# Agilent Technologies Infiniium 90000 X-Series Oscilloscopes

Data Sheet


## Engineered for 33 GHz true analog bandwidth that delivers

### Featuring Agilent's PrecisionProbe

Agilent Technologies

# Engineered for 33 GHz true analog bandwidth that delivers:

## *Need bandwidth?*

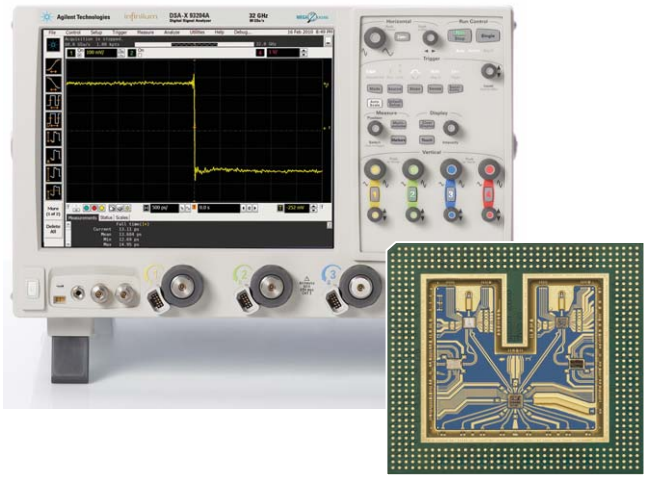
When you're deploying leading edge high-speed serial bus designs like FibreChannel, SAS 12 G, or 10 Gb Ethernet KR, jitter matters and picoseconds count. When you're doing spectral analysis of wide-bandwidth RF signals or investigating transient phenomena, bandwidth is critical. You need the most accurate real-time oscilloscope you can get. Agilent Infiniium 90000 X-Series scopes are engineered for **33 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

## ***33 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 **33 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.**

best electronic design 2010

EDN innovation EDN China Innovation Award EDN 创新奖 2010 最佳产品奖

Elektra 2010 European Electronics Industry Awards WINNER

Test & Measurement World BEST IN TEST 2011 FINALIST

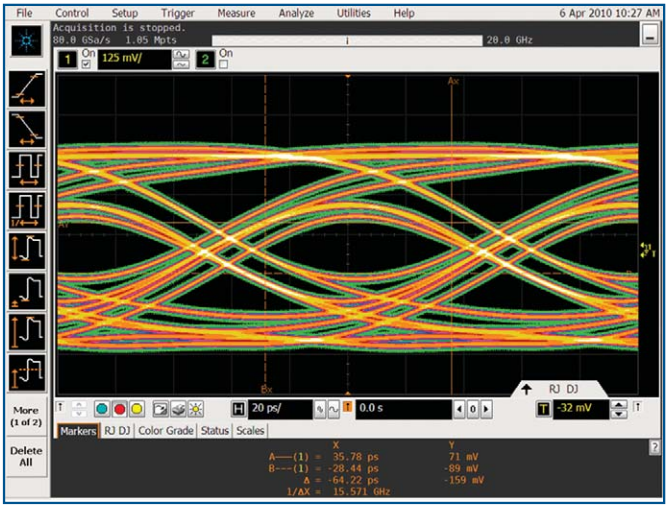
R&D 100 2011

| Model number | Analog bandwidth 2 channel | Analog bandwidth 4 channel | Sample rate 2 channel | Sample rate 4 channel | Max Memory depth 4 channel |
|---|---|---|---|---|---|
| DSA-X93204A | 33 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 |
| DS0-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 33 GHz

# Engineered for 33 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:

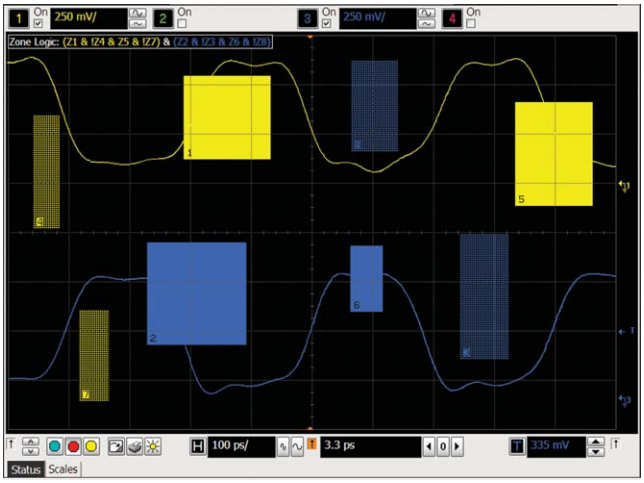
- Highest true analog bandwidth (33 GHz)
- Lowest oscilloscope noise floor (2.25 mV at 50 mV/div, 33 GHz)
- Lowest jitter measurement floor (150 fs)

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 33 GHz true analog bandwidth that delivers:

33 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.

Calibration edge with a rise time of less than 15 ps enables TDT calibration with PrecisionProbe software.


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 more than one oscilloscope, 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-Mbpts connection.

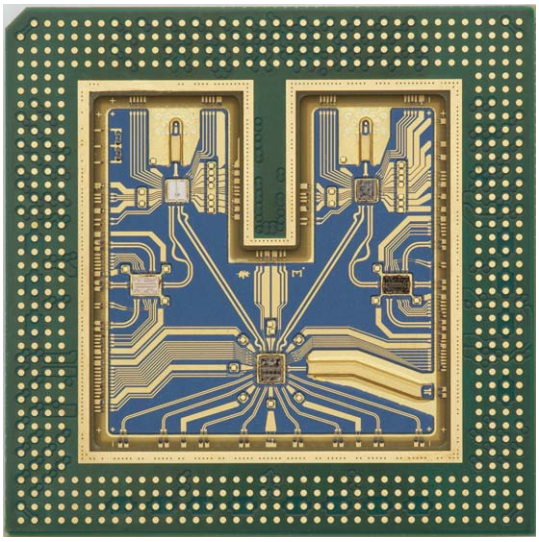
# Engineered for 33 GHz true analog bandwidth that delivers:

## *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

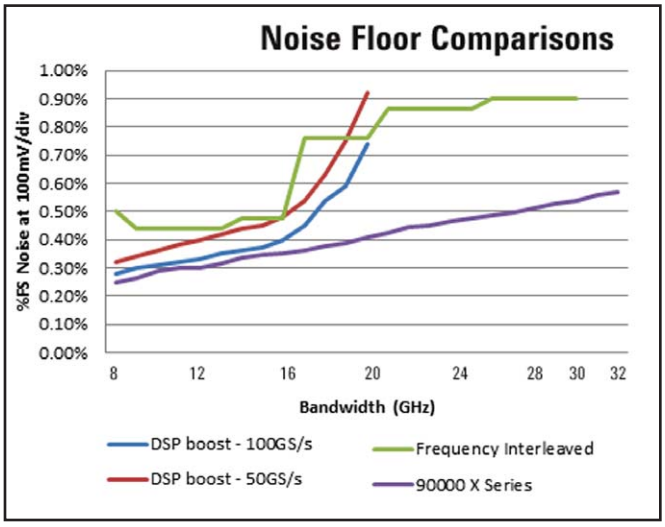


### Highest true-analog bandwidth- 33 GHz

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.

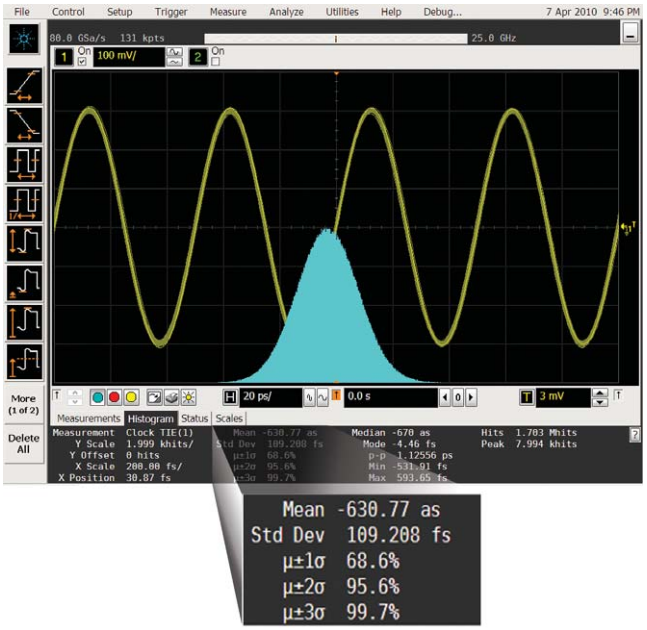
### Industry's lowest noise floor.

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 33 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 femptoseconds). 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.

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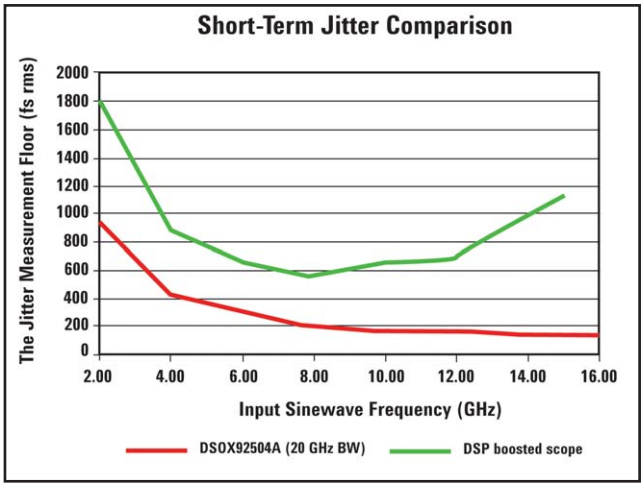
### How much better is our jitter measurement?

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.




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

# Engineered for 33 GHz true analog bandwidth that delivers:

## *Industry's first 30 GHz oscilloscope probing system*

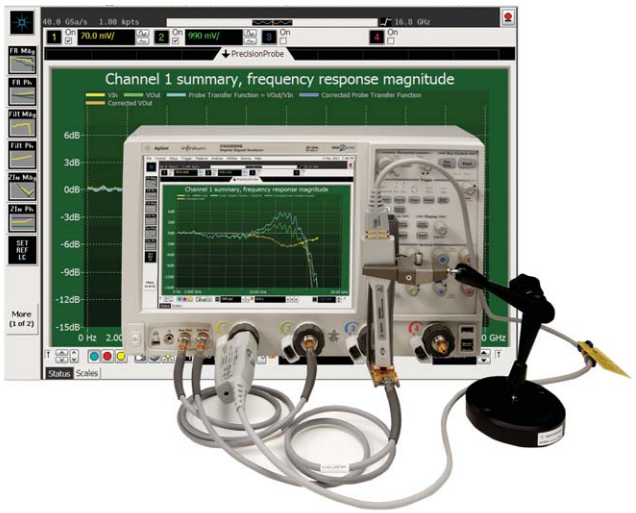
To take advantage of your investment in a high bandwidth oscilloscope, you must have a probing system that can deliver bandwidth to the probe tip. Agilent rises to the challenge of high speed signal reproduction with these probing innovations:

- The industry's first bandwidth upgradable probe amplifier
- Fully-integrated probe amplifier s-parameter correction

**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 |

### PrecisionProbe



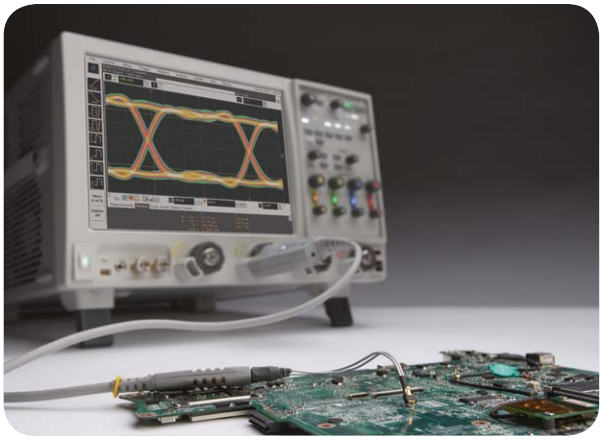

Agilent's PrecisionProbe uses its 200 GHz indium phosphide process to create a fast edge for characterization with PrecisionProbe.

Agilent's N2809A PrecisionProbe software quickly characterizes and compensates the frequency response of any path to the 90000 X-Series input. PrecisionProbe's patented technology uses the <15ps edge from the 90000 X-Series oscilloscope to:

- Measure input impedance and response of any probe and the loss of any cable
- Quickly correct from probe and cable loss(without extra instruments such as VNA or TDR)
- Correct probing issues such as phase nonlinearity, magnitude non-flatness, and see the effect of probe loading
- Quickly gain insight into impedance/capacitance that defines your connection

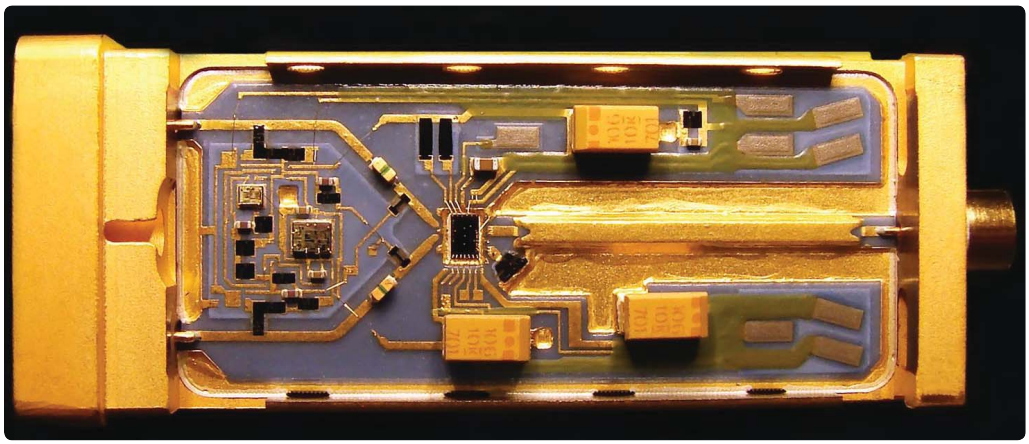
# Engineered for 33 GHz true analog bandwidth that delivers:

## *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 $I^2C$ 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 33 GHz Bandwidth Upgrade |

# Engineered for 33 GHz true analog bandwidth that delivers:

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

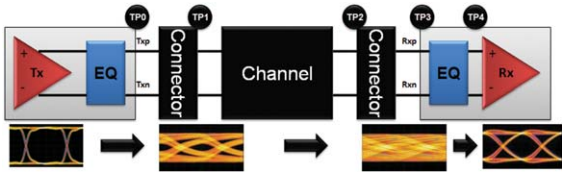
To get the most out of your Agilent Infiniium 90000 X-Series oscilloscope, choose from a wide array of application specific software options that speed your measurement tasks including:

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

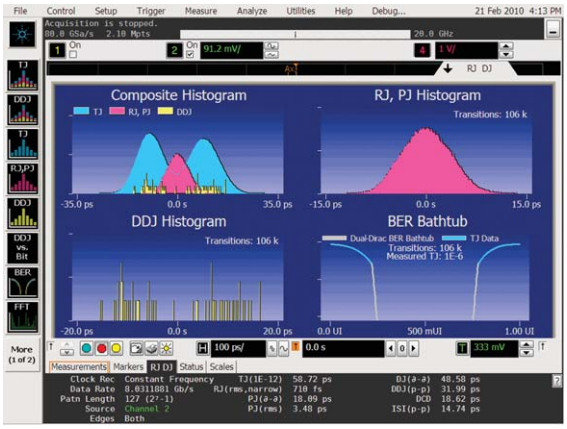
### A broad range of jitter, trigger, measurement, analysis, and display tools

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.



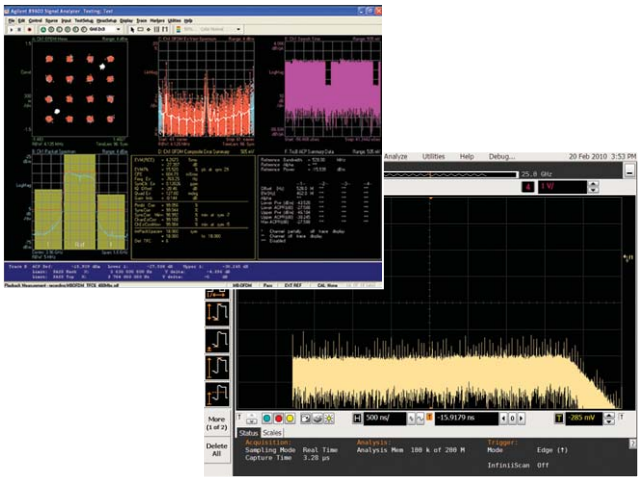

**Agilent's InfiniiSim waveform translation toolset provides efficient de-embedding of probe and circuit element loading, enables measurement translation from accessible probe points to other locations in the system, and simulates waveforms with channel models inserted. Combine measurements and models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




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

### Not just a tool for the digital world

Infiniium 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.



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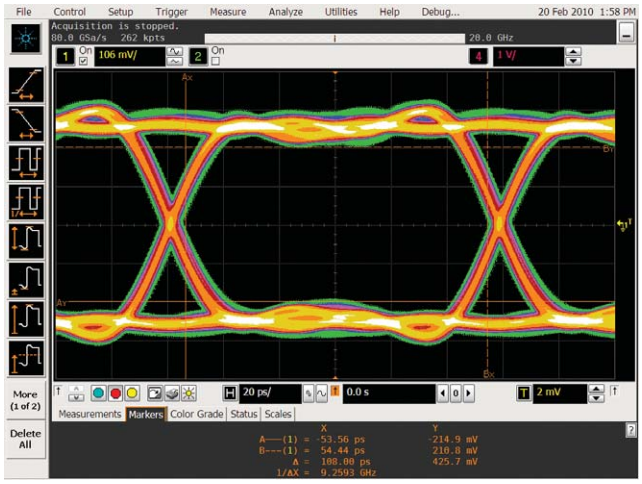
## *The industry's most comprehensive application-specific measurement software*




### 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.

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### 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.

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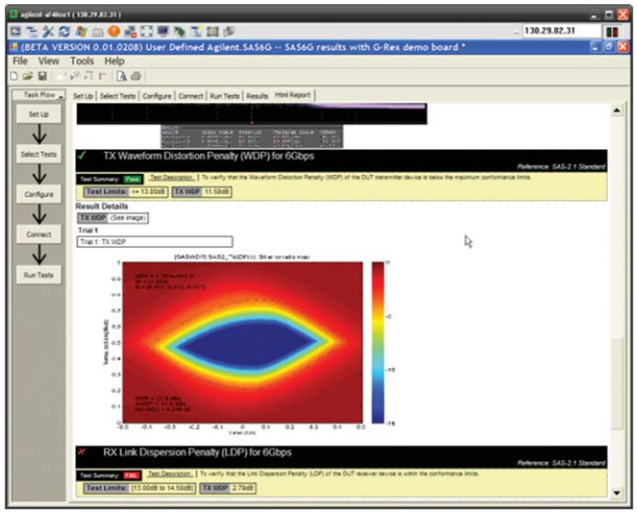



### User Defined Application software allows automated compliance testing on proprietary buses or while emerging test standards solidify.

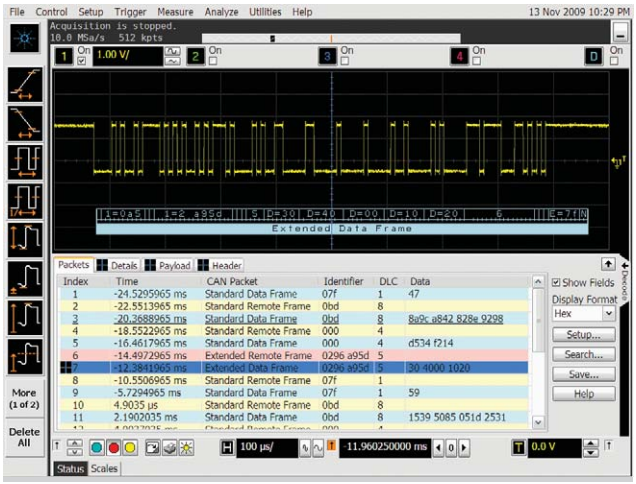
Rapidly develop automated measurements for compliance testing with Agilent's User Defined Application software. This tool provides the framework you need to quickly program and automate any set of measurements with an interface similar to that provided in our standard compliance test software. Full control 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 33 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**

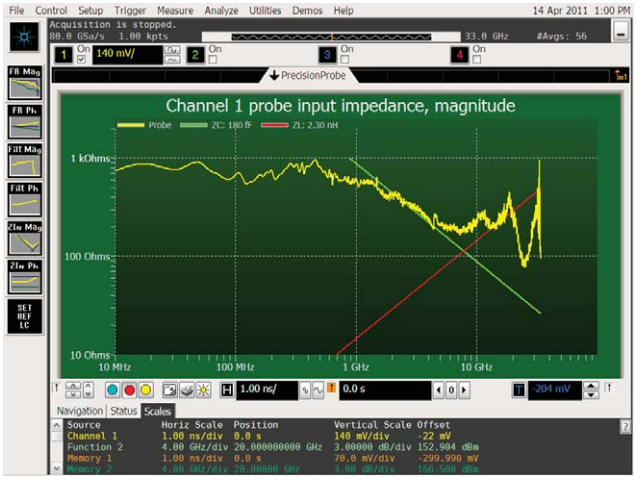

**Easily separate the spread spectrum clock using EZJIT analysis software.**

## 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**




**Quickly characterize and correct for any input to your oscilloscope.**

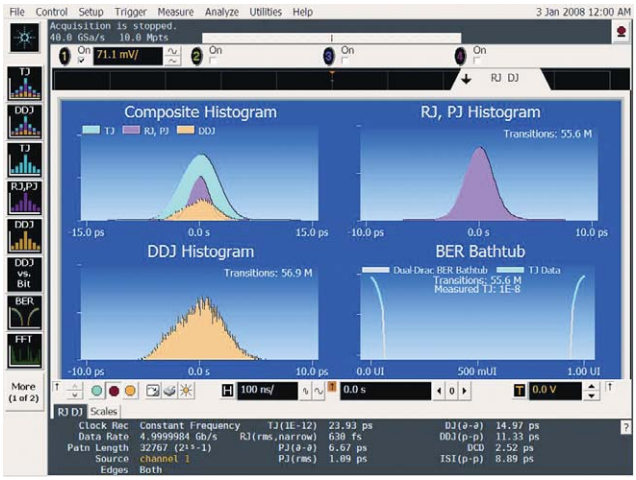
## PrecisionProbe software (N2909A or Option 001 on new scope purchases)

Make more accurate measurements independent of what probes or cables used. Agilent's N2909A PrecisionProbe software characterizes and corrects for the loss in your specific cable or probe. PrecisionProbe removes the uncertainty about the input connected to your oscilloscope by allowing you to see its characteristics in less than five minute. PrecisionProbe gives you design and debug confidence by allowing you to quickly de-embed probe and cable loss to make more accurate measurements.

For more information: **www.agilent.com/find/PrecisionProbe**

# Engineered for 33 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**

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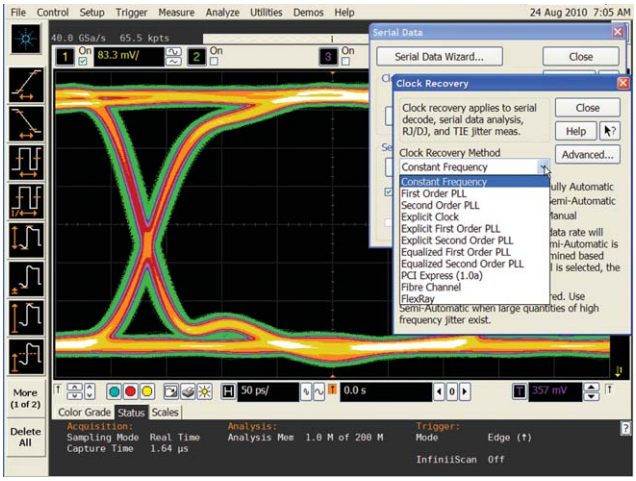



**Recover embedded clocks with serial data analysis (SDA).**

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

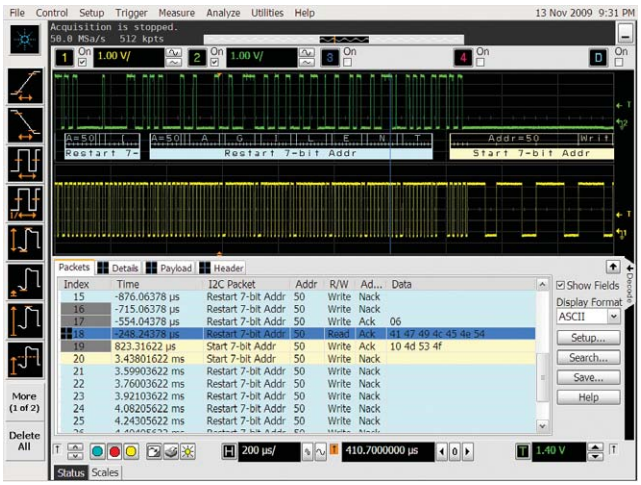
Quickly validate signal integrity for high-speed serial interfaces with embedded clocks. Recover embedded clocks synchronized with the analog waveform view. Build and validate eye diagrams.

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**

# Engineered for 33 GHz true analog bandwidth that delivers:

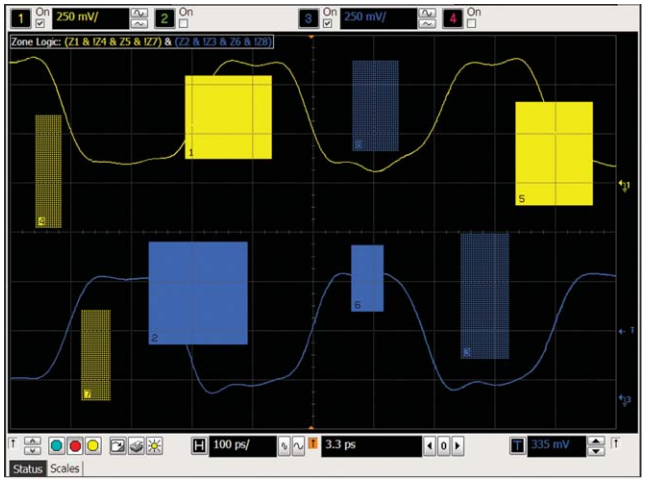
*The industry's most comprehensive application-specific measurement software: measurement, analysis and decode software packages*




**Trigger and view on-screen serial decode of $I^2C$ packets**

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

Given even futher 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.




**Identify signal integrity issues with InfiniiScan Zone – Qualify triggering.**

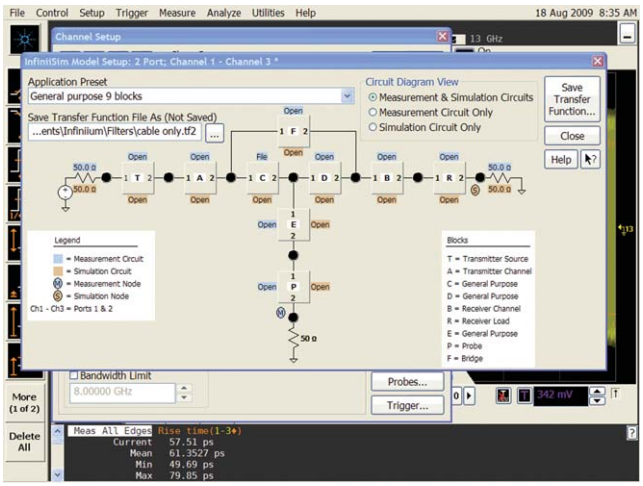
## InfiniiScan event identification featuring zone-qualify triggering (N5415B or Option 009 on new scope purchases)

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**

# Engineered for 33 GHz true analog bandwidth that delivers:

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



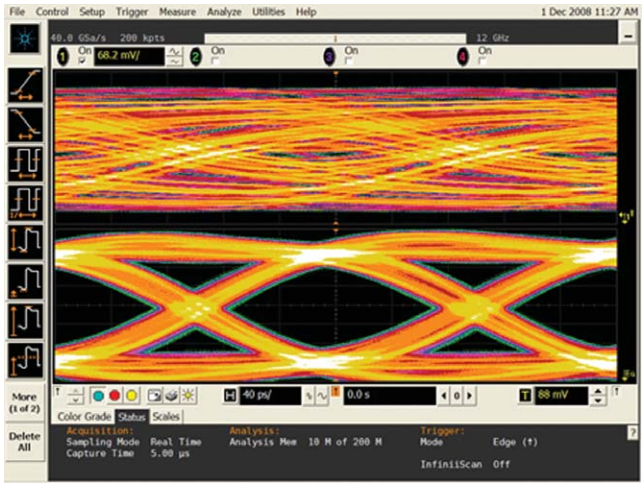

**Model channel effects including reflection.**

## 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**




**Reduce receiver errors by opening tightly shut eyes.**

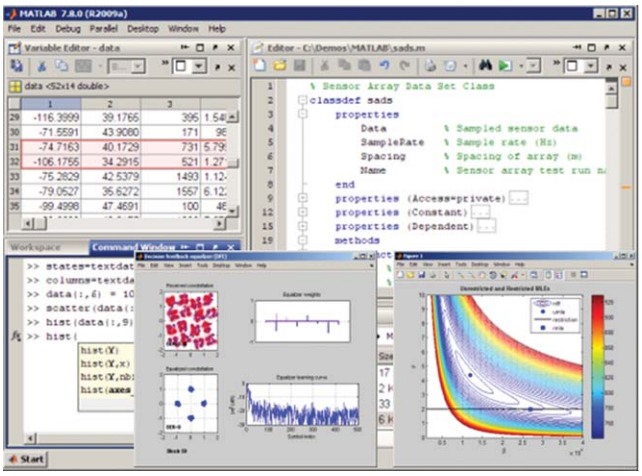
## Infiniium serial data equalization (N5461A or Option 012 on new scope purchases)

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**

# Engineered for 33 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 in 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**

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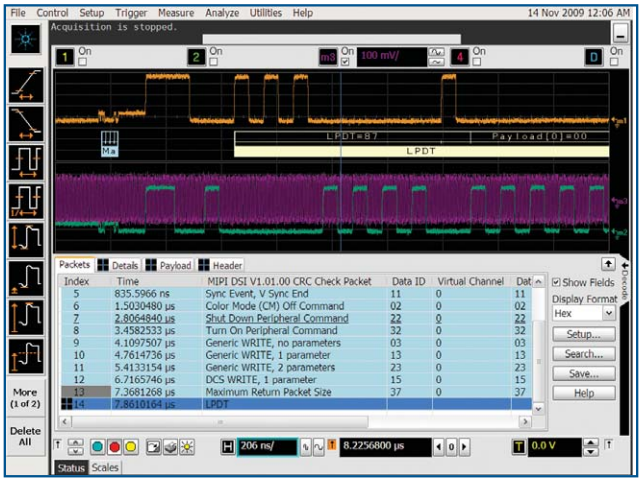


**Trigger and view on-screen serial decode of MIPI traffic**

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

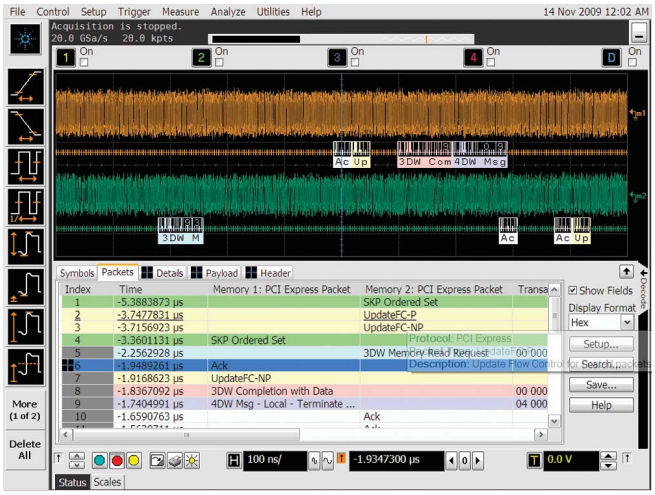
This application eliminates the need to manually decode bus traffic. Using data captured on the scope, the application lets you easily view the information sent over MIPI serial buses.

The application also enables software based protocol triggering.

For more information: **www.agilent.com/find/N8802A**

# Engineered for 33 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**

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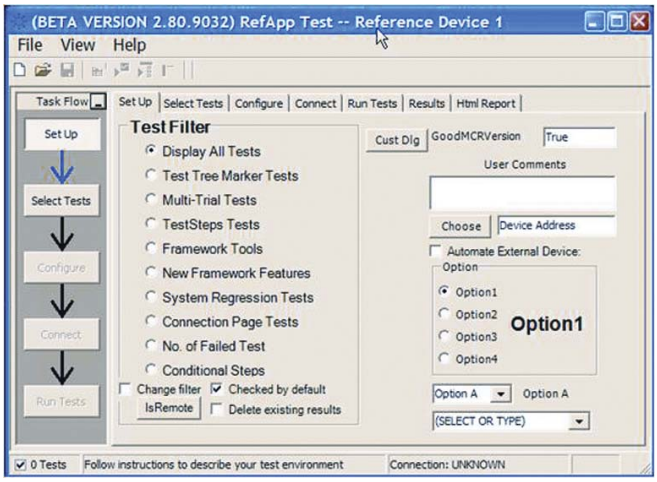



**Control your compliance applications remotely.**

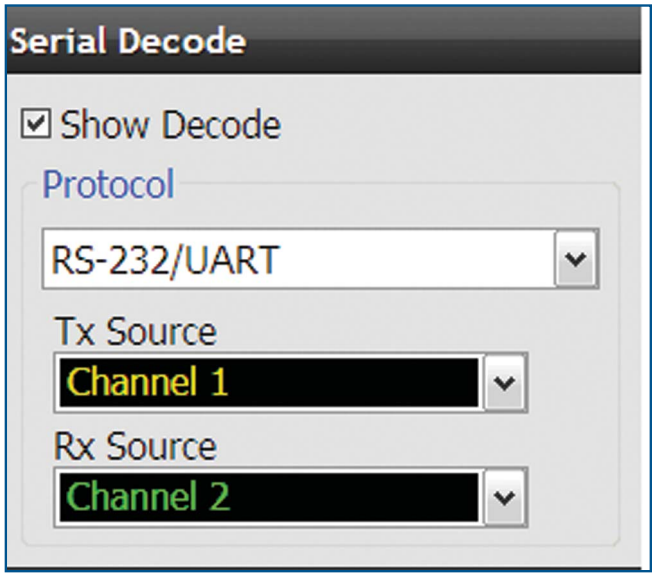
### Remote programming interface (N5452A or Option 011 on new scope purchases)

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

For more information: **www.agilent.com/find/RPI**

# Engineered for 33 GHz true analog bandwidth that delivers:

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



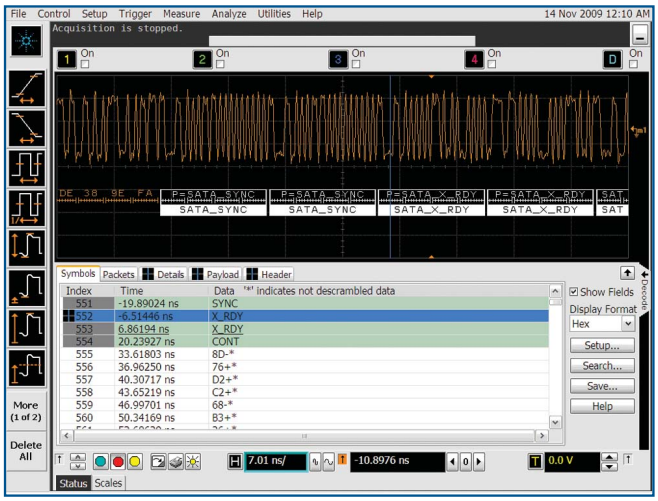

**Trigger on and decode RS-232/UART transmission**

**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**




**Trigger on and decode SAS/SATA serial packets.**

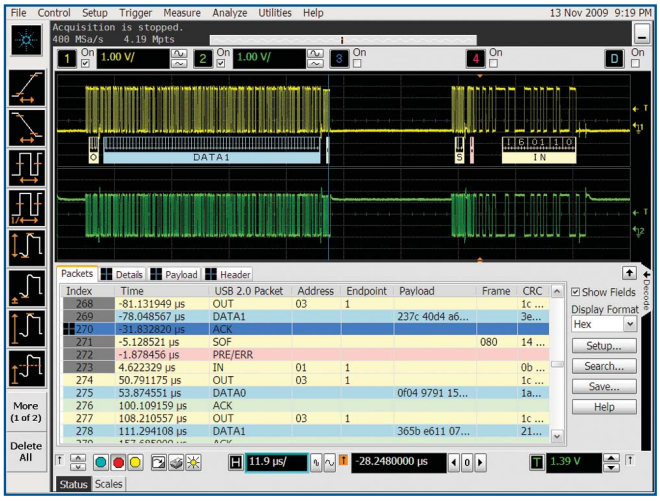
**SATA/SAS triggering and decode (N8801A or option 018 on new scope purchases)**

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**

# Engineered for 33 GHz true analog bandwidth that delivers:

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

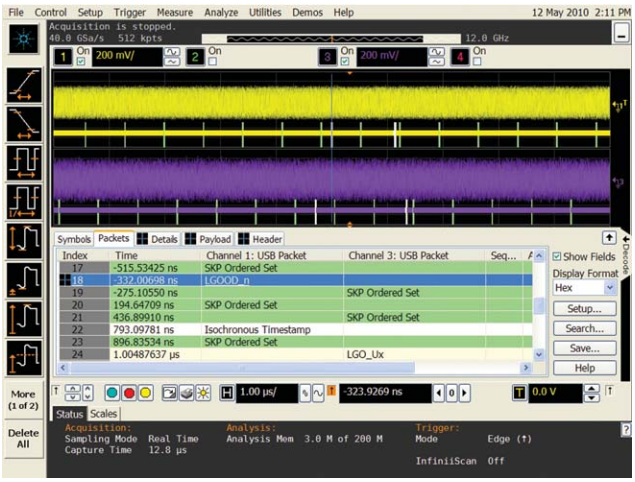


**Trigger on and decode USB packets.**

### 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**



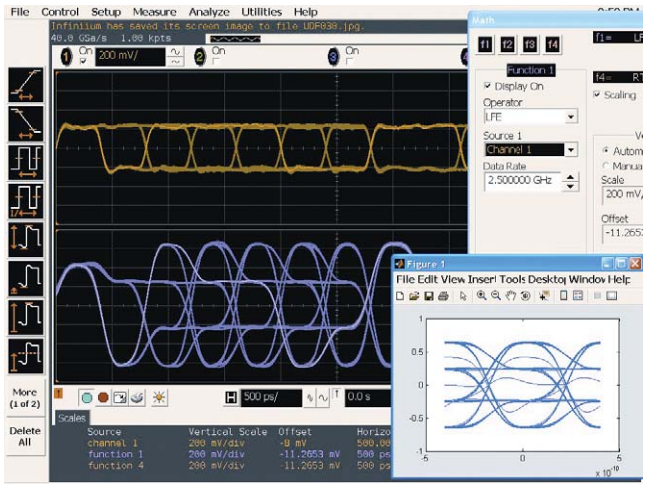
**Isolate signal integrity problems from logic-level coding errors on bidi-rectional serial data streams.**

### 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**



**Signal equalization using user-defined function.**

### 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 Infiniium 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**

# Engineered for 33 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**

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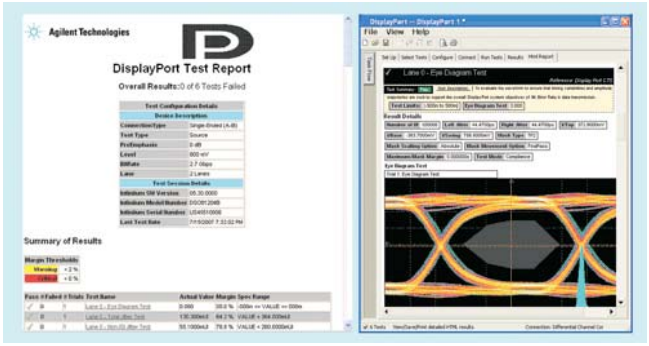



**Full suite of DisplayPort source tests.**

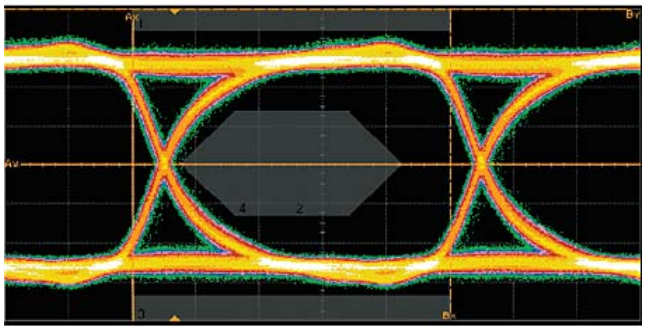
**DisplayPort compliance test software (U7232A or Option 028 on new scope purchases)**

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**

# Engineered for 33 GHz true analog bandwidth that delivers:

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

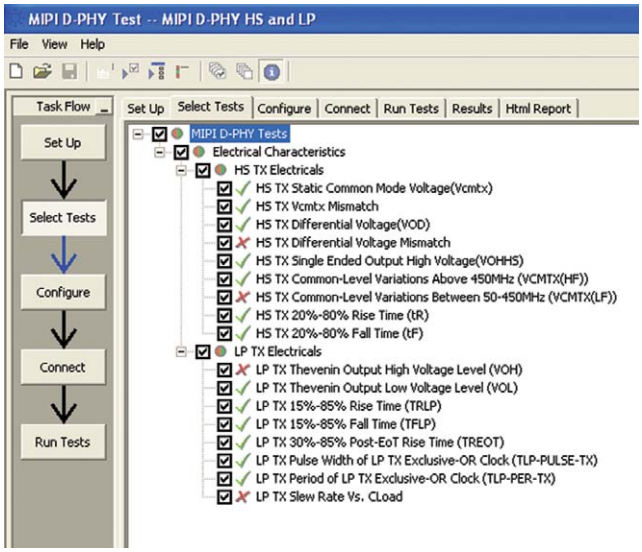


**Verify and debug your HDMI designs.**

**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**




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

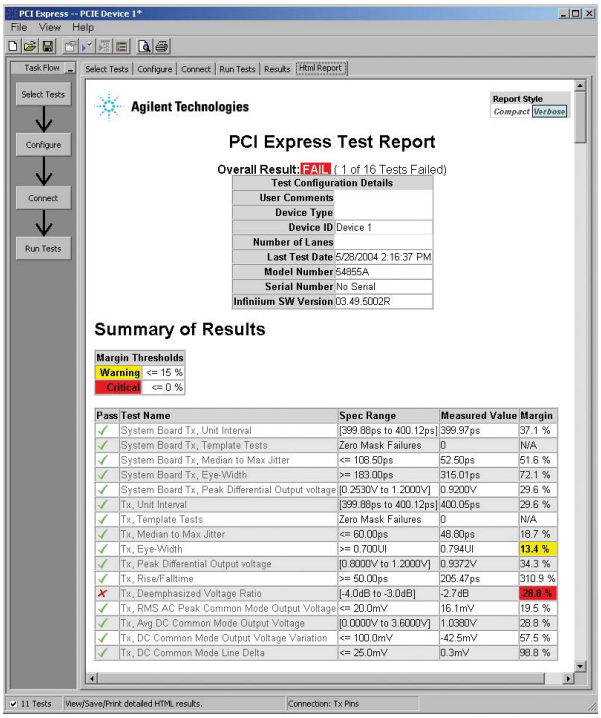
**MIPI D-PHY Compliance test software (U7238A or Option 035 on new scope purchases)**

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-phy_compliance**

# Engineered for 33 GHz true analog bandwidth that delivers:

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

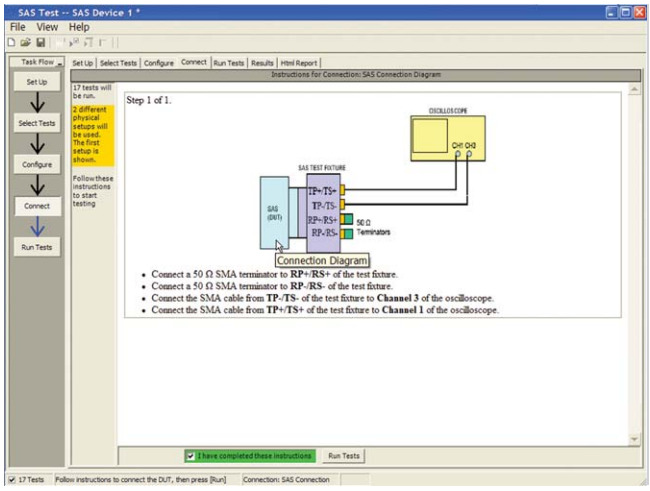



**Quickly verify and debug your PCI Express® designs**

### 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**




**Quickly validate and debug your SAS designs**

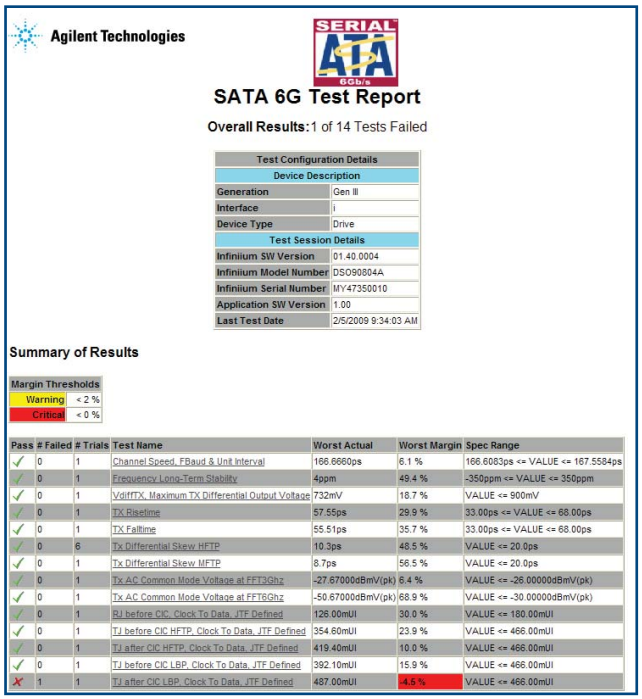
### Serial attached SCSI (SAS) electrical performance validation and compliance software (N5412A or Option 027 on new scope purchases)

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**

# Engineered for 33 GHz true analog bandwidth that delivers:

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



Agilent Technologies

SATA 6G Test Report

**Overall Results:** 1 of 14 Tests Failed

| Test Configuration Details | |
|---|---|
| **Device Description** | |
| Generation | Gen III |
| Interface | i |
| Device Type | Drive |
| **Test Session Details** | |
| Infiniium SW Version | 01.40.0004 |
| Infiniium Model Number | DSO90804A |
| Infiniium Serial Number | MY47350010 |
| Application SW Version | 1.00 |
| Last Test Date | 2/5/2009 9:34:03 AM |

**Summary of Results**

| Margin Thresholds | |
|---|---|
| Warning | < 2 % |
| Critical | < 0 % |

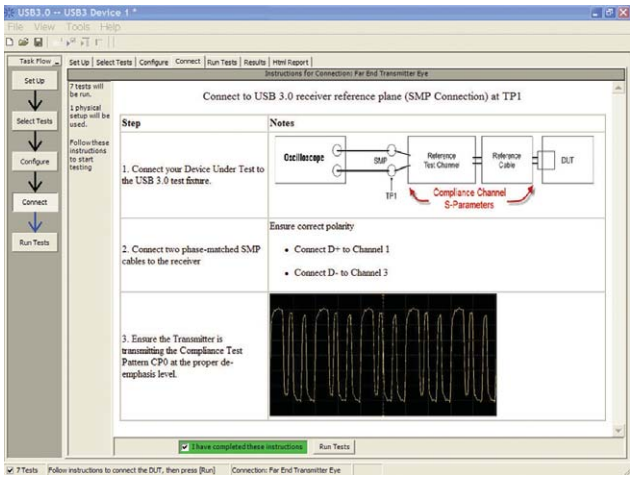
| Pass | # Failed | # Trials | Test Name | Worst Actual | Worst Margin | Spec Range |
|---|---|---|---|---|---|---|
| ✓ | 0 | 1 | Channel Speed, FBaud & Unit Interval | 166.6660ps | 6.1 % | 166.6083ps <= VALUE <= 167.5584ps |
| ✓ | 0 | 1 | Frequency Long-Term Stability | 4ppm | 49.4 % | -350ppm <= VALUE <= 350ppm |
| ✓ | 0 | 1 | VdiffTX, 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 | -27.67000dBmV(pk) | 6.4 % | VALUE <= -26.00000dBmV(pk) |
| ✓ | 0 | 1 | Tx AC Common Mode Voltage at FFT6Ghz | -50.67000dBmV(pk) | 68.9 % | VALUE <= -30.00000dBmV(pk) |
| ✓ | 0 | 1 | RJ before CIC, Clock To Data, JTF Defined | 126.00mUI | 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 | 4.5 % | 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**




**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**

# Engineered for 33 GHz true analog bandwidth that delivers:

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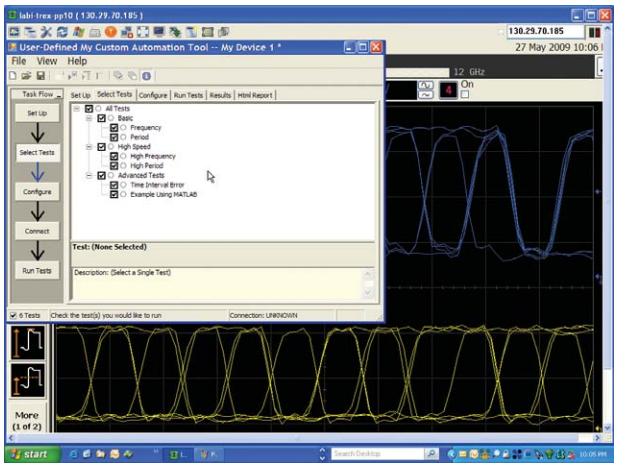
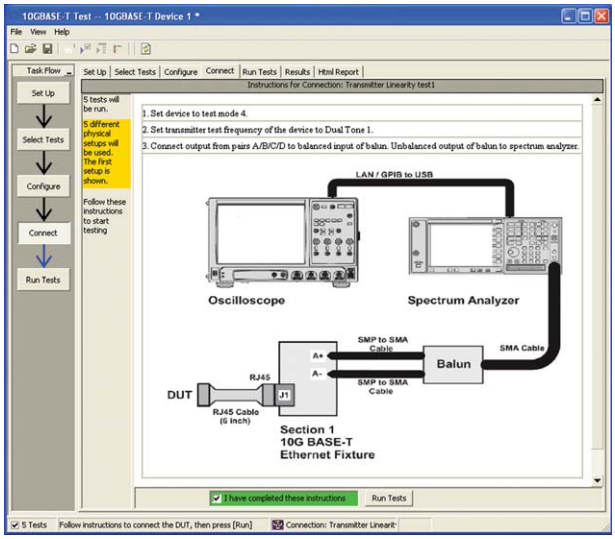



**Quickly automate oscilloscope measurements.**

**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**




**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**

# Agilent Infiniium Portfolio

Agilent's Infiniium lineup includes bandwidths from 600 MHz to 33 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 33 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"<br>33cm x 43cm x 23cm | 11.1" x 17" x 19.9"<br>28cm x 43cm x 51cm | 10.5"x16.75"x18.7"<br>27cm x 43cm x 48cm |
| **Precision Probe** | NO | YES to 13 GHz | YES to 35 GHz |
| **De-embedding** | YES | YES | YES |
| **Data sheet** | 5990-3746EN | 5989-7819EN | 5990-5271EN |

# Engineered for 33 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 | 33 GHz Signal Analyzer* |
| DSOX93204A | 33 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+, and Serial Data Analyisis 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 | DSOX90000-808 | N5443A |
| Rack mount kit option | DSOX90000-1CM | N5470A |
| Removable hard drive with Windows XP | | N5474B |
| Removable hard drive with Windows 7 | DSOX90000-801 | N5474C |

# Engineered for 33 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 cable | N2812A |

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 |
|---|---|---|
| PrecisionProbe software | DSOX90000-001 | N2809A-001 |
| 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 |
| $I^2C$/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 33 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 | N5412A |
| SATA 6Gb/s Compliance | DSOX90000A-038 | N5411B |
| USB 3.0 Compliance Software | DSOX90000A-041 | U7243A |
| User Defined Application | DSOX90000A-040 | N5467A |
| Xaui compliance application | | N5431A |
| 10GBASE-T Ethernet Automated Test Application | DSOX90000A-036 | U7236A |
| SAS-2 Compliance test software | DSOX90000A-043 | N5412B |
| PCI Express Compliance test software for PCIe 1.0/2.0/3.0 | DSOX90000A-004 | N5393C |

**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 33 GHz Bandwidth upgrade |

| Memory upgrades | |
|---|---|
| N2810A-050 | Upgrade 20 Mpts/ch to 50 Mpts/ch memory |
| N2810A-100 | Upgrade 50 Mpts/ch to 100 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 |

| Operating systems upgrades | |
|---|---|
| N2753A | Windows 7 for Infiniium 90000 X-Series |

# Infiniium DSO-X 90000A Series Oscilloscopes

## Performance characteristics

**Vertical**

| | | | | | |
|---|---|---|---|---|---|
| Input channels | Four | | | | |
| Analog bandwidth (–3 dB)*, | **91604A** | **92004A** | **92504A** | **92804A** | **93204A** |
| 2 channel | 16 GHz | 20 GHz | 25 GHz | 28 GHz | 33 Ghz |
| 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 | **91604A** | **92004A** | **92504A** | **92804A** | **93204A** |
| 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[3] | 50 Ω, ± 3% | | | | |
| Sensitivity[2] | 1 mV/div to 1 V/div | | | | |
| Full scale hardware sensitivity | 60 mV to 8 V | | | | |
| Input coupling | DC | | | | |
| Vertical resolution[1] | 8 bits, ≥ 12 bits with averaging | | | | |
| Channel to channel isolation (any two channels with equal V/div settings) | DC to 16 GHz: 40 dB<br>16 GHz to BW: 35 dB | | | | |
| DC gain accuracy* | ± 2% of full scale at full resolution channel scale (± 2.5% for 5mV/div) | | | | |
| Maximum input voltage | ± 5 V | | | | |

| Offset range | **Vertical sensitivity** | **Available offset** |
|---|---|---|
| | 0 mV/div to ≥ 49 mV/div | ± 0.4 V |
| | > 50 mV/div to ≥ 100 mV/div | ± 0.7 V |
| | > 100 mV/div to ≥ 199 mV/div | ± 1.2 V |
| | > 200 mV/div to ≥ 499 mV/div | ± 2.2 V |
| | > 500 mV/div | ± 2.4 V |

| | | | | | |
|---|---|---|---|---|---|
| Offset accuracy* | ≤ 3.5 V: ± (2% of channel offset + 1% of full scale + 1 mV)<br>> 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)]<br>Single cursor: ± [(DC gain accuracy) + (offset accuracy) + (resolution/2)] | | | | |
| RMS noise floor (scope only) | | | | | |
| **Volts/div (mVrms)** | **91604A** | **92004A** | **92504A** | **92804A** | **93204A** |
| 10 mV | 0.35 | 0.43 | 0.50 | 0.53 | 0.60 |
| 50 mV | 1.34 | 1.53 | 1.76 | 1.86 | 2.10 |
| 100 mV | 2.63 | 3.02 | 3.39 | 3.62 | 3.98 |
| 1 V | 26.65 | 30.05 | 34.15 | 36.57 | 39.92 |

| | 16 GHz | 20 GHz | 25 GHz | 28 GHz | 33 GHz |
|---|---|---|---|---|---|
| %FS Noise @ 50mV/div | 0.335% | 0.383% | 0.440% | 0.465% | 0.525% |

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

1. Vertical resolution for 8 bits = 0.4% of full scale, for 12 bits = 0.024% of full scal
2. Full scale is defined as 8 vertical divisions. Magnification is used below 7.5 mV/div. Below 7.5 mV/div, full-scale is defined as 60 mV/div. The major scale settings are 5mV, 10mV, 20mV, 50mV, 100mV, 200mV, 500mV, and 1V.
3. Input impedance is valid when V/div scaling is adjusted to show all waveform vertical values within scope display.

# 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* | ± [0.1 ppm (immediately after calibration) ± 0.1 ppm/year (aging)] |
| Delta-time measurement accuracy<br>Absolute, averaging disabled | $5 \cdot \sqrt{\left(\frac{Noise}{SlewRate}\right)^2 + SampleClock\ Jitter^2} + \frac{TimeScaleAccy \cdot Reading}{2}$ sec rms |
| Absolute, >- 256 averages | $0.35 \cdot \sqrt{\left(\frac{Noise}{SlewRate}\right)^2 + SampleClock\ Jitter^2} + \frac{TimeScaleAccy \cdot Reading}{2}$ 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:

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

Periodic Jitter:

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

Cycle-Cycle:

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

Maxium 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<br>Number of segments (Up to 524,288 with option 02G)<br>Maximum time between triggers is 562,950 seconds<br>Re-arm time: 4.5µs<br>Maximum memory depth: Up to 4 Gpts in 1/2 channel mode with option 02G |
| Filters<br>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: 22 GHz<br>Internal high<br>Auxiliary: 36 GHz |
| Edge Trigger Bandwidth | >20 GHz |
| Minimum Pulse Width Trigger | |
| Hardware | 250 ps |
| Software (InfiniiScan) | 40 ps |
| Level Range<br>Internal<br>Auxillary | <br>± 4 div from center screen or ± 4 Volts, whichvever is smallest<br>± 5 V, also limit input signal to ± 5V |
| Sweep Modes | Single, segmented, and continuous. |
| Display jitter<br>(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)<br>> 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 |
| Voltage | |
| Time | Rise time, fall time, positive width, negative width, burst width, Tmin, Tmax, burst period, Tvolt, + pulse count, - pulse count, burst and burst interval |
| 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 ± 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

| | |
|---|---|
| Measurement modes | |
| Automatic measurements | Measure menu access to all measurements, up to ten measurements can be displayed simultaneously |
| Multipurpose | Front-panel button activates up to ten pre-selected or up to ten 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 |

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

### 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)<br>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. |
| 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)), hierarchal data file (*.hf5 (2 Gpts)) |
| Images | BMP, PNG, TIFF, GIF or JPEG |

| | |
|---|---|
| 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 +65 °C |
| Humidity | Operating: up to 95% relative humidity (non-condensing) at +40 °C; Non-operating: up to 90% relative humidity at +65 °C |
| Altitude | Operating: up to 4,000 meters (12,000 feet); Non-operating: up to 15,300 meters (50,000 feet) |
| 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”x16.75”x18.7” (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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**Americas**

| | |
|---|---|
| Canada | (877) 894 4414 |
| Brazil | (11) 4197 3500 |
| Mexico | 01800 5064 800 |
| United States | (800) 829 4444 |

**Asia Pacific**

| | |
|---|---|
| Australia | 1 800 629 485 |
| China | 800 810 0189 |
| Hong Kong | 800 938 693 |
| India | 1 800 112 929 |
| Japan | 0120 (421) 345 |
| Korea | 080 769 0800 |
| Malaysia | 1 800 888 848 |
| Singapore | 1 800 375 8100 |
| Taiwan | 0800 047 866 |
| Other AP Countries | (65) 375 8100 |

**Europe & Middle East**

| | |
|---|---|
| Belgium | 32 (0) 2 404 93 40 |
| Denmark | 45 70 13 15 15 |
| Finland | 358 (0) 10 855 2100 |
| France | 0825 010 700* |
| | *0.125 €/minute |
| Germany | 49 (0) 7031 464 6333 |
| Ireland | 1890 924 204 |
| Israel | 972-3-9288-504/544 |
| Italy | 39 02 92 60 8484 |
| Netherlands | 31 (0) 20 547 2111 |
| Spain | 34 (91) 631 3300 |
| Sweden | 0200-88 22 55 |
| United Kingdom | 44 (0) 131 452 0200 |

*For other unlisted countries:*
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Revised: June 8, 2011

Product specifications and descriptions in this document subject to change without notice.


Published in USA, September 20, 2011
5990-5271EN

Agilent Technologies