

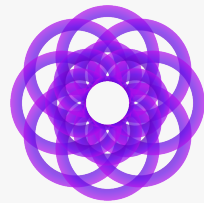
Q-CTRL Delivers Autonomous Calibration Solutions to Enable Rapid Integration with Ecosystem Partners QuantWare & TreQ

Partnership to enable access to more powerful quantum processors and reduce test times from days to hours using autonomous QPU characterization and calibration

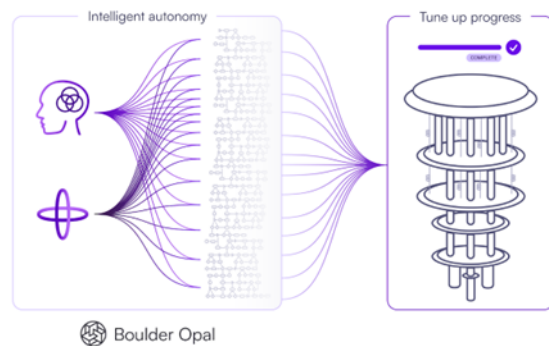
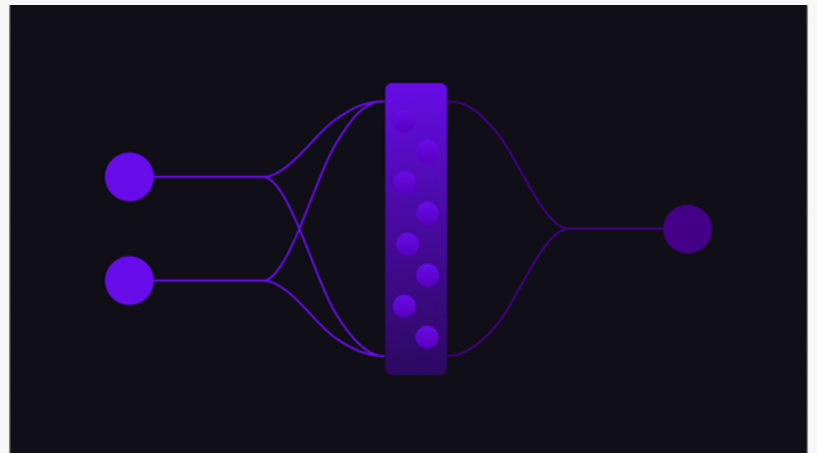
LOS ANGELES, CA, UNITED STATES, May 6, 2025 /EINPresswire.com/ -- Q-CTRL, the global leader in quantum infrastructure software, is now delivering a world-first autonomous calibration solution for quantum computers. In partnership with QuantWare, a provider of quantum processor scaling technology, and TreQ, a quantum systems engineering and manufacturing company, Q-CTRL is now enabling push-button boot up of on-premises quantum processors.

This capability is the key to widespread deployment of quantum computers in research facilities, corporate R&D labs, and data centers, and follows recent scientific demonstrations of fully autonomous tune-up of an IBM processor.

Delivering useful results from today's quantum computing hardware currently requires laborious, imprecise, serial, and manual tuning of all the various "control knobs" that govern



Q-CTRL



Boulder Opal Scale Up empowers quantum hardware manufacturers to create more efficient and scalable products through intelligently autonomous routines that boost operational efficiency while democratizing access to consistently high-performing quantum dev

quantum processing unit (QPU) performance. [Intelligent autonomy](#) is the solution that can enable QPUs to become ubiquitous computing engines in research facilities, corporate R&D labs, and data centers.

Q-CTRL's Boulder Opal Scale Up solution combines PhD-level human intelligence with AI-driven automation to overcome this industry bottleneck. Built on the company's track record of delivering peak QPU performance through physics-informed AI, Boulder Opal Scale Up provides an expert-configured and fully autonomous software solution to deliver fast, repeatable, and robust QPU characterization and calibration.

QuantWare's customers will be able to leverage this autonomous calibration solution from Q-CTRL to significantly accelerate the construction of their quantum systems using QuantWare's QPUs with their VIO scaling platform. By leveraging these solutions from Q-CTRL, any user can immediately achieve great performance on QuantWare QPUs with just a single line of code. This capability is critical for the rapid deployment and adoption of next-generation devices like [Contralto-A](#), a 17-qubit tunable coupler QPU, making it easier than ever for customers to build faster and with greater confidence. QuantWare will also use Q-CTRL's solution internally to optimize their test processes, improving the quality of their QPUs and effectively doubling their testing throughput.

"As we rapidly scale our devices thanks to VIO, tuning up systems built with our QPUs needs to be automated," said Matthijs Rijlaarsdam, CEO of QuantWare. "We are excited not just to use Q-CTRL's software internally, but especially to help our customers scale their systems faster and with confidence. Boulder Opal with Contralto-A is an extremely powerful combination that will greatly expand the capabilities of our customers."

In addition, Q-CTRL has partnered with TreQ, a leading quantum computing system integrator, through a [joint Innovate UK grant](#) to deliver a complete modular compute system to end-users. Through the Open Architecture Quantum (OAQ) Testbed – powered by Q-CTRL's Boulder Opal Scale Up solution – end users will benefit from access to a complete system operated the calibration experience as used by QuantWare, now also addressing Novera hardware provided by Rigetti.

"The OAQ Testbed project pushes the bounds of quantum computing systems," said Dr Joseph Rahamim, Director of Systems Engineering at TreQ. "By integrating software and hardware, we expand the focus beyond processors to the systems engineering required to develop the supply chain, engage more innovators, and accelerate development. We know autonomous calibration tasks like those developed by Q-CTRL are a key part to enabling that system-level approach, allowing more users to access quantum computing resources."

Boulder Opal Scale Up also complements Q-CTRL's error-suppressing performance management software, Fire Opal, and in combination allows end users to go from a bare metal processor to a useful computer without any overhead or expert knowledge required.

“It’s our mission to make quantum technology useful for as many teams as possible,” said Michael J. Biercuk, CEO and Founder of Q-CTRL. “We’re excited to bring our expertise in physics-informed AI and performance management to the products of QuantWare and TreQ, and to all of their customers, so together we can have the biggest possible impact on delivering quantum advantage to the community.”

Learn more about these autonomous solutions to better enable cutting-edge quantum devices at q-ctrl.com.

About Q-CTRL

Q-CTRL is a key player in the global quantum technology industry as a category-defining business for quantum infrastructure software. Leading quantum computing hardware providers integrate its performance-management software with their superconducting and silicon-based platforms to deliver unprecedented capabilities to end users. The company’s global leadership in quantum sensing for defense and dual-use was featured in The New York Times. Q-CTRL also developed Black Opal, an award-winning edtech program that enables users to quickly learn quantum computing.

Founded by Michael J. Biercuk in November 2017, Q-CTRL has assembled the world’s foremost team of expert quantum-control engineers, providing solutions to global quantum technology leaders, including Fortune 500 companies, startups, national research labs, and academic institutions. The company has international headquarters in Sydney, Los Angeles, San Francisco, Berlin, and Oxford.

About QuantWare

QuantWare is a leading provider of quantum hardware and creator of the VIO QPU scaling technology. Leading the Quantum Open Architecture paradigm, QuantWare powers the quantum computers of customers in 20 countries, spread over four continents. QuantWare’s VIO provides a scaling platform to unlock the fastest path towards systems with more than 1 million qubits. Available in fully packaged QPUs and via Foundry and Packaging Service. For more info, visit our website www.quantware.com

About TreQ

TreQ is a global quantum systems engineering and manufacturing company building and operating bespoke, open-architecture quantum computing clusters. For more info, visit our website <https://treq.tech/>

Editor’s note

Quantum computers are exceptionally delicate devices. Not only are the underlying hardware elements susceptible to noise and error, but each individual element must be calibrated individually in order to operate at near-optimal performance. Moreover, given the complexity

and interdependency of these measurements, it is typical that a human operator must interpret results in real time in order to adjust settings for future tuneup procedures. The fragility of devices means that things frequently fail in the laboratory and require intervention in order to recover meaningful performance.

The Quantware QPU calibrated for initial demonstrations had more than 50 individual elements that must be tuned, including each qubit and corresponding resonator, multiple feedlines, and dozens of multiqubit edges. Each element itself possesses multiple parameters that must themselves be individually calibrated, resulting in a 10:1 calibration-step: qubit ratio. Each calibrated element must also be assured to work under varying operating conditions and debugged when calibration routines inevitably encounter errors and exceptions. “Lite” parallelization already fails whenever small deviations from target performance arise, posing a major serialization bottleneck. As the number of qubits per device scales into the hundreds, thousands, and eventually millions needed for broad quantum applicability, these individual elements will grow to extreme levels.

In typical laboratory settings, advanced research teams use “lite” automation via a script that serially executes predefined measurement and characterization routines over a week or more of continuous measurement. This procedure is highly inefficient and brittle: it requires taking more data than is strictly necessary to function, and it will fail in totality if any single element suffers an exception (for instance, a failure of a fitting routine to the data). In such cases a human operator must intervene to decide how to resolve the problem; when such issues arise overnight or on weekends, the overall procedure can simply stop, and progress is lost.

By encoding expert-level insight with physics-aware AI, Boulder Opal Scale Up can go far beyond the execution of a script, autonomously and adaptively determining the most efficient routine to execute. AI automation delivers several key advantages over existing solutions:

Efficient measurements: Via an adaptive automation strategy, the package updates the type and characteristics of the next measurement to be taken in a sequence, reducing data requirements by more than 10x. In addition, the package trades standard “scans” and functional fit over variable values with AI-driven closed-loop feedback (where the agent directly probes the hardware and decides the next measurement to perform based on the resultant data) to efficiently reduce experiment requirements for each step.

Peak performance: Q-CTRL has repeatedly validated in the peer-reviewed scientific literature and in its products that closed-loop AI agents can design superior control operations to “hand-crafted” quantum logic operations. These agents discover detailed insights that are largely invisible to human operators via rapidly iterating adaptive tests. Closed-loop agents are used throughout Boulder Opal Scale Up to deliver performance exceeding that which is possible by scripted execution of fixed experiments.

Adaptive error handling: The computational graph framework underpinning Boulder Opal Scale

Up ensures that the routine works every time, even when individual experiments fail (a common occurrence in lab settings). The adaptive procedure identifies failures and uses expert-level logic to identify the source of the failure and correct or compensate for it, all without human intervention, so it works even when surprising edge cases are encountered.

Expert-informed configuration: The expert Q-CTRL team configures the characterization routine to be most efficient for Quantware QPUs, delivering the knowledge and experience of the world's largest team of experts in quantum control to every user. The team has built a library of hardware-validated, high-efficiency control and calibration routines built on the optimization engines of Boulder Opal and draws from them to deliver the most effective configuration for Quantware or any other QPU.

This package builds on previous scientific demonstrations from Q-CTRL that AI agents could automatically calibrate a superconducting quantum computer from a cold start in just 90 minutes, making it the only automation tool that's validated end-to-end on real hardware.

As a simple but powerful example of this approach, Q-CTRL ran a tuneup challenge at the APS Global Physics Summit, tasking the expert-level audience with executing a relatively simple task: calibrating a single-qubit operation known as a "gate". Even competing against an expert audience of professional physicists, the autonomous calibration was 42x better than the average "manual" gate tuneup, and was completed 3x faster.

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