

# Infiniium UXR-Series Oscilloscopes



The Keysight **Infiniium UXR-Series oscilloscopes** deliver world-leading performance, ultra-low noise, and high signal fidelity for you to truly see and understand the fastest phenomena – enabling you to develop the next generation of technology and research more quickly.

## More Accurate Analysis

Up to four channels of simultaneous 110 GHz of bandwidth, each channel is concurrently sampling at a rate of 256 GSa/s with 10 bits of high-definition Analog to Digital Converter (ADC) resolution.

## Runs Faster

The UXR-Series is up to 100x faster, enabled by a powerful new measurement acceleration application specific integrated circuit (ASIC) chip and memory controller capable of five trillion integer operations per second (IOPS).

## Fully Upgradeable

The Infiniium UXR-Series is scalable — you can easily upgrade the bandwidth, memory, channel count, and software capabilities to meet your future needs.

## Best Signal Integrity

The Infiniium UXR-Series oscilloscopes help you see what's really happening in your design with the industry's lowest noise and jitter measurement floor. This functionality means less scope noise in your measurements and a truer depiction of your signal.

- Lowest noise
  - <860  $\mu\text{V}$  RMS at 110 GHz
  - <500  $\mu\text{V}$  RMS at 70 GHz
  - <266  $\mu\text{V}$  RMS at 33 GHz
- Lowest intrinsic jitter
  - 25  $\text{fs}_{\text{RMS}}$
- Lowest interchannel jitter
  - 10  $\text{fs}_{\text{RMS}}$
- Highest effective number of bits (ENOB)
  - 5.0 bits at 110 GHz
  - 5.4 bits at 70 GHz
  - 5.9 bits at 33 GHz
- Best error vector magnitude (EVM)
  - 1.22% for 802.11ay at 61.5 GHz



The UXR-Series oscilloscope can analyze signals up to 110 GHz

The UXR is available in three models based on bandwidth and input connector size. The 3.5mm models are equipped with Keysight AutoProbe II interfaces while 1mm and 1.85 mm models incorporate an advanced high-performance high-bandwidth Keysight AutoProbe III interface.

	1 mm input	1.85 mm input	3.5 mm input
At maximum bandwidth			
Bandwidth	5 to 110 GHz	40 to 70 GHz	10 to 33 GHz
Frequency analysis range	DC to 110 GHz	DC to 70 GHz	DC to 33 GHz
Sample rate	256 GSa/s per channel	256 GSa/s per channel	128 GSa/s per channel
High-definition analog-to-digital converter (ADC)	10-bit ADC	10-bit ADC	10-bit ADC
Deep memory	Up to 2 Gpts per channel	Up to 2 Gpts per channel	Up to 2 Gpts per channel
Noise (highest sensitivity)	< 0.9 mV (RMS)	< 0.5 mV (RMS)	< 0.3 mV (RMS)
Intrinsic jitter	25 fs (RMS)	25 fs (RMS)	25 fs (RMS)
Interchannel jitter*	10 fs (RMS)	10 fs (RMS)	10 fs (RMS)
Effective number of bits (ENOB)	> 5.0 bits (110 GHz) > 8.1 bits (5 GHz)	> 5.4 bits (70 GHz) > 5.8 bits (40 GHz)	> 5.9 bits (33 GHz) > 7.0 bits (10 GHz)
Vertical sensitivity (hardware)	60 mV to 4 V Full scale	60 mV to 4 V full scale	40 mV to 8 V full scale
Vertical sensitivity (using zoom feature)	1 mV / div to 500 mV / div	1 mV / div to 500 mV / div	1 mV / div to 1 V / div

\* Interchannel jitter is additive to intrinsic jitter for multichannel measurements

## Runs Faster

Get your job done faster with hardware-accelerated measurements.

A robust measurement acceleration ASIC and memory controller capable of five trillion integer operations per second (IOPS) powers the UXR-Series. Figure 1 shows that you can reliably and quickly capture even the most elusive glitches with the fast plot feature. With the UXR-Series hardware-accelerated measurements, you can get:

- up to 100x faster waveform throughput
- up to 50x faster averaging
- up to 20x faster to plot an eight million unit interval (MUI) non-return to zero (NRZ) eye
- up to 20x faster insight for equalization techniques: decision feedback equalization (DFE), feed-forward equalization (FFE), and continuous time linear equalization (CTLE)



Figure 1. Fast plot, a hardware acceleration option, captured an elusive glitch on the UXR in just five seconds

## Advanced Usability

- See your signal clearly with a large 15.4-inch capacitive touch screen display
- Display up to 20 measurements simultaneously
- Customize your oscilloscope with the multipurpose button: perform a favorite measurement, execute a script, save waveforms, load a setup, and more
- Quickly and easily perform precise measurements with dedicated front panel marker control knobs and activation button



Get more functions, more charts, more grids, more on-screen marker measurements, and more controls with the UXR-Series oscilloscope

## No Frequency Interleaving

High-performance Infiniium UXR-Series oscilloscope models incorporate revolutionary Keysight indium phosphide ASICs and technologies, enabling them to acquire, amplify, and sample incoming high-bandwidth analog signals without requiring legacy, signal-degrading frequency interleaving techniques to achieve the necessary bandwidth. The UXR-Series' proven time-interleaving sampling methods enable the UXR-Series to provide the lowest noise and highest signal integrity possible today. The UXR-Series does not use frequency interleaving techniques on any of its models.

## Extend Your Frequency Analysis Range

The UXR has frequency extension options to enable you that dynamically allocate bandwidth windows (up to 30 GHz wide) for analysis of frequency ranges up to the max bandwidth of the hardware model (regardless of the oscilloscopes maximum licensed native bandwidth). The UXR comes factory-calibrated up to the max bandwidth no matter what native bandwidth you purchase, so you can immediately activate the frequency extension option with a license key.

## Fully Upgradeable

Buy with confidence, knowing your future is protected since each model is scalable:

- Upgrade up to 110 GHz bandwidth
- Get up to 4 full-bandwidth channels
- Manage your capital investment budget knowing upgrades are available when you need them

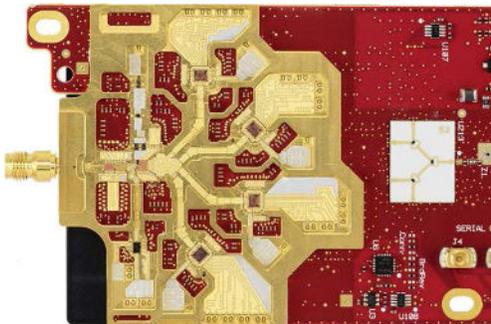


Figure 2. A single channel 110 GHz multichip module enables time-interleaving sampling instead of frequency interleaving on the UXR 1 mm and 1.85 mm models

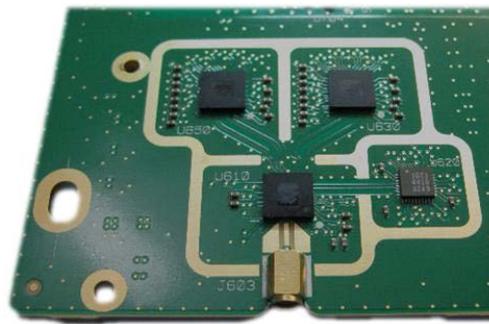


Figure 3. On the UXR-Series models with 3.5 mm input connectors, a dual-channel 33 GHz multichip module enables time-interleaving sampling

## Advanced and Flexible Probing System

The UXR-Series is compatible with Keysight's InfiniiMax probing system with probe amplifiers and tips ranging from 1.5 GHz to 30 GHz of low noise bandwidth (Figure 4). They are the most accurate and easiest to use probes in the market for measuring differential and single-ended signals in all high-speed digital designs. The Infiniium UXR-Series oscilloscopes are also compatible with optical-to-electrical converters and high-sensitivity photo-detector modules designed for direct optical-to-electrical conversion of telecom or datacom signals (Figure 5).



Figure 4. The intuitive InfiniiMax probing system connects with UXR-Series oscilloscopes to give you accurate measurements



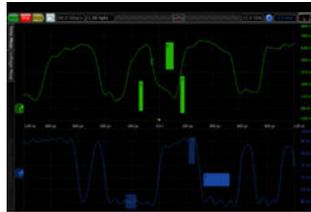
Figure 5. The N7005A and N7004A optical-to-electrical converters are an ideal solution for characterizing or troubleshooting high-speed optical signals

The Infiniium UXR-Series oscilloscopes feature application-specific software that opens up maximum insight into your design. Whether you are solving tough jitter or noise problems, removing loss due to cables or probes, or simply examining protocols, the UXR-Series has the most comprehensive application-specific software tools to help you realize your best design.



### **EZJIT Complete (D9020JITA)**

Gain insight into the causes of signal jitter to ensure high reliability of your design



### **Serial Data Equalization (D9020ASIA)**

Significantly reduce receiver errors by opening closed eyes through equalization emulation



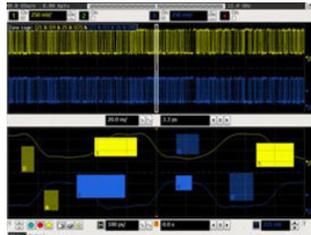
### **Compliance and Protocol (various)**

Automate compliance and protocol tests for all the latest standards



### **Phase Noise Analysis (D9020JITA)**

Easily measure the rapid, random fluctuations in the phase or frequency of your signal



### **InfiniiScan (D9020SCNA)**

Quickly and easily identify waveform anomalies or trigger on any event



### **Vector Signal Analysis (89600 VSA)**

Analyze and demodulate even the most advanced digital modulations



### **PrecisionProbe (D9010DMBA)**

Quickly characterize and compensate any input into your scope



### **InfiniiSim (D9020ASIA)**

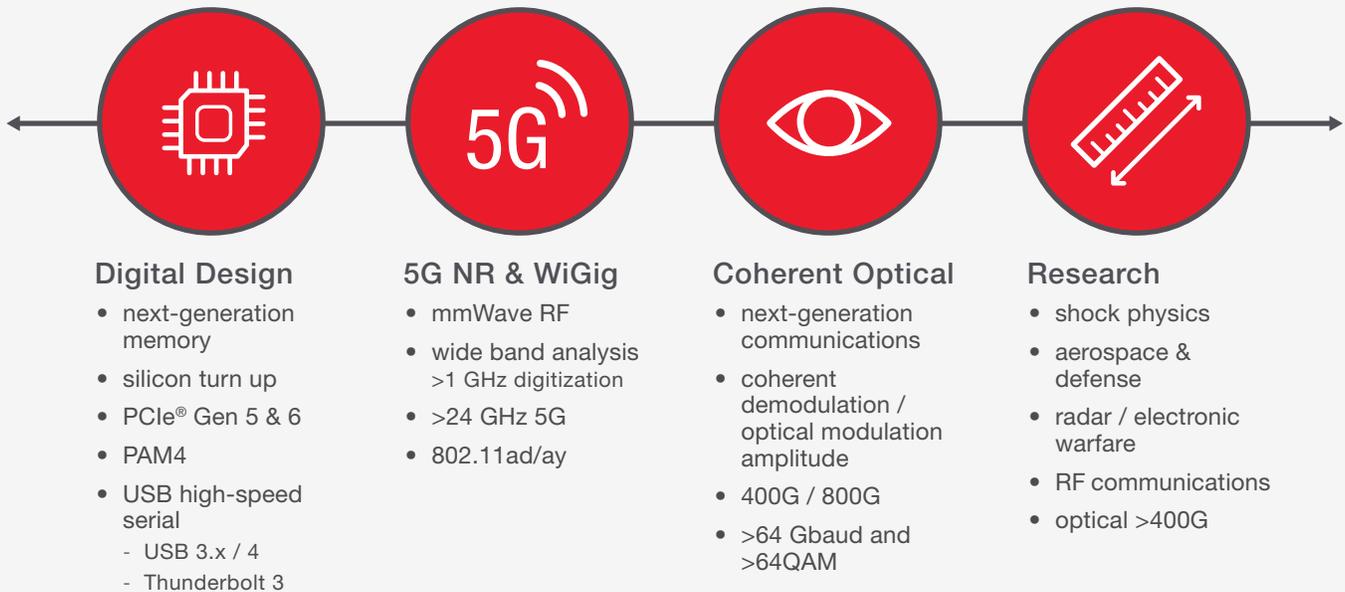
Render any waveform in a digital serial data link with waveform transformation software



### **Infiniium Offline (D9010BSEO)**

View and analyze signals anywhere your PC goes without being connected to your scope

The UXR-Series oscilloscopes have the signal integrity necessary to drive next-generation designs across many markets. Leaders in digital design, 5G, coherent optical, and research are turning to the unique capabilities of the UXR-Series to deliver breakthrough applications.



PCI-SIG®, PCIe® and the PCI Express® are US registered trademarks and/or service marks of PCI-SIG.

## See the Truest Depiction of Your Digital Signal

The UXR-Series helps you see what's really happening in your design by featuring the industry's lowest noise and jitter measurement floor, which means less scope noise in your measurements and a truer depiction of your signal (Figure 6). The UXR-Series is ideally suited for the faster speeds required in next-generation technologies including:

- PAM4
- PCIe Generation 5 and 6
- USB 4
- Thunderbolt 3
- HDMI 2.1
- DisplayPort 2.0
- DDR 5 and 6

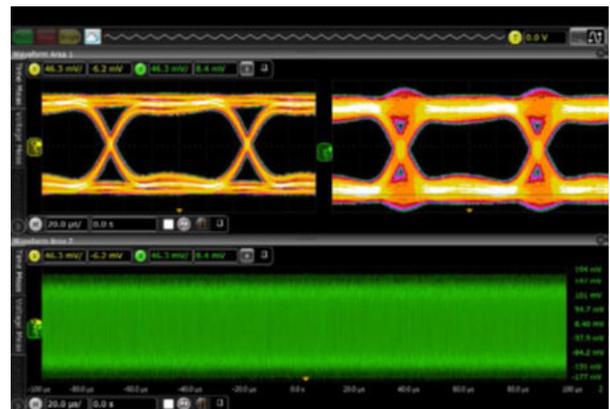


Figure 6. Capture, display, and measure multiple real-time eyes simultaneously with the UXR

## Advanced Capabilities for Millimeter Wave Applications

The Infiniium UXR-Series is the first real-time oscilloscope to provide flexible bandwidth allocation options, hardware-accelerated acquisition, and the signal integrity necessary to enable affordable wideband multichannel millimeter wave (mmWave) signal analysis. Available mmWave wideband analysis acceleration and frequency extension options, coupled with 1 mm input UXR-Series models, enable you to dynamically allocate up to 30 GHz wide frequency analysis bandwidth windows from DC to 110 GHz, regardless of the oscilloscope's maximum licensed native time-based bandwidth. The placement of windows at unique center frequencies on different input channels enables easy RF versus IF analysis.



The UXR with the 89600 VSA Software can easily perform a 5G NR measurement

## Automatic RF, Radar, and Satellite Communications Analysis

Infiniium UXR-Series oscilloscopes include a fast Fourier transform (FFT) for frequency domain (spectrum) analysis. The integrated FFT offers an alternative to a dedicated spectrum analyzer. Use the FFT to compute both magnitude and phase and take advantage of several useful features to assist in spectral analysis (Figure 7). The FFT can control span and resolution bandwidth. Automatic measurements and markers measure spectral peak frequencies and magnitudes as well as deltas between peaks. Use the amplitude demodulation (envelope mode) to measure rise and fall times on the entire envelope.



Figure 7. The UXR FFT quickly identifies peaks and has key controls such as span, start and stop, which make the oscilloscope behave more like a spectrum analyzer

## Maximize Your Margins with Network Analyzer Capabilities

As bandwidths continue to increase and cable loss becomes more and more challenging, the UXR-Series oscilloscopes offer **Keysight's PrecisionProbe advanced technology**. You no longer need to ignore cable loss because you are short on time or budget. Using PrecisionProbe, you can characterize cables as fast as 110 GHz and remove the loss they create. Figure 8 is an example of PrecisionProbe using the calibration module that gives you one of the fastest edges at less than 4 ps and uses this edge to perform a time-domain transmission (TDT) on your cable. Based on the loss of your cable, PrecisionProbe then compensates your measurement system, gaining back valuable margin typically lost in cables.

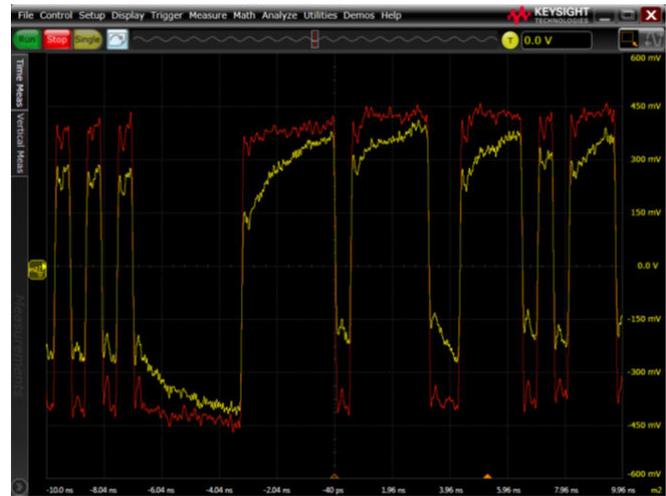


Figure 8. By analyzing cables, you can increase your margins by removing insertion loss caused by the cables

## The Optical Modulation Analyzer

The Keysight **N4391B optical modulation analyzer** with the UXR-Series is the best-suited optical modulation analyzer to support your application requirements. The solution combines industry-leading low-noise performance and highest bandwidth with a proven optical front-end architecture.

This compact solution offers the highest real-time bandwidth options and is the most advanced test solution available for research on 400G to terabit and beyond transmission (Figure 9). By providing four channels of up to 110 GHz bandwidth, the UXR-Series saves you the expense of a second instrument to analyze dual polarization. Even for the lower 20 GHz bandwidth range, this easy-to-use solution, with the best EVM and highest ENOB, is a preferred reference system for 100G transmission and beyond.



Figure 9. The integrated UXR and N4391B optical modulation analyzer is a compact, fully calibrated turn-key solution for 400Gb/s to 1.2 Tb/s and beyond

## Multichannel Coherent Electronic Warfare Analyzer

The UXR-Series oscilloscope combined with Keysight's [Pathwave 89600C vector signal analysis software \(VSA\)](#) transforms the instrument into a multichannel, phase-coherent electronic warfare (EW) analyzer for the most demanding EW applications (Figure 10). This solution enables key measurements so you can validate your signals by measuring:

- emitter / antenna scan patterns
- range / velocity (delay / Doppler) displays
- automatic pulse descriptor word (PDW) extraction
- statistical pulse analysis

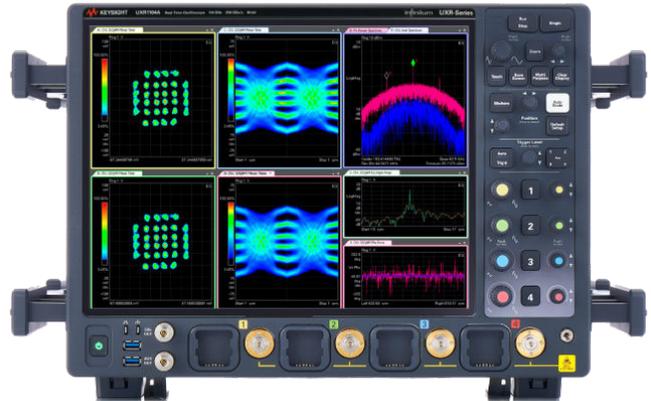


Figure 10. The 89600C VSA software turns the UXR into a coherent EW analyzer for the most demanding EW applications

The Infiniium UXR-Series oscilloscopes set a new standard for real-time oscilloscope accuracy, with models ranging from 5 to 110 GHz. Extreme signal integrity, 10-bits of vertical resolution, and ultra-low noise floor specifications allow for the truest representation of signals. Invest with confidence today, knowing you can meet the needs of technology advancements tomorrow. For more information on the UXR, check out the following:

- [Infiniium UXR-Series Oscilloscopes Data Sheet](#)

