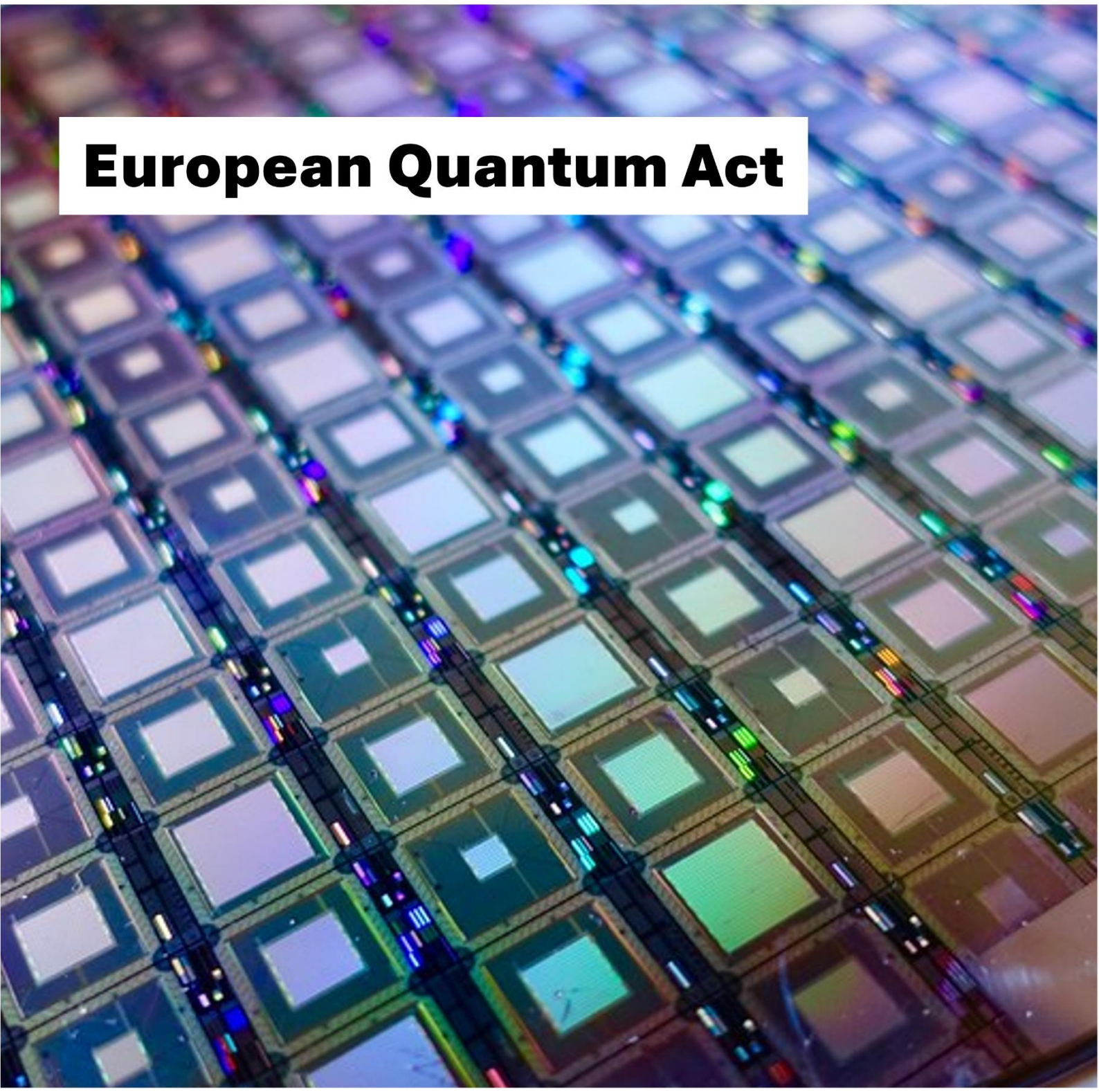


Position Paper

European Quantum Act



Executive Summary

SEMI Europe spans semiconductor manufacturing equipment, materials, advanced packaging, enabling technologies, and hybrid classical-quantum infrastructures that are critical to the future industrialisation of quantum technologies. This position allows SEMI to contribute system-level insights on manufacturability, scalability, supply-chain readiness, and timing, complementing research- and application-focused perspectives in the quantum ecosystem.

SEMI Europe welcomes the European Commission's efforts in developing an EU legislative framework to support the quantum ecosystem in Europe and further strengthen Europe's digital capabilities.

The quantum sector is primarily composed of a dense start-up ecosystem, research and technology organisations (RTOs) and larger companies that are, for the most part, standing at the research and development (R&D) phase of their quantum activities. The peculiar characteristics of the quantum ecosystem create a need for a thorough tailoring of the Pillar structure that the European Commission has selected for the upcoming Quantum Act.

To guarantee that the Quantum Act will effectively respond to the concerns and needs of the quantum ecosystem in Europe, SEMI Europe highlights the following key points:

SEMI Europe – Policy Recommendations for a Quantum Act

Pillar I: Design a quantum R&D framework that **captures all quantum (enabling) technologies** and that is **accessible to both private and public actors** regardless of size, providing support and setting administrative processes adapted to their structure and resource constraints.

Pillar II: Establish **industrialisation policy mechanisms and solutions for the entire quantum value chain**, stimulate end-user demand for quantum technologies and encourage industrial consortium initiatives.

Pillar III: Allocate appropriate resources to guarantee the effective monitoring of the European and global quantum value chain, supporting functional policy-making decisions, effective consultation of the industry and **providing tangible values to the quantum industry** notably by emphasising on quantum market dynamics and use cases.

Pillar IV: Coherently and efficiently **integrate the Quantum Act in the wider network of EU policies** to secure the growth of the quantum ecosystem in Europe, incentivising cross-sector synergies, **advancing scalable quantum manufacturing capabilities**, and **promoting quantum integration** across various end-user applications.

Inter-Pillar and Cross-Policy Coordination: Efficiently connect the four pillars within the structure of the Quantum Act to prevent the potential misalignment of measures supporting research and industrial deployment, and **prevent potential industrialisation gaps** in the future.

Pillar I – A Tailored European Quantum R&D Framework Considering the Unique Quantum Business Landscape

SEMI Europe supports the European Commission's suggestion to create a single R&D framework, pooling together existing funding mechanisms and tools. This framework must be tailored to the quantum business landscape, giving careful consideration to resources of SMEs, start-ups and scale-ups, and capture all quantum technologies and quantum enabling technologies.

Scope of the EuroHPC JU: Encompassing quantum technology varieties and enabling technologies

EuroHPC is focusing on the development of Europe's "supercomputing, quantum computing, service and data infrastructure ecosystem"¹. **Quantum technologies are nevertheless not limited to computing and do not belong to a unified technological class.** They include quantum sensing and communication technologies which, together with quantum computing, can rely on enabling technologies ranging from materials, electronics, lasers and optics, cryogenics and vacuum technologies, controls, transductions, hardware, software and algorithms².

Those technologies are equally important to maintain and stimulate Europe's digital and technological edge while bringing wider benefits to European citizens. Enabling components, materials and technologies such as cryogenic systems, lasers and optics are **critical to the development and functioning of quantum technologies while also having unique applications.** Their critical nature requires to secure their supply in Europe and guarantee that emerging actors in these fields can grow on the European market.

Technologies falling under the scope of the future EuroHPC JU must be clearly defined to **encompass the entire quantum value chain**, from quantum sensors, computers and communication to the enabling technologies that are supporting their development and functioning, and which cannot be supplied in Europe.

EuroHPC design: Adapting to the European quantum business landscape

Learning from the experience of the first Chips Act, a EuroHPC JU structure replicating the one of the Chips JU will create considerable impediments to, and dramatically **hinder the results of R&D projects supported under Pillar I of the Quantum Act and their industrialisation.**

"Research" pilot line projects funded under JUs provide funding exclusively to public organisations, namely RTOs and academia. Companies willing to participate in these projects must cover all participation costs, including costs to access developed systems, to complete product prototyping and development, to integrate technologies into industrial applications, and to ensure their commercial

¹ Regulation (2021/1173) establishing the European High Performance Computing Joint Undertaking. [URL](#)

² In this regard, quantum sensors have promising potentials for a plethora of applications that could influence citizens' daily lives. These notably include health, where quantum sensors are already acknowledged as technologies that could "revolutionise diagnostics, imaging, and treatment monitoring by providing unprecedented sensitivity and precision". The transition to Post-Quantum Cryptography (PQC) technologies will also secure widely used, public and private, algorithms that are at the core of modern communication technologies, but remain vulnerable to quantum computers' capacities.

viability, often requiring substantial material and logistical resources. These **costs are unbearable for SMEs, start-ups and scale-ups featuring the quantum business landscape** and for whom access to RTOs' services and products is too expensive³. The Quantum Act must therefore privilege "Industrial" pilot lines as they allow for financing private companies.

To avoid the formation of an industrialisation gap between raw technologies being developed and the integration of these technologies into unique quantum products at the industrial level, the Quantum Act must guarantee and ease the participation of all public and private quantum enabling actors to EU-funded research and industrialisation projects.

Maximising across-the-board industry participation in EU-funded projects via lighter application processes

On the administrative side, access to European funded projects under JUs is lengthy, complex, and disproportionate to the level of funding requested. They often require companies to commit additional full-time employees to the task or to outsource the process to costly consultancies. These significant costs associated with administrative processes have **disincentivised SMEs, start-ups and scale-ups to get involved, thereby excluding them** from the process.

To maximise the success of the EuroHPC JU, it is necessary to guarantee that private actors can receive financial support when they access R&D projects and RTOs facilities, while **guaranteeing SME- and start-up-friendly administrative procedures**.

Pillar II – A Policy Toolbox for Industrialisation

SEMI Europe welcomes the approach suggested by the European Commission in Pillar II of the Quantum Act, whereby it aims to support industrialisation of quantum technologies by increasing supply of enabling technologies, end-user demand and facilitating permitting.

These efforts must focus on stimulating demand for quantum technologies and incentivise cross-industry initiatives aimed at identifying and developing concrete use cases. To achieve this goal, Europe must establish a **flexible technological prioritisation, increase public demand for quantum technologies and encourage joint ventures and cross-industrial initiatives**.

Designing a flexible technology prioritisation for final and enabling technologies

Foundational technologies that are being developed in the field of quantum hardware, are advanced but modest breakthroughs⁴ which still need to be substantially improved and scaled to demonstrate industrial potentials and concrete end-user applications.

³ SEMI Europe, Chips Act Report: 30 SEMI Recommendations for a Chips Act 2.0. [URL](#)

⁴ David D. Awschalom et al., Challenges and opportunities for quantum information hardware. Science 390,1004 1010(2025). DOI:10.1126/science.adz8659

As use cases will need to be demonstrated at the industrial level, the European Union must prioritise a flexible approach and **target both final, foundational technologies and materials that are unavoidable to the quantum sphere**, and which are inadequately supplied in Europe and NATO countries⁵. Supply capacities and access to **exotic materials and rare earth elements will equally need to be secured** considering their unavoidable role for quantum applications while their supply in Europe is vulnerable (Ex. Helium 3, erbium, ytterbium, aluminium, strontium, rubidium, lithium niobate, silicon and germanium isotopes)⁶.

Public support for stimulating quantum demand and developing concrete use cases

Although potential quantum solutions are known in various domains (Ex. health, AI, telecommunications, aerospace and defence) **third industries are still unaware about the future relevance of quantum** for their businesses and solutions.

To stimulate cross-industry synergies and use cases, **public support and public-private initiatives are pivotal**. Public funding in the form of multi-level and combined financing schemes from the European Union and Member States as well as public procurement will play a major role in this regard. A “Buy-European” or EU Preference approach could leverage demand and secure supplies in Europe, but it must carefully take into consideration the global structure of the quantum ecosystem, potential value chain dependencies and the central role of international technological partnerships.

The abovementioned tools could **support cross-industry initiatives that would pool resources from various private actors together** to meet their needs in quantum enabling technologies. For instance, the equipment and tools used in the development of quantum technologies are similar and have low usage rates. This makes it advantageous to share these tools among multiple start-ups and achieve long-term economies of scale, high utilisation rates and appropriate supply of quantum hardware.

Pillar III – Dedicating Appropriate Resources to the Quantum Value Chain Mapping and Monitoring

An EU-level monitoring and resilience framework for the quantum value chain can significantly contribute to navigate the future evolution and industrialisation in the quantum field. To maximise industrial participation in this endeavour, this framework can respond to a dual need to sharpen Europe’s policy resilience while stimulating cross-industry synergies.

⁵ These include quantum computers, sensors, communications, as well as enabling technologies such as laser and optics, cryogenics, vacuum or control systems, related semiconductor technologies (Ex. Ion traps, superconducting and semiconductor spin quantum chips, control systems, photonic qubits) and complementary hardware/electronics used in laser systems and cryogenics. NATO, Transatlantic Quantum Community, Critical Vulnerabilities in the Quantum Computing Supply Chain within the NATO Alliance. [URL](#)

⁶ NATO, Transatlantic Quantum Community, Critical Vulnerabilities in the Quantum Computing Supply Chain within the NATO Alliance. [URL](#)

Establishing a functional consultation mechanism in an EU-level monitoring and resilience framework

To effectively mirror the quantum ecosystem, the EU framework must be constructed in **close collaboration with the industry** and establish a **functional consultation process** between these actors, European institutions and Member States. Learning from the implementation of Pillar III of the Chips Act, the Quantum Act will be required to allocate sufficient resources to operationalise and run this framework.

To best reflect the reality of the quantum ecosystem and maximise the participation of the industry, it is of upmost importance to **demonstrate clear involvement benefits to the industry**. Very often, SMEs, start-ups and scale-ups, which make up most of the quantum business landscape, lack the resources needed to actively engage in these initiatives.

This framework could become a **dual-use tool that supports pragmatic and appropriate policy making while stimulating cross-industry synergies** and quantum demand in Europe. This could be achieved at the working level of the framework's structure by emphasising on existing final and enabling quantum technologies as well as their various use cases. This information will be complementing the data on potential chokepoints and the quantum value chain dynamics. Such a focus can incentivise businesses' participation in the framework, especially from SMEs, start-ups and scale-ups which have limited engagement resources while developing promising quantum technologies. .

Pillar IV – Thinking Beyond the Quantum Act: Cross-Policy Alignment and Coordination

The Quantum Act should not be viewed in isolation but as part of a broader policy ecosystem in which complementary legislation can significantly influence its implementation and outcomes, both positively and negatively. Aligning the needs and ambitions of the Quantum act with third legislations is pivotal to demonstrate Europe's long-term commitment to the quantum ecosystem in Europe and help generating demand of quantum technologies in end-user applications and industries.

Vertical Coordination - Policy foundations for quantum growth in Europe

Vertically, the Quantum Act must be supported by a robust policy framework that guarantees a **coherent budget aligned with its ambitions**, an enabling environment that strengthens Europe's attractiveness to both domestic and foreign investors and a **stable global trade environment** and **steady supply of critical minerals**.

Third policy frameworks (Ex. **Multiannual Financial Framework 2028-2034, Capital Markets Union, trade policies, FDI screening and export controls**) will play a decisive role in shaping the success of **Quantum Act and must be closely aligned on its objectives**. Together, they provide the financial, regulatory, and technological foundations needed to sustain quantum investment, foster innovation, and ensure strategic alignment across EU initiatives.

The Quantum Act should be suitably aligned with the implementation of the EU Economic Security Strategy and the Economic Security Doctrine. A **harmonised dual-use regulation framework** in Europe is equally important to reduce the complexity of fragmented national control list across the European union and provide industry with greater clarity when navigating across different Member States⁷.

Horizontal Coordination – Stimulating cross-industry collaboration and generating demand for end-user demand for quantum technologies

Horizontally, aligning the priorities of the Quantum Act with third industrial policies will be important to **stimulate demand of quantum technologies and the supply of quantum enabling technologies**.

The upcoming **Quantum Act and the Chips Act 2.0 must be closely coordinated and articulated** to avoid duplicative measures and overlapping instruments, notably for quantum chips development and industrialisation. This is especially relevant considering that superconducting quantum processors, amongst other technologies, rely on traditional semiconductor manufacturing techniques. Together, these frameworks should prioritise advancing scalable quantum manufacturing and leverage silicon-based processes to drive efficiencies and accelerate the commercialization of quantum technologies.

By **aligning the Chips Act 2.0 and the Quantum Act**, Europe can create a coordinated ecosystem where public funding, industrial-scale semiconductor infrastructure, and startup innovation work together. Clarifying the scope of both instruments is essential to avoid over-complicating the efforts of quantum companies seeking EU and national public support and cross-policy overlaps.

⁷ As recommended by NATO's Transatlantic Quantum Community (TQC), trade interventions and the use of trade barriers such as tariffs and export controls with like-minded countries must be avoided⁷. Coordinating these frameworks with the Quantum Act will be essential to building a coherent, resilient, and globally competitive quantum ecosystem.

Contact persons

Stefano Ramundo Orlando
Manager Advocacy and Public Policy
sorlando@semi.org

Adrien Padovani
Senior Policy Coordinator
apadovani@semi.org

SEMI Europe

Rue du Commerce 124, 1000 Brussels
EU Transparency Register : 597361847853-70
<http://www.semi.org/eu>