Switzerland
A Hub for Quantum

swissnex

Project Quantum

A Century of Quantum in Switzerland

The world marked 100 years of the development of quantum mechanics in 2025. As host to Albert Einstein and Erwin Schrödinger, Switzerland pioneered many of the first discoveries unlocking the mysteries of the quantum world. Today, Switzerland continues to nurture a world-class quantum ecosystem, through the bottom-up dynamism of its top-flight universities and research centers, its high-tech innovation economy, and its deep international connections.

World-Class Quantum Science
Switzerland, a country of 9 million, produces world-class quantum information science beyond what its modest size would suggest, boasting the highest impact factor for quantum research publications of any country in the world. It was an early pioneer in the second quantum revolution, having established four quantum-focused National Centers for Competence in Research (NCCRs) – in nanoscience, quantum photonics, quantum science, and spin qubits – since 2001. This investment in research has helped attract dozens of new professors to universities like ETH Zurich, EPFL, the University of Basel, and the University of Geneva.

Broad Excellence
Switzerland's research success extends across most major quantum subfields. In addition to well-regarded research on most leading quantum hardware platforms, Swiss researchers are renowned for their work on quantum communications, sensing, materials, and photonics. Extensive research on quantum theory, simulation, and algorithms round out this broad spectrum of expertise. At its Universities of Applied Sciences, researchers are tackling use cases to prepare the economy, and the workforce, for a quantum future.

Pioneering Startups
Thanks in large part to university spin-offs, Switzerland maintains a robust quantum innovation sector. Pioneering start-ups such as ID Quantique and Zurich Instruments have grown into essential suppliers in the global quantum value chain. Many younger quantum technology companies, bolstered by Swiss engineering excellence, are emerging with particular strengths in trapped-ion computing, microscopy, and measurement, as well as enabling technologies such as photonics and precision nanomanufacturing.

International Engagement
The Swiss quantum ecosystem is internationally entangled at all levels, with among the highest rates of international co-authorship in quantum science. Organizations like CERN, the Open Quantum Institute, and the Geneva Science and Diplomacy Anticipator (GESDA) are working to ensure that quantum technologies have broad benefits for the global scientific community and society at large.

National Coordination
Swiss success in quantum research and innovation relies on its bottom-up approach. To provide coordination for the Swiss quantum ecosystem, in 2022, the Federal Council mandated a new Swiss Quantum Initiative to build a framework for research calls, coordinate infrastructure, develop curricula, and strengthen international partnerships. With CHF 100M in targeted funding for 2023-28, the Initiative is working to strengthen Switzerland's leading position in quantum research, technology, and applications.

Swiss Quantum By Numbers

- McKinsey & Company has estimated the global quantum technology market could be worth over $198B by 2040.

- There have been four quantum science national research centers founded since 2001 (nanoscience, quantum photonics, quantum science, spin qubits) each funded with approximately CHF 50M.

- In 2007, Switzerland deployed the world's first commercial quantum cryptography system, developed by Geneva-based ID Quantique. The system is used to secure elections in the Canton of Geneva.

- The Swiss Quantum Initiative, launched in 2023, has been mandated to improve the leading position of the Swiss Quantum Ecosystem with CHF 100M in targeted funding for research, infrastructures, and innovation through 2028.

- QS World University Rankings 2026 ranked ETH Zurich the 7th best university in the world.

- Switzerland has been ranked #1 in the world in innovation by the World Intellectual Property Organization for 15 consecutive years.

What's the Hype About Quantum?

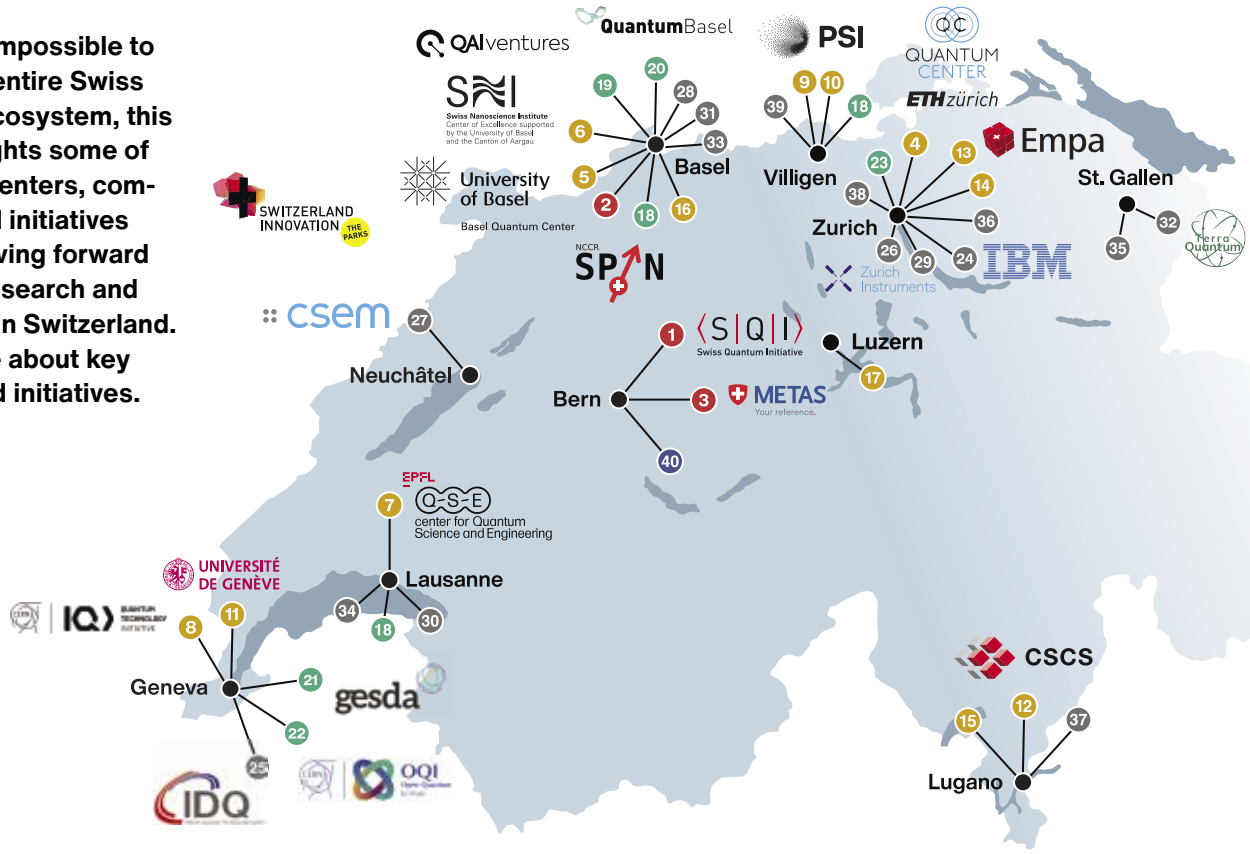
At the smallest scales of the known universe, the laws of classical mechanics break down. Over the last century, physicists have uncovered the mind-boggling principles that define this quantum realm, which has allowed us to develop technologies like lasers, MRI scanners, and GPS. Now we stand at the verge of a second quantum revolution, which is engineering computers, sensors, and other technologies that harness the information conveyed by quantum systems. This revolution could transform both scientific discovery and key technologies just as radically as the classical computing revolution.

While IBM and Google have both predicted the availability of quantum computers with useful, real-world computational advantages by 2030, fundamental scientific and engineering hurdles remain. Even with this uncertain future, technologists, companies, and governments are eager to push for a first-mover advantage. This has created pockets of hype around quantum.

Switzerland is well positioned to persist through any hype cycles and remain a leading ecosystem. Its strengths reside in bottom-up collaboration, long-term commitment to research, world-class universities, and cutting-edge engineering. Switzerland maintains particular strength in quantum sensing, which builds off its rich expertise in precision measurement and is already offering useful real-world advantages.

Swiss Quantum Ecosystem

While it is impossible to depict the entire Swiss quantum ecosystem, this map highlights some of the major centers, companies, and initiatives that are driving forward quantum research and innovation in Switzerland. Learn more about key centers and initiatives.



National Initiatives (Headquarters)

1. Swiss Quantum Initiative
2. National Centre for Competence in Research SPIN
3. Federal Institute of Metrology (METAS)

University Centers and Research Hubs

4. ETH Zurich Quantum Center
5. Basel Quantum Center at the University of Basel
6. Swiss Nanoscience Institute
7. Quantum Science and Engineering Center at EPFL
8. Quantum Technology Initiative at CERN
9. Paul Scherrer Institute (PSI)
10. ETH-PSI Quantum Computing Hub
11. Geneva Quantum Centre at the University of Geneva
12. Swiss National Supercomputing Center (CSCS)
13. Swiss Federal Laboratories for Materials Science and Technology (Empa)
14. Zurich University of Applied Sciences (ZHAW)
15. University of Lugano (USI)
16. University of Applied Sciences Northwestern Switzerland (FHNW)
17. Lucerne University of Applied Sciences and Arts (HSLU)

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National Initiatives

Swiss Quantum Initiative

The Swiss Quantum Initiative has been working to strengthen Switzerland's place among leading nations in quantum information science and technology by coordinating activities at a national level since 2023. The Initiative is led by the Swiss Quantum Commission (SQC) composed of experts from the field; hosted at the Swiss Academy of Sciences (SCNAT); and tasked with defining a national strategy, frameworks for competitive calls, promoting curricula, and strengthening international partnerships. The SQC works closely with the Swiss National Science Foundation (SNSF), Innosuisse, and the wider research and innovation communities.

National Centre for Competence in Research SPIN

The National Centre of Competence in Research (NCCR) SPIN is developing compact, fast, and scalable spin qubits using silicon and germanium, combining cutting-edge quantum physics research with advanced qubit architecture design. Bringing together physicists, materials scientists, engineers, and computer scientists from the University of Basel, EPFL, ETH Zurich, University of Konstanz, IBM Research, and Roche, NCCR SPIN integrates hardware and software innovations to lay the foundations for future quantum technologies. It promotes close collaboration between theory and experimentation, and between academia and industry.

METAS

The Swiss Federal Institute of Metrology (METAS) is Switzerland's national centre for all questions relating to measurement. Through applied research, METAS continuously improves measurement methods across various domains. Quantum systems have long served as reference standards in metrology. As quantum technologies evolve in the second quantum revolution, they must also be accurately characterised and calibrated using SI-traceable measurements. METAS is thus establishing a testing infrastructure to support this need, aiming to become Switzerland's leading competence centre for quantum metrology - ensuring reliability, comparability, and innovation in this rapidly advancing field.

University Centers and Research Hubs

ETH Zurich Quantum Center

The Quantum Center is ETH Zurich's central hub for quantum science and technology. It unites over 600 physicists, computer scientists, chemists, engineers and materials scientists from 40 groups spanning six ETH departments, PSI and Empa, to research quantum sensing, simulation, communication, computing and fundamental science. The Center facilitates interdisciplinary collaboration; serves as a liaison for industry partnerships, grants and donations; and promotes public understanding of quantum technologies through outreach and education. The Center supports ETH's Master's in Quantum Engineering, and its dedicated Engineering Unit focuses on advancing quantum hardware.

Basel Quantum Center at the University of Basel

The Basel Quantum Center (BQC) at the University of Basel integrates and coordinates the quantum science and technology activities in the Basel trinational region. It comprises more than 200 researchers working on all major quantum technology platforms and applications. The BQC supports a PhD program and a cross-border postdoc cluster with the University of Freiburg, Germany. The Center has close links with the Swiss Nanoscience Institute, the NCCR SPIN, and the QC2 center, and is one of the nodes of the Generation Quantum PhD program at the European Campus Eucor.

Swiss Nanoscience Institute at the University of Basel

The Swiss Nanoscience Institute (SNI) is a center of excellence for nanoscience and nanotechnology, a basis for quantum research. It is supported by the University of Basel and the Canton of Aargau and promotes research, education, and technology transfer in Northwestern Switzerland, bringing together interdisciplinary teams from the University of Basel, FHNW, PSI, D-BSSE, CSEM in Allschwil, and the technology transfer center ANAXAM.

Quantum Science and Engineering Center at EPFL

At EPFL, the QSE Center is an interdisciplinary hub for research, education, innovation, and societal impact in quantum science and engineering. It unites leading scientists across physics, computer science, and engineering to develop transformative quantum technologies for fundamental research and real-world appli-

cations. Its research pillars span quantum information science, simulation, materials, devices, systems, optics, measurements, and enabling hardware. The Center created EPFL's Master's in QSE to train future quantum leaders through a multidisciplinary curriculum and integration with research labs. It shapes Switzerland's quantum future via grants, partnerships, and public engagement.

Quantum Technology Initiative at CERN

The CERN Quantum Technology Initiative (QTI) is an international research programme aimed at exploring and harnessing the transformative potential of quantum technologies for the advancement of high-energy physics and broader societal applications. Launched as a strategic response to the rapid global progress in quantum science, the QTI serves as a collaborative platform that brings together leading experts from academia, industry, and research institutions. Through this initiative, CERN is actively developing and disseminating enabling quantum technologies—such as ultra-sensitive quantum sensors, time synchronization protocols for quantum communication systems and state of the art quantum computing algorithms — that can significantly enhance future particle physics experiments. By fostering strong academia–industry partnerships, the programme aims to accelerate the development of quantum skills and competencies across Europe and beyond, while ensuring the development of a quantum ecosystem grounded in practical applications.

Paul Scherrer Institute

Paul Scherrer Institute (PSI), the Swiss national lab for natural and engineering sciences, is home to a growing ecosystem of quantum research, technology transfer and commercial activities. Efforts in quantum computing range from fundamental materials research, leveraging the institute's large-scale facilities, to specific modalities such as neutral atoms and superconducting bosonic qubits. Its cleanroom is equipped with advanced manufacturing tools tailored to both photonics application and quantum devices. The ETHZ-PSI Quantum Computing Hub, and quantum companies such as YQuantum and Swiss PIC are supported by PSI.

ETH-PSI Quantum Computing Hub

The ETHZ-PSI Quantum Computing Hub was established in May 2021 as a joint center for the development of quantum computers. It brings together the resources of ETH Zurich with the Paul Scherrer Institute (PSI), the largest research institute for natural and engineering sciences in Switzerland. The Hub's central aim is to target the technical and scientific challenges on the way to realizing large-scale quantum computers based on both superconducting circuits and trapped ions.

Geneva Quantum Centre at University of Geneva

The Geneva Quantum Centre at the University of Geneva brings together around 20 research groups building on a tradition of pioneering research in quantum sciences, most notably in quantum communications, quantum sensing, quantum materials, and in the theoretical foundations of these domains. It targets broad education programs for the general public, schools, and the training of engineers, and has launched new Bachelor and Masters programs. It is also working with industry and other quantum actors in the region to synergize the local quantum ecosystem.

Swiss National Supercomputing Centre (CSCS)

The Swiss National Supercomputing Centre (CSCS), founded in 1991 in Lugano and operated by ETH Zurich, develops and operates Switzerland's leading high-performance computing (HPC) and data infrastructure. Supporting partners like CERN and MeteoSwiss, its energy-efficient site uses Lake Lugano for cooling. In September 2024, CSCS inaugurated the "Alps" supercomputer to advance AI research, climate modeling, and high-resolution weather forecasting. CSCS also drives the integration of HPC with quantum technologies, fostering hybrid workflows for future scientific breakthroughs.

Swiss Federal Laboratories for Materials Science and Technology (Empa)

The Swiss Federal Laboratories for Materials Science and Technology (Empa) is a research institution established in 1880. Today it mainly focuses on interdisciplinary research on materials and technologies, especially those promising a more sustainable future. One of their research focus areas is explicitly targeting quantum devices, ranging from nanoscale material synthesis and characterization all the way to advanced manufacturing technologies.

Universities of Applied Sciences

Zurich University of Applied Sciences (ZHAW)

ZHAW drives applied research in quantum algorithms and machine learning, analyses natural quantum processes, and fosters industry-academia synergies for innovation via the Quantum Algorithms Expert Group in Innosuisse AI Booster.

University of Lugano (USI)

The University of Lugano (USI) features a group dedicated to cryptography and quantum information.

University of Applied Sciences Northwestern Switzerland (FHNW)

The University of Applied Sciences Northwestern Switzerland (FHNW) is increasingly active in various applied quantum technologies such as biopharma with strong industrial collaborations and education for non-specialists to build quantum awareness.

Lucerne University of Applied Sciences and Arts (HSLU)

The Lucerne University of Applied Sciences and Arts (HSLU) hosts research on practical quantum cryptography and on quantum computing applications for business use cases.

Ecosystem Builders and Accelerators

Switzerland Innovation Parks

Switzerland Innovation's network of parks offer state-of-the-art facilities and a comprehensive array of services tailored to nurture quantum enterprises and foster strategic partnerships. Three key locations focus on quantum innovation. Switzerland Innovation Park Basel Area is nested in a thriving ecosystem of research and commercialization, including the Basel Quantum Center at University of Basel, NCCR SPIN, University of Applied Sciences Northwestern Switzerland, QuantumBasel, and QAI Ventures. Switzerland Innovation Park Innovaare, strategically co-located with the Paul Scherrer Institute (PSI), features ETH Zurich's scale-up research facilities in quantum computing, along with unparalleled expertise in detector design, electronics, cryogenics, integrated photonics, and materials characterization. Switzerland Innovation Park Network West EPFL draws on the strength of EPFL research and talent, with strengths in quantum measurement, communication, photonics, optoelectronics, and optics.

QAI Ventures

QAI Ventures is a global VC firm based in Basel, Switzerland, investing in quantum technologies, AI, and advanced computing start-ups from early-stage to later-series C. With offices in Canada, Japan, and Singapore, and backed by a solid lab-to-IPO start-up support global program, they have become the leading Quantum AI ecosystem builder.

QuantumBasel

QuantumBasel is a leading quantum computing and AI competence center in Switzerland. At the heart of a vibrant ecosystem connecting academia, corporates, and start-ups on the uptownBasel innovation campus, the center serves as a bridge from lab to industry. QuantumBasel offers hands-on access to leading quantum systems, strategic guidance, training, and industry-specific projects, for example in energy, finance, healthcare and pharma, logistics, and manufacturing. The team includes quantum algorithms researchers and data scientists with expertise in areas such as time series forecasting, quantum machine learning, LLM fine-tuning, and agentic AI.

The Open Quantum Institute (OQI) at CERN

The Open Quantum Institute (OQI), hosted at CERN, is a multilateral governance initiative to promote global and inclusive access to quantum computers in order to develop applications that benefit humanity. In its pilot phase from 2024-26, it is gathering stakeholders from academia, diplomacy, the private sector and philanthropy promoting international collaboration to stimulate use cases aligned with SDGs. OQI is building capacity through a range of educational efforts, including developing tools such as the OQI Hackathon in a Box, and regional events taking place across multiple continents with a focus on underserved geographies The OQI acts as the societal arm of the QTI within CERN.

The Geneva Science and Diplomacy Anticipator (GESDA)

The Geneva Science and Diplomacy Anticipator (GESDA) has made quantum technologies into

one of its key focus areas. Its radar tracks predicted trends in quantum computing, communication, and sensing on five, ten, and twenty-five year time horizons. Working with leading scientists, GESDA is also anticipating use cases for quantum technologies to reach the UN sustainable development goals (SDGs), and is planning a competition in collaboration with XPRIZE to democratize quantum computing. In October 2023 GESDA launched the Open Quantum Institute to be hosted at CERN.

Verve Ventures

Zurich-based Verve Ventures is one of Europe's most active early-stage investors. The company invests in energy and resources, health, and the future of computing, which includes quantum computing. It has invested in the quantum computing start-ups C12, Orca Computing, Kipu Quantum, Kiutra, Miraex, and the quantum sensing start-up Qnami. Verve Ventures offers qualified investors access to start-ups through its digital investment platform and counts many industry executives and professors among its network.

Private Companies and Centers

IBM Research

Zurich hosts one of IBM's 12 global research labs and represents their European site. While representing many of IBM's research interests, the Zurich hub maintains a strong focus on quantum optimization and algorithms.

ID Quantique

Headquartered in Geneva, ID Quantique, now part of the IonQ family, is a global company with offices and engineering labs across the world. They are a leading company for mature technologies in quantum key distribution (quantum-safe cryptography), random number generation, and quantum detection systems.

Zurich Instruments

Zurich Instruments brings innovation to quantum control systems in the form of efficient workflows, tailored specifications, and a high degree of reliability. The company supports quantum researchers and engineers by allowing them to focus on developing quantum processors while benefiting from the most advanced classical control electronics and software.

CSEM

CSEM, the Swiss Center for Electronics and Microtechnology, is a public-private, not-for-profit Swiss applied Research and Technology Organization (RTO), whose mission is to promote technology transfer to foster industrial innovation. They focus on precision manufacturing, digitalization, ultra-low-power electronics, micro- and nanofabrication, photonics, AI, and sustainable energy. Their quantum research mainly focuses on developing vapor cell and nitrogen-vacancy (NV) based atomic clocks and sensors for real-world application, including the fabrication of MEMS vapor cells and PICs for chip-scale atomic clocks and other miniature quantum sensors.

Basel Precision Instruments

Basel Precision Instruments is a leading provider of ultra-low noise electronics and cryogenic microwave filters & thermalizers. By unlocking new measurement possibilities, they enable innovators to explore new frontiers of quantum computing and quantum science.

Swissphotonics

Swissphotonics is an association with over 210 paying members promoting the competitiveness of its members through innovation activities and support. Swissphotonics serves the full field of photonics, from materials for light generation and detection to applications such as photonic manufacturing imaging, life sciences, sensing, communication, photovoltaics and illumination. Many Swiss photonics companies are active in quantum and provide essential technologies to the quantum research and innovation sectors in Switzerland and globally.

Miraex

Miraex is a company focused on developing quantum interconnects for distributed quantum computing and quantum communication applications. Miraex quantum interconnects link microwave and optical frequency domains, allowing exponential scale-up of quantum processing units via optical interconnectivity, and quantum entanglement distribution on future quantum networks.

Qnami

Qnami is a venture capital-backed company working on highly sensitive quantum sensors

to measure magnetic fields on an atomic scale. They have created the first scanning nitrogen-vacancy system, which makes possible high precision imaging.

Terra Quantum

Terra Quantum AG delivers Quantum-as-a-Service (QaaS) across three core domains: Quantum Algorithms provides access to quantum and hybrid algorithms to solve complex optimization, quantum machine learning, and simulation challenges via an enterprise-grade platform (TQ42). Quantum Computing grants access to proprietary high-performance simulated quantum processing units (QPUs), integrates seamlessly with the global ecosystem's physical QPUs, and drives advances in classical semiconductor technologies to enable scalable quantum hardware. Quantum Security delivers comprehensive quantum-safe solutions by combining Post-Quantum Cryptography with Quantum Key Distribution, ensuring secure communications across both quantum and post-quantum environments worldwide.

IonQ

IonQ, a leader in trapped ion quantum computing, has partnered with Quantum Basel to establish a European quantum data center. Two IonQ systems will be installed at the uptown-Basel campus, which will also host an IonQ quantum innovation center to drive quantum research and development in Europe, the Middle East, and Africa (EMEA).

Ligentec

LIGENTEC is providing integrated photonics solutions for the quantum industry. We work closely with a number of companies that need to integrate their optical circuits on a photonic integrated circuit (PIC). Our offering is tailored for quantum computing using photons, atoms and ions as qubits as well as for QKD and QRNG systems. The offering ranges from design and layout to fabrication and testing of customer specific PICs. A unique selling point is that we can offer those PICs from small quantities for prototyping to large volumes for product integration.

HUBER+SUHNER

With decades of expertise in cryogenic applications for the space industry, HUBER+SUHNER brings proven reliability and engineering excellence to the quantum computing sector. Its deep knowledge in radio frequency technologies, and a focus on high-density, multicoax solutions, enables them to develop high-performance interconnects that meet the stringent demands of cryogenic environments. Engineered for the most advanced quantum computing applications, their multicoax precision connectors ensure reliable high-density, low-loss, and non-magnetic signal transmission from the room temperature controller down to the Quantum Processing Unit.

QZabre

QZabre is an ETH Zurich spin-off specialized in nitrogen-vacancy technologies. They offer high-precision scientific instruments: nitrogen-vacancy scanning tips with unprecedented sensitivity and quantum scanning microscopes for nanoscale magnetometry. Their product line also includes quantum confocal scanning microscopes allowing diamond characterization, customizable diamond membranes with pillars, as well as a hands-on educational kit for teaching quantum mechanics and sensing using nitrogen-vacancies.

FEMTOPRINT

FEMTOPRINT is a Swiss contract & development manufacturer providing glass devices with precision to the micrometer, therefore enabling the development of quantum hardware. Solid know-how and accumulated experience in glass fabrication techniques, electrode geometries and metallization methods allow FEMTOPRINT to realize: complex 3D ion traps; optical structures such as fiber inlets, mirrors, lenses, and optical waveguides; glass printed circuit boards and through-glass vias for electrical connectivity; multi-layer devices through laser welding of glass and metal substrates; and vapor cells.

ZuriQ

ZuriQ is the first Swiss start-up building a commercial quantum computer. Their systems are powered by trapped-ion qubits which have traditionally offered the highest quality performance. Their core innovation is the development of a novel trapping architecture based on reconfigurable two-dimensional arrays of trapped ions. This novel approach unlocks scalability, is compatible with industrial silicon chip

fabrication processes, and offers a pathway to quantum advantage in various sectors.

YQuantum

YQuantum, founded in 2024 as a University of Basel start-up, is a quantum hardware company developing miniaturized cryogenic components for scalable quantum computing. Quantum processors operate in cryostats at extremely low temperatures, where limited space and bulky components restrict the size of processors with many qubits. By miniaturizing and integrating these elements, YQuantum removes a key bottleneck and enables higher-density architectures. Leveraging strong global academic and industry partnerships, the company draws on decades of expertise in quantum technologies. Its products include QPU packaging solutions and high-frequency filtering for cryogenic applications.

Government

Swissnex

Swissnex is the Swiss global network connecting Switzerland and the world in education, research and innovation. An initiative of the Swiss State Secretariat for Education, Research and Innovation, Swissnex works collaboratively to support the exchange of knowledge, ideas, and talent. Through its Project Quantum, it works to deepen connections between Swiss quantum researchers, entrepreneurs, and ecosystem builders with their counterparts around the globe.

References and Further Reading:

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