Press release

HPCQS: A new step in the deployment of Ruby at TGCC, reaching a first 35 trapped atoms, on track for the final 100-qubit capability for H1 2025

Krakow, March 20th 2025

In the framework of the European project HPCQS, a major milestone has been achieved by Pasqal in the deployment of Ruby (Pasqal's neutral-atom analogue quantum computer) at TGCC, reaching first 35 trapped atoms and on track for 100-qubit capability. Ruby's integration with the Joliot-Curie supercomputer, operated by CEA at TGCC, will help researchers explore hybrid HPC-QC computing capabilities.

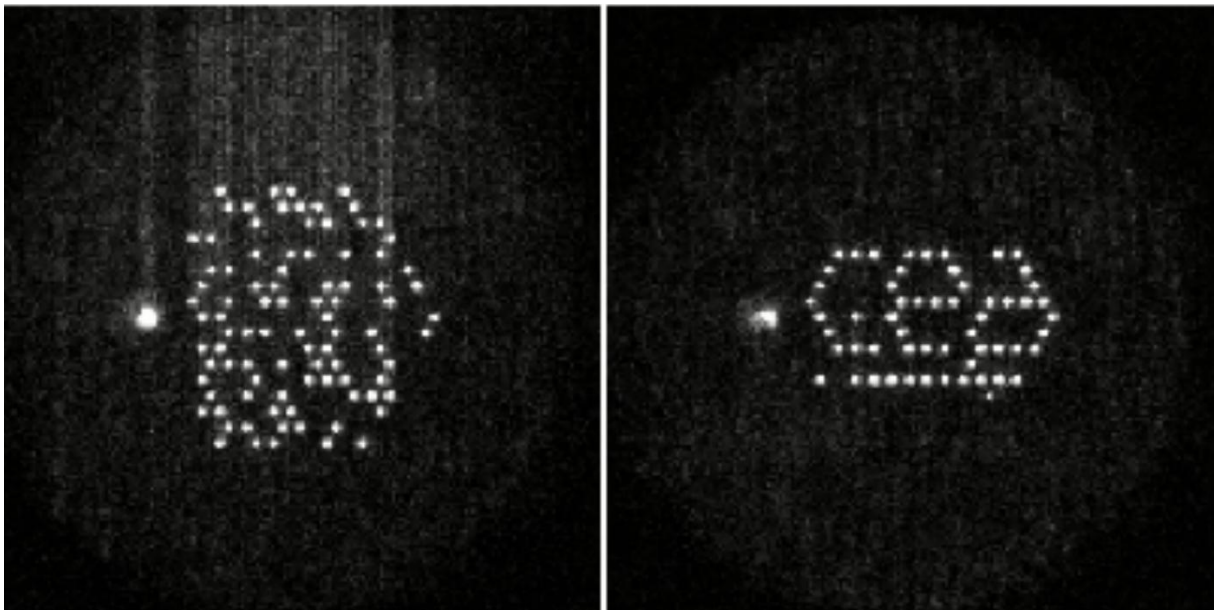

Image of 35 atoms trapped by the Ruby system

CEA, Pasqal, GENCI and the HPCQS project announce today a significant advancement in the deployment of its Ruby quantum processing unit (QPU) at the TGCC (Très Grand Centre de calcul of CEA) in collaboration with GENCI (Grand Équipement National de Calcul Intensif). Ruby has successfully trapped and rearranged 35 atoms, marking a key step toward achieving its final goal of 100 qubits.

The milestone is part of the ongoing development within the HPCQS (High-Performance Computer and Quantum Simulator hybrid) project, which brings together Pasqal, GENCI, and CEA in France as well as Pasqal and Forschungszentrum Jülich in Germany to pioneer the future of hybrid quantum computing. At the same time the installation of Ruby was ended at TGCC, the Jülich neutral Atom Device – JADE – has been installed at the Jülich Supercomputing Centre and is currently being validated. These achievements demonstrate the ability of Pasqal to deploy and install on end customers premises two analogue quantum computers

simultaneously and their readiness for integration with high-performance computing (HPC) resources.

Pasqal's Ruby is being hosted at the TGCC, one of Europe's most advanced high-performance computing centres. The deployment of two systems by Pasqal – at both Jülich Supercomputing Centre and TGCC – is part of the European project HPCQS, co-funded by the European HPC Joint Undertaking and supported by the France2030 investment programme for the partners CEA and GENCI and the German Federal Ministry of Education and Research for Forschungszentrum Jülich and other German partners. This collaboration aims to accelerate the development of quantum technologies and their integration with supercomputers.

Ruby's integration with GENCI's Joliot-Curie supercomputer, operated by CEA at TGCC, will help researchers explore hybrid computing capabilities. By combining quantum processing with traditional supercomputing, the system is hoping to enable European scientists to solve complex computational problems faster and more efficiently, unlocking new opportunities for scientific discovery.

Pioneering Quantum Use Cases

The team at Pasqal has already demonstrated several use cases on a similar quantum system that will soon be ported to Ruby. Notable examples include a collaboration with EDF to optimise energy demand forecasts for electric vehicle smart charging and an exciting partnership with Qubit Pharmaceuticals to design quantum algorithms for drug discovery.

The ongoing work with organisations like EDF and Qubit Pharmaceuticals demonstrates the growing relevance of neutral atom quantum computing in addressing some of today's most pressing challenges.

Pasqal's progress toward the 100-qubit Ruby system is on track, with future milestones expected to enhance the quantum capabilities available for researchers and industries alike. The HPCQS project, which is set to run for four years with a €12 million budget, will continue its integration and improvement work, culminating in the full hybridisation of quantum simulators with high-performance supercomputing resources.

Europe's commitment to advancing quantum technologies through projects like HPCQS underscores the region's determination to remain at the forefront of the quantum revolution.

About

HPCQS

HPCQS seeks to integrate and couple two analogue quantum computers, each capable of controlling more than 100 atoms, with two existing European Tier-0 supercomputers, and to deploy an open European federated hybrid HPC-QS infrastructure that will provide non-commercial cloud access to public and private European users. The project aims to develop a hybrid programming platform which allows to combine quantum simulations with classical high-performance computing and thus accelerates the computing speed of classical supercomputers. With such powerful computers, new and better solutions for complex problems can be found, for example in the areas of simulating physics and chemistry systems, material development, personalised medicine, optimisation problems for logistics and transport, and quantum-enabled machine learning. In addition to developing the world's first deeply integrated high-performance computer and quantum simulator systems to solve complex everyday problems of our society, HPCQS will strengthen Europe as an attractive business location and its global competitiveness and will participate actively in pioneering work in the field of quantum computing and simulation.

HPCQS has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 101018180. The JU receives support from the European Union's Horizon 2020 research and innovation program and Germany, France, Italy, Ireland, Austria and Spain in equal parts.

GENCI

Created by the 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.

CEA

The CEA is a unique public research body whose raison d'être is two-fold: it helps public policymakers to make informed decisions, and it gives French and European companies – as well as local authorities – the scientific and technological tools they need to face the major societal changes related to the digital and energy transitions, the future of health care, and global defence and security. Its action is based on three key values that drive the CEA teams in their daily work: curiosity, cooperation, and a keen sense of responsibility.
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Pasqal

Pasqal is a leading Quantum Computing company that builds quantum processors from ordered neutral atoms in 2D and 3D arrays to bring a practical quantum advantage to its customers and address real-world problems. Pasqal was founded in 2019, out of the Institut d'Optique, by Georges-Olivier Reymond, Christophe Jurczak, Professor Dr. Alain Aspect – Nobel Prize Laureate Physics, 2022, Dr. Antoine Browaeys and Dr. Thierry Lahaye. Pasqal has secured more than €140 million in financing to date. To learn more about us, visit www.pasqal.com.

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