Quantum

To unlock the transformative power of quantum, the EU should develop a solid industrial base that builds on its tradition of excellence in quantum research.

© European Commission - What is quantum

In the next few years, quantum technologies will make it possible to do things that simply cannot be done today. With quantum, we could be able to look far beneath the ground or under the sea and perform complex computational tasks, like modelling biomolecular and chemical reactions, that the most powerful supercomputers cannot currently manage. Quantum will help us send sensitive information safely to anywhere, and diagnose diseases more quickly and accurately by looking inside cells.

In the first quantum revolution during the early twentieth century, scientists learned to understand and apply the properties of quantum mechanics - the interactions of molecules, atoms, and even smaller particles like photons and electrons. This ultimately allowed them to create transistors, lasers and microprocessors: foundational technologies for computers, telecommunications, satellite navigation, smartphones, modern medical diagnostics, and much more.

Now, the second quantum revolution is underway. Researchers can detect and manipulate individual particles and their physical interlinkages and interactions, and build new technologies and systems that make use of the properties of the underlying quantum mechanics. These developments have led to major technical advances in many different areas, including quantum computing, sensors, simulations, cryptography and telecommunications. A whole generation of new quantum technologies with the potential for far-reaching economic and societal impact is starting to emerge. Some are already in development, while many others will be developed in the next few decades.

The Quantum Technologies Flagship

Europe has a long tradition of excellence in quantum research. It is now crucial to develop a solid industrial base that builds on this tradition. Without coordinated research and funding efforts at European level, Europe would risk falling behind its global competitors.

To meet this challenge, the Quantum Technologies Flagship was launched in 2018. It is a large-scale, long-term research initiative funded by the EU that brings together research institutions, industry and public funders, consolidating and expanding European scientific leadership and excellence in this field.

Quantum computing

As part of the European High Performance Computing Joint Undertaking (EuroHPC JU), the Commission is now planning to build state-of-the-art pilot quantum computers by 2023. These computers would
act as accelerators interconnected with the Joint Undertaking’s supercomputers, forming ‘hybrid’ machines that blend the best of quantum and classical computing technologies.

In 2021, work will begin on the Joint Undertaking’s first quantum simulator, which would also be interconnected with a supercomputer. This will be the first element of a European quantum simulation infrastructure available via the cloud on a non-commercial basis to public and private European users. The infrastructure will be used to address complex simulation and optimisation problems, especially in materials development, drug discovery, transportation and other real-world problems of high importance to industry.

**EuroQCI**

Since June 2019, all 27 EU Member States have signed the EuroQCI Declaration, agreeing to work together, with the Commission and with the support of the European Space Agency, towards the development of a quantum communication infrastructure covering the whole EU (EuroQCI).

Discover more about EuroQCI.

**Read more on quantum**

Brochure on Quantum
Factsheet on quantum
Follow the latest progress and learn more about getting involved.
Commission to invest more than €1 billion under the Connecting Europe Facility for innovative and secure connectivity

The Commission adopted the first Work Programme for the digital part of the Connecting Europe Facility (CEF Digital), which defines the
scope and objectives of the EU-supported actions needed to improve Europe's digital connectivity infrastructures for 3 years.

PRESS RELEASE | 17 November 2021
First calls for proposals under the Digital Europe Programme are launched in digital tech and European Digital Innovation Hubs

The Commission announced this week the first set of calls for proposals under the Digital Europe Programme. This follows the adoption of the work programmes allocating nearly €2 billion for investments aimed to advance on the digital transition.

PRESS RELEASE | 10 November 2021
Commission to invest nearly €2 billion in delivering digital advances to business, citizens, and public administrations

The Commission has adopted three work programmes for the Digital Europe Programme, outlining the objectives and specific topic areas that will receive a total of €1.98 billion in funding. This first set of work programmes includes strategic investments that will be instrumental in realising the Commission's goals in making this Europe's Digital Decade.

DIGIBYTE | 28 July 2021
All Member States now committed to building an EU quantum communication infrastructure

Ireland is the 27th EU Member State to sign the EuroQCI Declaration. This means that all 27 EU Member States have signed it.

Browse Quantum
EU investment in high performance computing and computing technologies will enable Europe to lead the way in supercomputing in the Digital Decade.

**Dig deeper**

The European Quantum Communication Infrastructure (EuroQCI) Initiative
The EuroQCI initiative aims to build a secure quantum communication infrastructure that will span the whole EU, including its overseas territories.

Quantum Technologies Flagship

The Quantum Technologies Flagship is a long-term research and innovation initiative that aims to put Europe at the forefront of the second quantum revolution.

See Also

Destination Earth

Destination Earth aims to develop a high precision digital model of the Earth to model, monitor and simulate natural phenomena and related human activities.

Electronics

Micro and nano-electronics take us to the world in miniature, where big things are facilitated by the smallest and smartest electronic components and systems.

Photonics

We are on the verge of a new photonics era, and the European Commission is working to ensure citizens and businesses enjoy the full benefits of this technology.

High Performance Computing

High performance computing refers to computing systems with extremely high computational power that are able to solve hugely complex and demanding problems.

Source URL: https://digital-strategy.ec.europa.eu/policies/quantum