

Press release

Quandela (France) and attocube systems AG (Germany) selected by EuroHPC and EuroQCS-France to supply Europe's most powerful photonic quantum computer

Paris, 25/09/2024

Following a call for tenders launched in January 2024, EuroHPC and EuroQCS-France have announced the acquisition of Europe's most powerful universal photonic quantum computer from a consortium formed by Quandela (France) and attocube systems AG (Germany). The system, owned by EuroHPC and co-acquired by GENCI, will be hosted and operated by CEA at TGCC. It will be coupled to the Joliot-Curie supercomputer, and will be made available to scientific communities in 2025 as part of open research.

The consortium led by French company Quandela and German company Attocube was selected at the end of June by the Joint Undertaking EuroHPC following the tender launched on January 30, 2024, with a total cost of 8.5 million euros, for the acquisition, delivery and installation, software and hardware maintenance of a photonic quantum computer with at least 12 qubits. This will be at date Europe's most powerful photonic quantum computer.

- EuroHPC JU is the owner of the purchased system
- GENCI is the hosting entity for the photonic quantum computer
- The CEA is the hosting site, so the quantum computer is hosted at the TGCC.

In 2025, this computer will be installed in the CEA's TGCC computing center in Bruyères-le-Châtel, and will be coupled to GENCI's Joliot-Curie supercomputer. This hybrid HPC-Quantum platform will be made available to serve the needs of French and European open research communities, both from Academia and Industry. When the EuroQCS-France consortium was initiated, its partners ICHEC (Ireland), FZJ (Germany) and UPB (Romania) already identified use cases that could be applied to this photonic technology.

Lucy: a cutting-edge photonic computer for scientific excellence

The name chosen for the photonic quantum computer is "Lucy". This technology is at the cutting edge of photonics innovation, not only in Europe, but worldwide. Photonic quantum computers open up new avenues of research in the field of quantum computing. The method used by Quandela consists in emitting single photons, which are routed by optical fiber to a chip where they interfere to perform a calculation. The result is measured at the output of the chip using detectors.



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With an initial capacity of 12 qubits, which is envisioned to be doubled by 2026, the specific architecture of the Lucy universal quantum computer will enable the resolution of existing problems and the discovery of new use cases. Among the use cases already identified that could benefit from Lucy's HPC-Quantum coupling are electromagnetic simulation, structural mechanics, combustion in engines, materials simulation, meteorology and earth observation.

The French part of this acquisition was carried in the context of the French National Quantum Strategy, carried by the *Secrétariat Général pour l'Investissement* (SGPI) via France 2030. GENCI and CEA, together with Inria, have set up a hybrid HPC-Quantum computing infrastructure called [HQI \(France Hybrid HPC Quantum Initiative\)](#) in which various quantum technologies will be coupled to the Joliot Curie supercomputer, hosted and operated at TGCC. This platform will be surrounded by application- and community support. A neutral-atom quantum computer from Pasqal called Ruby, acquired in the context of the [HPCQS](#) European project, is currently being installed and will be available by the end of 2024.

Like all quantum computers acquired by EuroHPC, Lucy will be made available to a wide range of users in the scientific community, industry and the public sector, throughout Europe. To enable communities to get better acquainted with the use of photonic quantum computing paradigms ahead of the system's arrival at the TGCC in 2025, the consortium will be setting up a remote access to a 6-qubit Quandela system by the end of 2024.

The purchase of Lucy is part of an unprecedented pan-European deployment plan. EuroHPC plans to acquire 6 quantum computers, based on a variety of complementary European technologies. The other 5 systems will be hosted by Poland (PSNC, EuroQCS-Poland, based on trapped ions), the Czech Republic (IT4I, LUMI-Q, superconducting technology with star topology), Spain (BSC-CNS, EuroQCS-Spain, quantum annealing system), Germany (LRZ, Euro-Q-Exa, scalable superconducting technology) and Italy (CINECA, EuroQCS-Italy, based on neutral atoms). In fact, GENCI's partners will have access to all these quantum computers, enabling them to assess the fit between these complementary technologies and the resolution of their practical problems.

Quandela and attocube systems AG: a long-term partnership

Founded in 2017 on the basis of work carried out by Pascale Senellart-Mardon's group at C2N (Centre de Nanosciences et de Nanotechnologies), the French company Quandela stands out for a high-performance manufacturing process for single-photon sources. This technology enables them to offer modular and powerful quantum computing systems.

Attocube systems AG and Quandela have been collaborating since the French company's inception. The former supply compact cryogenics systems to efficiently cool the sources and detectors of quantum computing systems designed by the latter. Lucy will benefit from this long-standing partnership.

Niccolo Somaschi, CEO and co-founder of Quandela, and Peter Kraemer, CEO of attocube systems AG declared:

"Quandela and attocube systems AG, two pioneering European deep-tech companies, have joined forces to introduce MOSAIQ-12, a state-of-the-art 12-qubit photonic quantum computer. This groundbreaking system integrates Quandela's advanced qubit generator with attocube's compact cryogenic system (attoCMC), alongside proprietary photon demultiplexing technology, a sophisticated 24-mode photonic chip, high-precision single photon detectors, and a comprehensive electronic and software control stack. MOSAIQ-12 represents a leap forward in quantum computing practicality, boasting a remarkably compact 2 square-meter footprint and energy-efficient operation at under 5kW. This achievement underscores the partners' commitment to user-centric design and environmental responsibility. To ensure seamless transition, Quandela will provide access to a remote similar photonic quantum computing system from contract signing through system delivery. This collaboration between Quandela and attocube exemplifies the successful transition of quantum technology from theoretical research to practical, real-world applications, marking a significant milestone in the commercialization of quantum computing."

"Following the commissioning of a first neutral atom system acquired through a joint acquisition between EuroHPC and GENCI, the installation of Lucy, a new photonic-based QPU from Quandela at TGCC marks another major milestone within the French and European quantum computing strategy. We are proud to make available to French and European HPC users such innovative European quantum computing technologies! This installation foreshadows the key role that quantum systems will play in the future world of hybrid HPC." said Jacques-Charles Lafoucriere HPC Programme Director at CEA and Head of HQI.

About:

➤ **EuroHPC JU**

The EuroHPC Joint Undertaking (EuroHPC JU) is a legal and funding entity created in 2018 to enable the European Union and EuroHPC participating countries to coordinate their efforts and pool their resources with the objective of making Europe a world leader in supercomputing.

In order to equip Europe with a world-leading supercomputing infrastructure, the EuroHPC JU has already procured [nine supercomputers](#), located across Europe. Three of these EuroHPC

supercomputers are now ranked among [the world's top 10 most powerful supercomputers](#): [LUMI](#) in Finland, [Leonardo](#) in Italy and [MareNostrum 5](#) in Spain.

No matter where in Europe they are located, European scientists and users from the public sector and industry can benefit from these EuroHPC supercomputers via the [EuroHPC Access Calls](#) to advance science and support the development of a wide range of applications with industrial, scientific and societal relevance for Europe.

➤ **About GENCI**

Created by the French public authorities in 2007, GENCI (Grand Équipement National de Calcul Intensif) is a major research infrastructure. This public operator aims to democratise the use of digital simulation through high performance computing associated with the use of artificial intelligence, and quantum computing to support French scientific and industrial competitiveness.

GENCI is in charge of three missions:

- To implement the national strategy for the provision of high-performance computing resources, storage, massive data processing associated with Artificial Intelligence technologies and quantum computing, for the benefit of French scientific research, in conjunction with the 3 national computing centres (CEA/TGCC, CNRS/IDRIS, France Universités/CINES).
- Supporting the creation of an integrated ecosystem on a national and European level
- Promoting digital simulation and supercomputing to academic research and industry

GENCI is a civil company 49% owned by the State represented by the Ministry in charge of Higher Education and Research, 20% by the CEA, 20% by the CNRS, 10% by the Universities represented by France Universités and 1% by Inria.

Regarding the national quantum strategy GENCI is partner together with CEA and Inria of HQI, the French HPC hybrid Quantum Initiative.

Follow GENCI on [LinkedIn](#), and visit their website <https://www.genci.fr/>

➤ **About Quandela**

Quandela is a quantum computing company, specialized in industry-grade cloud, and on-premises solutions. It is a leading light of the tech world. The company leverages semiconductor and photonic industries to manufacture qubit technologies and modules for quantum computing systems that scale. With a focus toward the development of useful quantum computing solutions, Quandela works on machines and algorithms for quantum advantage, to propel the industry toward error corrected system, enabling their Quantum Transformation along the journey.

Follow Quandela on [LinkedIn](#), and visit their website www.quandela.com.

➤ **About attocube systems AG**

attocube systems AG was founded in 2001 and is recognized for innovation and excellence in developing, manufacturing, and distributing cutting-edge components and solutions for nano- and quantum technology applications in research and industry. The portfolio includes market leading vibration-isolated cryostat systems, nano-positioners for ultra-precise positioning, highly precise displacement sensors, and microscope systems capable of operating under extreme environmental conditions such as ultra-high vacuum, cryogenic temperatures, or high magnetic fields. With the product line 'Compact Mobile Cryogenics' the company offers most compact and energy-efficient 19" cryostat systems that can be easily integrated into

OEM systems, thus pushing the commercialization of photon-based quantum applications one step further.

All products are developed and manufactured at the company's headquarters in Haar, Germany. An international team of physicists, engineers, software developers, and product designers collaborates closely from conception to delivery. Products are distributed globally, with attocube having a presence in the USA and a broad network of distributors serving customers in over 40 countries.

Follow attocube systems AG on [LinkedIn](#), and visit their website <https://www.attocube.com/>

Press contacts

➤ HQI and GENCI

Communications department

contact@hqi.fr - +33 (6) 03 18 09 02