



## **Start of EPIQUE, to developing the European photonic quantum computer**

*A European €10 million project led by the Sapienza University of Rome with 18 partners, including Quandela.*

(01/17/24) – To pave the way for a **European quantum computer** based on photons, the **quanta of light**: this is the challenge of **EPIQUE**, the research project funded with €10,340,000 by the European Commission and carried out by 18 partners from 12 countries and led by the **Sapienza University of Rome**, which starts today with the kick-off meeting.

Quantum computers are one of the most promising technologies of the future, devices potentially capable of solving problems that are impossible even for the most powerful super computers, but they are still at the prototype stage and there are several possible paths of development. One of the most promising is light-based: the use of **photons as qubits**. **EPIQUE - European Photonic Quantum Computer** - was set up in order to investigate in depth the potential offered by the development of photonic quantum computing platforms, a project that aims to lead the way in a domain with wide margins for development.

Prototypes of quantum computers based on photonic technologies have demonstrated important advantages in recent years, in particular having a **low decoherence of qubits** that minimises the loss of information, a **simple infrastructure** that does not have to operate at near-zero temperatures as in superconducting processors, and a natural **integration with fibre-optic communication** systems for networking. As many as three of the four demonstrations to date released of quantum advantage - meaning the ability to perform a calculation process that is effectively impossible for a conventional computer - have been achieved using photonic technologies.

However, existing results have often been limited by bulky and difficult-to-scale devices. Recognising the potential of this technological path, EPIQUE now aims to bring together the many European players, both academia and SMEs, already among the world leaders in various fields of photonic technologies, to realise a general-purpose photonic quantum platform. EPIQUE aims to develop three different demonstration prototypes of photonic quantum computers at tens of qubits and to pave the way towards a more ambitious **quantum platform of over 1,000 qubits**.

"EPIQUE's work is poised to set a new European standard in photonic quantum computing research", said Prof. **Fabio Sciarrino** from Sapienza University of Rome, the EPIQUE Coordinator. "By integrating advancements in both technology and algorithms – added Sciarrino – we are focused on developing a viable trajectory towards an innovative quantum computing platform. The impact of the developed technologies can also affect other application areas of quantum technologies, such as quantum sensing and metrology."

Dr Shane Mansfield, Chief Research Officer at quantum computing startup Quandela, said that "EPIQUE brings together an unprecedented consortium of the world's leading lights from academic institutions and pioneering startups, covering the full spectrum from hardware development to quantum algorithms. The photonic track to quantum computing is highly promising for its prospects for scalability, and we aim for this project to be the vehicle for Europe to take pole position in the global race to build scalable quantum computers."

EPIQUE is one of six projects, based on the same number of technological solutions, designed to physically develop a European quantum computer as part of the **Quantum Flagship** promoted by the European Commission in 2018 and funded with around EUR 1 billion.

The EPIQUE partners are:

- Sapienza Università di Roma (Uniroma1) Italy
  - Consiglio Nazionale delle Ricerche (CNR) Italy
  - Università degli Studi di Firenze (Unifi) Italy
  - Centre National de la Recherche Scientifique (CNRS) France
  - Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA) France
  - Quandela France
  - Single Quantum Bv (Single Quantum) Netherlands
  - Universitaet Paderborn (UPB) Germany
  - Ruprecht-Karls-Universitaet Heidelberg (UHEI) Germany
  - Qubig GmbH (Qubig) Germany
  - Universitat Wien (UniVie) Austria
  - Danmarks Tekniske Universitet (DTU) Denmark
  - Nkt Photonics A/S Denmark.
  - Laboratorio Iberico Internacional de Nanotecnologia Lin (INL) Portugal
  - Naukowa i Akademicka Siec Komputerowa - Panstwowy Instytut (NASK) Poland
  - Ceske Vysoke Uceni Technicke V Praze (CVUT) Czechia
  - Tyndall, University College Cork - National University of Ireland, Cork (UCC) Ireland
  - Interuniversitair Micro-Electronica Centrum (IMEC) Belgium
- More informations at <https://cordis.europa.eu/project/id/101135288>

#### **Images gallery**

<https://drive.google.com/drive/folders/1QACQqhxWm4damYwNWuqJHhM9MnFKV4Fe?usp=sharing>

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