# UK achieves milestone with first full-stack silicon CMOS quantum computer



The United Kingdom has marked a pioneering achievement in quantum computing by developing the world’s first full-stack quantum computer built entirely with standard silicon CMOS chip technology. This breakthrough, realised by London-based startup Quantum Motion, signifies a dramatic shift from conventional quantum systems that typically depend on vast cryogenic facilities and bespoke production environments. The innovative quantum computer fits within the footprint of three standard 19-inch server racks and operates using silicon qubits crafted on 300-millimeter wafers—the same manufacturing processes applied in producing everyday electronic devices such as smartphones and laptops.

Quantum Motion’s strategic choice to employ CMOS silicon semiconductor technology addresses one of the greatest obstacles in quantum computing: scalability through mass manufacturability. Unlike traditional superconducting qubits or ion-trapped systems which require highly specialised fabrication facilities, the CMOS method leverages existing semiconductor industry infrastructure, enabling industrial-scale production. This compact quantum computer incorporates a dilution refrigerator that achieves near-absolute zero temperatures, silicon qubits, and integrated control circuits in a design compatible with standard data centre environments. The system’s modular tile architecture means computational units—complete with reading circuits, activation systems, and communication interfaces—can be replicated across a chip to potentially scale up to millions of qubits.

The innovation extends beyond hardware. Quantum Motion provides a full-stack software ecosystem encompassing user interfaces, qubit control mechanisms, and integration with established quantum programming frameworks such as Qiskit and Cirq. This approach facilitates immediate application development without the overhead of constructing new infrastructure, making the technology more accessible for practical scientific and industrial use. The UK’s National Quantum Computing Centre (NQCC), where the machine is housed, has commenced real-world testing targeting industries including pharmaceutical molecular simulation, artificial intelligence, and network optimisation. Notably, the system incorporates self-calibration capabilities enabled by machine learning algorithms, optimising quantum operations autonomously.

This advancement sets the UK apart in the global race for quantum supremacy, underpinned by the compatibility of CMOS technology with modern electronics manufacturing and standard data centre integration. While other countries, such as China, are advancing rapidly in semiconductor and quantum technologies via large technology firms, Quantum Motion’s user-focused and industrialisation-driven philosophy contrasts with competitors primarily demonstrating feasibility rather than pursuing scalable commercial deployment.

Market analysts estimate that the global quantum computing industry could expand massively, with projected values ranging between approximately 76.5 billion and 722.5 billion euros by 2040. This market encompasses quantum hardware, cloud quantum services, and diverse applications spanning finance, energy, and healthcare sectors. Consumer-level quantum computing remains speculative for the next decade or two, with the more immediate impact expected through cloud-based quantum computing models accessible to research institutions and businesses without requiring personal ownership of quantum hardware.

By marrying quantum computing advancements with the reliable and proven production standards of silicon CMOS technology, the UK’s innovation lays foundational groundwork for the industrialisation and democratization of quantum technologies. This could expedite the integration of quantum acceleration into existing workflows and data centres across industries, dramatically enhancing practical problem-solving capabilities in areas critical to economic and technological progress.

### 📌 Reference Map:

* Paragraph 1 – [[1]](https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/), [[2]](https://www.datacenterdynamics.com/en/news/quantum-motion-delivers-silicon-cmos-based-quantum-computer-to-uks-national-quantum-computing-centre/), [[3]](https://www.ucl.ac.uk/news/2025/sep/first-quantum-computer-built-using-silicon-chips), [[4]](https://www.uktech.news/quantum/milestone-mass-production-of-quantum-computers-20250915), [[7]](https://www.tomshardware.com/tech-industry/supercomputers/uk-start-up-quantum-computer-runs-on-standard-chips)
* Paragraph 2 – [[1]](https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/), [[2]](https://www.datacenterdynamics.com/en/news/quantum-motion-delivers-silicon-cmos-based-quantum-computer-to-uks-national-quantum-computing-centre/), [[4]](https://www.uktech.news/quantum/milestone-mass-production-of-quantum-computers-20250915), [[5]](https://thequantuminsider.com/2025/09/15/quantum-motion-delivers-the-industrys-first-full-stack-silicon-cmos-quantum-computer/), [[6]](https://www.engineering.com/quantum-motion-delivers-full-stack-quantum-computer-on-cmos-chip/)
* Paragraph 3 – [[1]](https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/), [[5]](https://thequantuminsider.com/2025/09/15/quantum-motion-delivers-the-industrys-first-full-stack-silicon-cmos-quantum-computer/), [[6]](https://www.engineering.com/quantum-motion-delivers-full-stack-quantum-computer-on-cmos-chip/)
* Paragraph 4 – [[1]](https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/), [[7]](https://www.tomshardware.com/tech-industry/supercomputers/uk-start-up-quantum-computer-runs-on-standard-chips), [[2]](https://www.datacenterdynamics.com/en/news/quantum-motion-delivers-silicon-cmos-based-quantum-computer-to-uks-national-quantum-computing-centre/)
* Paragraph 5 – [[1]](https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/)

Source: [Noah Wire Services](https://www.noahwire.com)

## Bibliography

1. <https://evidencenetwork.ca/722-5-billion-in-sight-for-the-uk-as-it-becomes-the-first-country-in-the-world-to-achieve-the-feat-of-fitting-a-quantum-computer-into-a-laptop/> - Please view link - unable to able to access data
2. <https://www.datacenterdynamics.com/en/news/quantum-motion-delivers-silicon-cmos-based-quantum-computer-to-uks-national-quantum-computing-centre/> - Quantum Motion has delivered a full-stack quantum computer to the UK's National Quantum Computing Centre (NQCC). This system is the first to use 300mm silicon CMOS wafer technology, enabling mass production using standard chip fabrication processes. The computer comprises three 19-inch server racks, including a dilution refrigerator and integrated control electronics, designed to fit within standard data centre environments. The scalable tile architecture allows for future expansion to millions of qubits per quantum processing unit (QPU).
3. <https://www.ucl.ac.uk/news/2025/sep/first-quantum-computer-built-using-silicon-chips> - A spinout co-founded by a UCL professor has built the world’s first full-stack quantum computer made with the same silicon chip technology that is used in laptops and phones. The machine, built by the company Quantum Motion, is now installed at the National Quantum Computing Centre (NQCC) in Oxfordshire, where researchers will test how it can be applied to real-world problems such as drug discovery. Using standard silicon CMOS technology, the same material used in global chip factories, means the quantum computers made by Quantum Motion could be more easily mass-produced.
4. <https://www.uktech.news/quantum/milestone-mass-production-of-quantum-computers-20250915> - British computing company Quantum Motion has delivered the industry’s first full-stack quantum computer built with standard silicon chips in a major step towards mass production viability. Deployed at the UK National Quantum Computing Centre (NQCC), the new computer is the first of its kind to use mass manufacturable 300mm silicon CMOS wafer technology, the industry standard used in smartphone and laptop production. The system has a data centre footprint of three 19-inch server racks, housing the dilution refrigerator and integrated control electronics.
5. <https://thequantuminsider.com/2025/09/15/quantum-motion-delivers-the-industrys-first-full-stack-silicon-cmos-quantum-computer/> - Quantum Motion has delivered the first full-stack quantum computer built using standard 300 mm silicon CMOS chip fabrication, installed at the UK National Quantum Computing Centre under its Testbed Programme. The system integrates a silicon spin-qubit quantum processing unit (QPU), control stack, and user interface compatible with Qiskit and Cirq, housed in a data-centre-friendly three-rack footprint designed for scalable upgrades. Leveraging mass-manufacturable semiconductor processes, Quantum Motion aims to scale its tile-based architecture to millions of qubits, advancing fault-tolerant, commercially viable quantum computing.
6. <https://www.engineering.com/quantum-motion-delivers-full-stack-quantum-computer-on-cmos-chip/> - Quantum Motion has delivered the industry’s first full-stack quantum computer to be built using a standard silicon CMOS chip fabrication process – the same transistor technology used in conventional computers. Deployed at the UK National Quantum Computing Centre (NQCC), this is the first full-stack quantum computer to use mass manufacturable 300mm silicon CMOS wafer technology and the first silicon spin-qubit computer installed under the NQCC’s Quantum Computing Testbed Programme. The system integrates the company’s Quantum Processing Unit (QPU) with a user interface and control stack compatible with industry standard software frameworks, such as Qiskit and Cirq, making it a full-stack solution.
7. <https://www.tomshardware.com/tech-industry/supercomputers/uk-start-up-quantum-computer-runs-on-standard-chips> - A UK start-up, Quantum Motion, has unveiled what it claims is the world's first full-stack quantum computer built entirely with standard silicon CMOS chip technology—the same type used in conventional electronics like laptops and smartphones. Launched on September 15, 2025, the system has been installed at the UK’s National Quantum Computing Centre (NQCC) and comprises three standard 19-inch server racks, including cryogenics and control systems. The machine supports familiar software frameworks like Qiskit and Cirq, aiming to allow integration with existing data center infrastructure.