Telefónica

Quantum Act – Telefónica comments
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Summary

As a key player in the quantum ecosystem, Telefónica is pleased to provide its comments to the Quantum Act to support the successful implementation of Europe's quantum strategy. In the field of quantum technologies, Europe has significant opportunities in areas such as quantum communications, security, and sensing. |

The Quantum Act represents an opportunity to strengthen Europe's technological sovereignty and accelerate the market uptake of European technologies. The European framework should create the conditions for greater private-sector freedom to operate and achieve returns on investment, thereby mobilising additional private funding for advanced technologies. At the same time, and through proposals such as the Quantum Act, public-funding governance should be streamlined and funding and public procurement procedures simplified and leveraged to bring technologies and secure infrastructures to market and scale them in Europe. This includes making better use of testbeds, public procurement, and other enabling and funding mechanisms. |

The Quantum Act cannot be developed in isolation from the cryptographic challenges posed by quantum computing. The focus should extend beyond the technology itself to tackle its broader impact. Technologies that are not strictly quantum based, such as post-quantum cryptography (PQC), must be included within the scope of the Quantum Act, aligned with the European Roadmap on Post-Quantum Cryptography. In this context, adopting a holistic approach that encompasses quantum-related technologies -moving toward greater technological neutrality- is essential to ensure coherence and effectiveness. Attached are our detailed comments.

1. Introduction

Quantum technologies are a strategic priority for Europe. Their development will underpin digital sovereignty, economic security, and competitiveness across a range of sectors. To ensure leadership and autonomy in this critical domain, Europe must act decisively through coordinated instruments and policies.

On 31 October 2025, the European Commission issued a Call for Evidence on the EU Quantum Act[1] to advance the priorities of the Quantum Europe Strategy[2] and reinforce Europe's leadership and technological sovereignty in quantum technologies.

Set for adoption in 2026, the Act outlines three key objectives: boosting research and innovation; scaling industrial capacity -such as pilot lines and a design facility; and enhancing supply chain resilience and governance. The initiative will propose to explore instruments for quantum (strategic projects, a limited demand aggregation for dual use and space application, and streamlined permitting) to avoid fragmentation and accelerate deployment.

[1] https://digital-strategy.ec.europa.eu/en/news/commission-invites-contributions-shape-future-eu-quantum-act
[2] https://digital-strategy.ec.europa.eu/en/library/quantum-europe-strategy

As a key player in the quantum ecosystem, Telefónica is pleased to provide its comments on policy and funding proposals to support the successful implementation of Europe's quantum strategy, building on its initial response to the Quantum Strategy, and the response to the EU Roadmap on Post-Quantum Cryptography consultation[3].

2. Telefónica as a player and key partner in the Quantum ecosystem

Telefónica's early engagement in quantum technology positions it at the forefront of preparing for both the security risks and the new opportunities that quantum computing will bring.

Telefónica has established a dedicated Centre of Excellence for quantum technologies. The company is already making strides towards quantum-safe networks by integrating an additional layer of protection through quantum-resistant technologies, combining traditional cryptographic methods with post-quantum cryptography (PQC). Going beyond the lab, Telefónica is also advancing future technologies such as Quantum Key Distribution (QKD), having deployed them operationally within the EuroQCI network, to accelerate their maturity. This effort has been carried out in close collaboration with leading academic and research institutions, as well as in partnership with top network equipment manufacturers. Telefónica is working on international research initiatives, has filed patents for quantum-related technologies and is fostering open innovation ecosystem, offering infrastructures (e.g. DIANA NATO program) or investing in startups, such as Luxquanta. Also, it is playing a relevant role in standardization bodies to boost the quantum communications industry.

Telefónica is also collaborating with third parties. Several use cases were showcased at MWC25, including applications in healthcare, defence, and utilities, as well as broader efforts to build a robust quantum ecosystem. This includes partnerships in creating a quantum ecosystem with quantum computing manufacturers and collaboration with the Provincial Council of Biscay for example.

Telefónica Tech (June 2025) – Strategic preparation for Post Quantum Cryptography | Telefónica (March 2025) - Telefónica opens a dedicated Centre of Excellence for quantum technologies | Telefónica - Quantum-Safe Networks | Telefónica (October 2024) - QKD, cryptographic keys and quantum networks |Telefónica (March 2025) - Telefónica anticipates quantum challenges with an innovative demo at MWC |Telefónica (March 2025) - Telefónica and Vithas test shielding against quantum attacks in two hospitals |Telefónica (March 2025) - partner of Government of Biscay for development of its quantum technology industrial strategy

3. Scope of the Quantum Act

In the field of quantum technologies, Europe has strong opportunities in particular in **quantum communications, security and sensing**, where no single technology is expected to dominate, or industrial applications are approaching maturity. These domains align naturally with Europe's strengths in connectivity, standards, and secure infrastructure. By focusing on verticals where it already has solid capabilities and where the market remains open, the EU can position itself as a global leader and drive European manufacture the next wave of innovation in secure and resilient networks. This contrasts with quantum computing, where Europe faces a much tougher landscape: the market is expected to consolidate around dominant architectures, and major tech players in other regions already hold a significant lead, highlighting the need for improved cooperation with partners from different regions.

European telecom operators, already ensuring data integrity and privacy, are in an excellent position to support the evolution of quantum communications and the adoption of quantum-safe technologies. Meanwhile, the defence and European manufacturing sectors, seeking to regain capabilities and sovereignty, are ready to leverage quantum sensing.

Europe can lead the deployment of quantum infrastructures, including securing the necessary funding for the transition to Quantum-Safe networks. With widespread fibre infrastructure and a vibrant, innovative quantum ecosystem, Spain is well positioned to take a leading role in advancing quantum communications in Europe.

[3] https://www.telefonica.com/en/communication-room/blog/eu-post-quantum-cryptography-roadmap-timeline-sufficient/

Before delving into details, a final comment on the **scope of the Quantum Act**. Quantum technologies will offer transformative opportunities. However, the development of quantum computing presents a threat, particularly through 'store-now, decrypt-later' strategies that could exploit cryptographic vulnerabilities.

The Act cannot be developed in isolation from the cryptographic challenges posed by quantum computing. It should consider the published European Roadmap on Post-Quantum cryptography[4] and recognise that QKD and PQC technologies are complementary, requiring a coherent approach. QKD technologies are in fact recognised as a key technology in gaining security beyond de computational or mathematical security of cryptographic methods, reducing dramatically the "attack service" of critical communications. **As a funding instrument, the Quantum Act should also support the development, implementation, and market adoption of PQC or alternative cryptographic solutions**, even if these would not strictly be considered quantum technologies. In this context, adopting a holistic approach that includes quantum-related technologies in the Act - moving toward greater technological neutrality - is essential to ensure coherence and effectiveness.

4. Public Policy & Funding Proposals

Quantum technologies are a strategic priority for Europe. Their development will underpin digital sovereignty, economic security, and competitiveness across a range of sectors. To ensure leadership and autonomy in this critical domain, Europe must act decisively through coordinated action to unlock private and public funds efficiently. We are completely aligned that the main objective of the European quantum strategy should be to strengthen capabilities across the entire quantum value chain, and tackle fragmentation between current EU and national initiatives.

The Quantum Act's success hinges on turning public investments and policies into lasting industrial capacity and measurable results through clear and streamlined mechanisms.

First, to **unlock private funds**, a fresh approach to competition policy is essential to safeguard the competitiveness and productivity of European companies. Achieving sufficient scale is critical to enabling strategic investments that strengthen both Europe's economy and its security. Revisiting merger control rules could help companies reach the necessary scale and gain the incentives to make high-impact investments - investments that are currently only viable through IPCEIs or public subsidies due to persistent market failures. Additionally, exploring public-private partnerships, mobilising existing European funds, and leveraging innovative, strategic public procurement will lay the foundation for an interoperable, standards-aligned Quantum-Safe infrastructure.

The challenge of quantum is not only technological, but also financial and skills related. To ensure its deployment in Europe, it is necessary to take advantage of **European and national funding mechanisms and to promote public-private investment schemes**, both to develop this technology at scale and to develop use cases that exploit this technology, as well as to train professionals capable of using it.

We are proposing a series of measures that we believe can be aligned with the future strategy adopted by the EU in terms of:

- Strengthen Member State Cooperation, align R&D Programs and funding framework and develop innovative public procurement to support the strategy
- Build Pan-European Quantum Infrastructures
- Accelerate market deployment of Quantum Technologies
- Develop talent and skills for a competitive Quantum Ecosystem

Pillar 1 – Research & innovation framework

[4] https://www.telefonica.com/en/communication-room/blog/eu-post-quantum-cryptography-roadmap-timeline-sufficient/

The EU should stay ahead of emerging and especially promising areas for applying quantum technologies, such as quantum sensing and communications.

In general, public funding should be prioritised not only for research, where Europe has traditionally excelled, but also to accelerate the translation of innovation into market deployment, scaling, and implementation. Strengthening the link between research and industry Europe should support research centres and universities, while ensuring that funding targets higher Technology Readiness Levels (TRLs) than those typical of low-level academic research. Joint research between companies with internal R&D capabilities and academic or public research centres and proposals tailored to the needs of venture-capital investors (including within corporates, e.g Wayra) and startup ecosystems should be actively encouraged and rewarded. The proposals should support the development and deployment of infrastructure and technology, prioritising areas where Europe has clear competitive opportunities, while also fostering cooperation with other regions.

It should facilitate technology transfer, avoiding an exclusive focus on public research organisations and enabling the direct participation of companies. It should establish dedicated support lines for standardisation, intellectual property valorisation, technology transfer, and deep-tech venture development within the quantum ecosystem.

As the EU's primary collaborative platform driving excellence, innovation, and industrial maturation in quantum technologies, the Quantum Flagship should be granted a central and continuing role within the Quantum Act, ensuring that forthcoming measures, coordination structures, and investment instruments fully leverage its scientific leadership and ecosystem-building capacity.

Regarding the proposals, Option 1 (baseline) and Option 2 (more integration at EU level), while EuroHPC JU plays a central and well-established role in **high-performance computing and quantum computing (Option 2)**, for areas such as **security and communications**, the current ecosystem of **national programmes, Horizon Europe calls, the European Competitiveness Fund and the European Defence Fund (Option 1)** offers a more suitable and diversified framework. These instruments are already designed to accommodate the specific regulatory, operational and strategic requirements of these domains, which often differ from those of quantum computing.

Moreover, maintaining a **plurality of funding and governance channels** makes it easier to address sector-specific needs and allows Member States to retain flexibility in areas where national competences remain essential. A single consolidated framework under EuroHPC (Option 2) could limit this flexibility, especially in domains where EuroHPC does not yet have the same depth of expertise or established processes.

Finally, **combined EU–national financing**, as foreseen in Option 2, tends to be complex to implement in practice, particularly when strategic projects depend simultaneously on European instruments and heterogeneous national co-funding mechanisms. For many Member States, this can introduce uncertainty and delays, reducing the overall effectiveness of the framework.

Pillar 2 – Industrial capacity & investment ('Made in the EU')

We believe a combined approach between Options 2 and 3 could be developed, broadening the scope and including the elements described in this section. Coordination between national programmes and European instruments (Horizon Europe, Digital Europe, CEF Digital, etc.) should be strengthened to avoid overlaps and ensure synergies across funding streams.

The EU should encourage and provide long-term funding for quantum communications and computing, for example through industry-led consortia, administratively simplified IPCEI on Quantum Communications, or redirected Recovery, Transformation and Resilience Plan (PRTR) funds, and the creation of strategic security bonds, modelled on the successful framework of European green bondsPublic-private investment schemes should be supported.

Funding should also cover pilot tests and certifications in real-world environments to validate use cases in strategic sectors, enablers (e.g. cryptographic inventory tools, crypto-agility achievable with migration toolkits, interoperability testing…) and above all also support funding mechanisms for the long-term deployment of secure infrastructures.

Regarding quantum security and communications, these technologies are highly infrastructure-intensive in terms of CAPEX, but they are not yet mature enough to justify long-term investments, all within a very competitive environment for European companies. Current co-financing schemes (around 50%) are designed for partially or already deployed infrastructures, which does not apply to quantum technologies. The potential barriers in quantum technologies are higher, and co-financing should reflect this -likely through the launch of dedicated programs, integrated or coordinated with EuroQCI, with a stronger focus on cost-intensive infrastructures.

Finally, incentives should be introduced to foster the adoption of quantum solutions and a coordinated approach to public procurement should prioritise European technologies and suppliers.

Coordinating and aligning with European investment mechanisms will be key to advancing Europe's technological sovereignty, secure communications, and digital autonomy.

1. Financing and Regulatory Framework alignment

- Proposal to create an **IPCEI on Quantum Communications** for discussion with Member States.
- **Creation of Strategic security bonds for national and European Communications Resilience.** Effective funding is key. We propose a new class of Security Bonds, modeled on the successful framework of European Green Bonds, to drive measurable investments in the security and resilience of public communications infrastructure.
- Reallocate unspent funds from the Recovery, Transformation and Resilience Plan (**PRTR) and ERDF (MFF 2021-2027)** to accelerate **initial deployments of Quantum-Safe networks** and **investment** programmes **in computing, communication and sensing infrastructures.**
- **Focus on ensuring that the European Competitiveness Fund, regardless of the aid program behind it, include** major calls in key programmes or technology-specific programmes ensuring structural funding for the development and deployment of these technologies in Europe.
- **Coordination between national programmes and European instruments** (Horizon Europe, Digital Europe, CEF Digital, etc.) should be strengthened to avoid overlaps and ensure synergies across funding streams.
- Create **incentives for the adoption of quantum solutions** in strategic businesses and critical sectors.

The financing strategy should be structured in two phases:

1. a first one in the short term aimed in particular at reallocating unspent funds from the Recovery, Transformation and Resilience Plan (PRTR) and ERDF (MFF 2021-2027) in particular to accelerate the deployment of *Quantum-Safe* solutions in critical infrastructures; the creation of test-beds and developing the leverage effect of the Public Administration for the adoption of quantum technologies in strategic sectors, facilitating the entry of the private sector.

2. a medium to long-term strategy with the proposal for an IPCEI on Quantum Communications, the negotiation of the next Multiannual Financial Framework (MFF 2028-2034) to include specific programmes in quantum technology and the deployment of interoperable national networks to ensure secure cross-border connectivity and their integration with European digital infrastructures.

An IPCEI on Quantum Communications would allow funding the deployment of national quantum key distribution (QKD) networks ensuring their interoperability at European level. But as a complex instrument to coordinate and structure, it is necessary to accelerate the deployment of quantum-safe solutions through shorter-term funding mechanisms.

2. Innovative public procurement

As ***quantum-safe*** **communications** are urgently needed both to prevent industrial espionage and to protect government communications, all European states should **adopt a coordinated approach to public procurement prioritising European technologies and suppliers** in the acquisition and use of quantum technology.

By doing so, they would not only boost the development of this technology in Europe as consumers but also contribute to the creation of a strong and stable ecosystem.

3. Enabling Infrastructure Development through Public Support: funding needs to be rethought

To **achieve the objectives of building pan-European quantum infrastructures** and accelerating the market deployment of quantum technologies, as we have said preliminarily in point 1 above, **significant public investment will be necessary**.

These ambitions require the deployment of complex, high-cost infrastructures for which private investment is often insufficient due to high technological risks, uncertain returns, and the early stage of market development.

As seen in the telecommunications sector—particularly in the rollout of Spanish high-speed broadband networks—**market failures of this nature have been successfully addressed through targeted public support with *aid intensities,*** *which in other contexts (e.g., broadband deployment, IPCEI-CIS) have reached up to 90% when justified by clear market failure*. To incentivize the deployment of quantum infrastructures, the aid intensity has to be around these percentages.

In those cases, that intensity was justified by the absence of commercial interest to deploy infrastructures in specific areas or segments, despite their strategic value for competitiveness and cohesion, justifying a market failure that would overcome the State aid constraint.

We propose applying a similar approach to the quantum related domain, where a comparable market failure can be demonstrated. This would ensure that public support enables strategic deployments that the market would not deliver.

To maintain proportionality and accountability, **this market failure assessment could be subject to periodic review** in the coming years. To ensure responsible use of public funds and reinforce proportionality, these CapEx grants could be complemented with a **clawback mechanism**. This will allow for a partial reimbursement of the public subsidy if the infrastructure proves to be more profitable than expected within a defined period.

Such a framework would **safeguard public resources** while providing the predictability needed to mobilise large-scale private and public investment in quantum infrastructure, ensuring their correct use.

In this context, **infrastructure upgrades—such as fibre replacement and additional redundant links—should be considered eligible CAPEX for public support** when clearly justified as prerequisites for the deployment of quantum communications.

4. Quantum Network Infrastructures and Deployment

The European quantum strategy must ensure that all three technological pillars—secure communications, quantum sensing, and quantum computing—are adequately supported through coordinated funding and policy tools.

In secure communications, coordinated efforts to **deploy national quantum safe networks (including QKD and PQC technologies and their hybridization) interoperable at the European level** will ensure sovereignty and resilience. In **quantum sensing, industrial testbeds**—especially those integrated with 5G—can facilitate **pilot projects in logistics, energy, and industrial process control**. In **quantum computing, access to shared resources** through cloud platforms can democratise early-stage experimentation and prepare market for commercial use.

A balanced deployment strategy should therefore combine **infrastructure funding, cloud-based access models, and public-private partnerships** to guarantee that all Member States contribute to and benefit from Europe's future quantum capabilities.

Quantum Safe Networks:

- **Promote the deployment of interoperable national Quantum-Safe networks (including QKD and PQC technologies and their hybridation)**, as a foundation for a future pan-European secure connectivity framework. This effort should be coordinated in collaboration with leading telecom operators in each Member State.
- **Upgrading obsolete infrastructure** with fibre optics and retrofitting data centres to be hardened with quantum security. **Integrate fibre renewal and redundancy investments**—particularly in regions with older infrastructure or excessive signal attenuation—as eligible and necessary enablers for secure quantum network deployment.
- Foster the development of a **hybrid classical-quantum architecture** that allows for a phased and operational transition without a complete disruption of current systems.
- Encourage **adoption in the public administration** to boost the market for these solutions and generate a spill-over effect on the private sector.

Quantum Computing:

- **Create national centres for quantum computing and annealing computers**, providing access to companies, universities and start-ups.
- Support **early-stage commercialisation of quantum computing** by fostering cloud-based access to quantum resources for research centres, startups and industrial users—facilitating adoption through affordable access and public procurement of computing time.

Quantum Sensing:

- Promote **industrial pilots for quantum sensing technologies**, particularly in combination with 5G infrastructures, to explore use cases in sectors such as manufacturing, logistics, and environmental monitoring

5. Certification, Pilot Testing or test-beds and Technology Transfer

- Fund **pilot tests (POCs) and certifications** in real environments.
- Develop ***test-beds*** and foster the creation of **technology clusters and ecosystems** as validation spaces in secure communications, quantum computing and metrology. These environments will enable the validation of use cases in strategic sectors, following the model of the plans for 5G, as well as facilitating the **certification of solutions in real scenarios**. The participation of driving companies is key to boosting and consolidating this model. For example, test-beds for quantum-safe networks will be essential to raise awareness, trial solutions and real-world use cases, foster innovation, and validate scalability, performance, and interoperability, while ensuring that deployments in critical infrastructures remain cost-effective, resilient, and future proof. Facilitating **technology transfer**, avoiding programmes being exclusively aimed at PRIs (Public Research Organisations) and favouring the **direct participation of companies** with the appropriate capacities and, in any case, ensuring processes that allow for **efficient technology transfer to industry**.
- **Foster enablers for market deployment at scale**:
    - **Accelerate cryptographic inventory tools across Europe.** A secure quantum-safe transition requires clear risk awareness and cryptographic inventories. Standardized tools (e.g., CBOM/SBOM) integrated into IT systems will streamline migration, cut risks, and ensure compliance

- **Make crypto-agility achievable in real-world systems.** As quantum-safe standards evolve, systems must remain adaptable. Modular design, hybrid algorithms, migration toolkits, and interoperability testing enable crypto-agility, future-proofing Europe's digital infrastructure and ensuring smooth, risk-free transitions.

- Create dedicated support lines for **standardisation, intellectual property valorisation, technology transfer, and deep-tech venture development** within the quantum ecosystem.

Pillar 3 – Supply-chain resilience & governance

The EU should support the development of European quantum infrastructures, such as platforms for computing, the deployment of resilient communications, and sensing, while ensuring the supply of critical components. The framework should foster standardisation and European intellectual property while remaining flexible enough to enable cooperation and deployment. Measures to ensure resilience or supply chain redundancies beyond market expectations should be publicly funded and based on both risk and cost considerations. The supply of certified, secure, stable, and standardised components is essential. Quantum-safe deployment should be interoperable at the European level, as this will enhance sovereignty and resilience.

From the standardisation and Intellectual Property (IP) standpoint, the Quantum Act should:

- Help funding European activities in standardisation, certifications and patents
- Prioritise technologies based on European-owned intellectual property in public funding programmes and procurement processes.
- Promote the adoption of standards embedding European Intellectual Property, ensuring that licensing conditions follow FRAND models to guarantee balanced and competitive market access.
- Establish a safeguard mechanism to protect and retain strategic European IP, in coordination with broader EU sovereignty initiatives such as the European Economic Security Strategy.
- Develop policies to prevent IP leakage toward non-European actors, including enhanced security controls where strategically necessary.
- The Act should ensure clear frameworks for Intellectual Property Rights (IPR) sharing among EU-funded projects, as well as mechanisms for IPR alignment that enable technical interoperability and industrial exploitation.
- Introduce incentives for the creation and scaling of IP-rich SMEs and start-ups in the quantum technologies sector,
- Include explicit support for IPR protection (patents, licensing, and freedom-to-operate analyses) within the funding instruments derived from the Quantum Act.

Horizontal Pillar - Cross-cutting challenges: Skills & talent

The Quantum Act proposes reviewing European Degree in Quantum Technologies and accelerated mutual recognition of diplomas among participating Member States. We suggest adding funding for the following activities:

- Launch **training and reskilling** programmes in the different areas of quantum technologies, aimed at researchers, engineers and professionals in the ICT sector.
- Specialise **professional profiles** in quantum security (PQC, QKD, QRNG).