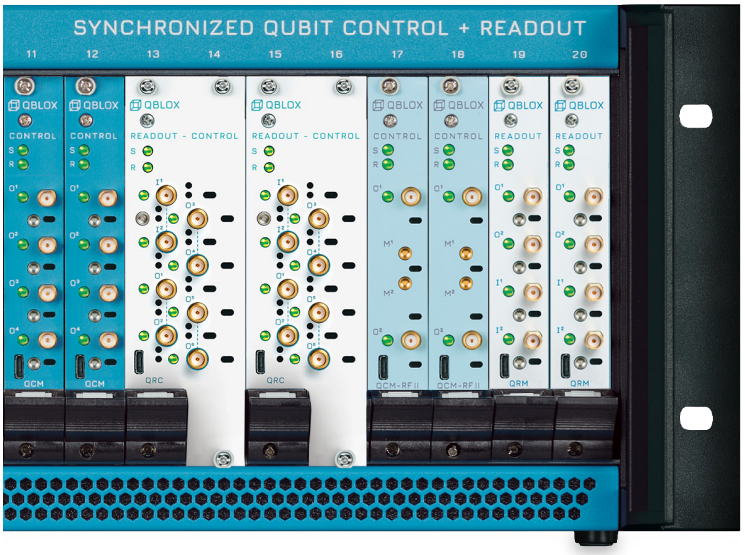
QBLOX

Control stack tailored for your qubits

SPIN QUBITS

DC-OPTIMIZED CLUSTER

CLUSTER



- ↔ Frequency range DC-18.5 GHz
- 1 ns pulse shaping and resolution
- Feedback latency under 400 ns

QBLOX

Hardware for superior analog performance

Gapless playback for predictable and reliable signal output, crucial for phase-coherent operations.

Short, parameterized pulses with the industry's fastest parameter update rate of 4 ns.

Exceptional signal integrity, optimized for high SNR, high SFDR, and low phase noise.

Unrivaled time domain performance through short rise times and low ringing, enabling ultra-fast high fidelity gates.

QBLOX Scheduler

Software enabling instant results

High-speed, large-scale experimentation through FPGA-based multi-dimensional real-time loops.

Extensive applications toolkit with plug-and-play qubit tune-up routines and the base for building advanced measurements.

Tighter integration with Qblox Instruments: Assembly-level software for advanced control and custom compilers.

Designed to be easily integrated with higher-level, automated calibration platforms.

Solution for high-fidelity quantum operations

Single-qubit gates

Manipulate quantum states precisely through high SNR and an exceptionally clean spectral response.

Push your gates into the <20 ns regime with 1 ns pulse-shaping precision, accurately executed through fast rise times and low analog ringing.

Speed up your experiment by leveraging active reset to initialize your qubit within 400 ns between consecutive runs.

Run multi-dimensional qubit calibration routines, such as Rabi, Ramsey, and T1 experiments, in a parameterized fashion.

Benchmark qubit performance via single-qubit randomized benchmarking or gate-set tomography.

Two-qubit gates

Manipulate charge states of quantum dots over a wider parameter space of the charge stability diagram, enabled by the 5 Vpp scan range.

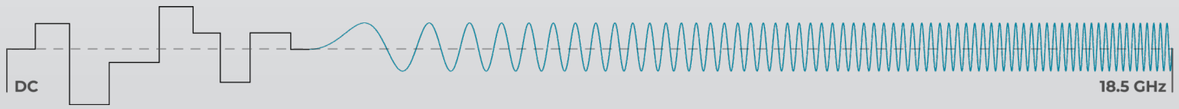
Implement the spin shuttling operation easily and intuitively to facilitate the two-qubit gate in a scalable QPU.

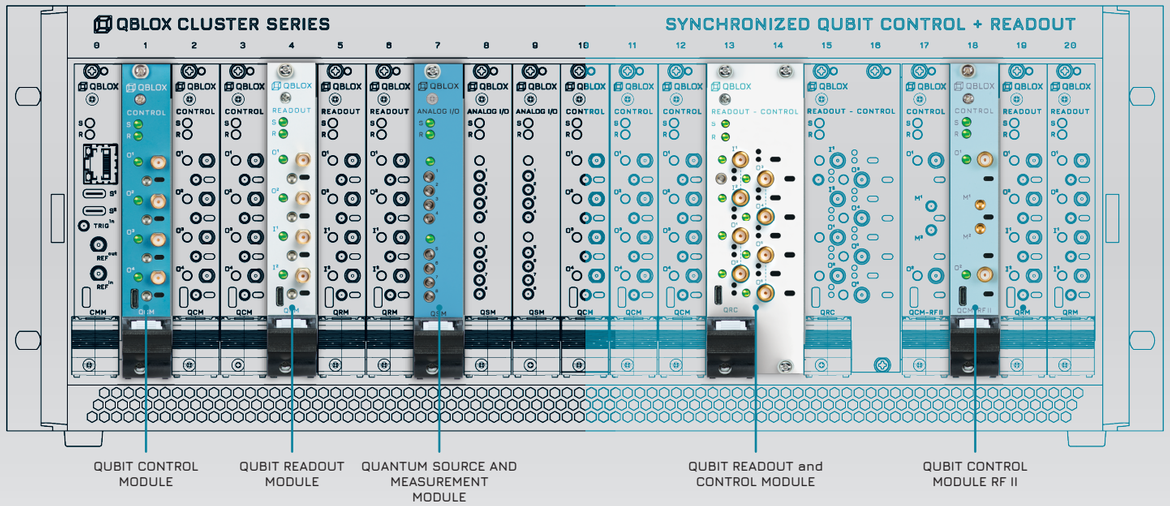
Perform 2-qubit gates by exploiting exchange interactions between quantum dots using tunneling gate pulses at 1 ns precision.

Operate qubit drive and exchange interactions up to 18.5 GHz to obtain spin evolution data.

Assess qubit performance by using either two-qubit randomized benchmarking or gate-set tomography.

All you need for spin qubit control and readout is in a single mainframe, providing continuous coverage from DC up to 18.5 GHz.





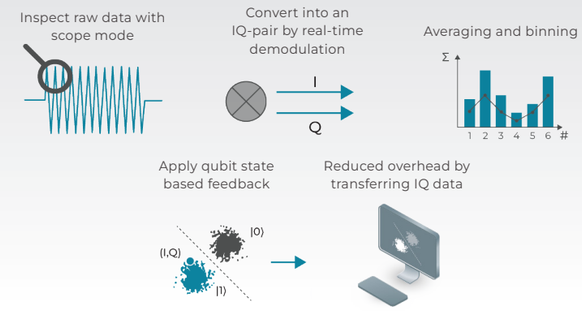
Optimal qubit readout

Perform spin qubit measurement experiments, utilizing either current-based DC sensing or reflectometry-based RF sensing.

Run RF-Reflectometry up to 8 simultaneous readout tones across 800 MHz.

Optimize readout fidelity by shaping the readout pulse and applying acquisition weights within the integration window.

Speed up your experiments with onboard data processing that supports real-time state-discrimination-based feedback.



Ground-loop free long term stability

Ensure interference-free operation with a DC-optimized Cluster with fully integrated DC and microwave generation.

Maintain interference-free electrostatic definition of quantum dots with ultra-stable and low noise outputs.

Monitor leakage currents upon a gate breakdown simultaneously on voltage output channels.

SYNQ — Automatic synchronization of all channels less than << 1 ns with ps-level jitter.

LINQ — Built-in scalable feedback infrastructure with all-to-all connectivity under 400 ns for conditional playback and branching.

Quantum error correction

Achieve massively parallel real-time signal processing using 120 sequencer cores housed in a single 19" mainframe.

Perform mid-circuit measurements and enable low-latency conditional feedback with all-to-all connectivity in under 400 nanoseconds.

Ensure clock synchronization accuracy within << 1 nanosecond across all processing units.

Integrate with real-time decoders for error correction and adapt with surface codes, stabilizer codes, and others.

Release September 2025_V1.0

Proven customer outcomes

> *"Qblox cluster is certainly one of the most important elements in our new spin qubit lab. The easy-to-use and compact system allows us to set up a spin qubit control system within a couple of hours. We have used it for the RF reflectometry readout of our first in-house quantum dot! I look forward to getting more exciting results by using the Qblox cluster. What I also appreciate is the good communication and friendship between Qblox and the customers."*

Tzu-Kan Hsiao
Assistant Professor

> *"Our group strives to be at the forefront of spin qubit research, and Qblox allows us to spend our time on discussing physics rather than fixing problems on experimental setups. They provide control electronics with excellent analog performance that we can rely on to manipulate our qubits with high precision. Furthermore, programming and executing complex waveforms can be accomplished with minimal experimental overheads. Finally, Qblox' solution is compact, their pricing is very competitive and their engineers offer outstanding service and advice."*

QuTech **Lieven Vandersypen**
Professor

> *"Switching to Qblox for our quantum memory control hardware has significantly improved our workflow. Its clear Python integration and fast compilation allow us to modify experimental parameters in real time. This has enabled us to replace manual optimization with a machine learning algorithm, saving time and making it easier to explore new ideas."*

ICFO **Leo Feldmann**
PhD Candidate

> *"I've been impressed by the technical background and helpful attitude of the team we have supporting us. They are always fast to respond, really helpful and give thoughtful answers. It's fantastic."*

OQC **Oscar Kennedy**
Senior Quantum Engineer

Scientific article highlights

Electron spin displacement with 99.5% fidelity over 10 µm in <200 ns enabled by Qblox's dynamic NCO phase and frequency control, baseband pulses, and RF reflectometry.

M. De Smet et al.,
Nat. Nanotechnol. 20, 866–872 (2025).

Gatemon qubit on a germanium quantum well in Ge/SiGe heterostructure characterized through pulsed spectroscopy with Qblox.

E. Kiyooka et al.
Nano Lett. 25, 562–568 (2025).

Want to accelerate your quantum computing research and development?

Prioritize your qubit research

High fidelity qubit control

Future ready system

Let's build quantum, together!

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