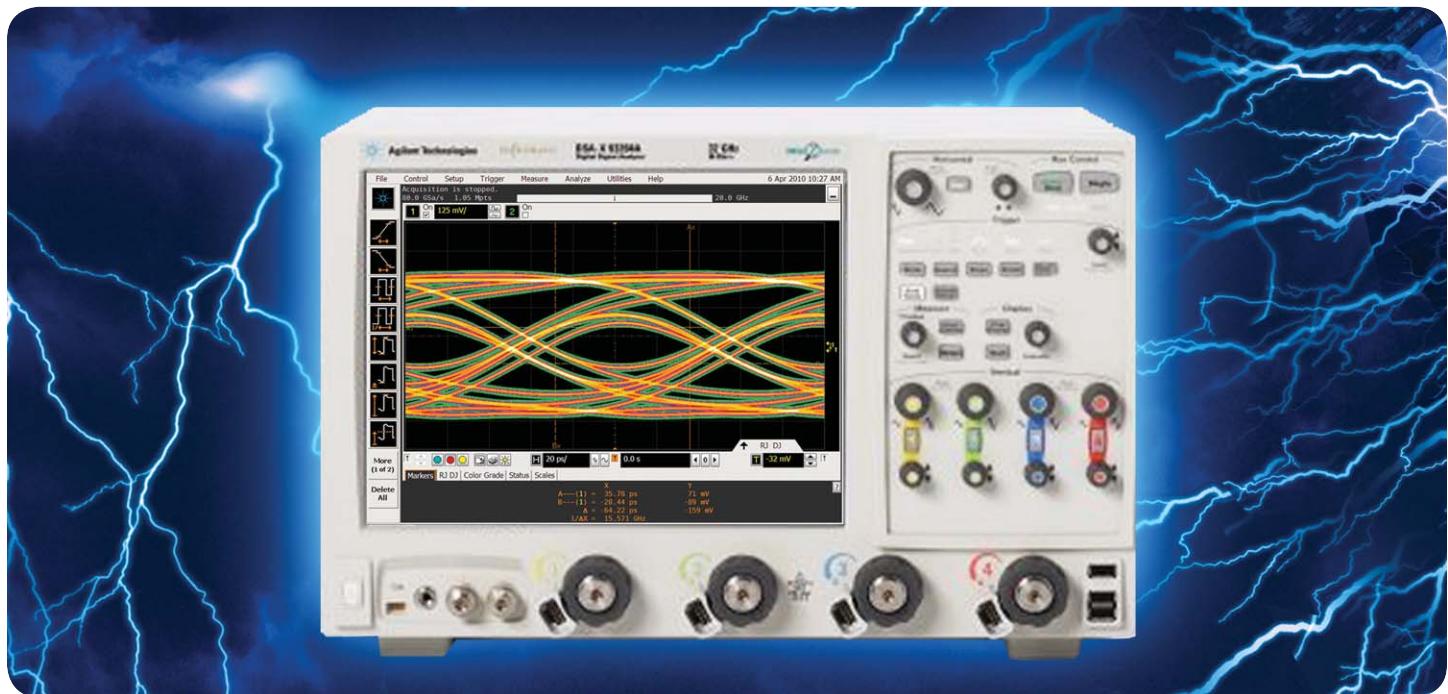


# Agilent Technologies Infiniium 90000 X-Series Oscilloscopes

## Data Sheet

**Engineered for 32 GHz true analog bandwidth that delivers**



**Real-time oscilloscope models from 16 GHz to 32 GHz**



**Agilent Technologies**

# Engineered for 32 GHz true analog bandwidth that delivers:

## Need bandwidth?

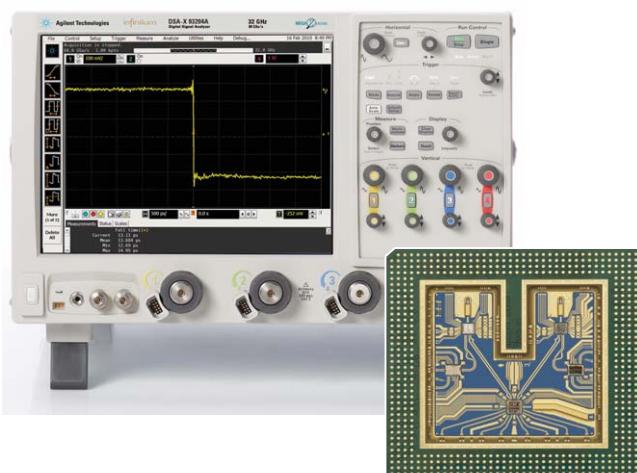
When you're deploying leading edge high-speed serial bus designs like FibreChannel, SAS 12 G, or 10 Gb Ethernet KR, jitter matters and picoseconds count. When you're doing spectral analysis of wide-bandwidth RF signals or investigating transient phenomena, bandwidth is critical. You need the most accurate real-time oscilloscope you can get. Agilent Infiniium 90000 X-Series scopes are engineered for **32 GHz** true analog bandwidth that delivers:

- The industry's highest real-time scope measurement accuracy
- The industry's only 30 GHz oscilloscope probing system
- The industry's most comprehensive application-specific measurement software

## 32 GHz true analog bandwidth

The quest for higher real-time scope bandwidth involves pushing against the physical limitations of state-of-the-art integrated circuit technology. We define true analog bandwidth as performance achieved directly through the hardware of the real-time oscilloscope, and we've achieved breakthrough performance of **32 GHz** with the Infiniium 90000 X-Series. Other vendors, limited to 16 GHz hardware, employ various techniques to boost the bandwidth specification of their scopes. However, these methods introduce noise and distortions that negatively impact measurements.

With the Agilent Infiniium 90000 X-Series oscilloscopes, you get the unmatched combination of the world's fastest real-time oscilloscope and the best measurement accuracy.



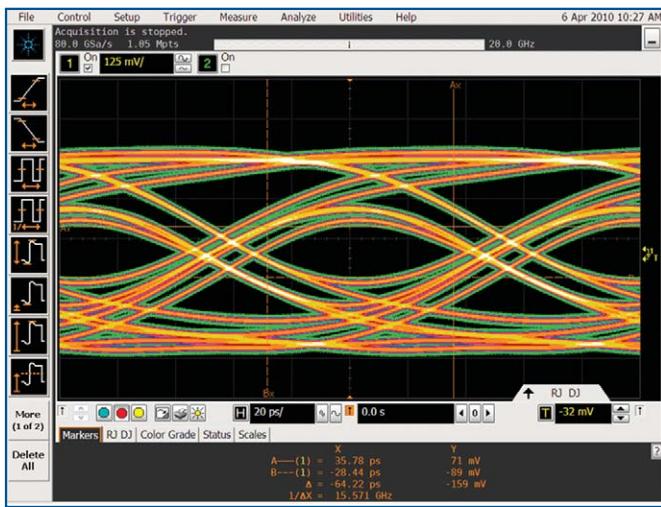
Custom front end technology requiring over five years of design effort yields the fastest real-time oscilloscope hardware available today.



Model number	Analog bandwidth		Sample rate		Max Memory depth 4 channel
	2 channel	4 channel	2 channel	4 channel	
DSA-X93204A	32 GHz	16 GHz	80 GSa/s	40 GSa/s	2 Gpts
DSO-X93204A	32 GHz	16 GHz	80 GSa/s	40 GSa/s	2 Gpts
DSA-X92804A	28 GHz	16 GHz	80 GSa/s	40 GSa/s	2 Gpts
DSO-X92804A	28 GHz	16 GHz	80 GSa/s	40 GSa/s	2 Gpts
DSO-X92504A	25 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts
DSA-X92504A	25 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts
DSO-X92004A	20 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts
DSA-X92004A	20 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts
DSO-X91604A	16 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts
DSA-X91604A	16 GHz	16 GHz	80 Gsa/s	40 Gsa/s	2 Gpts

**BW Upgradeable**  
Buy the performance you need today knowing you have the headroom you need for tomorrow with bandwidth upgradability to 32 GHz

## Engineered for 32 GHz true analog bandwidth that delivers:



### The industry's highest real-time scope measurement accuracy.

When you're designing with faster signals, shrinking eyes and tighter jitter budgets mean that error introduced by your oscilloscope can seriously impact your measurement results. The Agilent Infiniium 90000 X-Series scopes deliver the highest measurement accuracy available by offering the following industry-leading characteristics:

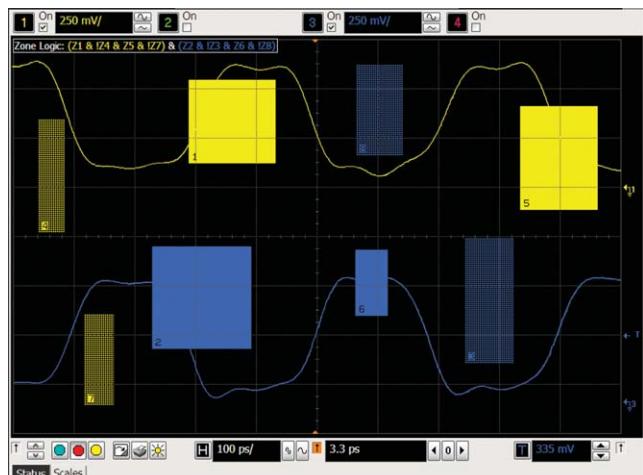
- Highest true analog bandwidth (32 GHz)
- Lowest oscilloscope noise floor (2.04 mV at 50 mV/div, 32 GHz)
- Lowest jitter measurement floor (150 fs)

Having the highest analog bandwidth, and lowest noise floor available means better spectral analysis of transients and wide-bandwidth RF signals.

### Industry's first and only 30 GHz oscilloscope probing system.

No matter how good your scope is, if your probes can't operate at sufficient bandwidths your measurements are compromised. The Agilent Infiniium 90000 X-Series scopes offer probing solutions that are up to the tough challenges of high-speed signal capture with the following:

- InfiniiMax III high frequency probes with automatic AC calibration (PrecisionProbe)
- Fully-integrated probe amplifier s-parameter correction
- The industry's first bandwidth-upgradable probe amplifier



Easily isolate signals of interest with zone qualified view using InfiniiScan software triggering, just one of over 40 application-specific software options

### The industry's most comprehensive application-specific measurement software.

When time is of the essence, you need tools that can speed true understanding of your signal activity. From serial bus debug and compliance testing to jitter measurements to sophisticated triggering capability, Agilent stays on top of the test standards and your requirements by working to ensure that you get accurate results more quickly. The Agilent Infiniium 90000 X-Series scopes offer the following

- The broadest range of jitter, triggering, analysis and display tools
- Pre-built compliance testing software based on the expertise of our engineers on the standards committees
- Support for emerging technologies including FibreChannel, SAS 12G, or MIPI-MPhy

## Engineered for 32 GHz true analog bandwidth that delivers:

32 GHz true analog bandwidth of the oscilloscope and 80 GSa/s sample rate provides ultra-low noise

Capture your longest signal with up to 25 ms data using 2 Gpt of acquisition memory at 80 GSa/s.

See your signal more clearly with a 12.1-inch XGA (1024 x 768) high-resolution color touch screen display

Identify anomalies easily with a 256-level intensity-graded or color-graded persistence display that provides a three dimensional view of your signals

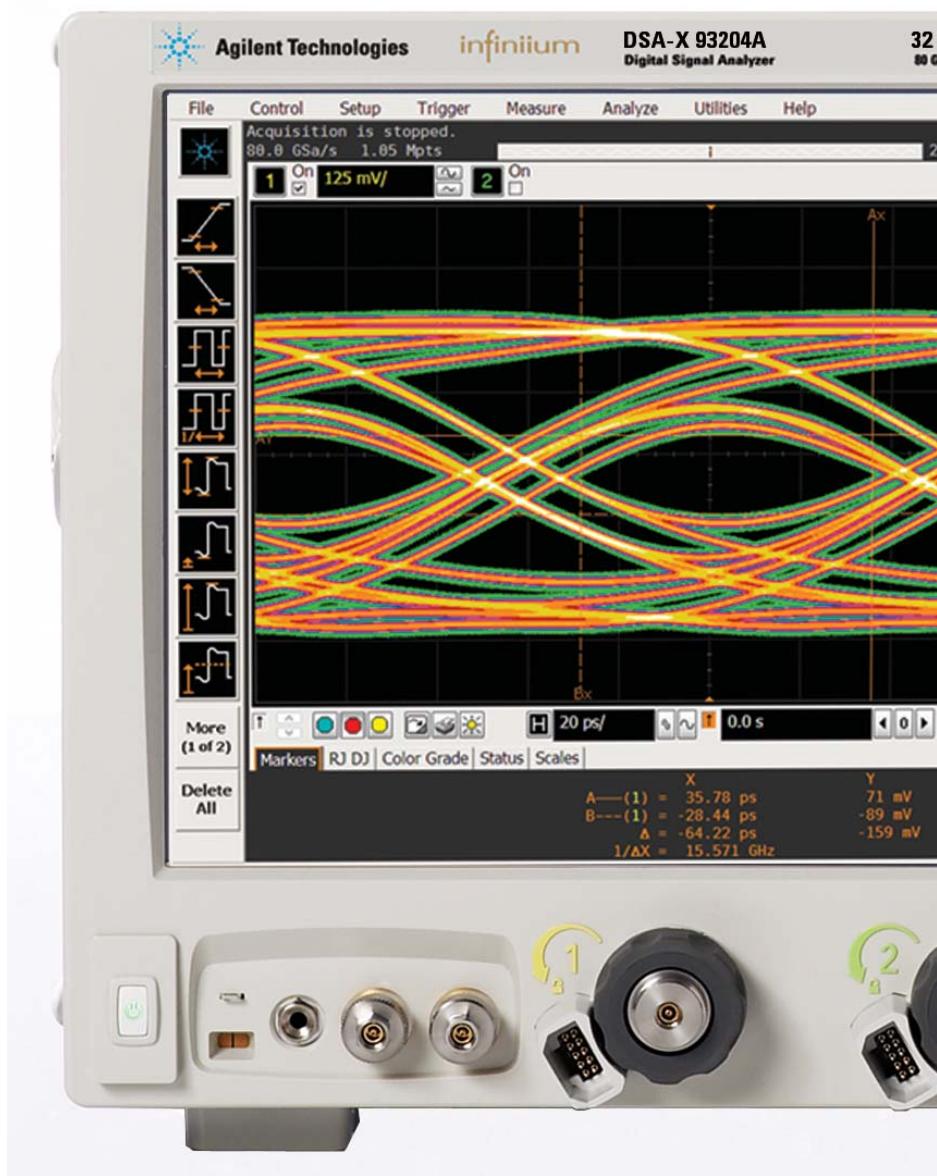
Live indicator shows when the scope is running a long operation.

Remote access through 10/100/1000 BaseT LAN interface with web-enabled connectivity uses ultra-responsive Ultra VNC.

GPIB and LAN provide remote measurements. Optional Infiniium application remote program interface allows application/compliance software automation. LXI class C compliant. MATLAB support.

Removable hard disk drive option is available for added data security.

Optional USB external DVD-RW drive allows you to install your favorite third-party software conveniently and can be used to back up your critical measurement data



Threaded RF connectors ensure the most reliable signal integrity for high-performance instruments. The Autoprobe II interface combines the tried-and-true, robust 3.5 mm threaded RF connector of Agilent sampling scopes with a convenient automatic torque mechanism (clutch) that ensures a consistent 8 in. lbs. connection is made without the hassles of a torque wrench.

Simply press the horizontal delay knob to set the delay value to zero. A zoom button provides quick access to two screen zoom mode.



Optional x4 PCIExpress slot speeds up offload times by a factor of 5, using socket drivers. Use this option (823) for faster deep offloads of the waveforms.

10 MHz reference clock can be input to or output from the scope to allow precise timebase synchronization with RF instruments or logic analyzers

Dedicated single acquisition button provides better control to capture a unique event

Customizable multipurpose key gives you any five automated measurements with a push of a button. You can also configure this key to execute a script, print/save screen shots, save waveforms or load a favorite setup.

Measure section, including a toggling marker button and a dedicated marker knob, provides quick access to your marker control.

Quick access to fine/vernier control by pressing the horizontal and vertical sensitivity knobs.

Increase your productivity with a familiar Infiniium graphical user interface, including your favorite drag-and-drop measurement icons. Infiniium's analog-like front panel has a full set of controls color-coded to the waveforms and measurements, making your tasks simple.

Three front panel USB 2.0 host ports match your USB keyboard, mouse, and USB memory drive connection for saving setup and data files and screen shots.

An additional four USB 2.0 host ports and a USB 2.0 device port on the back panel. Perfect for extra connectivity including an optical drive. A USB 2.0 device port lets you control the scope and transfer data via a USB 2.0 480-Mb/s connection.

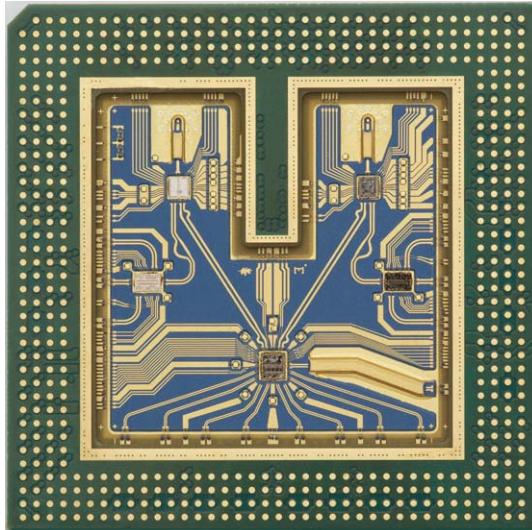
## Engineered for 32 GHz true analog bandwidth that delivers:

### *The highest real-time scope measurement accuracy*

Whether you're deploying emerging high speed bus technology, identifying spectral content of wide-bandwidth RF signals, or analyzing transient physical phenomena, you need the truest representation of your signals under test. Agilent invested in leading edge technology to bring you the highest real-time oscilloscope measurement accuracy available today.

New custom integrated circuits using a proprietary Indium Phosphide (InP) process and breakthrough packaging technology enable industry-leading performance, including the:

- Highest true analog bandwidth
- Lowest oscilloscope noise floor
- Lowest oscilloscope jitter measurement floor

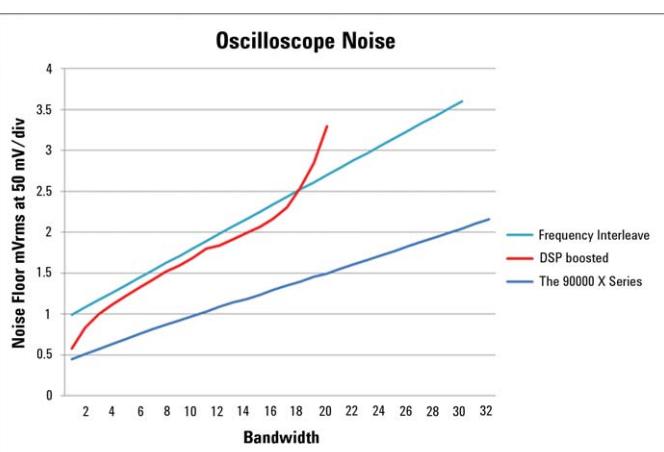


### **Highest true-analog bandwidth- 32 GHz**

The engineering of a high-performance real-time oscilloscope front end requires designing pre-amplifiers, triggering capability, and sampling technology. But putting it all together might be the toughest challenge. Using fine line microcircuit processes and relying extensively on years of experience with RF design, Agilent developed the front end multi-chip modules shown here for the Infiniium 90000 X-Series oscilloscopes. Packaging technology provides excellent high-frequency electrical properties along with superior heat dissipation. It enables the highest true analog bandwidth available today in real-time oscilloscopes.

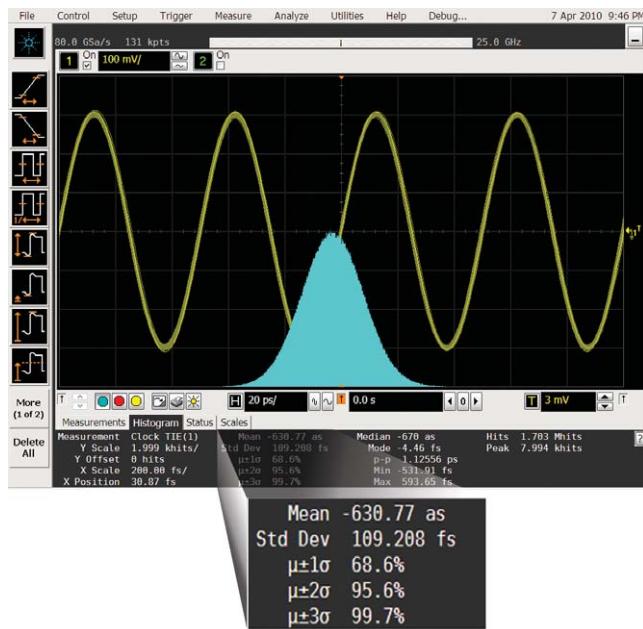
### **Industry's lowest noise floor.**

One of the keys to measurement accuracy at high bandwidths is minimizing the noise generated by the oscilloscope itself. Agilent utilizes a proprietary Indium Phosphide (InP) integrated circuit process in the design of the Infiniium 90000 X-Series oscilloscopes because other oscilloscope techniques just can't deliver the necessary combination of high-bandwidth and low noise. Not only does that mean you're purchasing the best tool today, but it also means you can count on technology leadership from Agilent in the future.



# Engineered for 32 GHz true analog bandwidth that delivers:

*The highest real-time scope measurement accuracy*



Jitter measurement floor of less than 150 fs

## Industry's lowest real-time oscilloscope jitter measurement floor

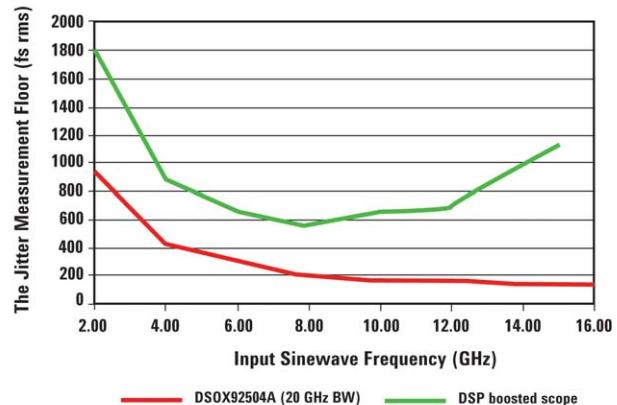
Oscilloscope bandwidth allows signal rise times to be more accurately depicted. The oscilloscope noise floor directly impacts the y-axis voltage placement of each signal data point. The Infiniium 90000 X-Series scopes combine superiority in these characteristics with extremely low sample clock jitter (< 150 femtoseconds). This ensures the lowest possible contribution to jitter measurements from the scope itself so you're using your jitter budget on your design.

In addition to its low jitter measurement floor, the 90000 X-Series has the industry's deepest memory with up to 2 Gpts, allowing you to resolve low frequency jitter components in a single measurement.

## How much better is our jitter measurement?

We made measurements on multiple sine waves from an Agilent signal generator. We compared the Agilent Infiniium 90000 X-Series scope to DSP boosted oscilloscopes from our competitor.

## Short-Term Jitter Comparison



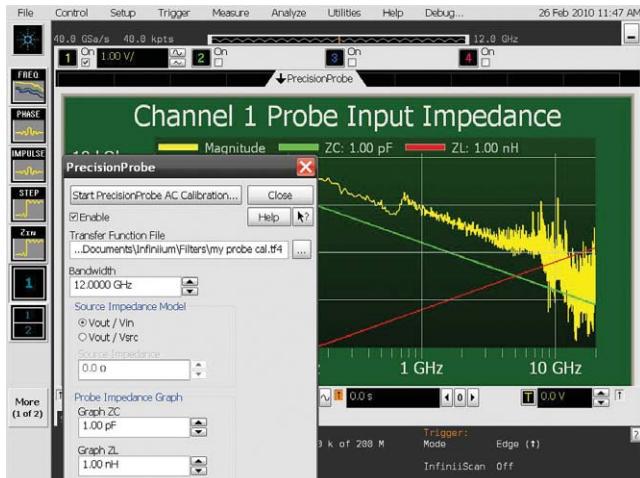
The results show that the 90000 X-Series consistently makes significantly (up to 10x) lower jitter measurements than its competitor.

# Engineered for 32 GHz true analog bandwidth that delivers:

## Industry's first 30 GHz oscilloscope probing system

To take advantage of your investment in a high bandwidth oscilloscope, you must have a probing system that can deliver bandwidth to the probe tip. Agilent rises to the challenge of high speed signal reproduction with these probing innovations:

- InfiniiMax III high-frequency probes with automatic AC calibration (PrecisionProbe)
- The industry's first bandwidth upgradable probe amplifier
- Fully-integrated probe amplifier s-parameter correction



### InfiniiMax III Probes with PrecisionProbe software

The Infiniium 90000 X-Series oscilloscope has the industry's only probe AC calibration software (PrecisionProbe), providing AC calibration of your entire InfiniiMax III probing system. Typically probe loading effects increase as the frequencies of your system increase. This causes measurement errors due to probe loading. PrecisionProbe automatically removes the effects of probe loading on your systems, without the need to create transfer functions via TDR or vector signal analyzer. Unlike other products which use generic models, it provides 100% accuracy to the tip of the probe.

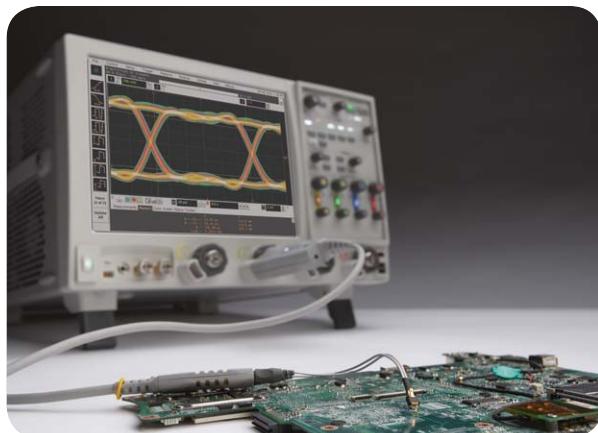


The InfiniiMax III 30 GHz probing system includes accessories to enable probing with a ZIF tip, browsing, or connecting to 3.5 mm inputs.

Model	Description
N2803A	30 GHz probe amp
N2802A	25 GHz probe amp
N2801A	20 GHz probe amp
N2800A	16 GHz probe amp

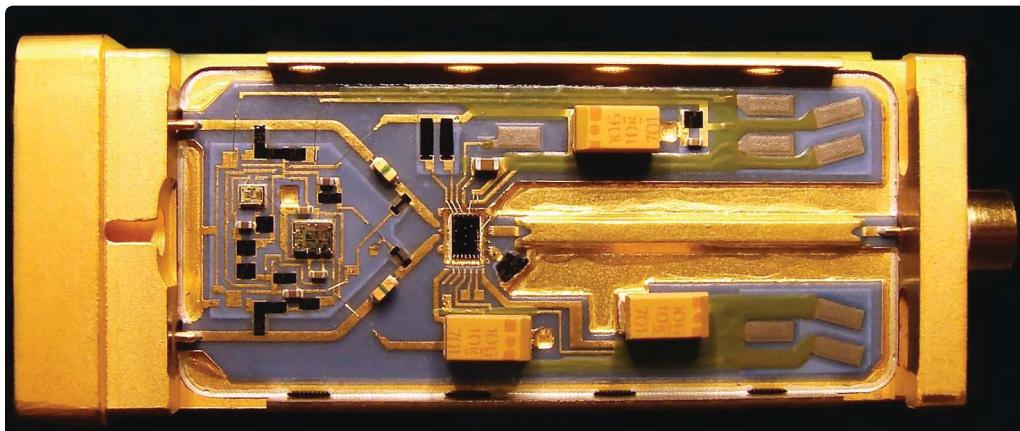
## Engineered for 32 GHz true analog bandwidth that delivers:

*Industry's first 30 GHz oscilloscope probing system*



### Fully-integrated probe amplifier s-parameter correction

Each InfiniiMax III probe amplifier comes pre-packaged with its own customized characteristics via s-parameter files. The InfiniiMax III probing system and the 90000 X-Series communicate via an I<sup>2</sup>C bus. This communication allows the 90000 X-Series to download the customized s-parameter files from the InfiniiMax III probing amplifier to the scope for greater accuracy.



The InfiniiMax III probing system uses the same InP technology that enables high bandwidth and low noise oscilloscope measurements.



### Industry's only bandwidth upgradable probes

Purchase the probing performance you need today with confidence that you have headroom for the future with Agilent's InfiniiMax III bandwidth upgradable probes. Upgrade to higher performance at a fraction of the cost of new probes as your needs evolve.

#### Bandwidth upgrades

N5471F	13 GHz 90000A to 16 GHz 90000 X-Series
N5471G	16 GHz to 20 GHz Bandwidth Upgrade
N5471H	20 GHz to 25 GHz Bandwidth Upgrade
N5471I	25 GHz to 28 GHz Bandwidth Upgrade
N5471J	28 GHz to 32 GHz Bandwidth Upgrade

# Engineered for 32 GHz true analog bandwidth that delivers:

## *The industry's most comprehensive application-specific measurement software*

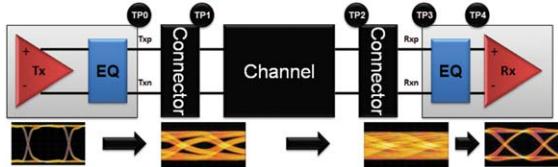
To get the most out of your Agilent Infiniium 90000 X-Series oscilloscope, choose from a wide array of application specific software options that speed your measurement tasks including:

- A broad range of jitter, triggering, measurement, analysis and display tools

### **A broad range of jitter, trigger, measurement, analysis, and display tools**

When time is of the essence you need your scope to acquire and present data in the most usable form so you can get to answers quickly.

The Agilent Infiniium 90000 X-Series oscilloscopes offer the industry's widest range of supporting software with an intuitive interface to simplify learning curves. We've highlighted some of our most popular tools here, and the complete list follows on the next pages.



Agilent's InfiniiSim waveform translation toolset provides efficient de-embedding of probe and circuit element loading, enables measurement translation from accessible probe points to other locations in the system, and simulates waveforms with channel models inserted. Combine measurements and models for accurate characterization of design performance, all done with hardware acceleration for fast update rates.

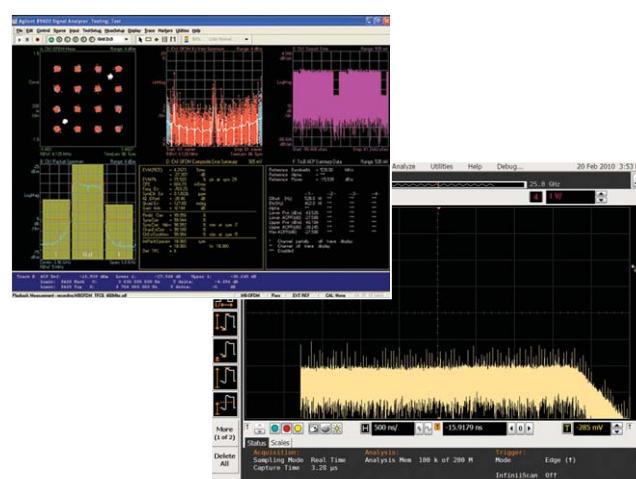
### **Not just a tool for the digital world**

Infinium built-in FFT allows users to quickly and easily analyze the frequency components of their signals. Both FFT magnitude and phase can be displayed and can be combined with other built-in math functions or MATLAB® based measurements. Standard windowing of Hanning, Blackman Harris, Flattop and Rectangular are supported along with cursor based power measurements. When more powerful frequency domain measurements are required, including modulation analysis, consider the Agilent 89601A Vector Signal Analyzer software.

- Pre-built compliance testing software based on the expertise of our engineers on the standards committees
- Support for emerging high speed serial buses including SAS 12G, FibreChannel, and PCIe™ gen3.

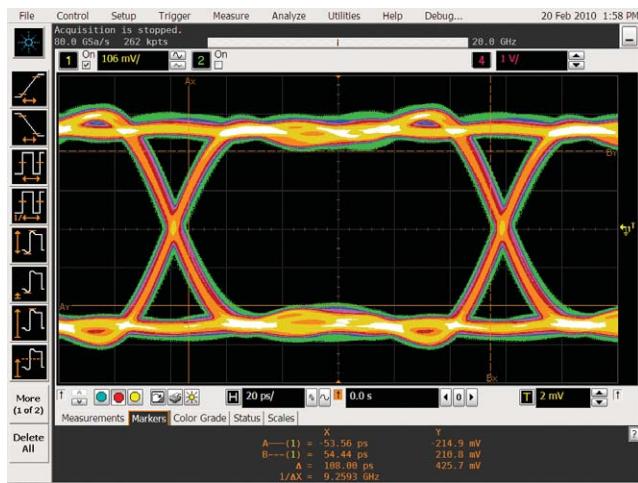


Quickly characterize jitter and display histograms, measurement trending, and jitter spectrum.



# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software*

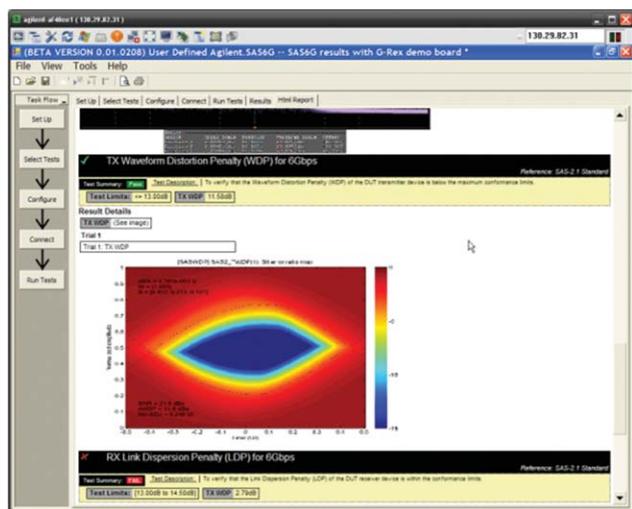


## Pre-built compliance testing software with Agilent expertise

Choose from the industry's widest range of complete applications for compliance and margin testing for high speed serial buses, including SATA, SAS, PCI Express, Ethernet, USB, JEDEC and more. Agilent's measurement experts sit on the industry standards committees and help define compliance requirements. They ensure that our tools deliver to the standards. Set up wizards combined with intelligent test filtering give you confidence you're running the right tests. Comprehensive HTML reports with visual documentation and pass/fail results guarantee that critical information is retained on each test. Technicians can run complete and accurate testing on their own, freeing valuable engineering resources.

## Support for proprietary and emerging high speed serial buses

Agilent engineers hold key positions within the governing bodies defining test requirements for interoperability on emerging high speed serial buses. We provide tools as quickly as possible on emerging standards.



## User Defined Application software allows automated compliance testing on proprietary buses or while emerging test standards solidify.

Rapidly develop automated measurements for compliance testing with Agilent's User Defined Application software. This tool provides the framework you need to quickly program and automate any set of measurements with an interface similar to that provided in our standard compliance test software. Full control of other Agilent instrumentation is possible, along with automated HTML reporting capabilities

Applications are available today for:

- MIPI M-Phy
- MDDI
- GDDR5
- SAS 6G

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



Trigger on and decode CAN, LIN and FlexRay serial packets

## CAN, LIN and FlexRay triggering and decode (N28803A or Option 063 on new scope purchases)

Trigger on and view both protocol layer information and physical layer signal characteristics for CAN, LIN and FlexRay buses. Numerical decode values are automatically displayed and synchronized below the captured signal or seen in protocol viewer.

Hardware-based triggering for CAN and LIN means triggering reliably, even on the most infrequent events. FlexRay uses software-based protocol triggering.

This application works on all models and can use any combination of scope and logic acquisition channels.

For more information: [www.agilent.com/find/N28803A](http://www.agilent.com/find/N28803A)



Easily separate the spread spectrum clock using EZJIT analysis software.

## EZJIT analysis software (E2681A or option 002 on new scope purchases)

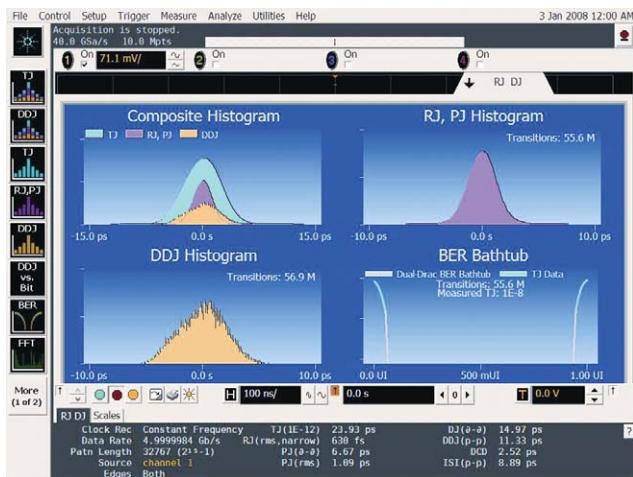
Quickly characterize and evaluate most commonly needed jitter measurements, including cycle-cycle, N-cycle, period, time-interval, error, setup and hold time, histograms, measurement trending and jitter spectrum.

This application is supported on all models and is standard on DSA models.

For more information: [www.agilent.com/find/EZJIT](http://www.agilent.com/find/EZJIT)

## Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



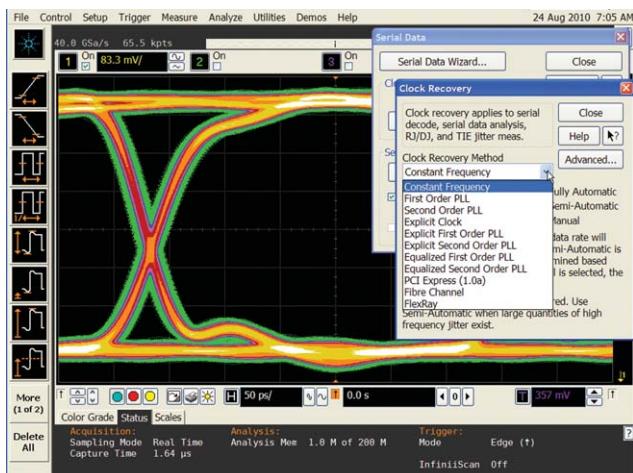
Analyze jitter plus RJ/DJ separation.

**EZJIT Plus analysis software (N5400A or Option 004 on new scope purchases. To upgrade from EZJIT to EZJIT Plus, order N5401A.)**

EZJIT Plus adds additional compliance views and an expanded measurement setup wizard to simplify and automate RJ/DJ separation for testing against industry standards.

This application is supported on all models and is standard on DSA models.

For more information: [www.agilent.com/find/EZJITPlus](http://www.agilent.com/find/EZJITPlus)



Recover embedded clocks with serial data analysis (SDA).

**High-speed serial data analysis software (E2688A or Option 003 on new scope purchases)**

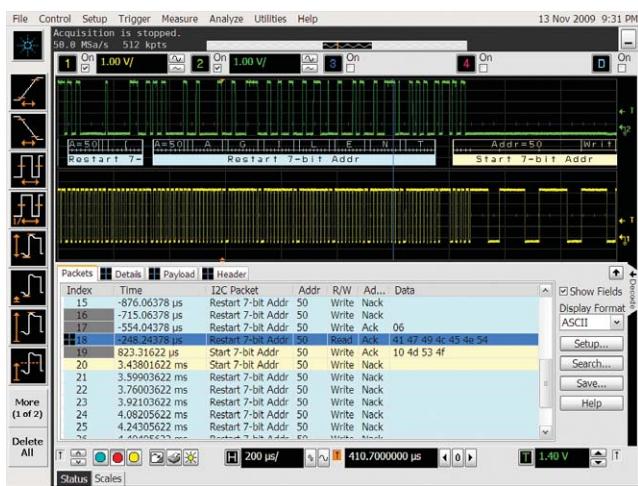
Quickly validate signal integrity for high-speed serial interfaces with embedded clocks. Recover embedded clocks synchronized with the analog waveform view. Build and validate eye diagrams.

The SDA package also includes software-based bit-level triggering and decode for 8B/10B. This application is supported on all models and comes standard on DSA models.

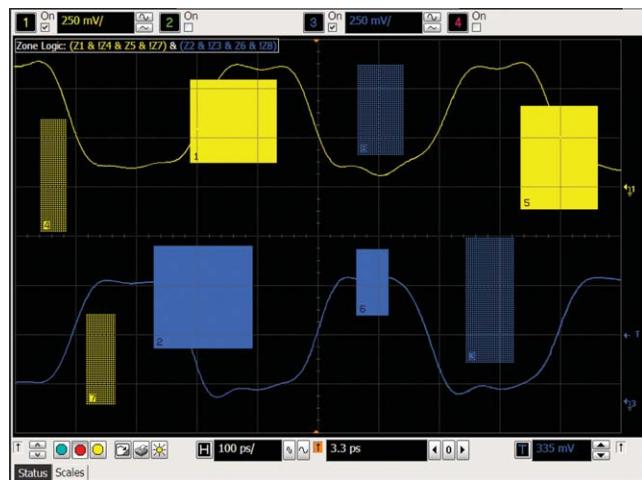
For more information: [www.agilent.com/find/SDA](http://www.agilent.com/find/SDA)

## Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



Trigger and view on-screen serial decode of I<sup>2</sup>C packets



Identify signal integrity issues with InfiniiScan Zone – Qualify triggering.

### I<sup>2</sup>C/SPI serial trigger and decode (N5391A or Option 007 on new scope purchases)

Given even further insights with protocol decode capability. Quickly move between physical and protocol layer information using the time-correlated tracking marker. Display protocol content using waveform symbols and the industry's first multi-tab protocol viewer. The packets tab shows a high level view of the packet over time.

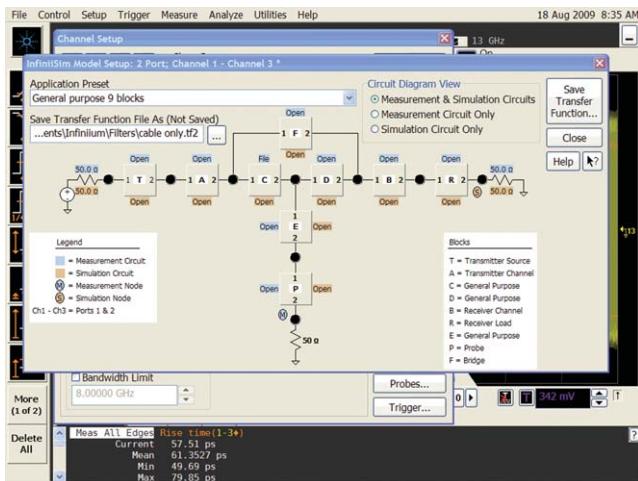
### InfiniiScan event identification (N5415B or Option 009 on new scope purchases)

Rapidly trigger on complex events and identify signal integrity issues. This innovative software quickly scans through thousands of acquired waveform cycles and isolates anomalous signal behavior.

For more information: [www.agilent.com/find/infiniiScan](http://www.agilent.com/find/infiniiScan)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



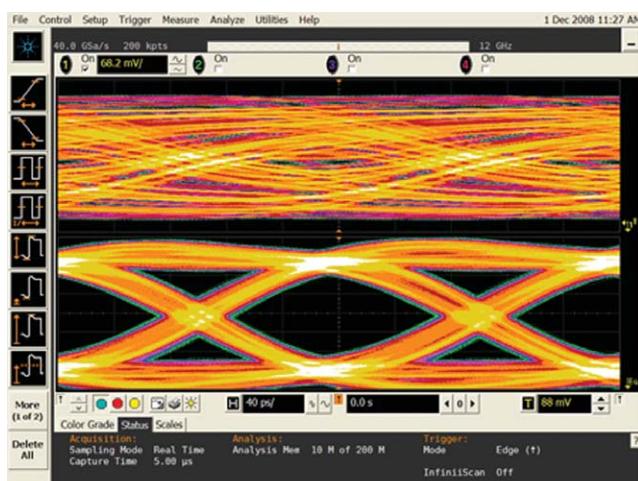
Model channel effects including reflection.

## InfiniiSim waveform transformation toolset (N5465A or option 013, and 014 on new scope purchases)

Use the InfiniiSim toolset to combine measurements and models to view simulated scope measurement results at any location in your design. Import design models (s-parameters or transfer functions), acquire real-time scope data, and transform to measurement locations you need.

Model single element systems such as de-embedding or embedding a cable or fixture with the basic InfiniiSim toolset. Choose 'advanced' for more extensive modeling of complex systems such as multiple element and probed systems.

For more information: [www.agilent.com/find/InfiniiSim](http://www.agilent.com/find/InfiniiSim)



Reduce receiver errors by opening tightly shut eyes.

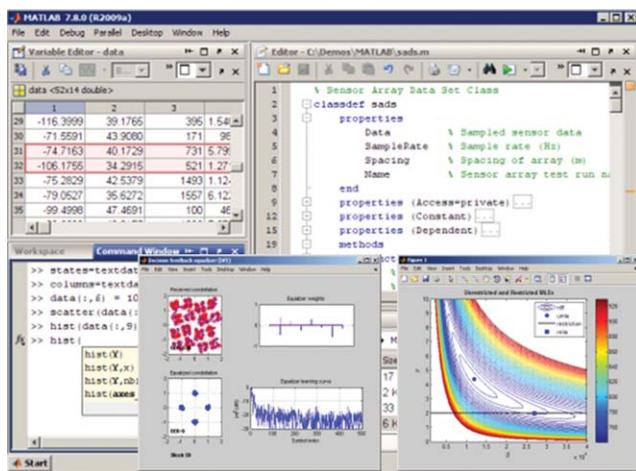
## Infiniium serial data equalization (N5461A or Option 012 on new scope purchases)

Measure at the pin and use equalization to see a virtual eye on the other side of an equalizer. Model equalization techniques such as DFE, FFE, and CTLE.

For more information: [www.agilent.com/find/SDE](http://www.agilent.com/find/SDE)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



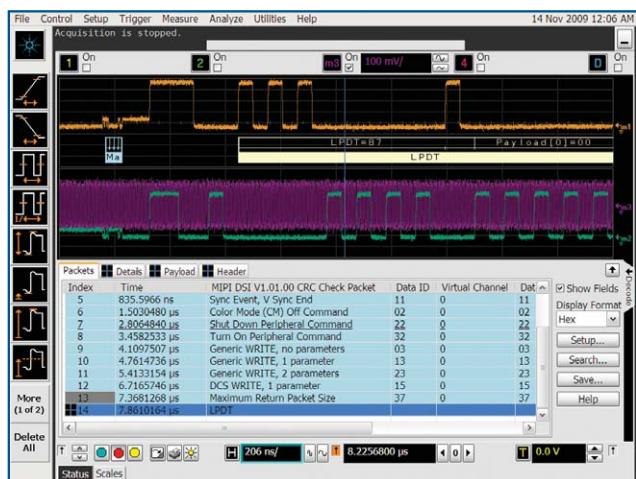
Make customized or automated measurements using MATLAB software

## MATLAB® data analysis software (Option 061 or 062 on new scope purchases)

MATLAB is a data analysis software environment and scripting language used by over 1,000,000 users in aerospace/defense, automotive, communications, electronics, and other applications. MATLAB is now available directly from Agilent as an instrument option with the purchase of your Agilent 90000-X Series oscilloscope. Install MATLAB on your oscilloscope or remote PC to make customized measurements, design and apply your own filters to oscilloscope signals, graphically visualize signals in 2-D or 3-D plots, automate measurements, or build test applications. Purchase MATLAB with your Agilent 90000-X Series oscilloscope to ensure version compatibility and so that your MATLAB software license is always available when you need it.

For more information:

[www.agilent.com/find/matlab\\_oscilloscopes](http://www.agilent.com/find/matlab_oscilloscopes)



Trigger and view on-screen serial decode of MIPI traffic

## MIPI D-phy trigger and decode (N8802A or Option 019 on new scope purchases)

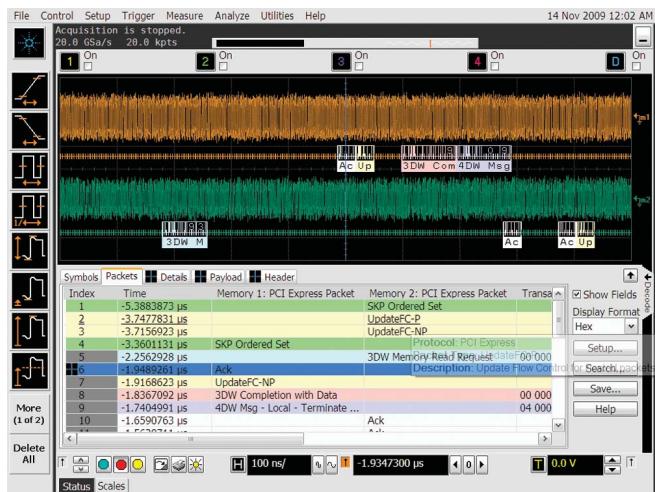
This application eliminates the need to manually decode bus traffic. Using data captured on the scope, the application lets you easily view the information sent over MIPI serial buses.

The application also enables software based protocol triggering.

For more information: [www.agilent.com/find/N8802A](http://www.agilent.com/find/N8802A)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



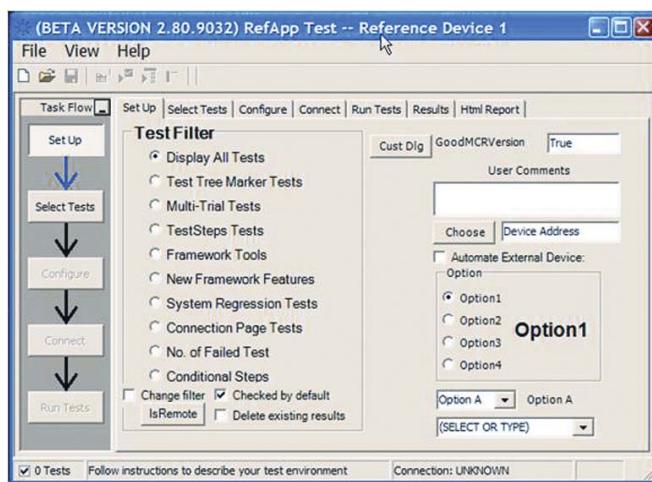
Trigger on and decode PCIe serial packets.

## PCI Express® serial trigger and protocol viewer (N5463A or Option 017 on new scope purchases)

This application provides protocol-level triggering and viewing of a PCIe® lane. Quickly view packets, payload, header, and detail information. Powerful time-correlated views of waveform, symbol, character, link and transaction layer packet data down to the bit level make it easy to isolate communication faults to logic or analog sources.

For more information:

[www.agilent.com/find/90000\\_PCI\\_protocol\\_viewer](http://www.agilent.com/find/90000_PCI_protocol_viewer)



Control your compliance applications remotely.

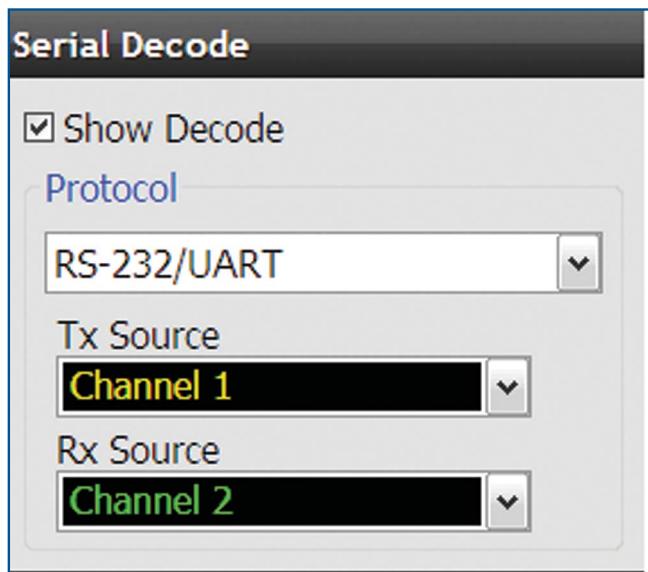
## Remote programming interface (N5452A or Option 011 on new scope purchases)

Operate your Infiniium compliance and validation applications remotely using .NET languages.

For more information: [www.agilent.com/find/RPI](http://www.agilent.com/find/RPI)

## Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



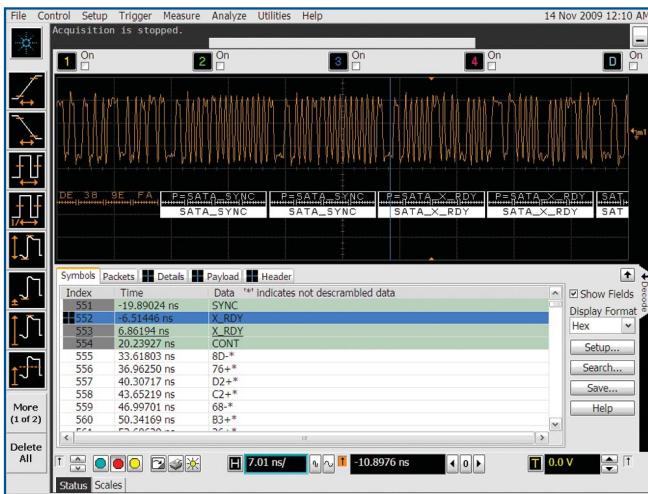
Trigger on and decode RS-232/UART transmission

### RS-232/UART serial decode and trigger (N5462A or Option 015 on new scope purchases)

This application eliminates the need to manually decode bus traffic. Using data captured on the scope channels, the application lets you easily view the information sent over an RS-232

Display real-time time-aligned decode of transmit and receive lines.

For more information: [www.agilent.com/find/90000\\_RS-232](http://www.agilent.com/find/90000_RS-232)



Trigger on and decode SAS/SATA serial packets.

### SATA/SAS triggering and decode (N8801A or option 018 on new scope purchases)

Trigger on and view both protocol layer information and physical layer signal

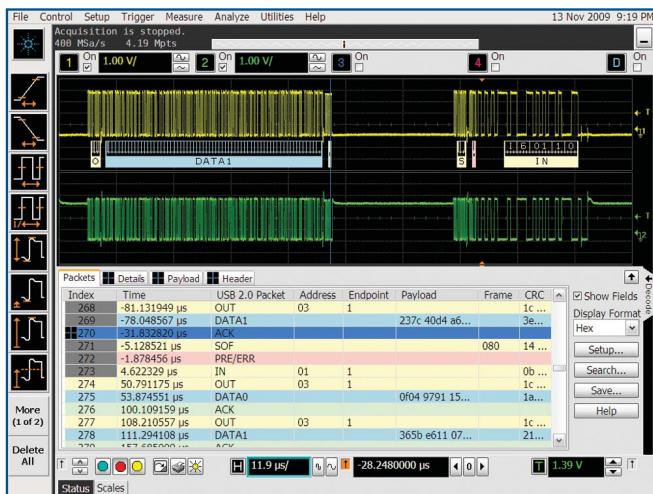
characteristics for SATA 1.5 Gb/s, 3.0 Gb/s, and 6.0 Gb/s.

Numerical decode values are automatically displayed and synchronizes below the capture signal or seen in protocol viewer.

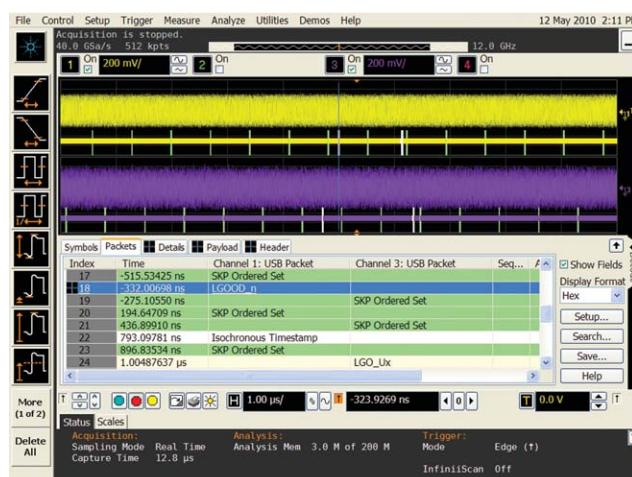
For more information: [www.agilent.com/find/N8801A](http://www.agilent.com/find/N8801A)

# Engineered for 32 GHz true analog bandwidth that delivers:

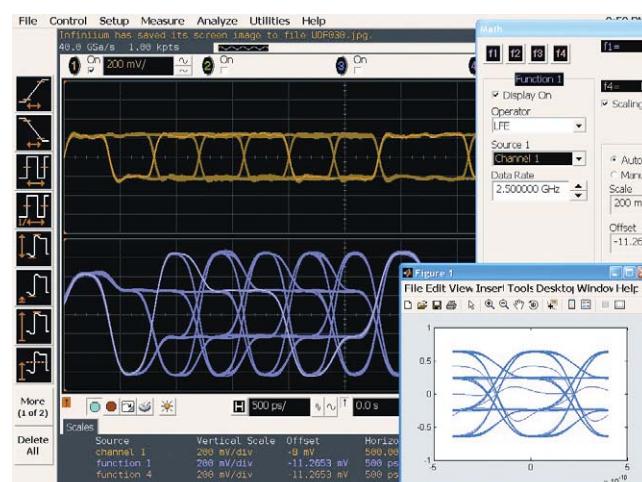
*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*



Trigger on and decode USB packets.



Isolate signal integrity problems from logic-level coding errors on bidirectional serial data streams.



Signal equalization using user-defined function.

## USB serial trigger and protocol viewer (N5464A or Option 016 on new scope purchases)

Trigger on and quickly view USB 2.0 packets, payload, header and detail information. Powerful time-correlated views of waveform and symbol, to the bit level, make it easy to isolate communication faults.

For more information:

[www.agilent.com/find/90000\\_USB\\_protocol\\_viewer](http://www.agilent.com/find/90000_USB_protocol_viewer)

## N8805A USB 3.0 Protocol Triggering and Decode (N8805A or Option)

Trigger on and view USB 3.0 with the industry's first oscilloscope-based protocol analyzer with time-correlated views of physical layer and transaction layer errors. The multi-tab protocol viewer includes correlation between the waveforms and the selected packet, enabling you to quickly move between the physical and protocol layer using the time-correlated tracking marker.

For more information:

[www.agilent.com/find/usb3decode](http://www.agilent.com/find/usb3decode)

## User-defined function (N5430A or Option 010 on new scope purchases)

If we haven't provided exactly what you need, use the N5430A User Defined Function software to create it yourself. Develop your own math functions or filters using MATLAB. Your custom functionality is seamlessly integrated into the Infinium 90000 menus and results are displayed on the scope screen. This requires MATLAB (available as Option 062) to be installed directly on the oscilloscope. Agilent is the only T&M manufacturer today that sells and supports MATLAB as its own product.

This application is supported on all models and requires MATLAB software (not included with UDF)

For more information: [www.agilent.com/find/UDF](http://www.agilent.com/find/UDF)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: compliance testing and validation software packages*



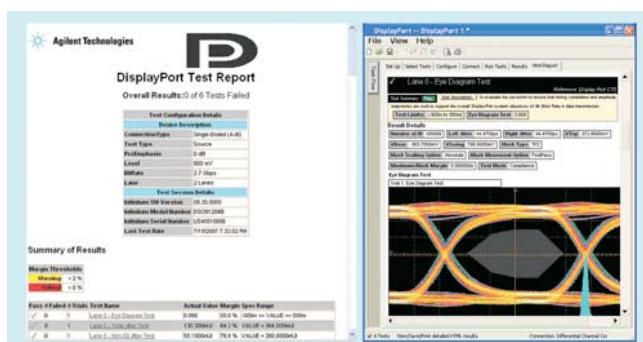
Quickly validate DDR1/2/3 and LPDDR signals

**DDR1 and LPDDR/DDR2 and LPDDR2/DDR3 compliance testing (U7233A/N5413B/U7231A or Options 031/033/032 on new scope purchases) or N5459A Option 001 for all memory applications**

Quickly and easily evaluate and characterize your memory designs. Automated testing based on JEDEC specifications saves time. The application also includes additional debug and compliance capabilities.

This application is supported on all models. However, the DDR technology you are using may dictate the minimal bandwidth required for your scope.

For more information: [www.agilent.com/find/DDR](http://www.agilent.com/find/DDR)



Full suite of DisplayPort source tests.

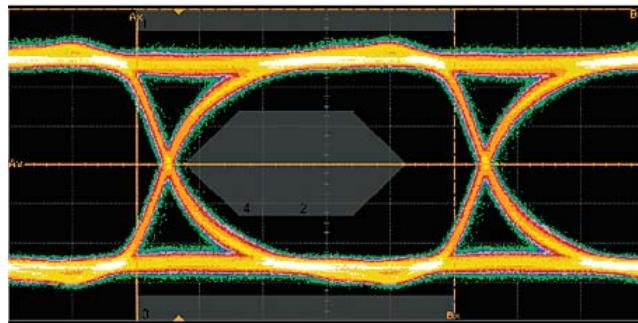
**DisplayPort compliance test software (U7232A or Option 028 on new scope purchases)**

Sets the benchmark for ease-of-use, and offers complete testing without compromise. The software guides the user sequentially through the tasks ensuring minimal setup error, executes the tests specified by the standard and conveys the test information through a convenient software generated report. The three modes of physical layer test allow for automated measurements based on the customizable configuration of compliance and characterization testing. To make the test signal connection, the Agilent W2641A DisplayPort test point access adaptor completes the DisplayPort source solution.

For more information: [www.agilent.com/find/U7232A](http://www.agilent.com/find/U7232A)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: compliance testing and validation software packages*

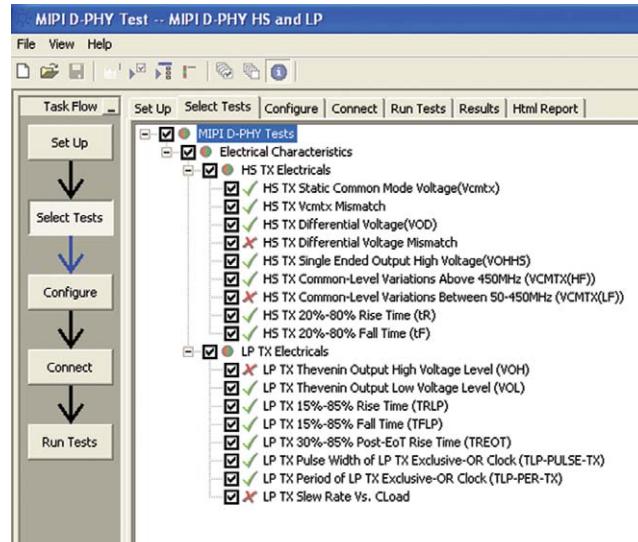


Verify and debug your HDMI designs.

## HDMI Electrical performance validation and compliance software (N5399A or Option 023 on new scope purchases)

Quickly verify and debug your high definition multi-media interface (HDMI) designs. The N1080A fixture provides access to the compliance points for the electrical measurements required for the transmitter compliance testing.

For more information: [www.agilent.com/find/N5399A](http://www.agilent.com/find/N5399A)



Automatically execute D-PHY electrical checklist tests for CSI and DSI architectures.

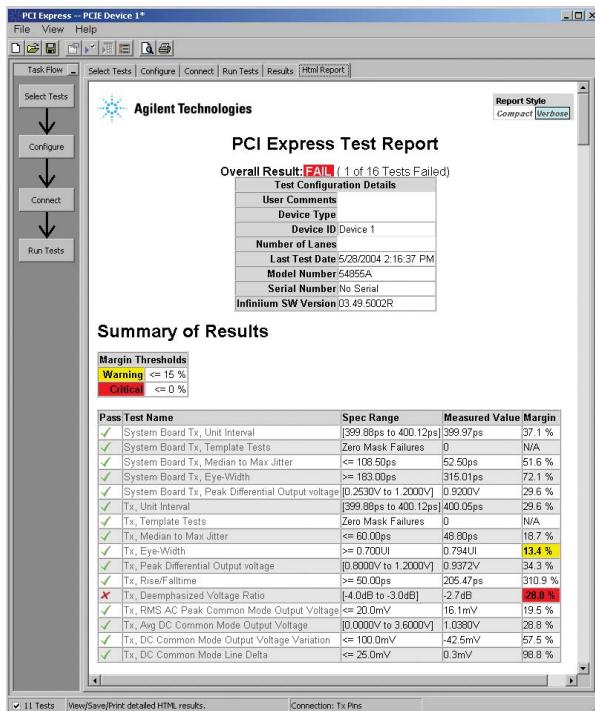
## MIPI D-PHY Compliance test software (U7238A or Option 035 on new scope purchases)

Automatically execute D-PHY electrical checklist tests for CSI and DSI architectures. Displays the results in a flexible report format.

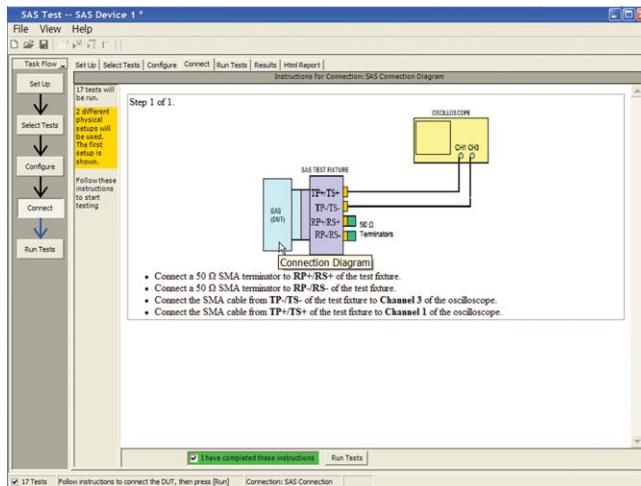
For more information:  
[www.agilent.com/find/d-phyc\\_compliance](http://www.agilent.com/find/d-phyc_compliance)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: compliance testing and validation software packages*



Quickly verify and debug your PCI Express® designs



Quickly validate and debug your SAS designs

## PCI Express® Electrical performance validation and compliance software (N5393B or Option 022 on new scope purchases)

Provides fast and easy way to verify and debug your PCI Express designs. Allows you to automatically execute PCI Express electrical checklist tests, and displays the results in a flexible report format. Ensures that your Gen2 measurements will have absolute consistency with measurements made using the PCI-SIG's® standalone Sigtest software.

For more information: [www.agilent.com/find/N5293B](http://www.agilent.com/find/N5293B)

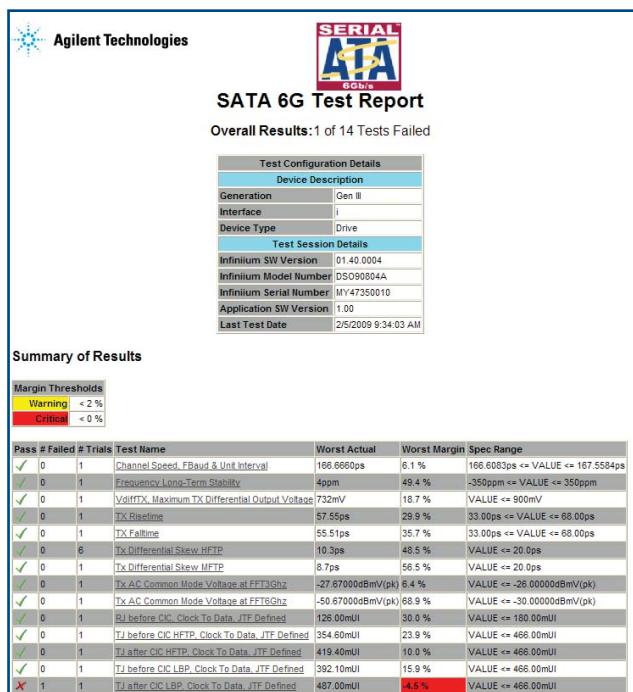
## Serial attached SCSI (SAS) electrical performance validation and compliance software (N5412A or Option 027 on new scope purchases)

Serial attached SCSI (SAS) electrical performance validation and compliance software for Infiniium oscilloscopes provides you with a fast and easy way to validate and debug your SAS 1.5-Gbps (SAS 150) and 3.0-Gbps (SAS 300) silicon, host bus adapter, initiator, high-density disk drive or enclosure backplane. The SAS electrical test software allows you to automatically execute SAS electrical checklist tests at each of the IT, CT, IR and CR interface points, and displays the results in a flexible report format. In addition to the measurement data, the report provides a margin analysis that shows how closely your device passed or failed each test.

For more information: [www.agilent.com/find/N5412A](http://www.agilent.com/find/N5412A)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: compliance testing and validation software packages*



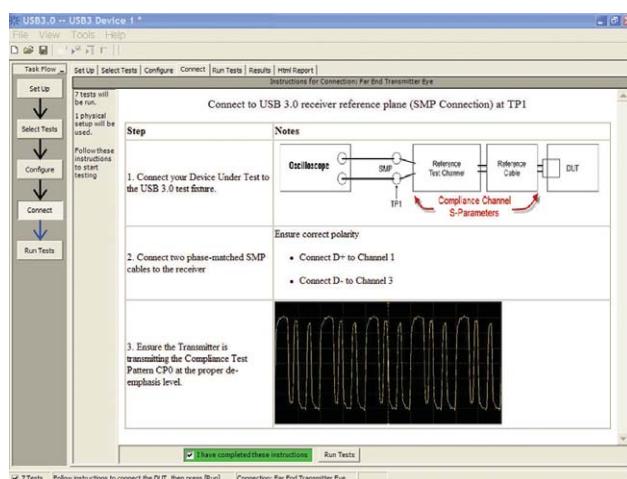
Pass #	Failed #	Trials	Test Name	Worst Actual	Worst Margin	Spec Range
✓	0	1	Channel Speed, FBaud & Unit Interval	166.6660ps	6.1 %	166.6083ps <= VALUE <= 167.5584ps
✓	0	1	Frequency, Long-Term, Stability	40ppm	49.4 %	-350ppm <= VALUE <= 350ppm
✓	0	1	VorlffTX, Maximum TX Differential Output Voltage	732mV	18.7 %	VALUE <= 900mV
✓	0	1	TX RiseTime	57.55ps	29.9 %	33.00ps <= VALUE <= 68.00ps
✓	0	1	TX FallTime	55.51ps	35.7 %	33.00ps <= VALUE <= 68.00ps
✓	0	6	Tx Differential Skew HFTP	10.3ps	48.5 %	VALUE <= 20.0ps
✓	0	1	Tx Differential Skew MFTP	8.7ps	56.5 %	VALUE <= 20.0ps
✓	0	1	Tx AC Common Mode Voltage at FFT3GHz	-27.670000dBmV(pk)	8.4 %	VALUE <= -26.000000dBmV(pk)
✓	0	1	Tx AC Common Mode Voltage at FFT6GHz	-50.670000dBmV(pk)	68.9 %	VALUE <= -30.000000dBmV(pk)
✓	0	1	RJ before CIC, Clock To Data, JTF Defined	128.00mUI	30.0 %	VALUE <= 180.00mUI
✓	0	1	TJ before CIC HFTP, Clock To Data, JTF Defined	354.60mUI	23.9 %	VALUE <= 466.00mUI
✓	0	1	TJ after CIC HFTP, Clock To Data, JTF Defined	419.40mUI	10.0 %	VALUE <= 466.00mUI
✓	0	1	TJ before CIC LBP, Clock To Data, JTF Defined	392.10mUI	15.9 %	VALUE <= 466.00mUI
✗	1	1	TJ after CIC LBP, Clock To Data, JTF Defined	487.00mUI	2.5 %	VALUE <= 466.00mUI

Simplify the validation of SATA designs

## SATA 6G Compliance Test Software (N5411B or Option 038 on new scope purchases)

Rapidly validate and debug your SATA 1.5Gb/s (Gen 1), 3.0Gb/s (Gen2) and 6.0Gb/s (Gen3) silicon, host bus adapter, port multiplier, high-density disk drive, solid-state disk drive or optical disk drive. Provides automated compliance test support for the i (internal), m(eSATA) and x(SAS attachment) interfaces points, and displays the results in a flexible report format.

For more information: [www.agilent.com/find/n5411b](http://www.agilent.com/find/n5411b)



Validate and debug your USB 3.0 silicon, host, hub or device

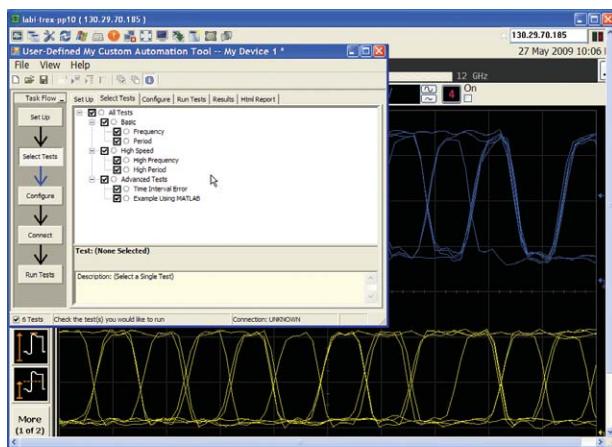
## USB 3.0 Compliance Test Software (U7243A or Option 041 on new scope purchases)

Provides industry leading automated test support for USB 3.0 products and displays the test results in a comprehensive test report. For best measurement accuracy use the Agilent U7242A USB 3.0 transmitter and receiver test fixtures. Agilent's USB 3.0 test solution is designed from the ground up with the needs of the test engineer in mind.

For more information: [www.agilent.com/find/USB3](http://www.agilent.com/find/USB3)

# Engineered for 32 GHz true analog bandwidth that delivers:

*The industry's most comprehensive application-specific measurement software: compliance testing and validation software packages*

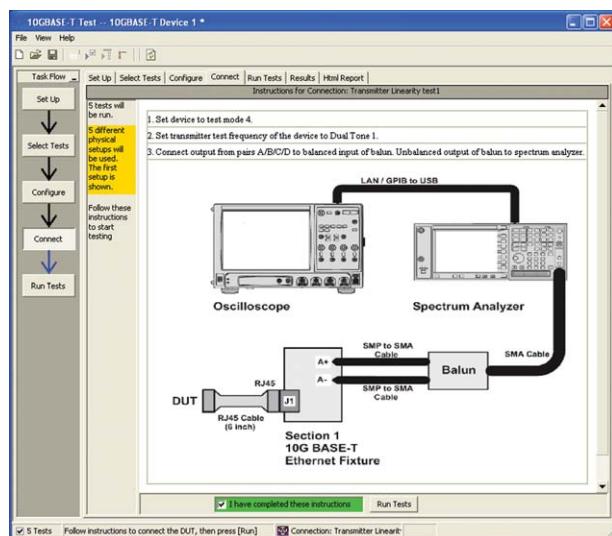


Quickly automate oscilloscope measurements.

## User-definable application (N5467A or Option 040 on new scope purchases)

Rapidly develop your own automated measurements and tests. This application provides the framework you need to quickly program and automate any single or set of measurements the oscilloscope can make. The application also provides full control of other Agilent instruments and HTML reporting capabilities.

For more information: [www.agilent.com/find/UDA](http://www.agilent.com/find/UDA)



Automatically execute 10GBASE-T Ethernet physical-layer (PHY) electrical tests

## 10GBASE-T Ethernet electrical conformance application for Infiniium oscilloscopes (U7236A or Option 036 on new scope purchases)

Takes care of the tedious task of instrument control and configures the oscilloscope, spectrum analyzer, or vector network analyzer as needed by each 10GBASE-T test to provide rapid, accurate, and repeatable test execution.

For more information: [www.agilent.com/find/10gbase-t](http://www.agilent.com/find/10gbase-t)

## Agilent Infiniium Portfolio

Agilent's Infiniium lineup includes bandwidths from 600 MHz to 32 GHz. Use the following selection guide to determine which best matches your specific needs.



Oscilloscope	9000 Series	90000 Series	90000-X Series
Type	Real Time	Real Time	Real Time
Bandwidth	600 MHz to 4 GHz	2.5 GHz to 13 GHz	16 GHz to 32 GHz
Sampling Rate (2 ch/4 ch)	20/10 GSa/s	40/40 GSa/s	80/40 GSa/s
Memory Depth	Up to 1 Gpt	Up to 1 Gpt	Up to 2 Gpts
Size (H x W x D)	12.9" x 16.8" x 9" 33cm x 43cm x 23cm	11.1" x 17" x 19.9" 28cm x 43cm x 51cm	10.5" x 16.75" x 18.7" 27cm x 43cm x 48cm
Precision Probe	NO	NO	YES
De-embedding	YES	YES	YES
Data sheet	5990-3746EN	5989-7819EN	5990-5271EN

# Engineered for 32 GHz true analog bandwidth that delivers

## Configure your high performance real-time oscilloscope solution today

Get the most out of your oscilloscope investment by choosing options and software to speed your most common tasks. Configure your Infiniium X-Series oscilloscope in three easy steps. Use option numbers when ordering at time of purchase. Use model numbers to add to an existing scope.

### 1. Choose your oscilloscope, memory and options

#### Mainframe:

Oscilloscopes	Description
DSAX93204A	32 GHz Signal Analyzer*
DSOX93204A	32 GHz Digital Signal Oscilloscope
DSAX92804A	28 GHz Signal Analyzer*
DSOX92804A	28 GHz Digital Signal Oscilloscope
DSAX92504A	25 GHz Signal Analyzer*
DSOX92504A	25 GHz Digital Oscilloscope
DSAX92004A	20 GHz Signal Analyzer*
DSOX92004A	20 GHz Digital Oscilloscope
DSAX91604A	16 GHz Signal Analyzer*
DSOX91604A	16 GHz Digital Oscilloscope

**All models come with power cord, keyboard, mouse, stylus, calibration cable, wrench and (5) coax adapters.\*\***

\*DSA models come with 50 Mpts memory, EZJIT, EZJIT+, Noise Reduction, and Serial Data Analysis standard.

\*\* 16 and 20 GHz models come with adapters rated to 25 GHz (1250-3758), all other models come with adapters rated to 35 GHz (5061-5311)

#### Memory:

Description	Options	Model number
20 Mpts/ch memory	Standard	N2810A-020
50 Mpts/ch memory	DSOX90000A-050	N2810A-050
100 Mpts/ch memory	DSOX90000A-100	N2810A-100
200 Mpts/ch memory	DSOX90000A-200	N2810A-200
500 Mpts/ch memory	DSOX90000A-500	N2810A-500
1 Gpts/ch memory	DSOX90000A-01G	N2810A-01G
2 Gpts/ch memory	DSOX90000A-02G	N2810A-02G

**20 M memory standard, add option to increase to desired capacity**

#### Options:

Description	Options	Model number
ANSI Z540 Compliant calibration	DSOX90000-A6J	
ISO17025 calibration	DSOX90000-1A7	
DVD RW	DSOX90000-820	N5473A
GPIB Card-interface	DSOX90000-805	82350B
PCI Express card-interface	DSOX90000-823	N4866A
Performance verification de-skew fixture	DSOX90000-OC-PROBES	N5443A
Rack mount kit option	DSOX90000-1CM	N5470A
Removable hard drive	DSOX90000-801	N5474A

**Engineered for 32 GHz true analog bandwidth that delivers**  
**Configure your high performance real-time oscilloscope solution today**

## 2. Choose your probes and accessories

Description	Oscilloscopes
30 GHz InfiniiMax III probe amp	N2803A
25 GHz InfiniiMax III probe amp	N2802A
20 GHz InfiniiMax III probe amp	N2801A
16 GHz InfiniiMax III probe amp	N2800A
ZIF probe head	N5439A
Browser (hand held) probe head	N5445A
Solder-in probe head	N5441A
3.5 mm/2.92-mm/SMA probe head	N5444A
450 Ω ZIF tip replacement (set of 5)	N5440A
250 Ω ZIF tip replacement (set of 5)	N5447A
Browser tip replacement (set of 4)	N5476A
PV/deskew fixture	N5443A
Precision BNC adapter (50 ohm)	N5442A
Sampling scope adapter	N5477A
2.92 mm head flex cable	N5448A
High impedance probe adapter	N5449A
35 GHz differential cable pair	N5412A

For more information about Agilent's InfiniiMax III probing system, check out the InfiniiMax III data sheet with the Agilent literature number, 5990-5653EN.

## 3. Choose your measurement-specific application software

### Measurement, Analysis and Decode Software Packages

Description	Product number	Model number
CAN/FlexRay decode	DSOX90000-063	N8803A
EZJIT jitter analysis software	DSOX90000-002	E2681A
EZJIT Plus jitter analysis software	DSOX90000-004	N5400A
High-Speed SDA and clock recovery	DSOX90000-003	E2688A
I <sup>2</sup> C/SPI Decode	DSOX90000-007	N5391A
InfiniiScan software triggering	DSOX90000-009	N5414B
InfiniiSim basic signal de-embedding	DSOX90000-013	N5465A-001
InfiniiSim advanced signal de-embedding	DSOX90000-014	N5465A-002
Serial data equalization	DSOX90000-012	N5461A
MATLAB - Basic digital analysis package	DSOX90000-061	
MATLAB - Standard digital analysis package	DSOX90000-062	
MIPI D-PHY protocol	DSOX90000-019	N8802A
PCI-Express protocol	DSOX90000-017	N5463A
Remote programming interface	DSOX90000-011	N5452A
RS-232/UART decode	DSOX90000-015	N5462A
SATA/SAS protocol	DSOX90000-018	N8801A
USB protocol	DSOX90000-016	N5464A
User-defined function	DSOX90000-010	N5430A

Choose your application-specific software packages (see pages 12 to 19) for details.

**Engineered for 32 GHz true analog bandwidth that delivers**  
**Configure your high performance real-time oscilloscope solution today**

**Compliance Testing and  
Validation Software  
Packages**

Description	Product Number	Model number
DDR1 and LPDDR compliance	DSOX90000A-031	U7233A
DDR2 and LPDDR2 compliance	DSOX90000A-033	N5413B
DDR3 up to 1660 MHz compliance	DSOX90000A-032	U7231A
DisplayPort compliance application	DSOX90000A-028	U7232A
Ethernet compliance application		N5392A
HDMI compliance application	DSOX90000A-023	N5399A
MIPI D-PHY compliance application	DSOX90000A-035	U7238A
PCI EXPRESS compliance application	DSOX90000A-022	N5393B
SAS compliance application	DSOX90000A-027	
SATA 6Gb/s Compliance	DSOX90000A-038	N5411B
USB 3.0 Compliance Software	DSOX90000A-041	U7243A
User Defined Application	DSOX90000A-040	N5467A
Xauí compliance application		N5431A
10GBASE-T Ethernet Automated Test Application	DSOX90000A-036	U7236A

**Choose your application-specific software packages (see pages 20 to 24) for details.**

**Upgrade your oscilloscope  
after purchase**

Bandwidth upgrades	
N5471F	13 GHz 90000A to 16 GHz 90000 X-Series
N5471G	16 GHz to 20 GHz Bandwidth upgrade
N5471H	20 GHz to 25 GHz Bandwidth upgrade
N5471I	25 GHz to 28 GHz Bandwidth upgrade
N5471J	28 GHz to 32 GHz Bandwidth upgrade

Memory upgrades	
N2810A-050	Upgrade 20 Mpts/ch to 50 Mpts/ch memory
N2810A-100	Upgrade 50 Mpts/ch to 1000 Mpts/ch memory
N2810A-200	Upgrade 100 Mpts/ch to 200 Mpts/ch memory
N2810A-500	Upgrade 200 Mpts/ch to 500 Mpts/ch memory
N2810A-01G	Upgrade 500 Mpts/ch to 2 Gpts/ch memory
N2810A-02G	Upgrade 1 Gpts/ch to 2 Gpts/ch memory

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

### Vertical

Input channels	Four								
Analog bandwidth (-3 dB)*	<b>91604A</b>	<b>92004A</b>	<b>92504A</b>	<b>92804A</b>	<b>93204A</b>				
2 channel	16 GHz	20 GHz	25 GHz	28 GHz	32 GHz				
4 channel	16 GHz	16 GHz	16 GHz	16 GHz	16 GHz				
Rise time/fall time <sup>1</sup>	<b>91604A</b>	<b>92004A</b>	<b>92504A</b>	<b>92804A</b>	<b>93204A</b>				
10 - 90%	28.5 ps	20 ps	17.5 ps	14.4 ps	12.5 ps				
20 - 80%	21.5 ps	15 ps	13 ps	11 ps	9 ps				
Input impedance	50 Ω, ± 3%								
Sensitivity <sup>3</sup>	1 mV/div to 1 V/div								
Input coupling	DC								
Vertical resolution <sup>2</sup>	8 bits, ≥ 12 bits with averaging								
Channel to channel isolation (any two channels with equal V/div settings)	DC to 3 GHz: 60dB (≥ 1000:1) 3 GHz to 8 GHz: 40 dB (≥ 100:1) 8 GHz to BW: 35dB (≥ 56:1)								
DC gain accuracy*	± 2% of full scale at full resolution channel scale (± 2.5% for 5mV/div)								
Maximum input voltage	± 5 V								
Offset range	<b>Vertical sensitivity</b> 0 mV/div to ≥ 49 mV/div > 50 mV/div to ≥ 100 mV/div > 100 mV/div to ≥ 199 mV/div > 200 mV/div to ≥ 499 mV/div > 500 mV/div	<b>Available offset</b> ± 0.4 V ± 0.7 V ± 1.2 V ± 2.2 V ± 2.4 V							
Offset accuracy*	≤ 3.5 V: ± (2% of channel offset + 1% of full scale + 1 mV) > 3.5 V: ± (2% of channel offset + 1% of full scale)								
Dynamic range	± 4 div from center screen								
DC voltage measurement accuracy	Dual cursor: ± [(DC gain accuracy) + (resolution)] Single cursor: ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)]								
RMS noise floor (scope only)									
<b>Volts/div (mVrms)</b>	<b>91604A</b>	<b>92004A</b>	<b>92504A</b>	<b>92804A</b>	<b>93204A</b>				
10 mV	0.348	0.426	0.496	0.534	0.597				
50 mV	1.34	1.53	1.76	1.862	2.03				
100 mV	2.63	3.02	3.39	3.62	3.975				
1 V	26.65	30.05	34.15	36.57	39.92				

\* Denotes warranted specifications, all others are typical. Specifications are valid after a 30-minute warm up period, and ± 5° C from annual calibration temperature

3. Full scale is defined as 8 vertical divisions. Magnification is used below 10mV/div. Below 10 mV/div, full-scale is defined as 80 mV/div. The major scale settings are 5mV, 10mV, 20mV, 50mV, 100mV, 200mV, 500mV, and 1V.

2. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scale

1. Calculated from the bandwidth using 0.42/bandwidth

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

### Horizontal

Main timebase range	2 ps/div to 20 s/div real-time
Main timebase delay range	200 s to -200 s real-time
Zoom timebase range	1 ps/div to current main time scale setting
Channel deskew	± 1 ms range, 10 fs resolution
Time scale accuracy*	± [0.075 ppm (immediately after calibration) ± 0.1 ppm/year (aging)]
Delta-time measurement accuracy Absolute, averaging disabled	$5 \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} + \frac{\text{TimeScaleAccy} \cdot \text{Reading}}{2}$ sec rms
Absolute, > 256 averages	$0.35 \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} + \frac{\text{TimeScaleAccy} \cdot \text{Reading}}{2}$ sec rms

### Sample Clock Jitter

Acquired Time Range	Internal Timebase Reference	External Timebase Reference
10 ms	150 fs rms	150 fs rms
10 ms - 100 ms	190 fs rms	190 fs rms
100 ms - 1 sec	500 fs rms	190 fs rms
>1 sec		190 fs rms

### Jitter Measurement Floor (6a, 6b, 6c)

TIE:

$$\sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

Periodic Jitter:

$$\sqrt{2} \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

Cycle-Cycle:

$$\sqrt{3} \cdot \sqrt{\left(\frac{\text{Noise}}{\text{SlewRate}}\right)^2 + \text{SampleClock Jitter}^2} \text{ sec rms}$$

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

### Acquisition

Maximum real-time sample rate	91604A	92004A	92504A	92804A	93204A
(2 channels)	80 GSa/s	80 GSa/s	80 GSa/s	80 GSa/s	80 GSa/s
(4 Channels)	40 GSa/s	40 GSa/s	40 GSa/s	40 GSa/s	40 GSa/s
Memory Depth per Channel					
Standard	20 Mpts on 4 channels				40 Mpts on 2 channels
Option 050	50 Mpts on 4 channels (standard on DSA models)				100 Mpts on 2 channels
Option 100	100 Mpts on 4 channels				200 Mpts on 2 channels
Option 200	200 Mpts on 4 channels				400 Mpts on 2 channels
Option 500	500 Mpts on 4 channels				1 Gpt on 2 channels
Option 01G	1 Gpts on 4 channels				1 Gpt on 2 channels
Option 02G	2 Gpts on 4 channels				2 Gpts on 2 channels

### Maximum acquired time at highest real time resolution

Real-Time Resolution	40 Gsa/s	80 Gsa/s
Standard	0.5 mS	0.5 mS
Option 050	1.25 mS	1.25 mS
Option 100 M	2.5 mS	2.5 mS
Option 200 M	5 mS	5 mS
Option 500 M	12.5 mS	12.5 mS
Option 01G	25 mS	12.5 mS
Option 02G	50 mS	25 mS

### Sampling Modes

Real-Time	Successive single shot acquisitions
Real-Time with Averaging	Selectable from 2 to 65534
Real-Time with Peak Detect	80 GSa/s in half channel mode, 40 GSa/s in full channel mode
Real-Time with Hi Resolution	Real-time boxcar averaging reduces random noise and increases resolution
Guassian Magnitude, Linear Phase	Slower filter roll off while mantaining linear phase
Roll Mode	Scrolls sequential waveform points across the display in a right-to-left rolling motion. Works at sample rates up to 10 MSa/s with a maximum record length of 40 Mpts
Segmented memory	Captures bursting signals at max sample rate without consuming memory during periods of inactivity Number of segments (Up to 524,288 with option 026) Maximum time between triggers is 562,950 seconds Re-arm time: 4.5µs Maximum memory depth: Up to 4 Gpts in 1/2 channel mode with option 02G
Filters Sin(x)/x Interpolation	On/off selectable FIR digital filter. Digital Signal Processing adds points between aquired data points to enhance measurement accuracy and waveform display

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

Hardware Trigger	
Sensitivity	Internal low Internal high Auxiliary
Edge Trigger Bandwidth	>20 GHz
Minimum Pulse Width Trigger	
Hardware	250 ps
Software (InfiniiScan)	40 ps
Level Range	
Internal	± 4 div from center screen or ± 4 Volts, whichever is smallest
Auxiliary	± 5 V, also limit input signal to ± 5V
Sweep Modes	Single, segmented, and continuous.
Display jitter (displayed trigger jitter)	50 fs
Trigger sources	Channel 1, Channel 2, Channel 3, Channel 4, aux, and line
Trigger Modes	
Edge	Triggers on a specified slope (rising, falling or alternating between rising and falling) and voltage level on any channel or auxiliary trigger. Edge trigger bandwidth is > 20 GHz.
Edge Transition	Trigger on rising or falling edges that cross two voltage levels in > or < the amount of time specified. Edge transition setting from 250 ps.
Edge then Edge (time)	The trigger is qualified by an edge. After a specified time delay between 10 ns to 10 s, a rising or falling edge on any one selected input will generate the trigger
Edge then Edge (Event)	The trigger is qualified by an edge. After a specified delay between 1 to 16,000,000 rising or falling edges, another rising or falling edge on any one selected input will generate the trigger.
Glitch	Triggers on glitches narrower than the other pulses in your waveform by specifying a width less than your narrowest pulse and a polarity. Triggers on glitches as narrow as 125 ps. Glitch range settings: < 250 ps to < 10 s.
Line	Triggers on the line voltage powering the oscilloscope
Pulse Width	Trigger on a pulse that is wider or narrower than the other pulses in your waveform by specifying a pulse width and a polarity. Triggers on pulse widths as narrow as 125 ps. Pulse width range settings 250 ps to 10 s. Trigger point can be "end of pulse" or "time out".
Runt	Triggers on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Can be time qualified with minimum setting of 250 ps.

## Hardware Trigger (continued)

Timeout	Trigger when a channel stays high, low, or unchanged for too long. Timeout setting: from 250 ps to 10 s.
Pattern/pulse range	Triggers when a specified logical combination of the channels is entered, exited, present for a specified period of time or is within a specified time range or times out. Each channel can have a value of High (H), Low (L) or Don't care (X).
State	Pattern trigger clocked by the rising, falling or alternating between rising and falling edge of one channel
Window	Triggers on an event associated with a window defined by two-user adjustable thresholds. Event can be window "entered," "exited," "inside (time qualified)," or "outside (time qualified)" voltage range. Trigger point can be "cross window boundary" or "time out." Time qualify range: from 250 ps to 10 s.
Video	Triggers from negative sync composite video, field 1, field 2, or alternating fields for interlaced systems, any field, specific line, or any line for interlaced or non-interlaced systems. Supports NTSC, PAL-M (525/60), PAL, SECAM (625/50), EDTV (480p/60), EDTV (576p/50), HDTV (720p/60), HDTV (720p/50), HDTV (1080i/60), HDTV (1080i/50), HDTV (1080p/60), HDTV (1080p/50), HDTV (1080p/30), HDTV (1080p/25), HDTV (1080p/24), and user-defined formats.
Trigger Sequences	Three stage trigger sequences including two-stage hardware (Find event (A) and Trigger event (B)) and one-stage InfiniiScan software trigger. Supports all hardware trigger modes except "edge then edge" and "video," and all InfiniiScan software trigger modes. Supports "delay (by time)" and "reset (by time or event)" between two hardware sequences. The minimum latency between "find event (A)" and "trigger event (B)" is 3 ns.
Trigger Qualification AND Qualifier	Single or multiple channels may be logically qualified with any other trigger mode
Trigger Holdoff Range	100nS to 10s
Trigger Actions	Specify an action to occur and the frequency of the action when a trigger condition occurs. Actions include e-mail on trigger and execute "multipurpose" user setting.

## Software trigger (requires InfiniiScan event identification software – Option 009)

Trigger Modes	
Zone Qualify	Software triggers on the user defined zones on screen. Zones can be specified as either "must intersect" or "must not intersect." Up to eight zones can be defined across multiple channels.
Generic Serial	Software triggers on NRZ-encoded data up to 8.0 Gbps, up to 80-bit pattern. Support multiple clock data recovery methods including constant frequency, 1st-order PLL, 2nd-order PLL, explicit clock, explicit 1st-order PLL, explicit 2nd-order PLL, Fibre Channel, FlexRay receiver, FlexRay transmitter (requires E2688A except for the constant frequency clock data recovery mode).
Measurement Limit	Software triggers on the results of the measurement values. For example, when the "pulse width" measurement is turned on, InfiniiScan measurement software trigger triggers on a glitch as narrow as 75 ps. When the "time interval error (TIE)" is measured, InfiniiScan can trigger on a specific TIE value
Non-monotonic edge	Software triggers on the non-monotonic edge. The non-monotonic edge is specified by setting a hysteresis value.
Runt	Software triggers on a pulse that crosses one threshold but fails to cross a second threshold before crossing the first again. Unlike hardware runt trigger, InfiniiScan runt trigger can be further qualified via a hysteresis value.

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

Maximum measurement update rate	> 50,000 measurement/sec (one measurement turned on) > 250,000 measurement/sec/measurement (ten measurements turned on)
Measurement Modes	Standard, Measure all edges mode
Waveform Measurements	Peak to peak, minimum, maximum, average, RMS, amplitude, base, top, overshoot, preshoot, upper, middle, lower, overshoot, V preshoot, crossing, Pulse base, pulse amplitude, burst interval
Time	Rise time, fall time, positive width, negative width, burst width, Tmin, Tmax, burst period, Tvolt, + pulse count, - pulse count,
Clock	Period, frequency, duty cycle to duty cycle
Data	Setup time*, hold time*
Mixed	Area, slew rate,
Frequency Domain	FFT frequency, FFT magnitude, FFT delta frequency, FFT delta magnitude, peak detect mode
Level Qualification	Any channels that are not involved in a measurement can be used to level-qualify all timing measurements
Eye-diagram measurements	Eye height, eye width, eye jitter, crossing percentage, Q factor, and duty-cycle distortion
Jitter analysis measurements	Requires Option 002 (or E2681A) or 004 (or N5400A). Standard on DSA Series.
Clock	Time interval error, N-period, period to period, positive width to positive width, neg width to neg width, and duty cycle to duty cycle
Data	Time interval error, unit interval, N Unit Interval, unit interval to unit interval, Data rate, CDR, de-emphasis
Statistics	Displays the current, mean, minimum, maximum, range (max-min), standard deviation, number of measurements value for the displayed automatic measurements
Histograms	
Source	Waveform or measurement
Orientation	Vertical (for timing and jitter measurements) or horizontal (noise and amplitude change) modes, regions are defined using waveform markers
Measurements	Mean, standard deviation, mean $\pm$ 1, 2, and 3 sigma, median, mode, peak-to-peak, min, max, total hits, peak (area of most hits), X scale hits, and X offset hits
Mask Testing	Allows pass/fail testing to user-defined or Agilent-supplied waveform templates. Automask lets you create a mask template from a captured waveform and define a tolerance range in time/voltage or screen divisions. Test modes (run until) include test forever, test to specified time or event limit, and stop on failure. Executes "multipurpose" user setting on failure. "Unfold real time eye" feature will allow individual bit errors to be observed by unfolding a real time eye when clock recovery is on. Communications mask test kit option provides a set of ITU-T G.703, ANSI T1.102, and IEEE 802.3 industry-standard masks for compliance testing.
Waveform Math	
Number of Functions	Four
Hardware Accelerated Math	Differential and Common Mode
Operations	Absolute value, add, average, Butterworth*, common mode, differentiate, divide, FFT magnitude, FFT phase, FIR*, high pass filter, integrate, invert, LFE*, low pass filter (4th-order Bessel Thompson filter), magnify, max, min, multiply, RT Eye*, smoothing, SqrtSumOfSquare*, square, square root, subtract, versus, and optional user defined function (Option 010)
FFT	
Frequency Range	DC to 40 GHz (at 80 GSa/s) or 20 GHz (at 40 GSa/s)
Frequency Resolution	Sample rate/memory depth = resolution
Window Modes	Hanning, flattop, rectangular, Blackman-Harris

\* Requires the purchase of User Defined Function (option 010)

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

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Measurement modes	
Automatic measurements	Measure menu access to all measurements, up to ten measurements can be displayed simultaneously
Multipurpose	Front-panel button activates five pre-selected or five user-defined automatic measurements
Drag-and-drop measurement toolbar	Measurement toolbar with common measurement icons that can be dragged and dropped onto the displayed waveforms
Snapshot	Takes 29 snap shot measurements (customizable).
Marker modes	Manual markers, track waveform data, track measurements

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### Display

Display	12.1-inch color XGA TFT-LCD with touch screen
Intensity grayscale	256-level intensity-graded display
Resolution XGA	1024 pixels horizontally x 768 pixels vertically
Annotation	Up to 12 labels, with up to 100 characters each, can be inserted into the waveform area
Grids	One, two or four waveform grids, each with 8 bit vertical resolution
Waveform styles	Connected dots, dots, infinite persistence, color graded infinite persistence. Includes up to 256 levels of intensity-graded waveforms.

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### Waveform Update Rate

Maximum Update Rate > 400,000 waveforms per second (when in the segment memory mode)

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### Computer system and peripherals, I/O ports

Computer system and peripherals	
Operating system	Windows® XP Pro
CPU	Intel® Core 2 Duo 3.06 GHz
PC system memory	4GB DDR2
Drives	≥ 250-GB internal hard drive Optional removable hard drive (Option 801) Optional USB external DVD-RW drive (Option 820)
Peripherals	Logitech optical USB mouse, compact USB keyboard and stylus supplied. All Infiniium models support any Windows-compatible input device with a serial, PS/2 or USB interface.

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### File types

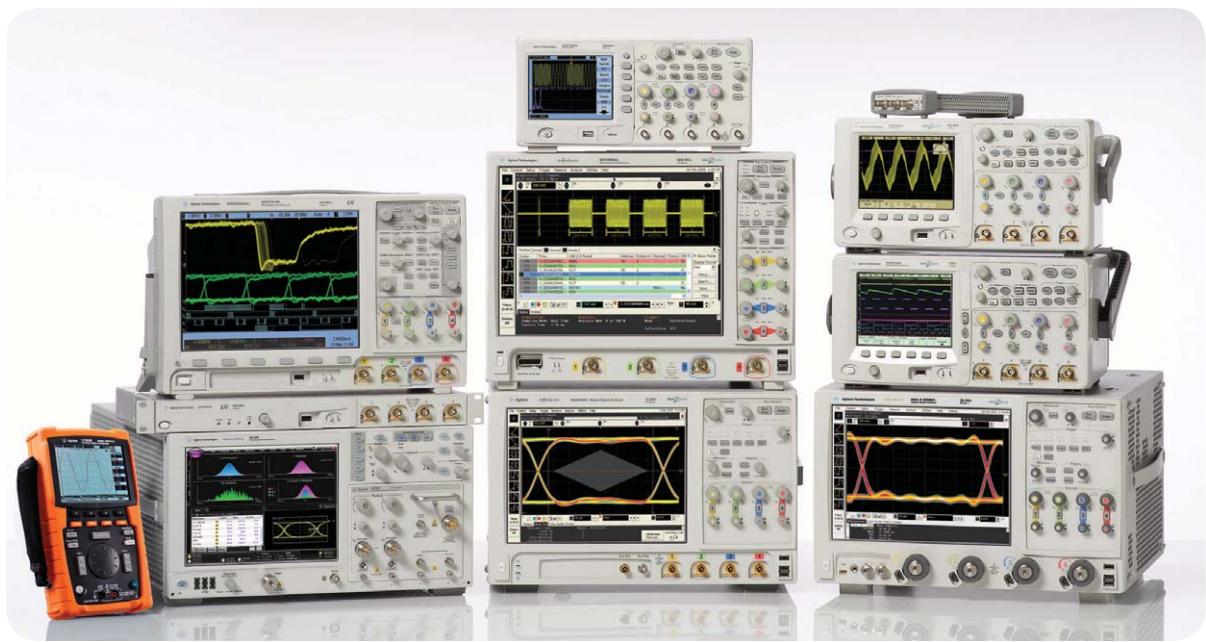
Waveforms	Compressed internal format (*.wfm (200 Mpts)), comma-separated values (*.csv (2 Gpts)), tab separated values (*.tsv (2 Gpts)), public binary format (.bin (500 Mpts)), Y value files (*.txt (2 Gpts)), hierachal data file (*.hf5 (2 Gpts))
Images	BMP, PNG, TIFF, GIF or JPEG

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# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

I/O ports	PCIe x4, GPIB, RS-232 (serial), Parallel, PS/2, USB 2.0 hi-speed (host), USB 2.0 hi-speed (device), Dual-monitor video output, Auxiliary output, Trigger output, Time base reference output
General Characteristics	
Temperature	Operating: 5 °C to + 40 °C; Non-operating: -40°C to +70 °C
Vibration	For operating random the 0.3 g(rms) should be 0.21 g(rms), for non-operating random the 2.41 g(rms) should be 2.0 g(rms) and for swept sins the (0.75g) should be (0.50g).
Power	100 - 240 VAC at 50/60 Hz; maximum input power 800 Watts
Weight	45.1 lbs (20.5 kg)
Dimensions	10.5" x 16.75" x 18.7" (27cm x 43cm x 48cm)
Safety	Meets IEC 61010-1 +A2, CSA certified to C22.2 No.1010.1, self-certified to UL 3111



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