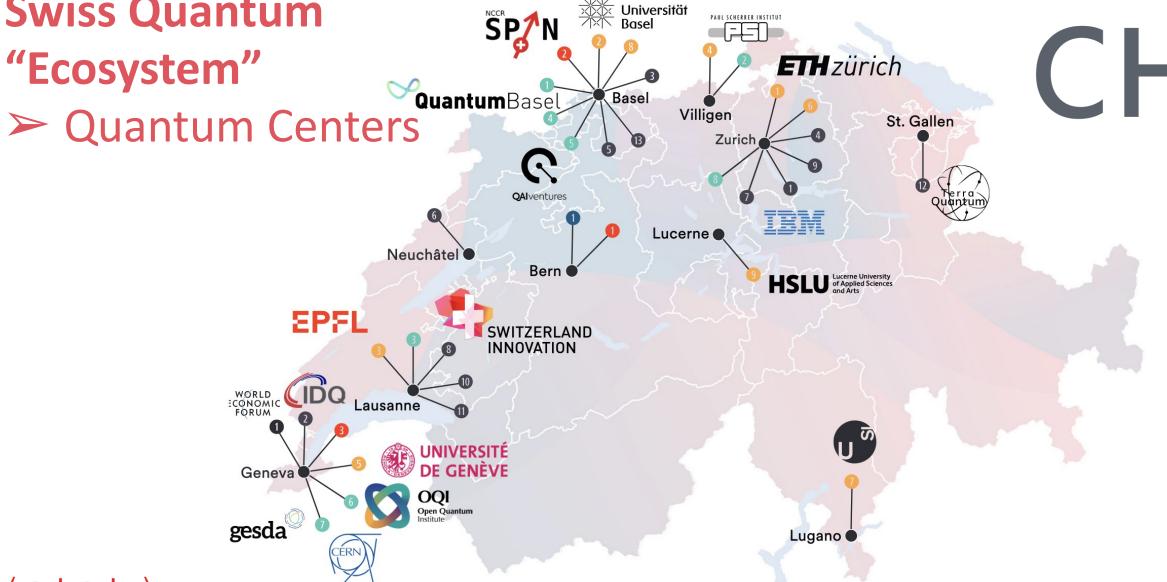


Jonathan **Home** ETH Zurich



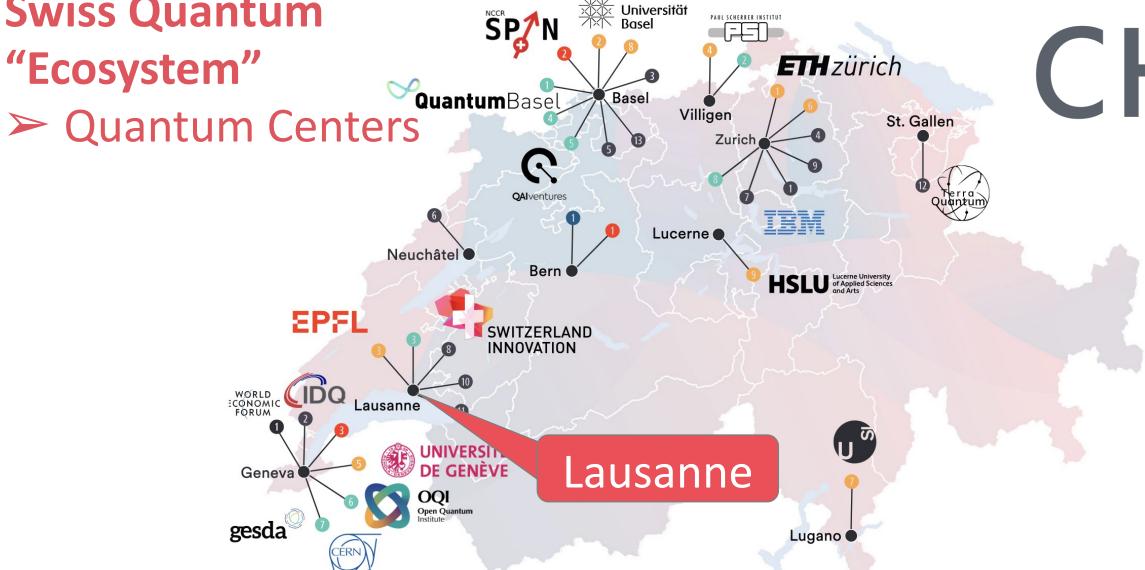
Heike E. **Riel** IBM Rüschlikon

**Swiss Quantum** 

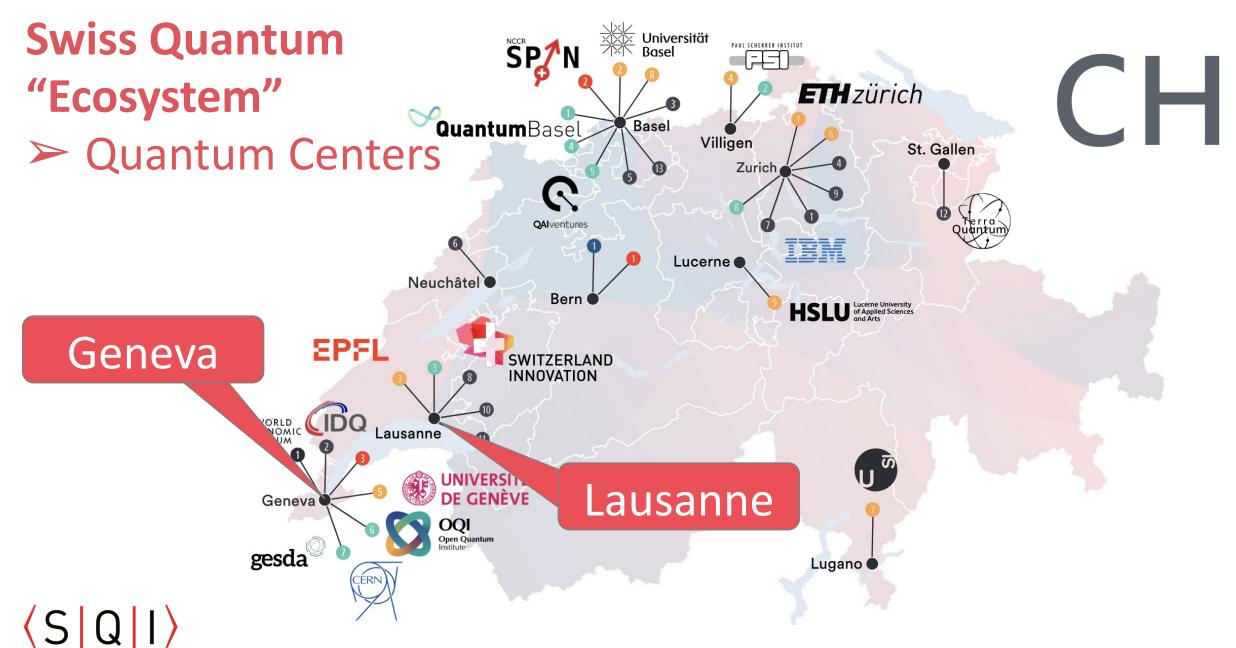


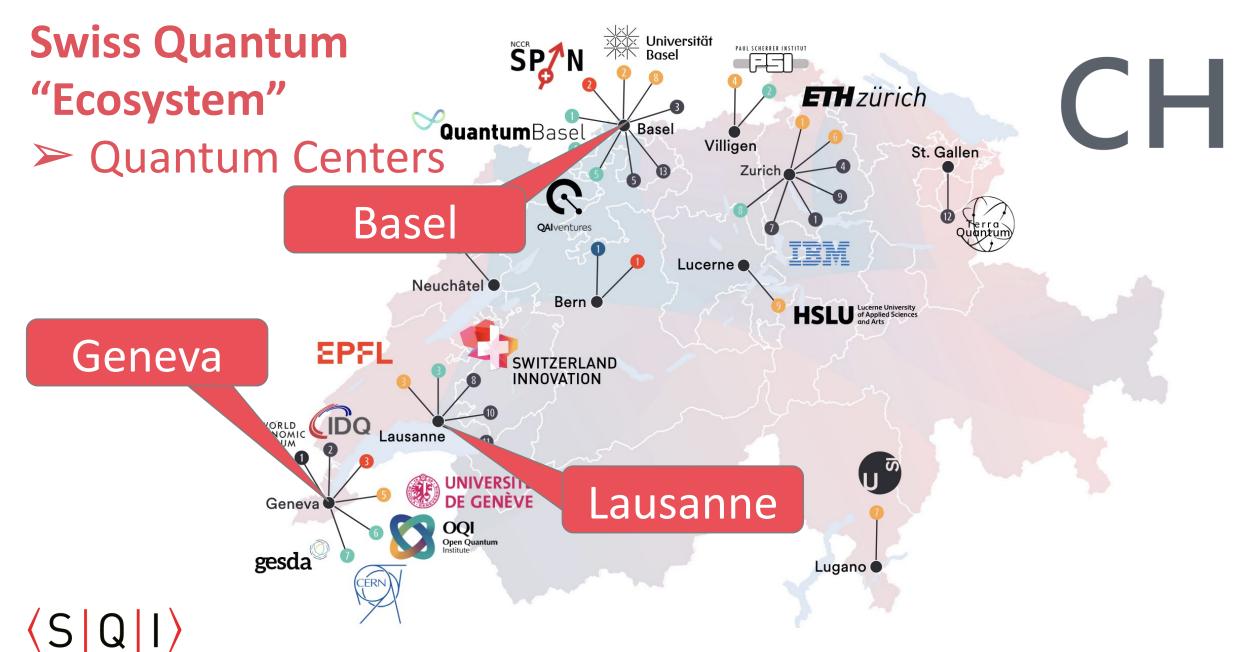


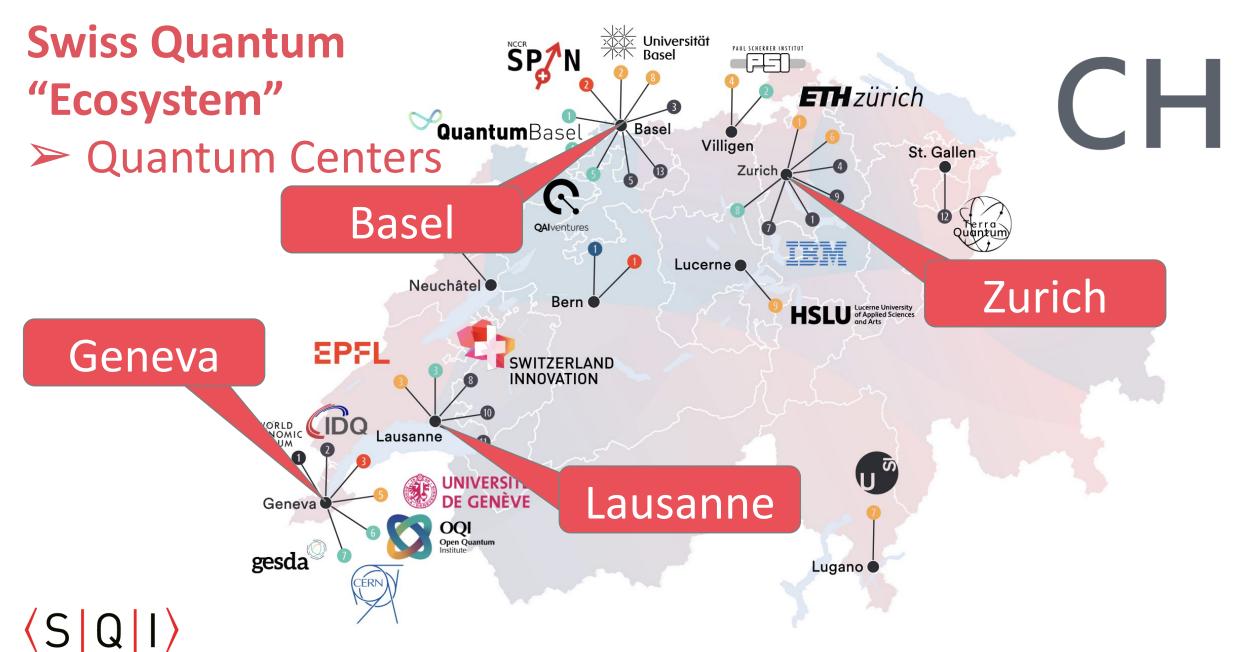
**Swiss Quantum** 

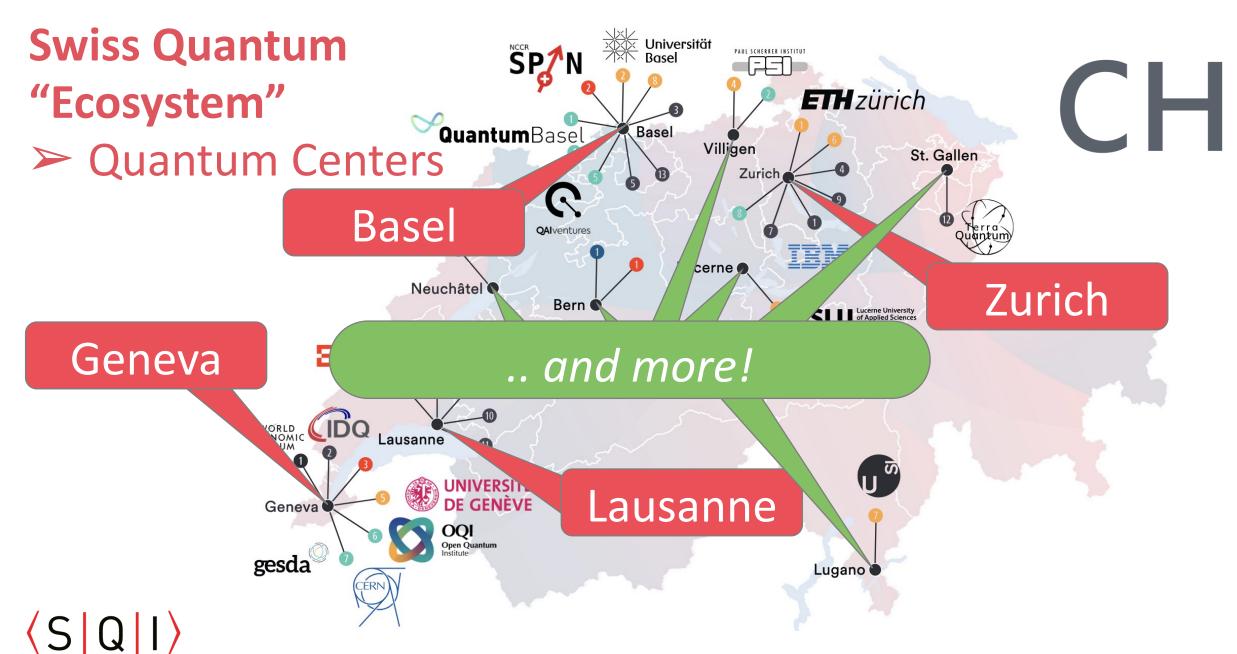












### The field(s) of quantum

Mastering quantum systems on the individual quanta level and engineered entanglement



### The field(s) of quantum

Mastering quantum systems on the individual quanta level and engineered entanglement

# Fields of applied research and development

- Quantum communication
- Quantum computation
- Quantum simulation
- Quantum sensing and metrology



### The field(s) of quantum

# Mastering quantum systems on the individual quanta level and engineered entanglement

# Fields of applied research and development

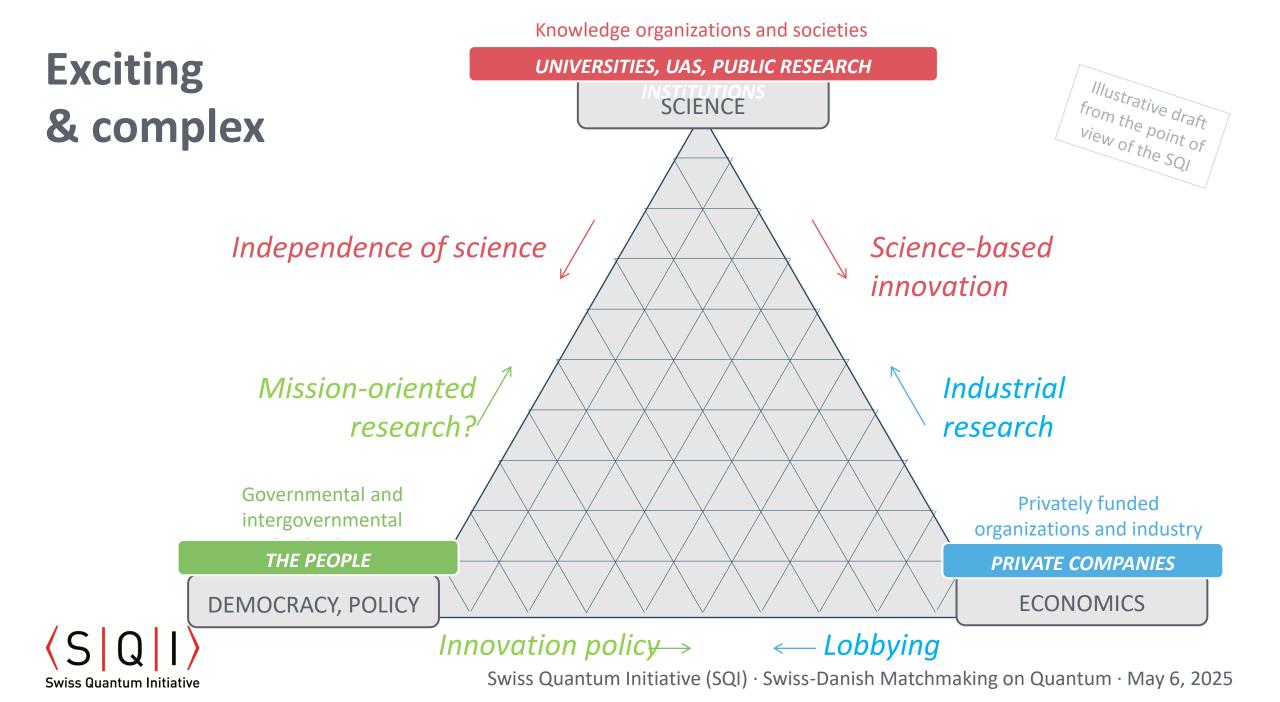
- Quantum communication
- Quantum computation
- Quantum simulation
- Quantum sensing and metrology

## Fields with a cross-sectional or foundational character

- Materials for quantum technologies
- synthetic quantum materials exhibiting entanglement
- Quantum control hardware
- Computer sciences
- Quantum theory

•





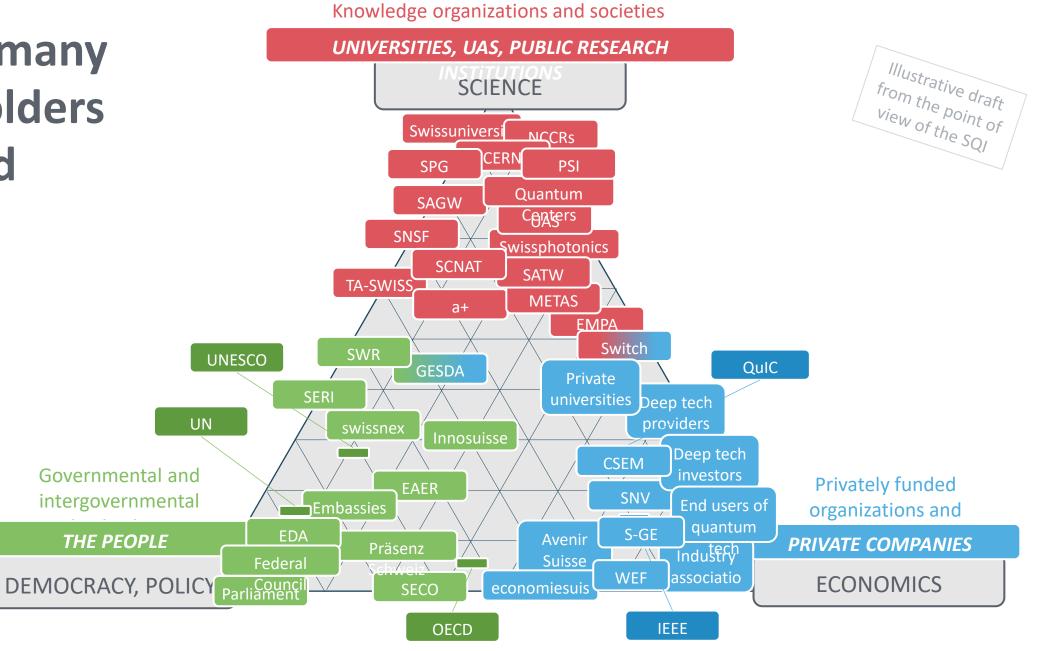
### ... with many stakeholders involved

Swiss Quantum Initiative

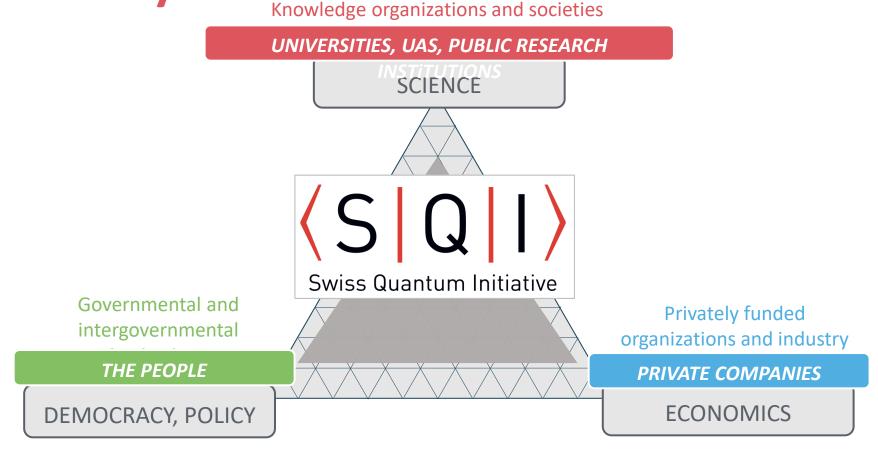
Governmental and

intergovernmental

THE PEOPLE



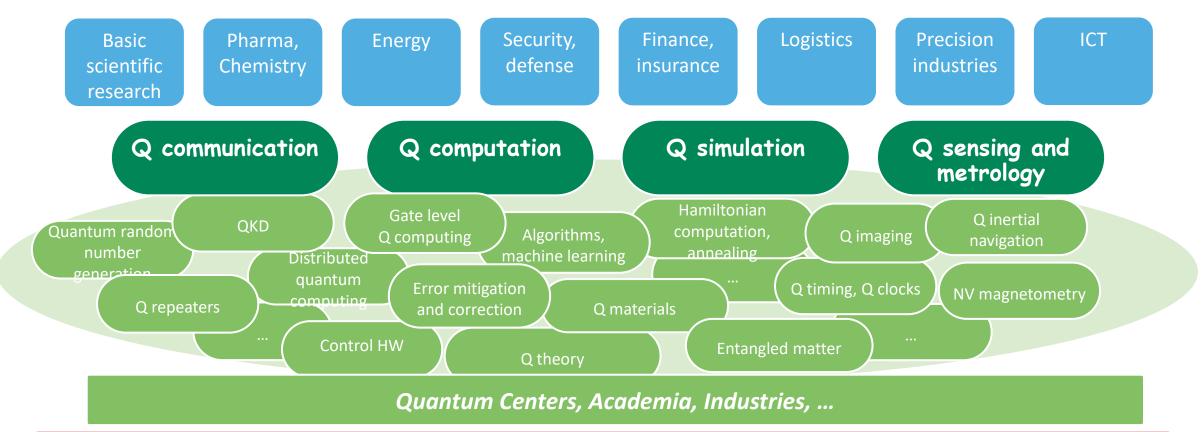
Embedded in democracy, science and the economy





#### **SQI** topic landscape





"Mastering quantum systems on the individual quanta level and engineered entanglement"



### Specialties of the Swiss approach

- Cooperative governance
- Open and liberal market approach; no top-down industrial policy
- Curiosity-driven innovation
- "On top" national funding; complementing existing, decentral structures
- Long-term view

Honest and enthusiastic communication



### Value chain, TRLs and typical investment stages



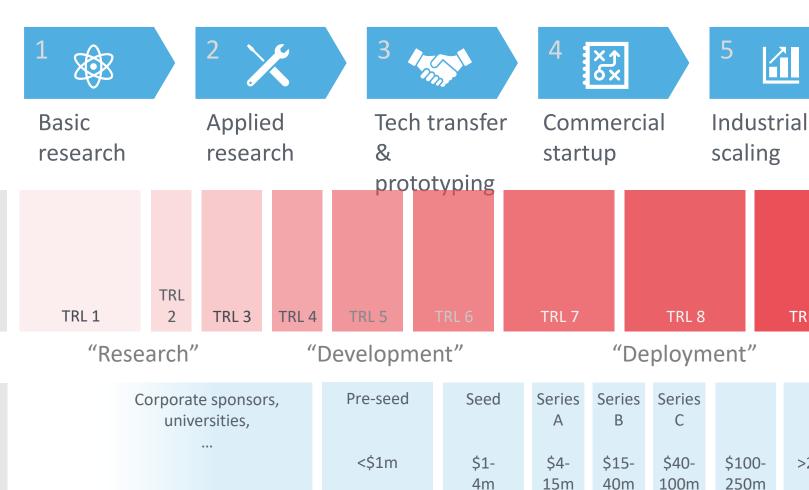
#### TRLs:

Swiss Quantum Initiative

Technology Readiness Levels (indication of typical steps; variations in practice)

#### **Investment stages:**

(indication of typical steps; variations in practice, depending on technical area, e.g. higher costs for quantum computing HW)



TRL 9

>250m

#### 4 specific goals for the Swiss Quantum Initiative

- (i) Promoting scientific research: Breakthroughs in scientific discoveries
- (ii) Fostering innovation: Fertile environment for ideas and projects to grow and mature into solutions of industrial size
- (iii) Developing infrastructures and platforms: Connect quantum research to real-world applications with the goal to offer benefits for society and impact on the economy
- (iv) Giving impulses for education and workforce: Improve quantum literacy at all educational levels; in particular quantum engineering skills

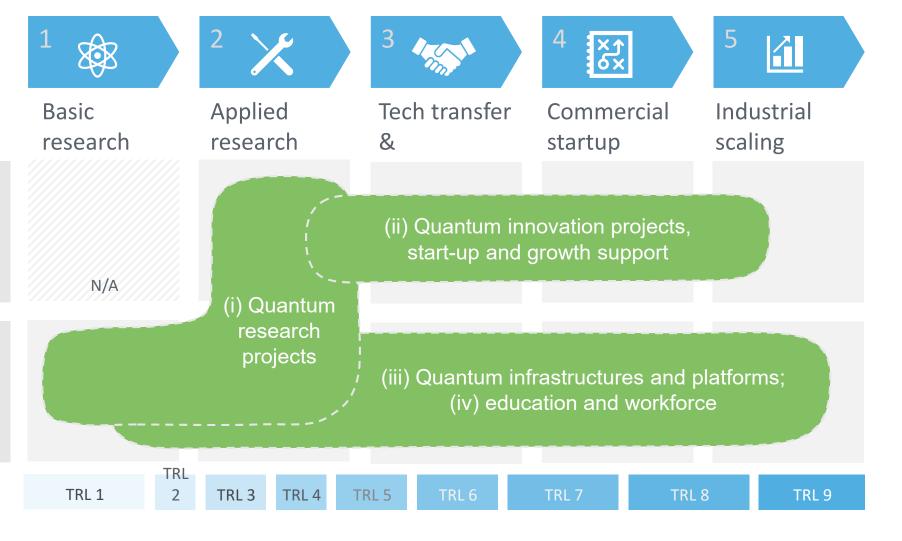


### SQI main fields of action and funding



Outcome-focus: towards specific applications.
Outcomes targeted at specific projects or beneficiaries (e.g. startup project funding)

Fundamental research and foundations: agnostic to specific beneficiaries or direct commercial outcomes (e.g. quantum infrastructure





(TRL):

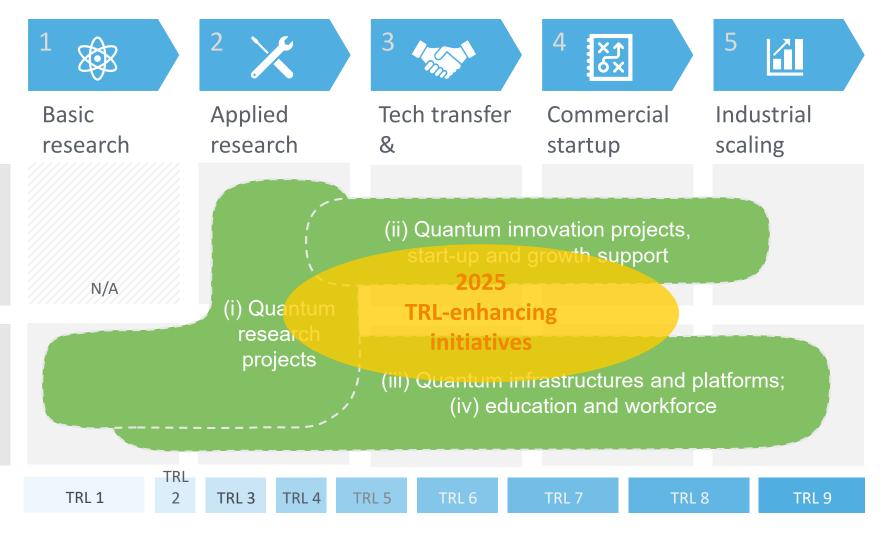
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Outcomes targeted at specific projects or beneficiaries (e.g. startup project funding)

Fundamental research and foundations: agnostic to specific beneficiaries or direct commercial outcomes (e.g. quantum infrastructure

Typical Pechnology readiness levels (TRL):





### SQC recommendations for 2025-2028 (selection)

Overall, we are (still) in a time that calls for more curiosity-driven research and innovation



#### SQC recommendations for 2025-2028 (selection)

- Overall, we are (still) in a time that calls for more curiosity-driven research and innovation
- SQI funding for scientific research in 2025-28 should be bundled into one larger call, ca. in 2027



### SQC recommendations for 2025-2028 (selection)

- Overall, we are (still) in a time that calls for more curiosity-driven research and innovation
- SQI funding for scientific research in 2025-28 should be bundled into one larger call, ca. in 2027
- Significant attention should be given to mid-TRL enhancing projects, infrastructures and platforms for quantum



## SQC recommendations for 2025-2028 (selection)

- Overall, we are (still) in a time that calls for more curiosity-driven research and innovation
- SQI funding for scientific research in 2025-28 should be bundled into one larger call, ca. in 2027
- Significant attention should be given to mid-TRL enhancing projects, infrastructures and platforms for quantum
- There is a need to support innovation and young companies without interfering excessively in market dynamics with taxpayers' money



## **Science Diplomacy and More**





## **Science Diplomacy and More**





### **Science Diplomacy and More**



GENEVA

Swiss Quantum Week brings together academia, industry, policymakers, and the general public through a weeklong series of specialized events from October 13-19 to build bridges and grow the Swiss and global quantum ecosystem as part of the UNESCO International Year of Quantum Science and Technology 2025.



CH

"We do not have emotions. We have money." 1)



CH

"We do not have emotions. We have money." 1)

1) Source: Hazel Brugger, Swiss comedian



CH

"We do not have emotions. We have money." 1)

1) Source: Hazel Brugger, Swiss comedian



CH

"We do not have emotions. We have money." 1)

We are passionate about quantum.

1) Source: Hazel Brugger, Swiss comedian





#### **Contact**

Dr Rebekka Garreis Swiss Quantum Initiative

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Swiss Academy of Sciences (SCNAT)
Laupenstrasse 7

quantum.scnat.ch

3001 Bern · Switzerland







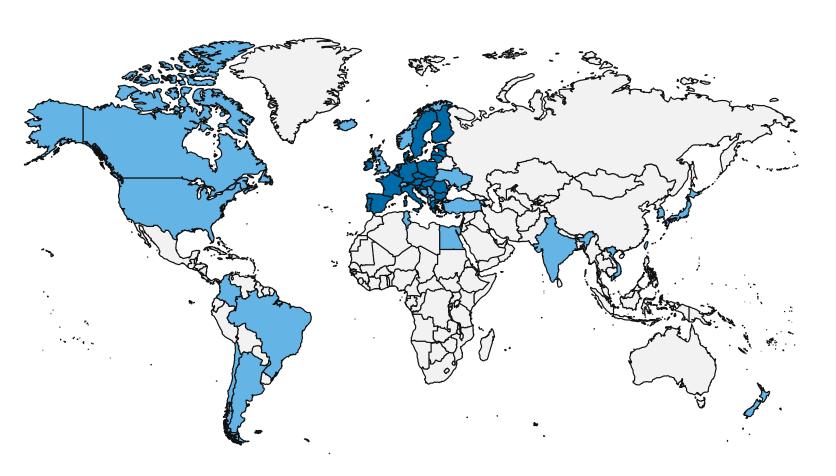


# Enterprise Europe Network Swiss-Danish Matchmaking on Quantum

Aija Konisevska Azadi EEN Denmark







#### **EU-27**

- Austria
- Belgium
- Bulgaria
- Croatia
- Cyprus
- Czechia
- Oenmark
- Estonia
- Finland
- France
- Germany
- Greece
- Hungary
- Ireland
- !taly
- Latvia
- Lithuania
- Luxembourg
- Malta
- Netherlands
- Poland
- Portugal

- Romania
- Slovakia
- Slovenia
- Spain
- Sweden

#### International

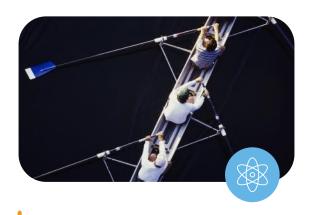
- Albania
- Argentina
- Armenia
- Bosnia and Herzegovina
- Brazil
- Canada
- Chile
- Colombia
- Egypt
- !celand
- India
- Israel
- Japan
- Korea

- Kosovo
- Moldova
- Montenegro
- New Zealand
- Northern Macedonia
- Norway
- Serbia
- Singapore
- Switzerland
- Taiwan
- Tunisia
- Türkiye
- Ukraine
- UnitedKingdom
- United States
- Vietnam

Disclaimer: Some countries' agreements might still be in process of being signed



# An open Network



#### **Coordination**

We bring together and coordinate regional perspectives to provide better services to our local partners and clients



#### **Synergies**

We foster synergies with regional, national and European business support ecosystems to better support SMEs



#### **Cooperation**

We work in close cooperation with key stakeholders, European programmes and initiatives



# **Partnering**

Helping to find the right partners worldwide





# Identify and meet potential partners

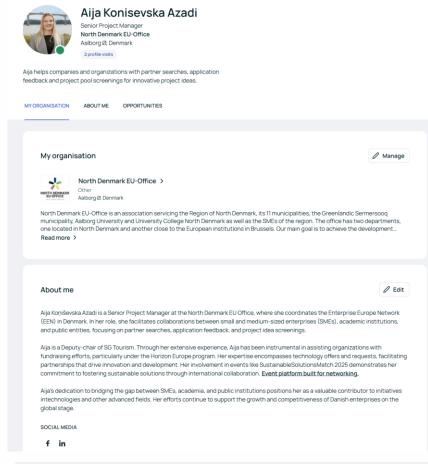
- Use the b2match platform to identify and meet potential project partners;
- Create a strong networking profile;
- Add marketplace opportunities to showcase what you can offer to other participants or what you are looking for;
- Search for relevant partners and book meetings;
- Check the "TOP MATCHES" section for meeting recommendations;

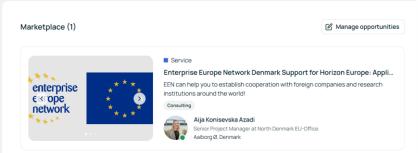




# Create a strong profile

- Update your own profile with your personal information, picture and with information (logo) regarding your company /host organization;
- Add project cooperation opportunity in the Marketplace: Describe your project idea, aim of the project, the expertise and type of partner sought;
- Strong profiles facilitate the partner search and meeting requests on the platform...

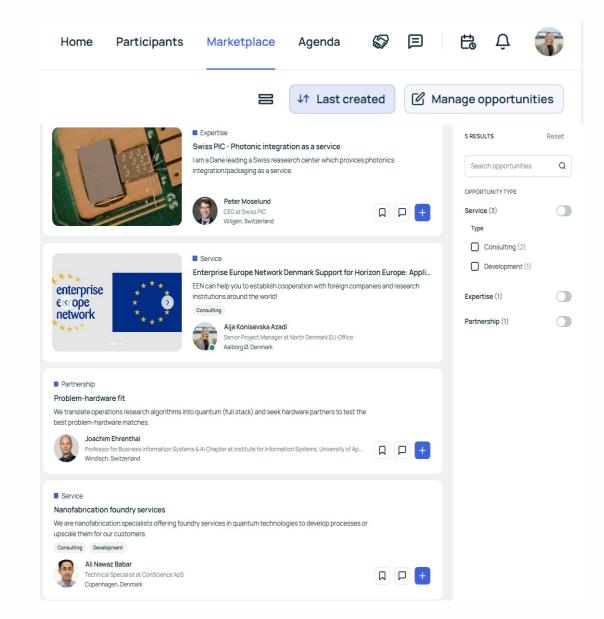






# Project cooperation– find project partners

- Check cooperation opportunities in the Marketplace;
- Apply filters to find relevant opportunities;
- Click message icon to send messages to participants;
- Click "+" to send meeting requests;
- Check "How it works" section on the page;







Marketplac

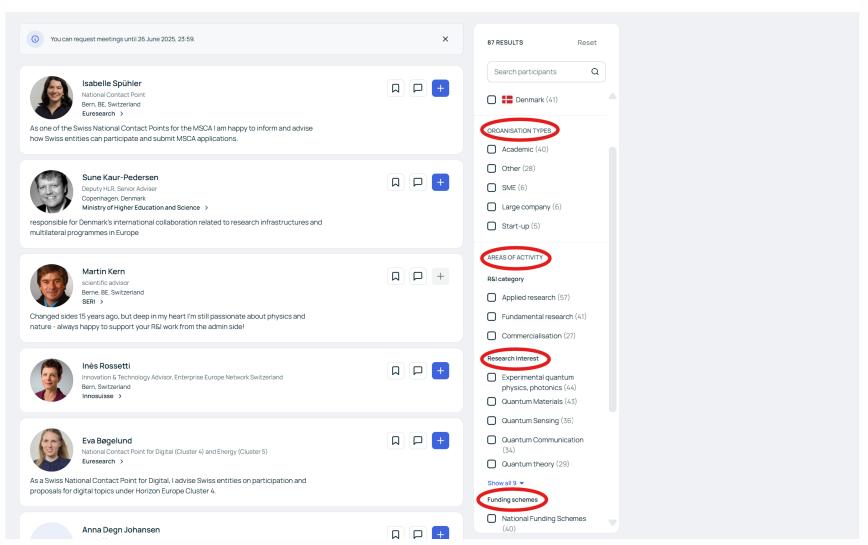




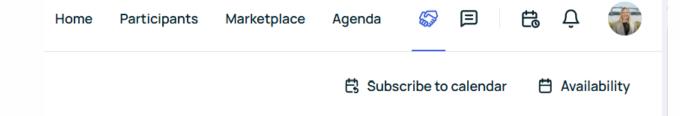


**↓**↑ Relevance

# How to search for relevant partners and book meetings







# Be proactive, professional and respect other participants' time

- Click "handshake icon" to check your upcoming meetings;
- Click "message icon" to check for conversations with other participants;
- Click "schedule icon" for upcoming meetings;
- Click "notifications icon" to check on any new activities;
- Cancel or re-schedule your meetings if needed;
- Subscribe to calender to sync all sessions and scheduled meetings with your personal calendar;

#### D



Anders Skeem
Food & Bio Cluster Denmark
EEN Denmark
as@foodbiocluster.dk
https://www.enterprise-europe.dk/





#### $\approx$

# Thank you

Follow us @EEN EU



Aija Konisevska Azadi NorthDenmark EU-Office EEN Denmark aka@ndeu.dk https://www.enterprise-europe.dk/





Ladina Schubert
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ladina.schubert@innosuisse.ch
https://swisseen.ch/en/



een.ec.europa.

V

Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra

Swiss Confederation

Innosuisse - Swiss Innovation Agency

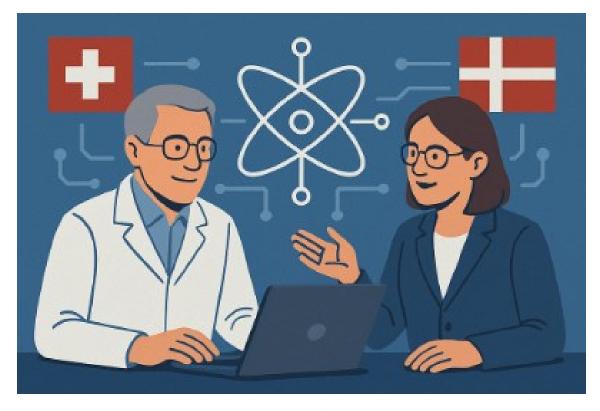








# Thank you! Let's entangle!



 $|\operatorname{research}\rangle \otimes |\operatorname{innovation}\rangle + |\operatorname{innovation}\rangle \otimes |\operatorname{research}\rangle$