QUANTIFI PHOTONICS®
A Teradyne Company




# QCA SERIES

## HIGH-SPEED COMMUNICATION ANALYZER

SPECIFICATION SHEET

quantifiphotonics.com

## INTRODUCING THE QCA 1000 SERIES

The **QCA Series High-Speed Communication Analyzer** is a digital equivalent-time sampling oscilloscope with a high-quality precision timebase and low jitter mode.

The QCA Series is designed to enable high-volume testing of next-generation optical interconnects which are crucial to unlock high-performance computing (HPC) and remove large-scale AI connectivity bottlenecks.

With ultra-low jitter performance and unrivalled instrument density, it overcomes the scalability and cost-of-test limitations of traditional solutions by supporting parallel high-speed I/O testing.

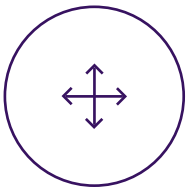
Paired with our QCR Series clock recovery instruments, it delivers a cost-effective, scalable approach for accurate, high-throughput testing to reduce the cost-of test in high-volume manufacturing and design verification testing applications.

## FEATURES



### Ultra-low jitter

High quality precision timebase with low jitter mode provides ultra-low jitter noise floor and PLL-based low frequency clock phase tracking.



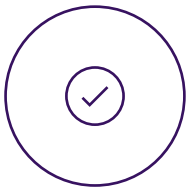
### Scalable

Designed to meet the requirements for high channel count validation and high-volume manufacturing and testing.



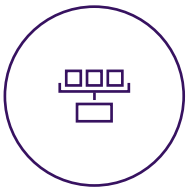
### Compact design

Compact design enables high-density, high-channel count, test solutions in a relatively small footprint.



### Accurate performance

Comparable feature set and predictive value (correlation) as the prohibitively expensive R&D set-ups.



### Ease of integration

Small footprint, remote control and API enable easy integration into probing and assembly equipment.



### Lower cost-of-test

Improved test efficiency and test throughput can reduce the cost-of test and accelerate time-to-market.



### VISEYE™ software

The newly-designed visualization and analysis software has powerful analysis capabilities and is intuitive and easy-to-use.

## WHY IS LOW JITTER AND HIGH-CHANNEL-DENSITY SO IMPORTANT?

Next-generation high-speed interconnects as well as novel, densely packed processing, compute and switch ASICs play a critical role in the roll-out of hyperscale data centers and emerging HPC and AI applications. These next-generation devices will contain hundreds of channels, each requiring testing at all stages of development, validation and manufacturing.

This development presents a set of new challenges for the test engineer: how to manage the cost-of-test, while meeting significantly increased test requirements? Densely-integrated technologies have a compressed point of failure – so skipping testing is not a viable option. All channels will need to be validated to make sure they meet specifications.

High-speed oscilloscopes have been used to test transmitters for many decades and the tried-and-tested eye diagram, and derived analysis such as TDECQ remain the primary performance measurement and are still a bottleneck in today's design, validation and manufacturing chain. At high baud rates, when jitter is combined with amplitude (or signal) noise, limited bandwidth, and multi-level signalling such as PAM4, timing deviations and signal integrity can get exponentially worse, and error-free transmission will be impossible if jitter is not controlled.

To be able to properly characterize the quality of high-speed interfaces, it is important that the jitter noise floor of the test instrumentation is low enough to be able to measure the jitter of the devices under test. It's also important that measurement equipment can track low frequency variations of the embedded clock in the high-speed signal. So-called clock wander is typical in link technologies that rely heavily on digital signal processing at the receiver or other advanced signalling formats.

Consequently, ultra-low jitter noise floor and PLL-based low frequency clock phase tracking are essential to provide the precision measurement conditions necessary for accurate and repeatable characterization of 100G per channel and above HSIO interfaces.

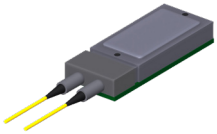
# JITTER MATTERS!

## CUSTOMERS & APPLICATIONS

**Developers of:**

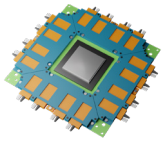
- Transceivers
- Photonic ICs
- Co-packaged optics (CPO)
- In-package optical IO
- Optics for AI networks





**Target applications:**

- Transmitter characterization
- High-volume test of high-speed PICs
- Validation testing (ODVT)
- Pre-production testing
- Transceiver validation
- High-volume transceiver manufacturing



## The QCA Series uses Quantifi Photonics' new VISEYE™ signal analysis software for an intuitive & easy-to-use experience to operate the oscilloscope and perform jitter and eye measurements.

VISEYE features a modern interface and has been designed to streamline the analysis process while providing full control of hardware and analysis functions. It also has a powerful API that allows streamlined automation for maximum measurement throughput.

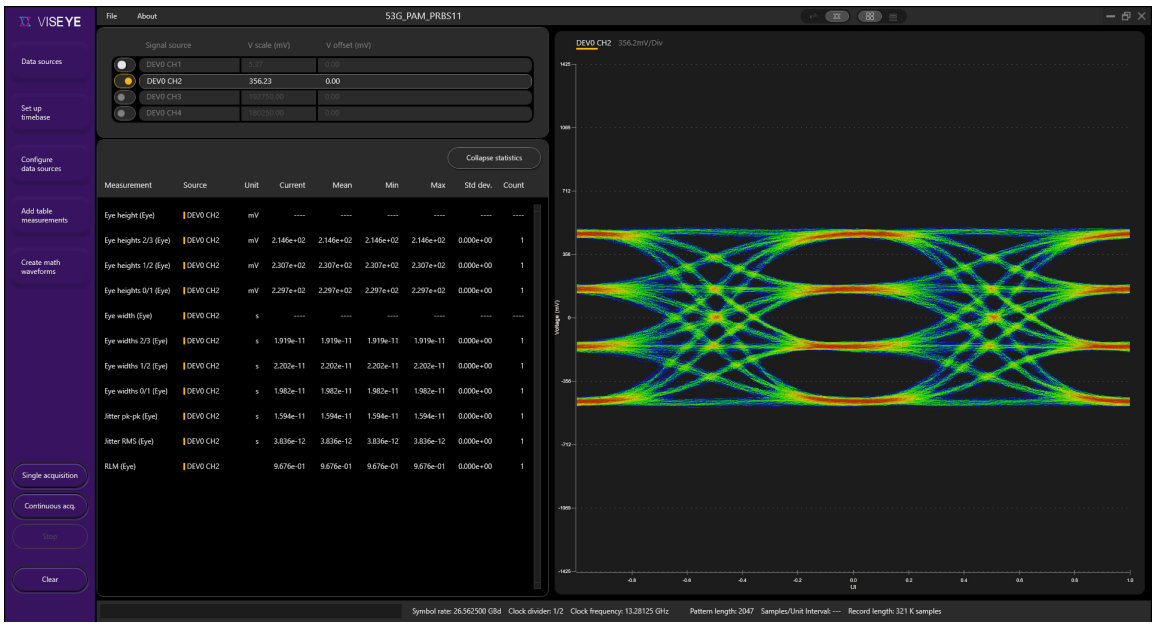



**Image:** 53 Gbps PAM4 signal eye diagram shown with numerical analysis parameters.

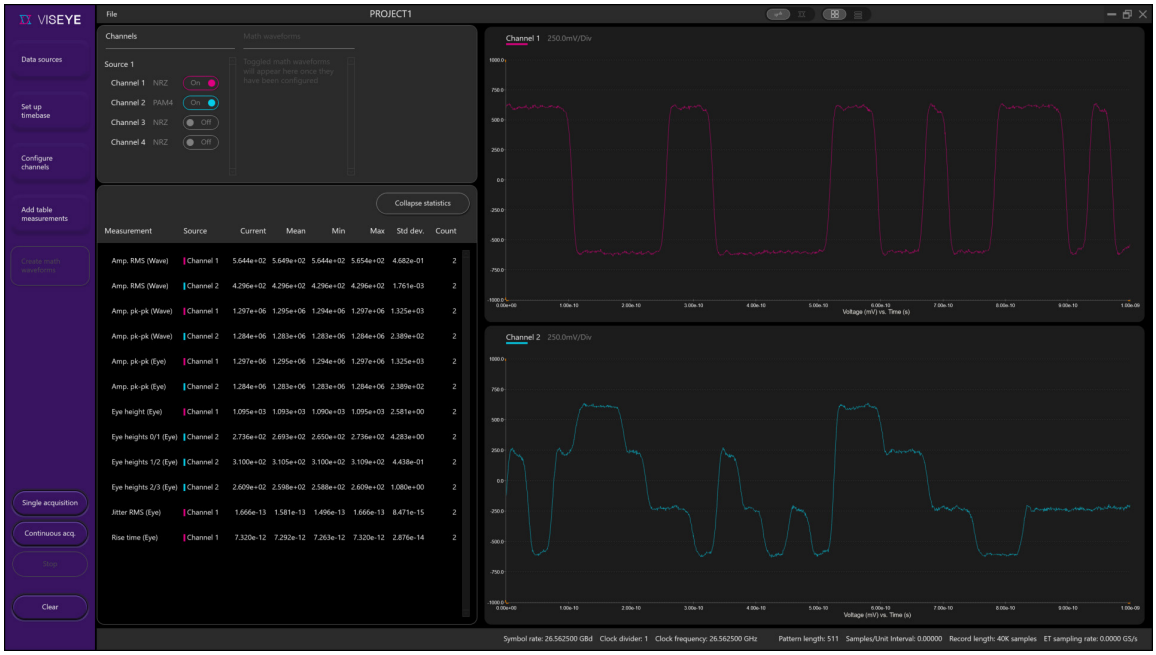
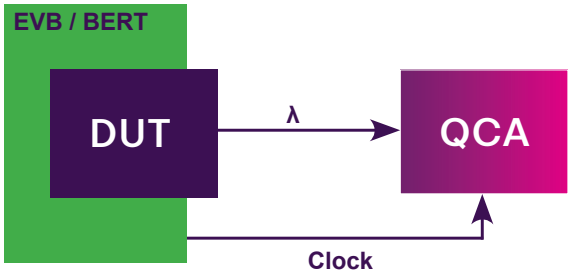
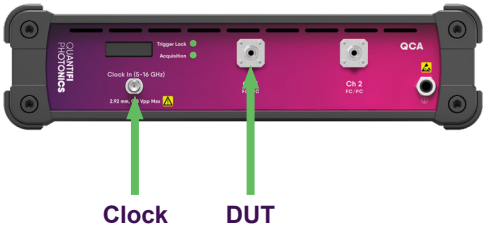


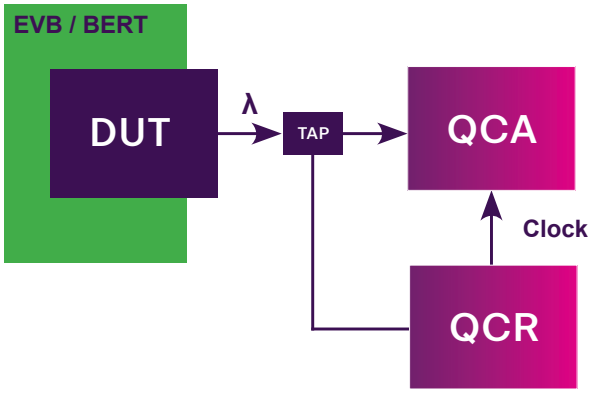

**Image:** 26 GBaud PAM4 trace plot shown with statistics of the numerical parameters.

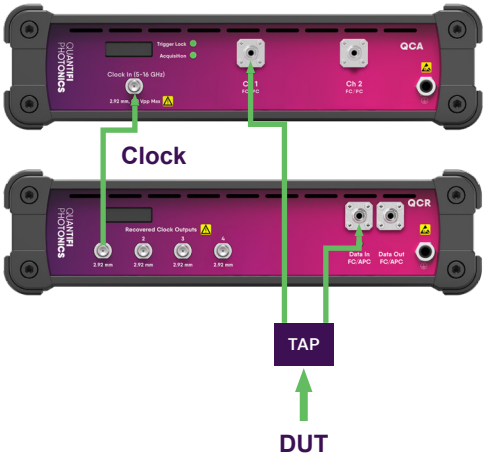
## **Use case 1:** Triggering using a synchronized clock



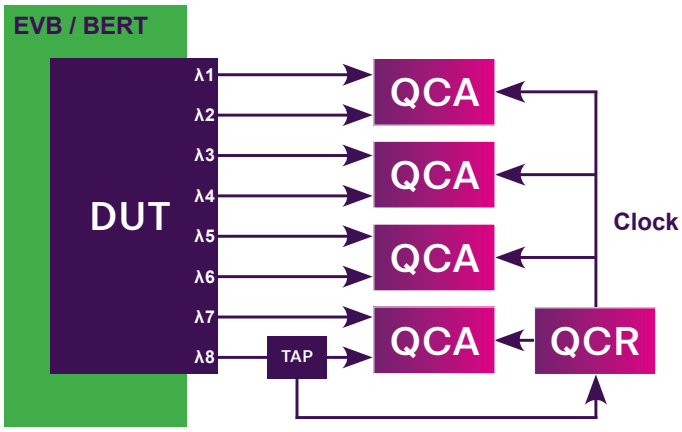




## **Use case 2:** Triggering using a recovered clock and optical splitter (tap)




## **Use case 3:** Triggering using a recovered clock and 8-channel DUT



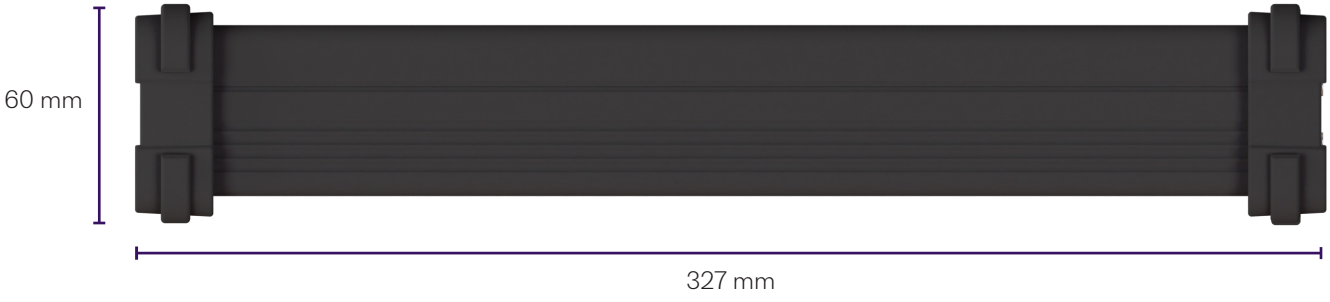
## Front view (2 channels)




## Rear view




## Side view



## QCA SERIES TECHNICAL SPECIFICATIONS

| General Specifications | QCA |
|---|---|
| Dimensions (HxWxD) | 60 x 244 x 327 mm \| 2.36 x 9.6 x 12.9 inches |
| Weight | 2.71 kg |
| Bus connection | Ethernet |
| Number of channels | 1 or 2 |
| Operating temperature range | 5 °C to 45 °C \| 41 °F to 113 °F |
| Storage temperature range | -40 °C to 70 °C \| -40 °F to 158 °F |

| Power Specifications | QCA |
|---|---|
| AC input voltage range | 100 to 240 V |
| AC input current | 1.3 A (115 V), 0.9 A (230 V) |
| AC frequency range | 47 to 63 Hz |

| Model Number | 1102[1] |
|---|---|
| Bandwidth (-3 dBe) | 44 GHz |
| Sampling rate, max | 3.5 MHz |
| Pattern capture, max | SSPRQ, PRBS16 |
| Optical connector type | FC/PC |
| Optical fiber type | SMF-28 |
| Wavelength | 1250 to 1650 nm (calibrated at 1310 and 1550 nm) |
| **Vertical** | |
| Dynamic range OMA | -8 to -1 dBm |
| Max input (damage threshold) | 9 mW peak, 6 mW average |
| Amplitude accuracy | < 5% |
| Noise floor, minimum | 4.8 $\mu W_{rms}$ |
| Optical return loss (ORL) | -15 dB |
| **Ref Clock Trigger Input** | |
| RF connector | 2.92 mm (female) |
| Nominal impedance | 50 Ω (AC-coupled, single-ended) |
| Frequency range | 5 - 16 GHz |
| Maximum input amplitude (single-ended) | 800 $mV_{pp}$<br>600 $mV_{pp}$ (7 - 14 GHz) |
| **Jitter** | |
| Jitter floor (trigger signal ≥ 10 GHz, ≥ 250 $mV_{pp}$) | ≤ 180 $fs_{rms}$ (typical) |
| Trigger sensitivity[2] | 75 $mV_{pp}$ ( ≥ 10 GHz)<br>150 $mV_{pp}$ ( < 10 GHz) |

**Notes**

1. Advanced specs as of October 2026 and subject to change.
2. Pattern trigger and low-jitter timebase operational; jitter floor is degraded by 50 $fs_{rms}$ (typical).

- Use up to eight sources of data, combined from the QCA instrument channels, captured waveform data files, or math waveforms.
- Show up to eight plots in a grid or stack view, in waveform mode or eye diagram mode.
- Use the project configuration file to capture your project settings to load it back easily for future use.
- Save your measurements results and statistics as a CSV file for further analysis.
- Configure the eye diagram plots – Select the heat map type, eye accumulation type, and the desired saturation intensity.
- Apply chains of mathematical functions to existing sources.

## Supported measurements

- Amplitude average
- Amplitude peak-peak
- Amplitude RMS
- Decision Feedback Equalizer (DFE)*
- Eye amplitude
- Eye center amplitude
- Eye crossing percentage
- Eye height (NRZ/PAM4)
- Eye one level
- Eye skews
- Eye width (NRZ/PAM4)
- Eye zero level
- Fall time
- Jitter peak-peak
- Jitter RMS
- Levels
- One/Zero levels
- Optical Extinction Ratio (ER)
- Outer ER
- Optical Modulation Amplitude (OMA)
- Outer OMA
- Overshoot (NRZ/PAM4)
- Rise time
- Signal-to-noise ratio (SNR)
- Signal to Noise Distortion Ratio (SDNR)
- Symbol period (Bit rate)
- Transmitter Dispersion Eye Closure Quarternary TDECQ
- Transmitter Dispersion Eye Closure TDEC*
- Transmitter linearity (RLM)
- Undershoot (NRZ/PAM4)

## Advanced math

- Continuous Time Linear Equalizer (CTLE)
- Linear Feed Forward Equalizer (FFE)
- S-parameter embedding and de-embedding (s2p file)
- TDECQ Reference Receiver & Equalizer

## Math functions

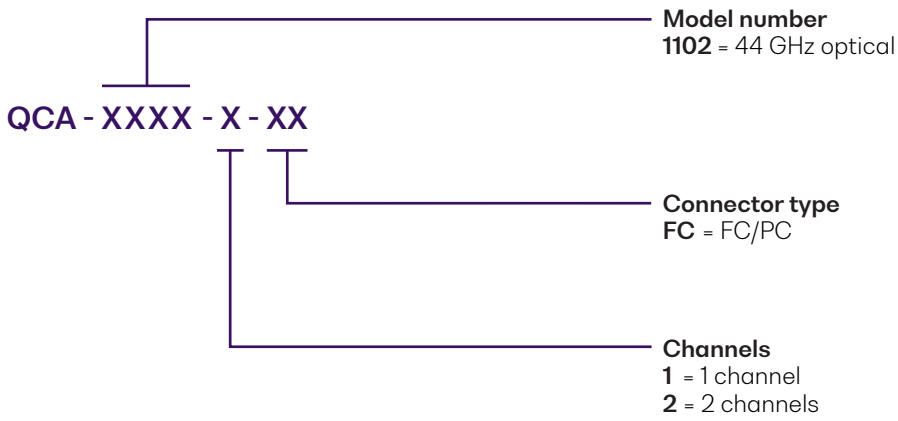
- Absolute value
- Add/subtract
- Align
- Amplify
- Average
- Common mode
- Delay*
- Difference
- Invert
- Max./Min.*
- Median*
- Multiply*
- Square*
- Square root*
- Summation*

*Future software updates will include additional measurement functions.

## MINIMUM PC REQUIREMENTS

- Operating system: Microsoft Windows® 11 (64-bit)
- Processor: Intel® CoreTM i7
- Memory (RAM): 16 GB (32 GB recommended)

## ORDERING INFORMATION




**Recommended auxiliary equipment:**

Quantifi Photonics' QCR Clock Recovery Instrument.

## WARRANTY INFORMATION

This product comes with a standard 1 year warranty.

## EXTENDED WARRANTIES AND CALIBRATION PLANS

With an **extended warranty and calibration plan** you'll spend more time focused on your priorities and less time worrying about maintenance.

Add a **3 or 5 year extended warranty** when you purchase your Quantifi Photonics instruments.



### Guarantee performance

Ensure your equipment is operating at the best it can be for reliable and accurate results.

### Lower cost of ownership

Lock in savings and maximise your testing budget with a lower base cost of ownership.

### Peace of mind

Spend less time worrying about maintenance and more on generating results.

## CALIBRATION PLANS FOR ADDITIONAL DISCOUNTS

Order a **calibration plan** when purchasing your Quantifi Photonics instruments and get additional discounts.

**10% Discount** On calibrations ordered at the time of purchase.

**25% Discount** Add on an extended warranty and receive a 25% discount on calibrations.

Over time and with regular use, all optical parts and connectors require re-calibration and maintenance to guarantee accurate and reliable performance. We recommend Quantifi Photonics optical instruments are re-calibrated every 12 months. With an instrument calibration performed by Quantifi Photonics technicians you receive:

- Comprehensive calibration to factory specifications
- End-to-end inspection to ensure all instrument functions are working and connectors are clean
- Firmware, software and documentation updates
- Certificate of calibration which includes detailed test results

# How to do I **secure my extended warranty or calibration plan**?

Contact your Quantifi Photonics sales representative or email **sales@quantifiphotonics.com**

Extended warranties and calibration plans must be ordered at the time of purchase and are available only for Quantifi Photonics' products. The 25% calibration discount only applies to calibrations while the product is covered by the extended warranty period.

# Versatile test modules for a wide range of requirements and applications.

## Tunable Laser Source



Versatile telecom laser sources with full tunability across C or L bands. Narrow 100 kHz linewidth, up to 16.5 dBm of power, optional whisper mode to disable frequency dither.

## Fixed Wavelength Laser Source



DFB laser sources available in a range of wavelengths and powers up to 24 dBm. Supports SMF, MMF and PMF.

## Swept, Tunable Continuous Wave Laser



Swept, tunable continuous wave (CW) laser source with 0.01 dB power stability and 400 nm/s high-speed scan rate for R&D and production testing.

## Superluminescent Diode Broadband Light Source



Super-luminescent LED light source with high output power, large bandwidth and low spectral ripple and various wavelengths.

## ELSFP-Compliant External Laser Source



Uses ELSFP-compliant pluggable modules to provide 8 channels of CW optical power at 1310 nm up to 24 dBm.

## Variable Optical Attenuator (VOA)



Fast attenuation speed with low insertion loss and built-in power monitoring. Operates in fixed attenuation or constant output power modes. Support SMF, MMF and PMF.

## Polarization Controller & Scrambler



High-speed automated polarization control with broad wavelength coverage from 1260 to 1650 nm, low insertion loss and back reflection. Full remote control via intuitive GUI, LabVIEW or SCPI.

## Optical Power Meter



Fast terminating or inline monitoring of optical signal power from -60 to +10 dBm across 750 to 1700 nm wavelengths. Model with logarithmic analog output for applications such as silicon photonics fiber alignment.

## Optical Spectrum Analyzer (OSA)



Cost-effective, spectral measurement in a compact module with built-in analysis for: SMSR, OSNR & spectral width. Targeted wavelengths for specific applications in O band, C band & L band.

## Optical-to-Electrical Converter



High bandwidth, broadband O-to-E converter. Choose from 1 or 2 channels, AC or DC coupling and various conversion gain and operating wavelength ranges.

## Optical Switch



Proven reliability and fast switching time. Wide variety of switch configurations and models support SMF, MMF and PMF.

## Photonic Doppler Velocimeter (PDV)



Purpose-built module for Photonic Doppler Velocimetry (PDV). A circulator, two VOAs and a passive coupler all built into one compact module.

## Passive Component Integration



Integrate passive optical components of your choice such as WDM couplers, splitters, band-pass filters, PM beamsplitters and circulators. SMF, MMF and PMF.

## Digital Sampling Oscilloscope (DSO)



Digital equivalent-time sampling oscilloscope (DSO) with high-quality precision timebase and low jitter mode, available in 1 or 2 channels in a compact benchtop instrument.

## Clock Recovery Instrument (CDR)



Clock recovery instrument for the QCA Series. Low jitter design and precise phase-locking provide a reliable, scalable solution for high-speed communication testing.

## Coherent Transmitter



Generate high-quality coherent optical signals for transmitter development, testing and advanced modulation research.

## Coherent Receiver



High-performance coherent optical receiver for accurate measurement and characterization of coherent modulation formats.

## VISIQ Analysis Software

Coherent signal analysis software for intuitive DSP configuration, signal analysis and optimization.

# Test. Measure. Solve.™

Quantifi Photonics provides test solutions to help customers unlock scalable and cost-effective high-volume manufacturing of photonic integrated circuits (PICs), co-packaged optics and pluggable optics. The company's portfolio includes a wide range of photonic test instruments, and digital sampling oscilloscopes, available as benchtop or the industry-standard PXI format to support cost-effective, high-throughput design verification testing and high-volume manufacturing.

## To find out more, get in touch with us today.


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