QBLOX

QTM

Qubit Timetag Module

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DESCRIPTION

The Qubit Timetag Module (QTM) adds digital signal generation and acquisition to the Cluster in a module optimized for optically addressable qubits.

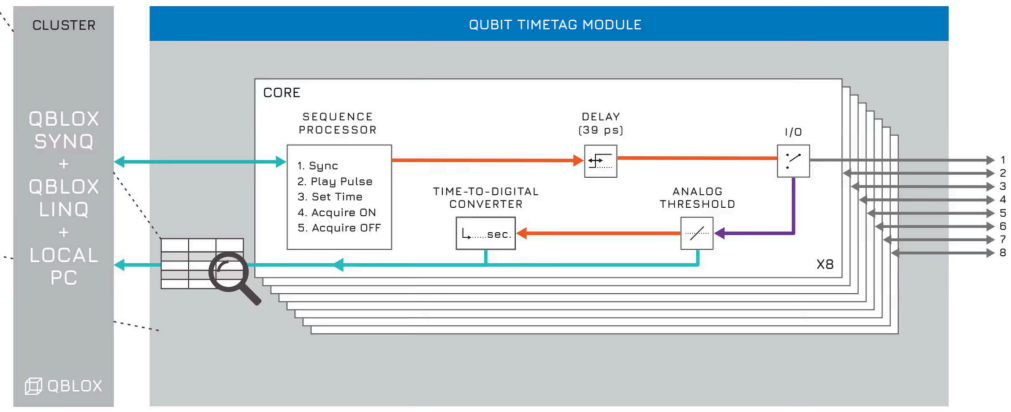
The output facilitates fast and precisely timed TTL signals for direct laser control. While at the input, a configurable analog threshold and windowing with photon counting and timetag functionalities ensure fast and reliable optical readout.

The integration of signal generation and acquisition in a single control instrument ensures inherent synchronization, rendering triggers redundant.

The module houses eight independent pulse sequence cores, that each are routed to an input/ output channel. The flexibility of real-time pulse sequencing allows for conditional feedback based on the measured photon count to coordinate the continuation of the control sequence.

Coincidence detection truth table

# photon input 1	# photon input 2	...	Feedback Operation
0	0	...	Scenario 1
1	0	...	Scenario 2
0	1	...	Scenario 3
1	1	...	Scenario 4
⋮	⋮	⋮	⋮



FEATURES

Digital channels can be configured as inputs or outputs

TTL acquisition with configurable analog threshold

TTL acquisition windowing for optimal readout

Coincidence detection scheme up to 4 channels.

Time-to-digital converters enable accurate timetagging

TTL output signal with precise pulse placement

Synchronized to all other modules via SYNQ protocol

LINQ allows for photon-count based conditional feedback with low-latency to all other modules

SPECIFICATIONS

Digital input/output channels:	**8 I/O**
Output voltage:	**1.5 V (50 OHM) / 3.1 V (HIGH-Z)**
Output rate:	**1 GS/S**
Output skew resolution:	**39 PS**
Input threshold voltage:	**0 - 5 V (11 BIT)**
Input resolution TDC:	**20 PS (RMS)**
Dead time TDC:	**44 ns**
Dead time - burst mode:	**20 ns**
Repetition rate:	**22.7 MHz (timetagging) / 950 MHz (counting-only)**
Timetag trace memory:	**2,048 timetags**
Timetag memory:	**3,000,000 timetags**

Count result memory:	**3,000,000 bins**
Maximum no. of counts per bin:	**4,000,000,000**
Ethernet data rate:	**1 Gbit/s**
Driver/API:	**SCPI / PYTHON / QCODES**
Max. power consumption via Cluster:	**48 W**
Input/Output connector type:	**SMP**
Dimensions single module:	**269 X 130 X 20 mm³**