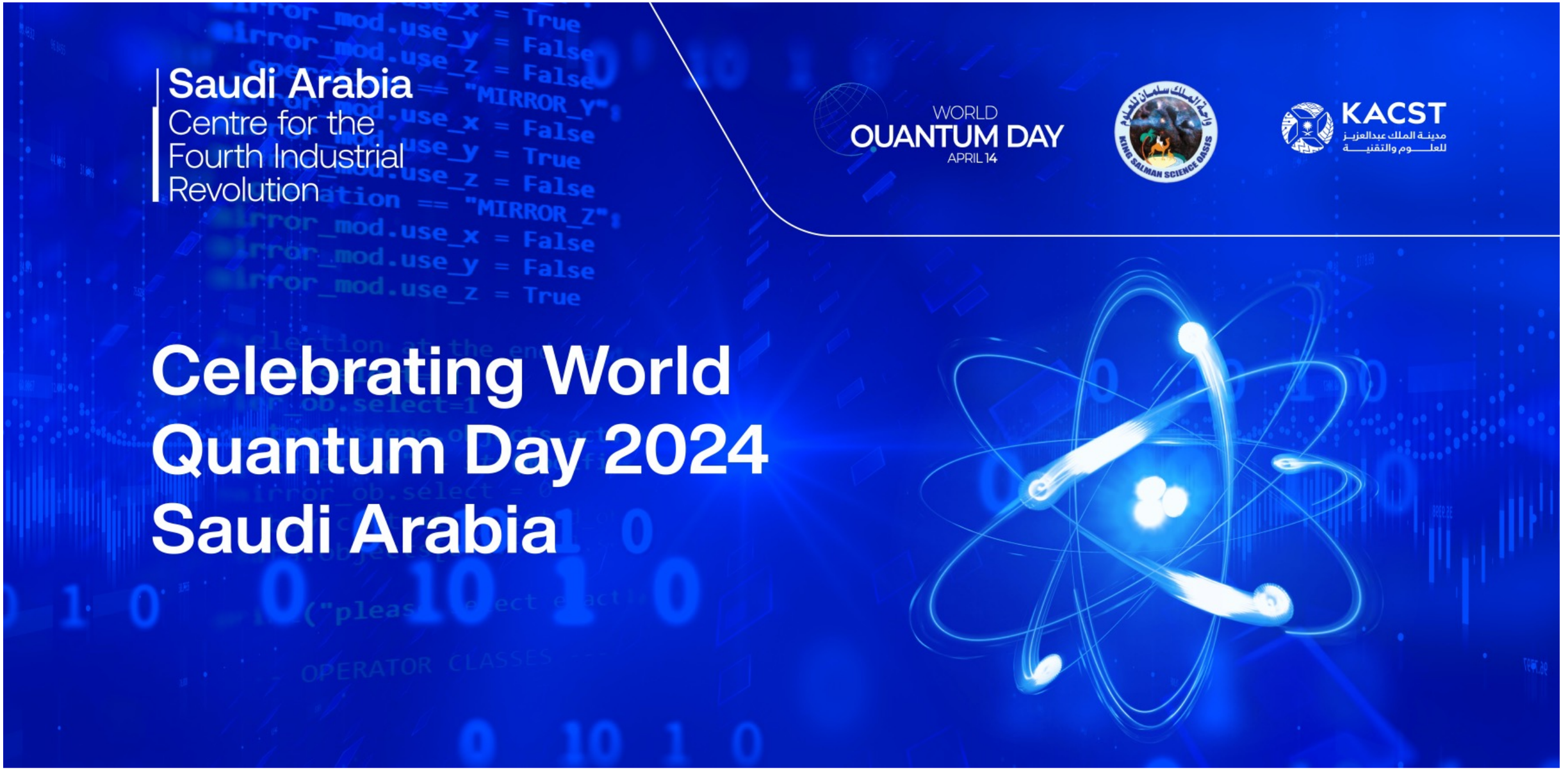
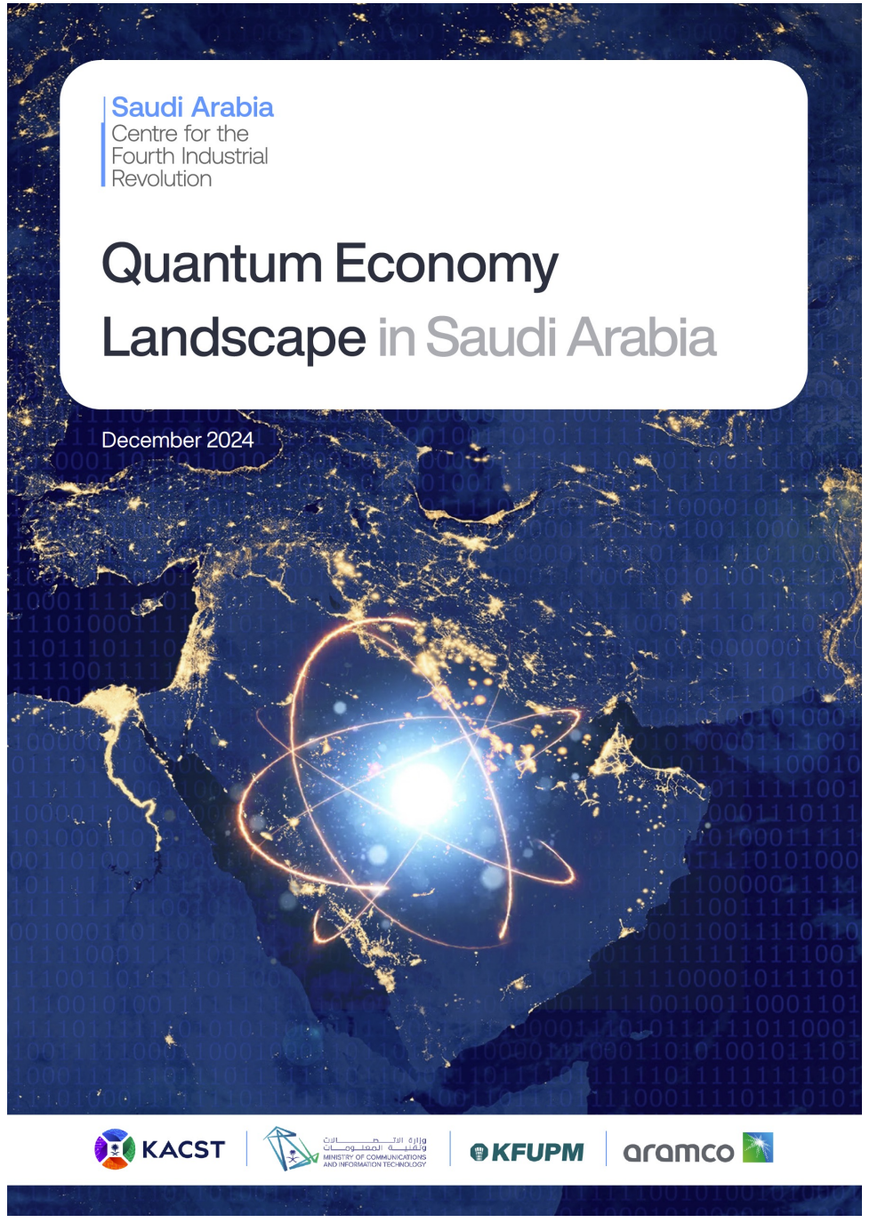
Welcome to KAUST-Aramco World Quantum Day

14 April 2026



2026 is 3rd annual WQD for Saudi Arabia – established internationally in 2021



“In a pioneering move, Saudi Arabia has become the first nation to pilot the World Economic Forum’s *Quantum Economy Blueprint*. The Quantum Economy Initiative, spearheaded by C4IR Saudi Arabia in partnership with the WEF, aims to harness the blueprint’s themes to develop a national roadmap that will inform a comprehensive national quantum strategy. This initiative seeks to build a robust quantum ecosystem by integrating efforts from government bodies, academic institutions, and industry.

The initiative aims to catapult key industries like cybersecurity, energy, healthcare, and manufacturing into the quantum era, positioning Saudi Arabia at the forefront of global technological progress. By promoting collaborative efforts and harmonizing with international quantum benchmarks and national goals, it strives to transform the Kingdom into a hub for quantum innovation, research, and commercial applications. This strategic approach is designed to support Saudi Arabia’s economic diversification efforts and drive sustainable growth, aligning with the country’s vision for a technologically advanced and economically robust future.”

"This roadmap pilots the World Economic Forum's *Quantum Economy Blueprint*, charting a course for Saudi Arabia to harness quantum technologies for economic diversification and societal well-being.

The first pillar, Building Capabilities, aims at understanding the quantum value chain and assessing Saudi Arabia's access to critical hardware infrastructure, supply chain robustness, and workforce endowment.

The second pillar, Driving Innovation, focuses on translating these capabilities into tangible economic value by implementing a mission-driven funding model that bridges the gap between research and commercialization, creating a national quantum innovation hub to accelerate technology transfer, and launching a coordinated awareness campaign to ensure strategic alignment and informed investment across government and industry.

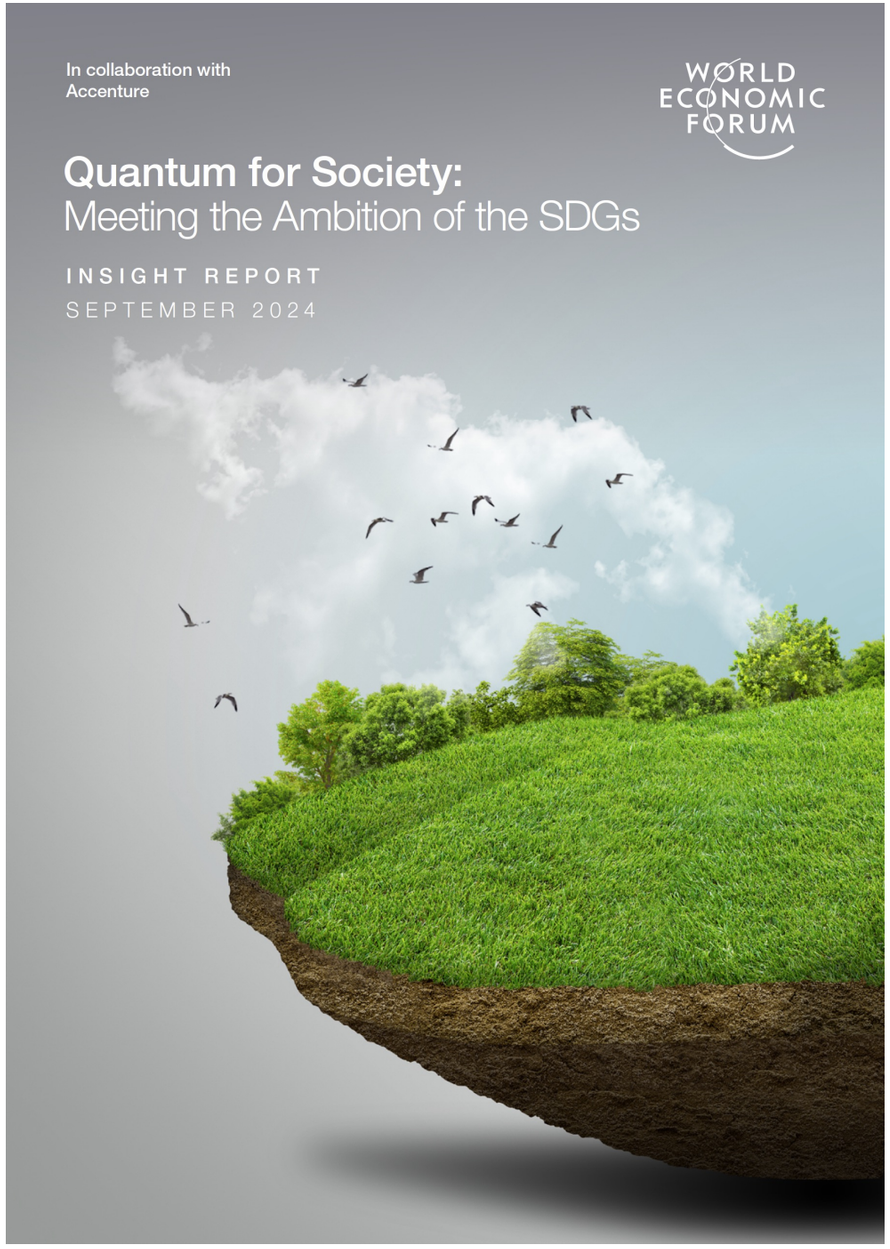
The third pillar, Ensuring Responsibility, focuses on building public trust and securing the nation's digital future. This involves establishing proactive governance and a national authority to lead standardization efforts, ensuring that quantum development is ethical, interoperable, and aligned with global best practices."

"Quantum computing is seen as a strategic technology by the world's leading economies. This fundamentally new way of computing – it is not just a stronger classical computer – has the potential to dramatically recast our ability to tackle climate change, hunger and disease. For many, its potential to render common cryptographic technologies obsolete, its economic potential, and its impact on global digital economy make it geopolitically strategic.

This report aims to give a holistic and neutral overview of the current state of play in quantum computing – the technology, its applications, the state of the emerging industry and key components of a successful quantum ecosystem. It aims to provide an accessible baseline of information for business executives and policy-makers worldwide, to support informed opinion and fact-based decision-making."

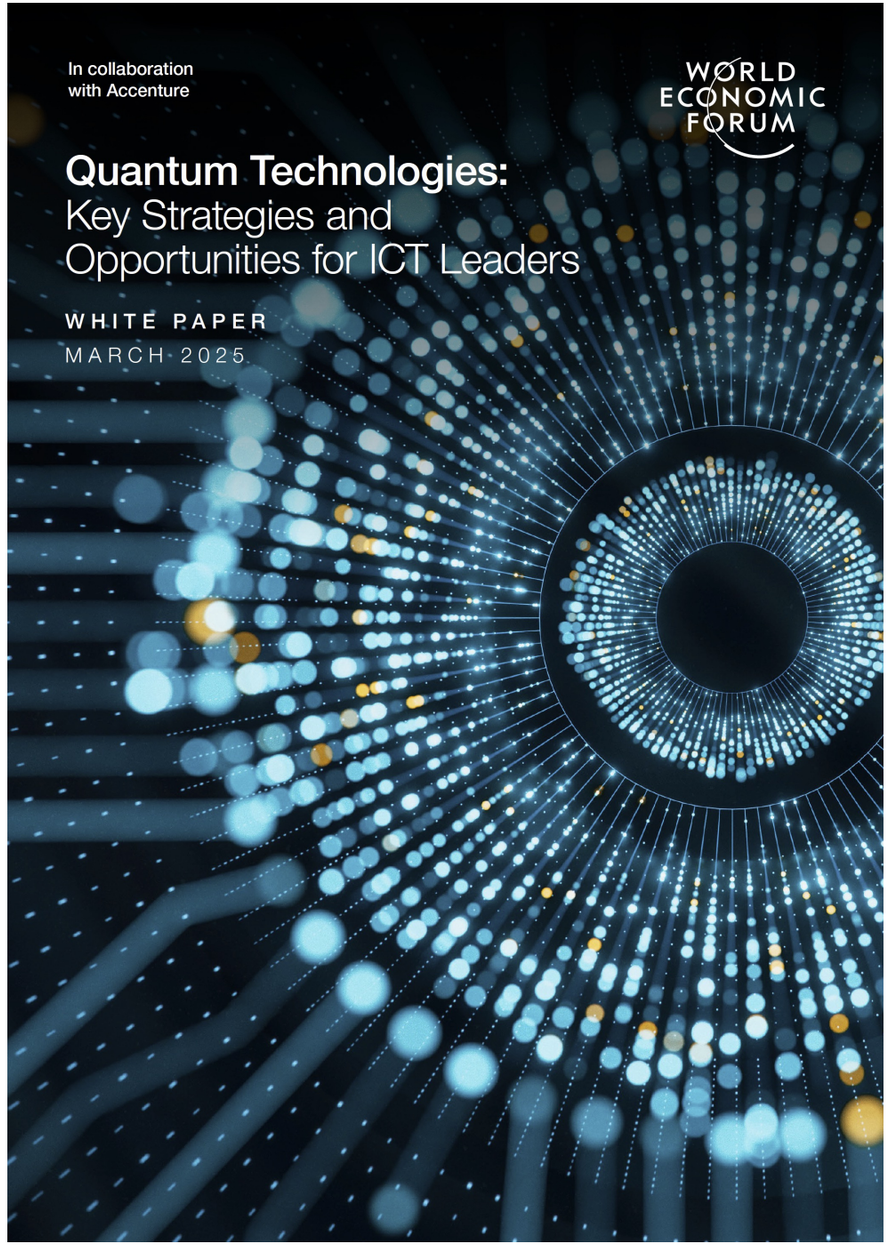
"The early adopter advantage we have with QT, which is still at a relatively early stage, helps us make decisions about how and where to explore – and hopefully reap – the benefits of QT. We can learn from the past and be proactive about making sure QT is being developed and deployed for the benefit of all. To do so, well-thought-through, scientifically sound and socio-economically holistic QT strategies are needed.

The Quantum Economy Blueprint intends to provide a reflection on already-existing quantum strategies. The abstracted dissemination of core elements of national and regional quantum strategies into building blocks enables others to learn from existing examples while also further developing the building blocks for individual successful strategies of QT."



"This report explores the connection between quantum technologies and the 2030 Agenda for Sustainable Development, which United Nations Member States adopted to address these issues through 17 clearly defined Sustainable Development Goals (SDGs).

This report explores why organizations and leaders must act now to invest in and prepare for quantum, so that this game-changing technology can be effectively harnessed in the coming years. While the timeline for the availability of fault-tolerant quantum computers remains uncertain, other technologies such as quantum sensing and quantum communication may achieve commercial readiness sooner. R&D-intensive industries are the front-runners in the quantum field, having experimented with industry-driven use cases and built proofs-of-concept for several years. However, uncertainty regarding quantum readiness and lack of clear returns on investment (ROI) hinder the foundation of a robust 'quantum for society' network."



"Real-world applications of quantum computing are emerging in areas such as 5G network optimization and customer product recommendations. Opportunities explored within key indicators were analyzed through use cases that highlight the transformative potential of quantum computing in optimizing legacy telecommunications networks and enhancing customer engagement.

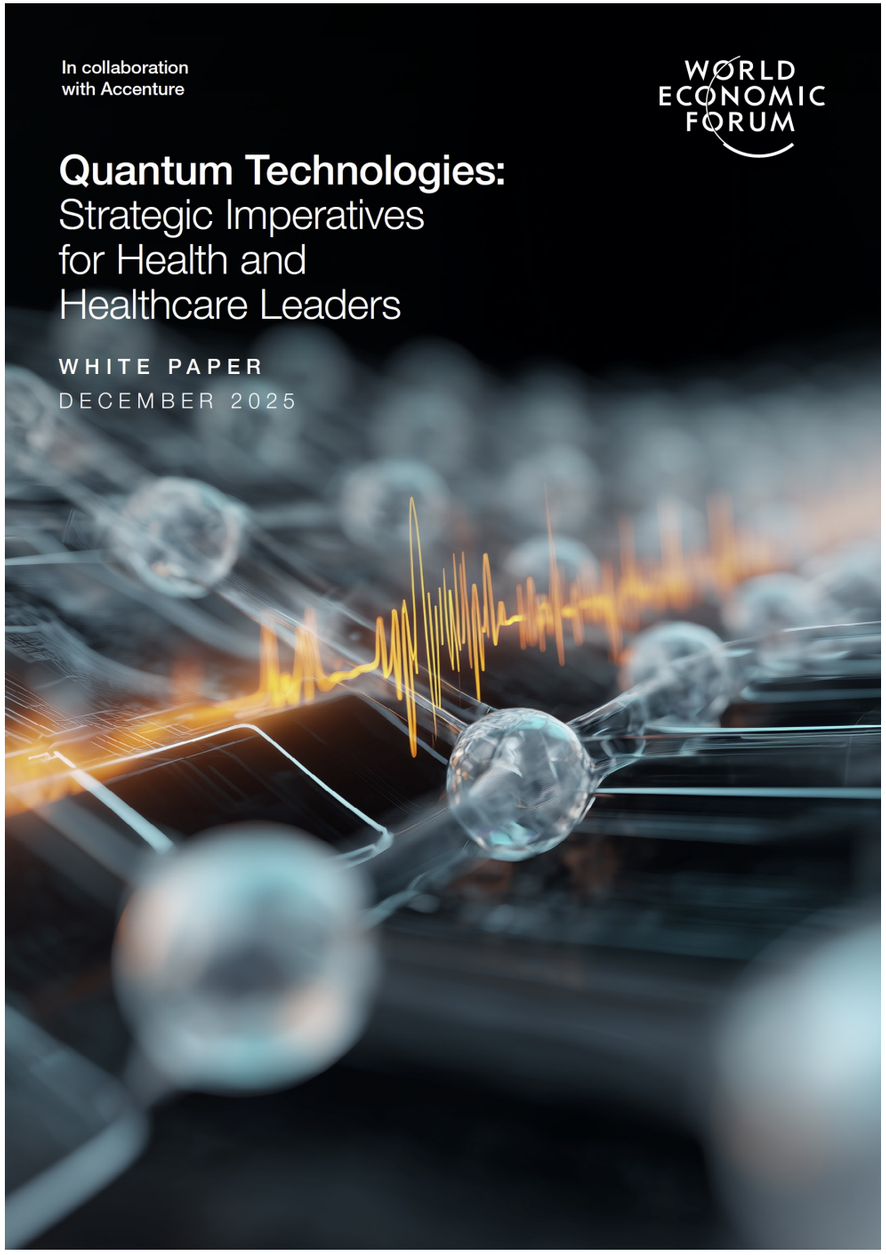
As quantum capabilities mature, proactive organizations will lead the next era of digital transformation. By embracing quantum technologies strategically, businesses can mitigate risks, enhance efficiencies and secure long-term competitive advantages. ICT leaders should adopt an iterative test-and-learn approach to integrate quantum technologies, setting strategic objectives and developing a research agenda. Long-term strategic planning, continuous learning and adaptation to emerging trends will be critical for maintaining competitiveness and driving significant advancements in the ICT sector."

"The financial services industry is at a technological inflection point, driven by the advent of quantum technologies. Quantum technologies harness quantum mechanics principles like superposition, entanglement and interference to facilitate powerful new capabilities in computing, communication and sensing. These principles allow quantum systems to process information in parallel, link particles across distances, and amplify correct outcomes while eliminating errors. While they promise breakthroughs in fields like cryptography, simulation and data analysis, practical implementation remains a significant challenge.

Quantum computing has the potential to offer more accurate risk modelling, fraud detection and portfolio optimization. Quantum communications technologies enable theoretically unbreakable encryption through methods such as quantum key distribution (QKD) and quantum random number generation (QRNG). Complementing this, classical approaches like post-quantum cryptography (PQC) algorithms can build resistance to quantum computer attacks, helping to protect sensitive financial data from emerging threats."

"The manufacturing and supply chain sector is experiencing its most turbulent period in decades, with disruption now being the norm rather than the exception. In 2024, global supply chain disruptions rose by 38% year-over-year, driven by extreme weather, geopolitical tensions, and labor strikes.

The potential of quantum technologies (quantum computing, quantum sensing, and quantum security and communications) is becoming increasingly relevant, not as a distant or academic pursuit, but as a powerful new set of tools that could unlock competitive advantage in precisely those domains where conventional technologies are reaching their limits."



"Quantum technologies are beginning to reshape many industries. The health and life sciences sectors stand out as being uniquely positioned to benefit from this change. Many of the most difficult challenges in these two fields, from simulating molecular interactions to measuring faint biological signals, are rooted in quantum physical phenomena. Advances that make it possible to model these processes accurately or measure them more precisely translate directly into new pathways for understanding the human body.

Quantum computing holds great promise for revolutionizing health and life sciences. Quantum computing is expected to drastically accelerate applications that are currently unfeasible for traditional systems, significantly impacting the cost and time-to-market of multi-billion-dollar projects. The question is no longer whether quantum will transform health, but how pioneering organizations from biopharma creators to health deliverers and ecosystem enablers will lead in shaping that future."

Research Grants

2025 Economies of the Future Priority

Focus Areas

هيئة تنمية البحث والتطوير والابتكار
Research Development and Innovation Authority

Priority Focus Areas

2. National Mission: Develop programmable fault-tolerant quantum computer by 2040

- Quantum Computing and Simulation Research Focus:
  - NISQ
  - Quantum annealing machine
  - Superconducting qubit
  - Ion trap
  - Photonic qubit
  - Cooled atom
  - Quantum Walk

So far, no RDIA support for this focus area, but the priority becomes more important by the month.

Shor's algorithm is possible with as few as 10,000 reconfigurable atomic qubits

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(Dated: March 31, 2026)

Quantum computers have the potential to perform computational tasks beyond the reach of classical machines. A prominent example is Shor's algorithm for integer factorization and discrete logarithms, which is of both fundamental importance and practical relevance to cryptography. However, due to the high overhead of quantum error correction, optimized resource estimates for cryptographically relevant instances of Shor's algorithm require millions of physical qubits. Here, by leveraging advances in high-rate quantum error-correcting codes, efficient logical instruction sets, and circuit design, we show that Shor's algorithm can be executed at cryptographically relevant scales with as few as 10,000 reconfigurable atomic qubits. Increasing the number of physical qubits improves time efficiency by enabling greater parallelism; under plausible assumptions, the runtime for discrete logarithms on the P-256 elliptic curve could be just a few days for a system with 26,000 physical qubits, while the runtime for factoring RSA–2048 integers is one to two orders of magnitude longer. Recent neutral-atom experiments have demonstrated universal fault-tolerant operations below the error-correction threshold, computation on arrays of hundreds of qubits, and trapping arrays with more than 6,000 highly coherent qubits. Although substantial engineering challenges remain, our theoretical analysis indicates that an appropriately designed neutral-atom architecture could support quantum computation at cryptographically relevant scales. More broadly, these results highlight the capability of neutral atoms for fault-tolerant quantum computing with wide-ranging scientific and technological applications.

Might Q-Day arrive as early as 2028?

Building the world's first fault-tolerant quantum computers

Fault-tolerant quantum computing is within reach.

From scientific discoveries to new paradigms in artificial intelligence, quantum computers allow us to truly understand our universe—but only if they can be made fault-tolerant. Until now, the overhead of error correction has made this goal impractical.

At Oratomic, we are building the world's first utility-scale quantum computers, enabled by a new regime of ultra-efficient error correction—using only light and atoms.

Why is Oratomic significant?

- Quantum Insider reports over 150 quantum computing companies
  - 76 are considered “major players” (IBM, Google, Microsoft, AWS, NVIDIA, D-WAVE, Rigetti, Quantinuum, Pasqal, ORCA, QuEra, etc.)
  - 44 are aspiring QC hardware vendors , spanning about 7-12 different qubit technologies (superconducting, trapped ions, neutral atoms, photons, Majorana Fermions, NV Centers, etc.)

- Oratomic is co-founded by John Preskill
  - Feynman Professor of Physics at Caltech, NAS
  - Coiner of “Quantum Supremacy”, “NISQ”, “FTQC”, “FASQ”, and “MegaQuop”

CEO of NVIDIA with 6 Quantum CEO’s at GTC’25

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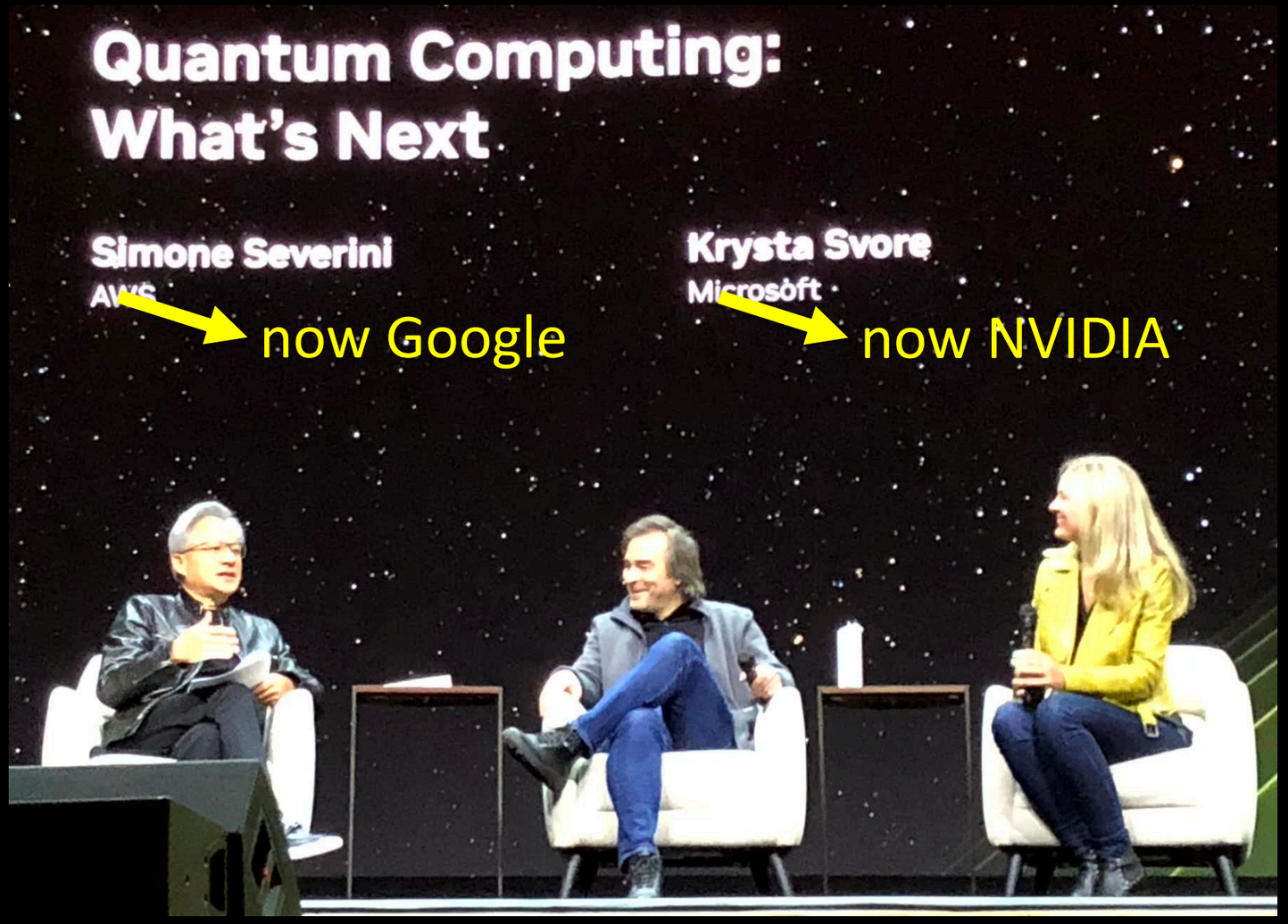
CEO of NVIDIA with Quantum VPs of hyperscalers



Quantum Computing Market Map

THE QUANTUM INSIDER

Non exhaustive and in no particular order. Excludes details on control systems, assembly languages, circuit design, etc.

Users
Select examples

Material Science
MERCK, OTI, AIRBUS, BMW

Finance
Goldman Sachs, BANK OF AMERICA, J.P.Morgan, WELLS FARGO

Life Sciences
ODYSSEY THERAPEUTICS, Boehringer Ingelheim, AstraZeneca, gsk

Other
VW, JOHNSON ELECTRIC, DENSO

Applications
Not mapped to verticals

Not strictly categorized given diversity of operations[1]
MULTIVERSE COMPUTING, QCWARE, 1QBit, NQCG, Aliro QUANTUM, HORIZON QUANTUM COMPUTING, HQS QUANTUM SIMULATIONS, ZAPATA, QCi Ready-to-run Quantum Software, QuantFi, ENTROPICA LABS, river lane, STRANGE WORKS, PHASECRAFT, aq, QunaSys, Terra Quantum, ⟨b| e^it, ProteinQure, KEYSIGHT TECHNOLOGIES, Qubit pharmaceuticals, Q-CTRL, CLASSIQ, Quantum-South, ParityQC

Software offerings
Includes control software

Cloud access to QPUs
aws, Google Cloud, Azure, Atos, FUJITSU, NVIDIA, HUAWEI, HUAWEI CLOUD

Simulators / q-inspired / etc

QPUs[2]

Superconducting
rigetti, Google AI Quantum, OQC, ILMANJARO QUANTUM TECH, IBM Q, qci, IQM, Nord Quantique, aws, seeqc, D-Wave The Quantum Computing Company, Alibaba.com Global trade starts here.

Ion Trap
QUANTINUUM, IONQ, Universal Quantum, atom computing, ColdQuanta, oxford ionics, AQT, QUDOOR 启科量子, eleQtron, IQuEra, PASQAL

Neutral Atoms

Silicon
Silicon Quantum Computing, intel, QUANTUM MOTION, equal 1, photonic

Photonics
PsiQuantum, QC82, XANADU, ORCA Computing, Quandela, TURING

Other
EeroQ QUANTUM HARDWARE, Electrons on helium, QUANTUM BRILLIANCE, NV Diamond

Hardware / components
Select examples only – not representative of entire ecosystem

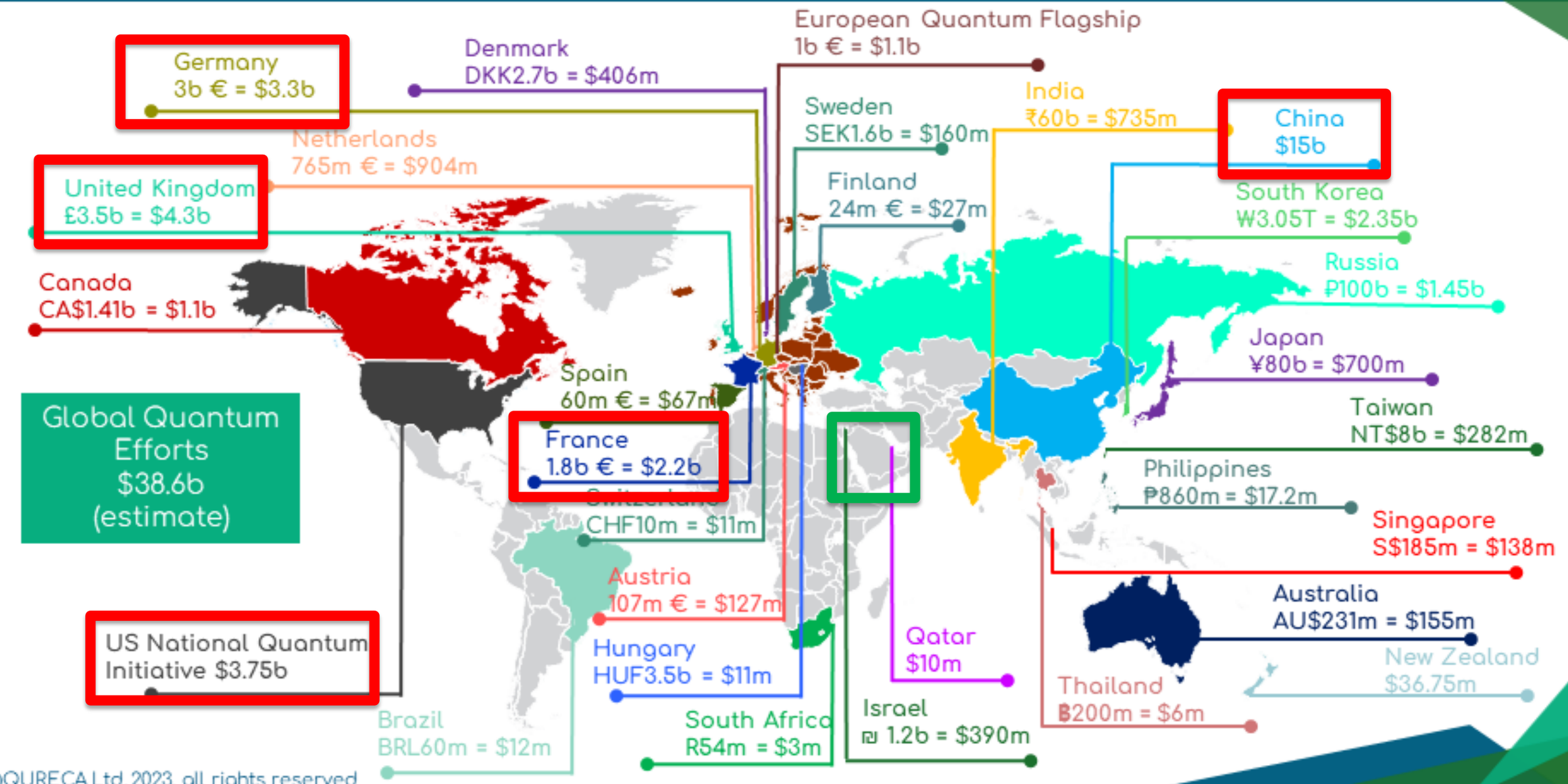
Cryogenics (includes testing)
OXFORD INSTRUMENTS, FormFactor, Lake Shore CRYOTRONICS, BLUEFORS, MONTANA INSTRUMENTS, ICE, Maybell

Lights and lasers
Vescent PHOTONICS, NKT Photonics, M SQUARED, COHERENT, QANT, TOPTICA PHOTONICS, LIGENTEC

Other componentry (examples)
Delft Circuits Hardware for quantum engineers, KEYSIGHT TECHNOLOGIES, QM QUANTUM MACHINES, Quantum Design, CryoCoax A division of Intellicoax, ZNF, QBLOX, QDevil, Zurich Instruments

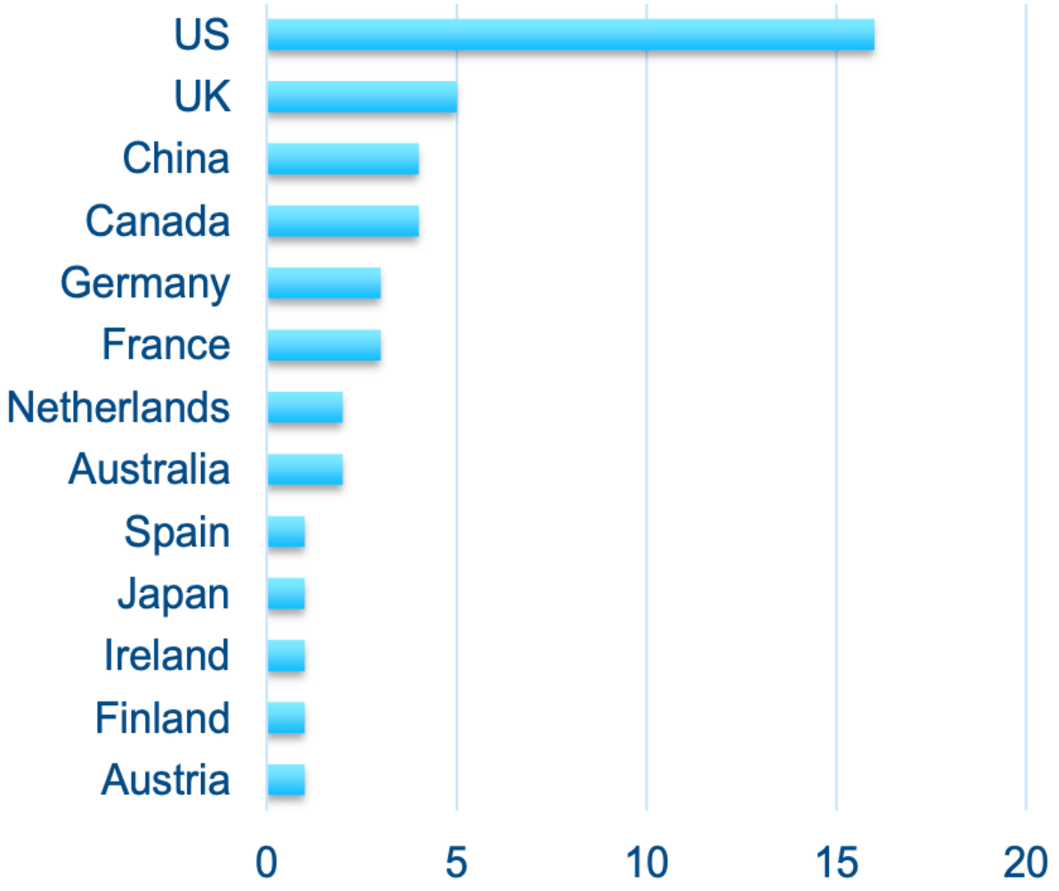
[1] Software offerings can be further classified into SDKs, firmware / enablers, algorithms / applications, simulators etc. but many companies are offering a mixture across the stack
[2] Many QPU providers are offering full stack services (e.g. Pasqal acquired Qu&Co, Quantinuum was originally CQC prior to merger with HQS, etc.)

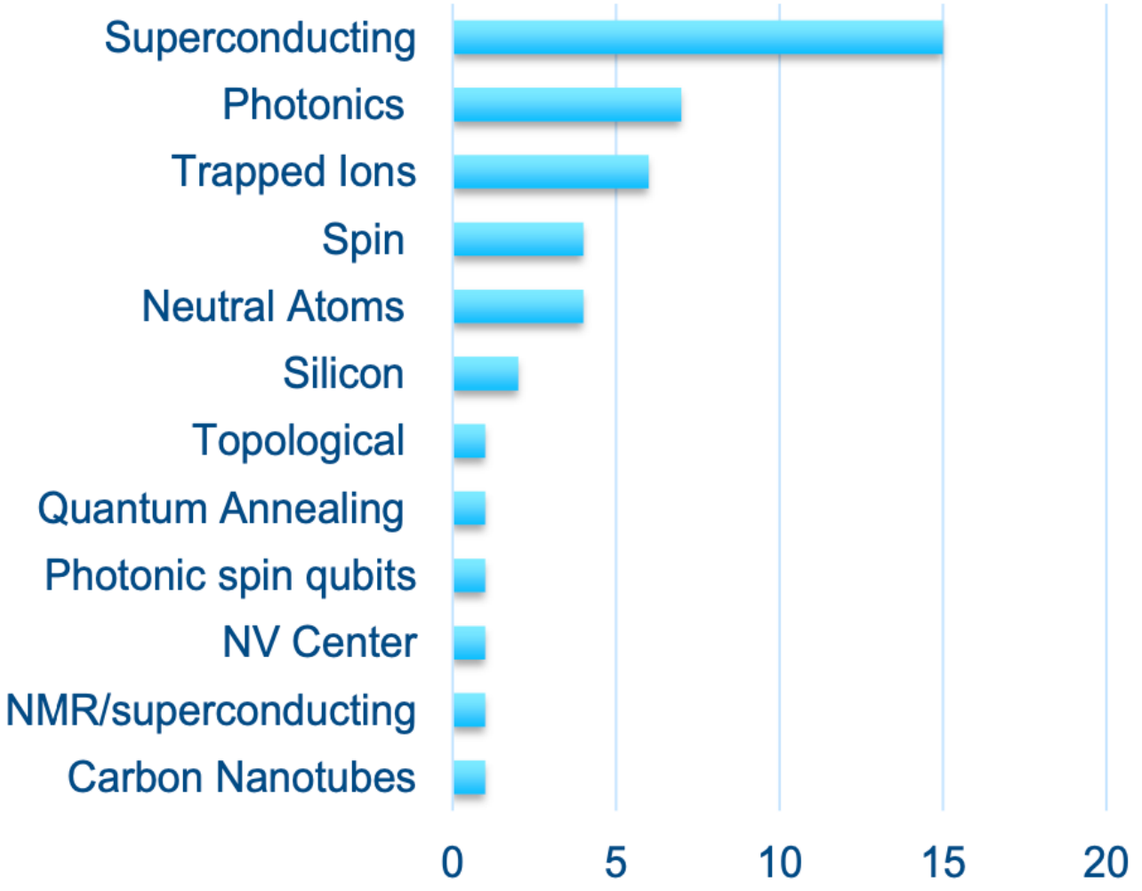
Quantum effort worldwide



Tracking the visible players from a global perspective

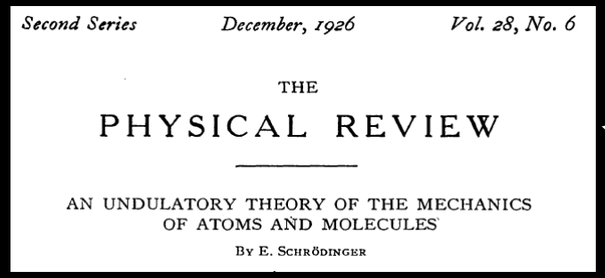
- **44 identified QC hardware developers**
- **12 quantum modalities under consideration**





source: Hyperion

Quantum mechanics is 100 years old


Second Series *December, 1926* *Vol. 28, No. 6*

THE

PHYSICAL REVIEW

AN UNDULATORY THEORY OF THE MECHANICS OF ATOMS AND MOLECULES

By E. Schrödinger

International Year of Quantum

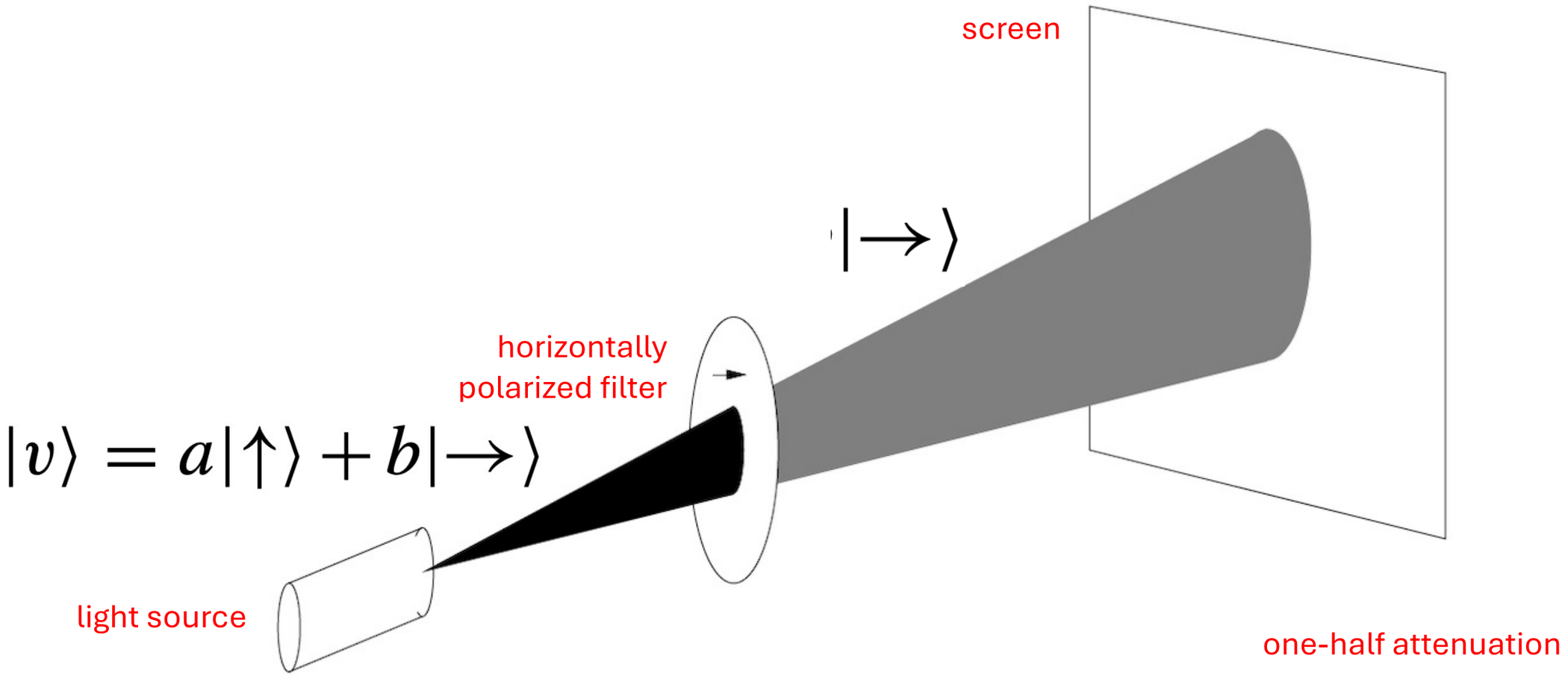
1 woman and 28 men – 17 of whom won Nobel Prizes in Physics

World Quantum Day

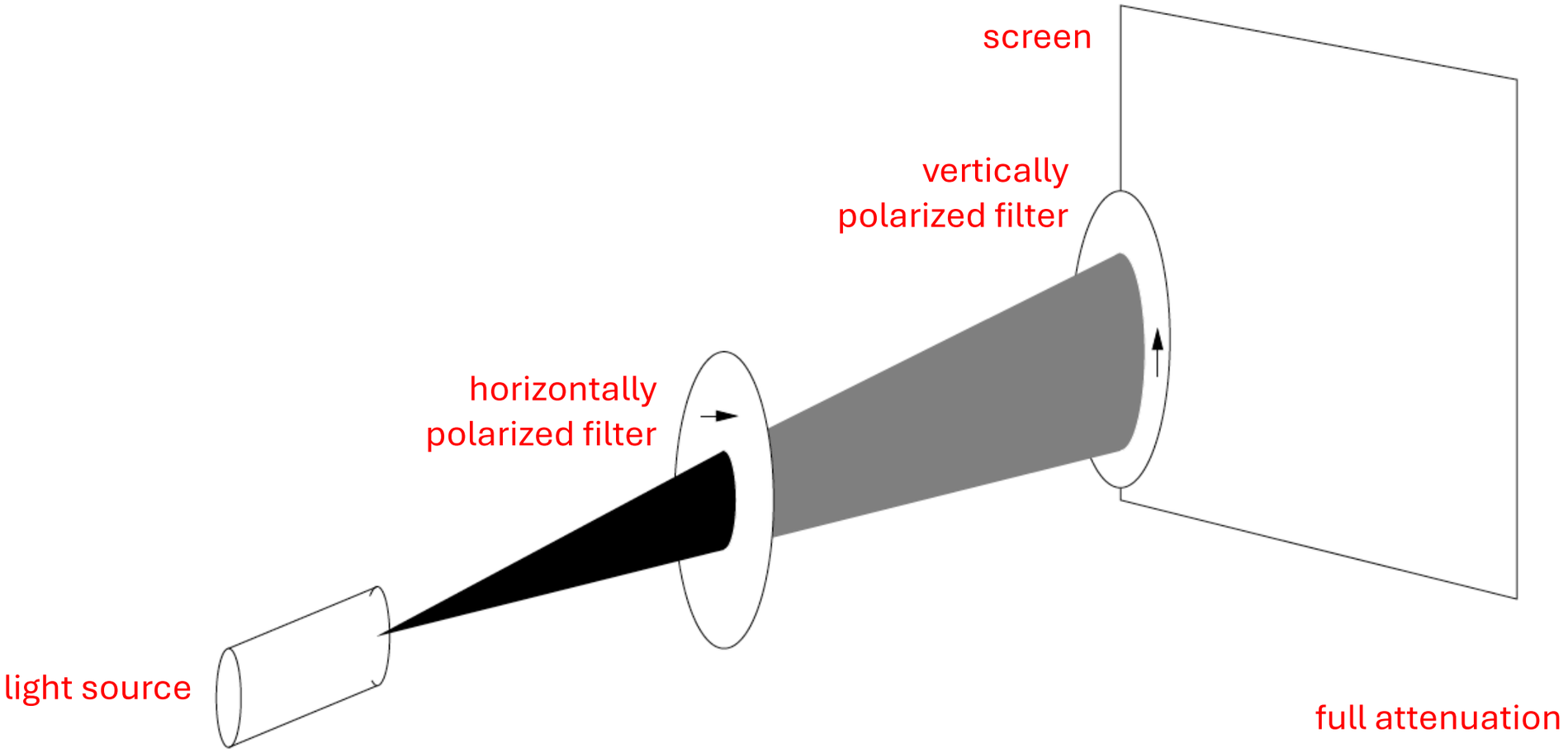
14 April 2026

Table-top Experiment on Photon Polarization

A simple table-top experiment (1/3)

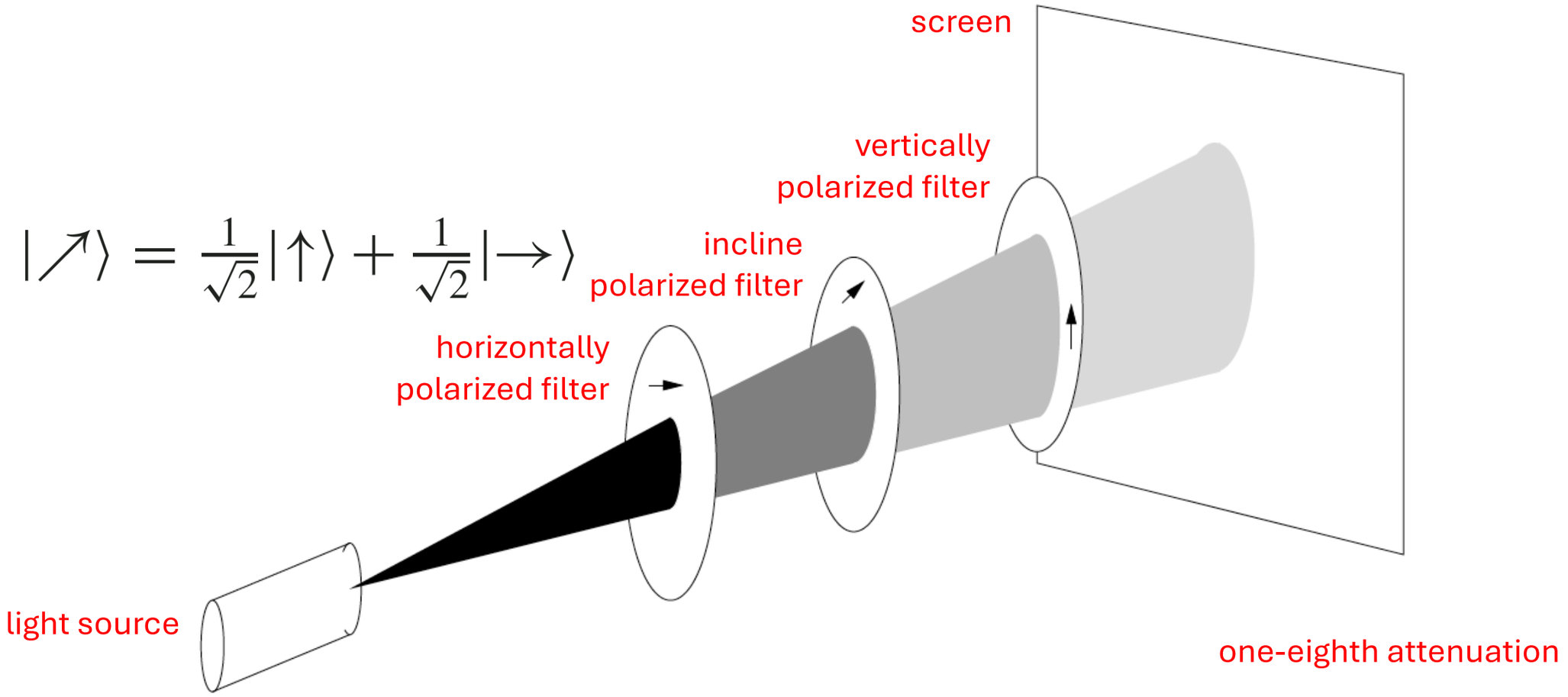


A simple table-top experiment (2/3)



A simple table-top experiment (3/3)

$$|\nearrow\rangle = \frac{1}{\sqrt{2}}|\uparrow\rangle + \frac{1}{\sqrt{2}}|\rightarrow\rangle$$



A simple table-top experiment

This experiment can be explained classically (see, e.g, Feynman's *Lectures on Physics*).

However, it can also be performed with a single photon.

The latter can be explained only with quantum mechanical superposition.