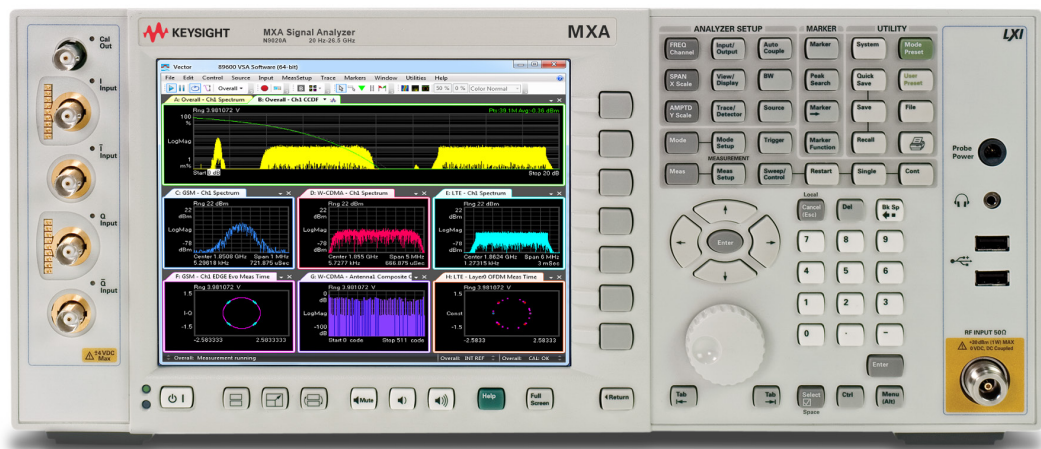# Keysight Technologies

## MXA X-Series Signal Analyzer N9020A

## X-Series Measurement Application

– 10 Hz up to 26.5 GHz frequency range

– Up to 160 MHz analysis bandwidth

– –114 dBc/Hz phase noise at 10 kHz offset

– ± 0.23 dB absolute amplitude accuracy

– +20 dBm TOI, -166 dBm DANL

– Real-time spectrum analysis



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## What is X-Series Signal Analysis?

**Future-ready**
Optimize your investment and extend instrument longevity with upgradeable processor, memory, connectivity, analysis bandwidth, real-time spectrum analyzer, and more to keep your test assets current today and tomorrow.

**Consistent measurement framework**
Achieve measurement integrity across your organization and drive more productivity in less time by leveraging a proven foundation for signal analysis and identical operation across the Keysight Technologies, Inc. X-Series instruments.

**Broadest set of applications**
Address the changing demands of technology with more than 25 measurement applications, the ability to run software inside the open Windows operating system, and a first-to-market track record in emerging standards.

Stay ready, stay in sync, and arrive ahead—with the Keysight X-Series.

www.keysight.com/find/X-Series
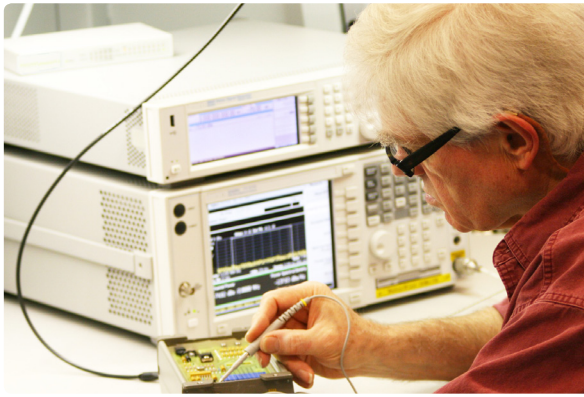
## Summary of Key Specifications

| | |
|---|---|
| Frequency ranges | Minimum: 10 Hz |
| | Maximum: 3.6, 8.4, 13.6, 26.5 GHz |
| Analysis bandwidth | 25 MHz standard; 40, 85, 125 or 160 MHz optional |
| Displayed average noise level (DANL) | –166 dBm at 1 GHz, preamplifier on |
| Third-order intermodulation (TOI) distortion | +20 dBm at 1 GHz |
| W-CDMA ACLR dynamic range | 78 dBc with noise correction on |
| Phase noise | –114 dBc/Hz at 10 kHz offset (1 GHz carrier) |
| Amplitude accuracy | ± 0.23 dB (up to 3.6 GHz) |
| Real-time bandwidth | 85, 125, or 160 MHz |
| Probability of intercept | 100% with signal durations as short as 3.57 µs |

# Accelerate in Wireless
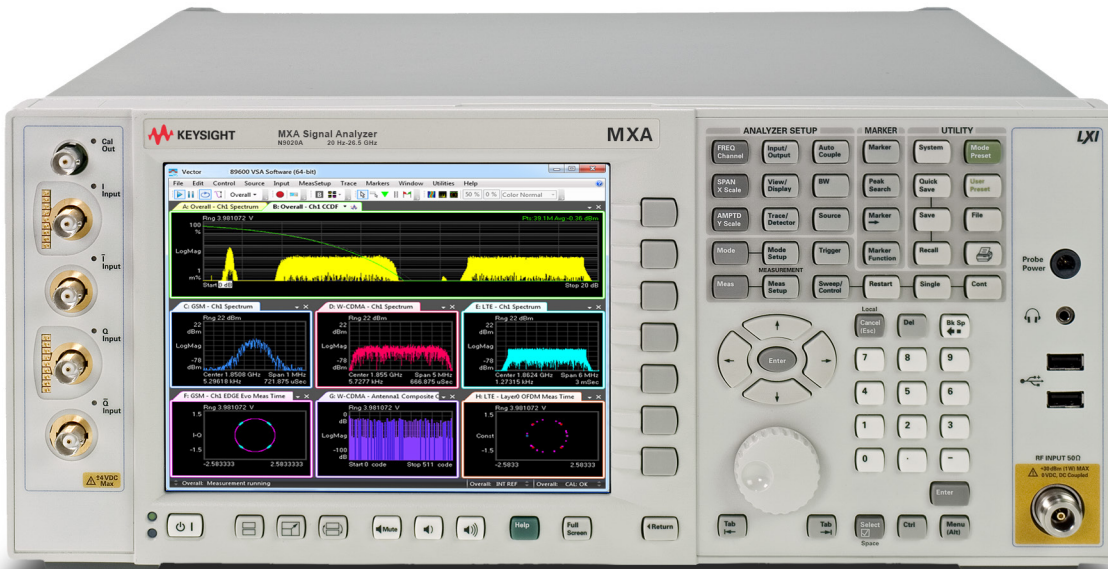


Even as standards evolve and signal environments become more complex, product cycles keep getting shorter. Now more than ever, each project demands tradeoffs and decisions about specs, features, throughput and yield. A highly flexible signal analyzer helps you make solid choices and keep things moving—quickly.

The midrange MXA is the optimum choice in wireless as you develop new devices and deliver them to manufacturing and the marketplace. It has the flexibility to quickly adapt to your evolving test requirements—today and tomorrow.

## Speed, performance, and application support

From 10 Hz to 26.5 GHz, the MXA is built for speed: it helps you shorten test times with capabilities such as rapid local measurements, display updates, and marker peak searches. Fast sweep speed optimizes your spurious measurements.

It's also built for performance: you can accurately characterize device performance by measuring small signals in the presence of large ones with up to 116 dB (typical) third-order dynamic range. The best-in-class phase noise (–114 dBc/Hz at 10 kHz offset) enables you to achieve the lowest internal EVM floor for cellular communication standards like LTE. With deep capture memory, you can perform thorough signal characterization by capturing longer I/Q samples from signals-under-test.

The library of available X-Series measurement applications lets you test the latest standards—LTE-Advanced, HSPA+, multi-standard radio (MSR), and wireless LAN—with one-button simplicity and up to 160 MHz analysis bandwidth. If your organization uses the Keysight PXA or EXA signal analyzers in other areas, measurement settings and control programs are compatible across the X-Series family.

All this capability makes it possible to use one instrument to characterize

signals in different subassemblies. For example, you can easily analyze baseband signals with the baseband I/Q (BBIQ) analog inputs[1]. You can also measure RF signals at the front end of the assembly or analog baseband signals at the backend.

## Add real-time spectrum analysis

Adding real-time spectrum analyzer (RTSA) capabilities is an upgradable option for new and existing MXAs (wide bandwidth option required), enabling you to see, capture and understand fleeting signals at very low levels in the increasingly complex communication signal environments.

It eliminates the need for a specialized or dedicated instrument and retains all the functionality of a traditional signal analyzer. Use integrated applications for power measurements and communications standards and, when needed, shift to real-time capabilities in the same unit.

1. MXA analog BBIQ input (Option BBA) is only compatible with 40 MHz BW (Option B40) or below.

# Move Ahead Quickly in Wireless Device Design

Getting your latest designs to market on time starts with deeper insights from better measurements. In the MXA, you can more easily find small signals such as spurious responses with excellent sensitivity (–166 dBm DANL) and an internal preamplifier that covers the analyzer's full frequency range up to 26.5 GHz. Significantly enhanced phase noise performance (–114 dBc/Hz at 10 kHz offset) helps you to test your design with the greatest confidence.

The MXA also helps you analyze signals from virtually any wireless device—quickly and confidently—with up-to-date parametric and RF functional tests. In design verification, the MXA helps shorten test time with 4-ms local measurements and display updates. To take your measurements to the next level, the 89600 VSA software

helps you see through the complexity of leading-edge cellular signals such as LTE-Advanced and wireless connectivity signals such as 802.11ac WLAN, along with the optional wide analysis bandwidth. –50 dB of internal EVM for the 802.11ac signal demodulation with optional 160-MHz analysis bandwidth provides you with performance previously only seen in the highest-performance analyzers in marketplace. To enhance your perspective, the software includes a multi-measurement mode that can simultaneously analyze waveforms from any combination of the 75-plus supported standards and modulation types. To help you find the root problem quickly, the 89600 VSA includes a variety of advanced troubleshooting tools that let you explore signals in the time, frequency, and modulation domains, simultaneously.

## 89600 VSA software

On the leading edge of wireless design, signal interactions can cause the unexpected. Recognizing there is a problem is relatively easy—achieving the clarity to find the root cause is the real challenge.

Keysight 89600 VSA software is your window into what's happening inside complex wireless devices.

www.keysight.com/find/89600_VSA
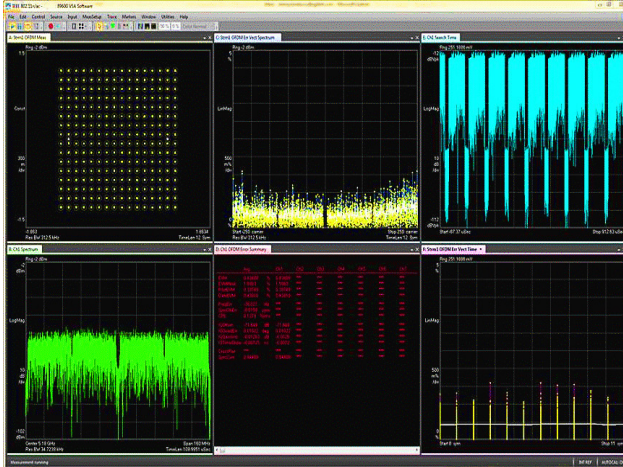


*Exceptionally low EVM measurement results (< 0.4%) from the MXA with 160 MHz analysis bandwidth and 89600 VSA for an 802.11ac signal demodulation*
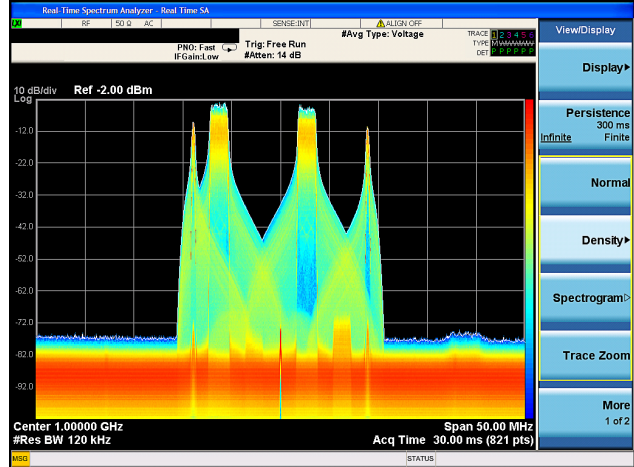


*Real-time display helps reveal more details for the time-varying spectral used in cellular communications such as an LTE-FDD uplink signal.*

## Troubleshooting in wireless communication and connectivity

With a real-time MXA, you can capture and analyze complete transmitter-channel characteristics at gap-free bandwidths of up to 160-MHz within a 26.5-GHz frequency range. In highly integrated multi-mode devices, you can

identify intermittent interoperability issues with the best POI currently available. You can also observe base station function using wideband persistence displays, which help pinpoint problems such as intermittent pre-distortion issues.

The standard frequency mask trigger (FMT) capabilities enable you to

characterize frequency switching, verify overall system operation and find system violations. For deeper analysis, add the 89600 VSA software. To reveal greater detail, you can check PLL settling and identify LO issues by combining FMT, 89600 VSA software and real-time spectrogram displays.

# Speed Base Station Manufacturing

With MXA, you're equipped to increase test throughput and yield while minimizing costs in 4G manufacturing. For example, it provides the fastest, most accurate signal and spectrum measurements available in a midrange analyzer: key specifications include 1.5-ms marker peak searches, 1.5 s sweep rate across 26.5 GHz span with 20 kHz RBW, ± 0.23 dB absolute amplitude accuracy, and –114 dBc/Hz phase noise at 10 kHz offset.

You can make fast, standard-based, one-button measurements with our library of more than 25 X-Series measurement applications. These applications cover a broad range of complex modulated signals: 2G, 3G, and 4G cellular communications; LTE and LTE-Advanced; MSR; and 2G through 5G wireless LAN formats. As an example, one-button measurements are available for testing of 2G, 3G, 4G, and MSR base stations.

To help you stay competitive and maintain market leadership, you can configure the MXA with 25-MHz (standard) and up to 160-MHz (optional) analysis bandwidth capability. Bandwidth options of 40, 85, 125, and 160 MHz let you address evolving and future standards and extend test-stand relevance and optimize balance between your technical requirements and budgetary constraints. At these bandwidths, you can perform CCDF, burst power, I/Q waveform, and EVM measurements.
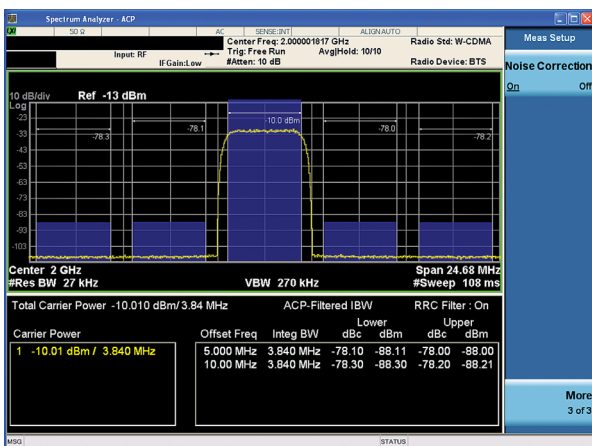
*78 dB W-CDMA ACLR dynamic range*
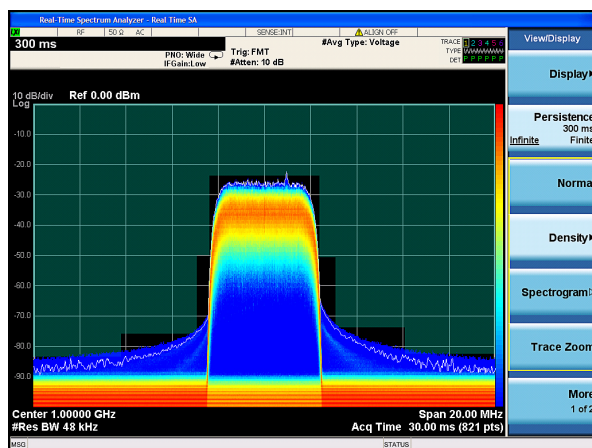


*A density persistence display for a single carrier W-CDMA signal in the real-time spectrum analyzer mode with standard frequency mask trigger (FMT)*

# Verify Standards Conformance

With a shared library of more than 25 measurement applications, the X-Series signal analyzers provide essential measurements for specific tasks in general purpose, cellular communications, wireless connectivity, and digital video applications. An X-Series measurement application transforms the MXA into a transmitter tester compliant with the latest standards, including LTE and MSR. Because the measurement applications closely follow each standard, you'll be equipped to handle your toughest challenges in design and manufacturing.

## Characterizing LTE transmitters

The LTE FDD and TDD measurement applications provide conformance measurements that help you design, evaluate, and manufacture base stations and user-equipment (UE). Automatic detection of downlink channels and signals simplifies the measurement setup process. For eNB conformance testing, measurements are simplified by easy recall of E-TM presets that comply with the 3GPP TS 36.141 conformance document.

For testing beyond the PHY layer, the applications include transport-layer decoding. This helps you troubleshoot problems and verify channel coding by providing access to data throughout the receiver chain.  In manufacturing, a "conformance EVM" measurement provides a speed improvement of as much as twice that of typical EVM measurements.

## Testing MSR transmitters

The MSR measurement application provides fast, one-button RF conformance measurements that enhance the design, evaluation, and manufacturing of base stations and base-station components.

Because MSR base stations must handle single- and multi-radio access technology (RAT) scenarios, the application provides an array of required measurements: ACLR, occupied bandwidth, and transmitter-branch time alignment for single-RAT; and channel power, modulation quality (EVM), frequency error, spurious emissions, and spectrum emissions mask (SEM) for multi-RAT.

For demodulated measurements such as EVM and frequency error, the MSR application uses an automatic sequencing function rather than a single wideband capture of a multi-carrier, multi-RAT signal. This helps reduce equipment costs by eliminating the need for the wide analysis bandwidth option in the MXA.

# MXA Front and Rear Panels
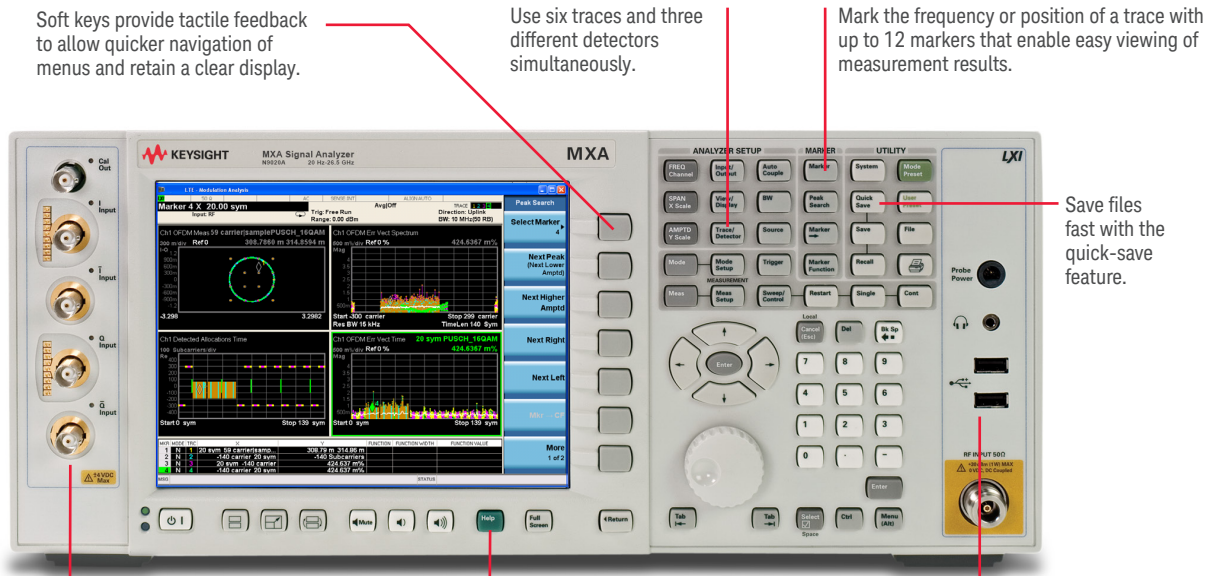
Soft keys provide tactile feedback to allow quicker navigation of menus and retain a clear display.

Use six traces and three different detectors simultaneously.

Mark the frequency or position of a trace with up to 12 markers that enable easy viewing of measurement results.



Save files fast with the quick-save feature.

Ensure the analog baseband signal quality with embedded 16-bit ADC. Keysight Infiniium/ InfiniiMax probes can be used with calibration utility and cal out port. (not compatible with analysis BW beyond 40 MHz)

Get answers quickly with the comprehensive, context-sensitive, help system.

Two USB 2.0 ports are conveniently located on the front of the instrument.

View the display on an external monitor by connecting it to the VGA video output interface.

Port for wideband IF output and programmable IF output.

Acquire IQ waveform data quickly or control the MXA remotely from an external PC over the USB 2.0 (type-B port) interface.

Connect external peripherals and transfer data via the USB 2.0 (type-A port) interface.

Control the MXA remotely over 1000Base-T LAN.

Use the MXA in an aerospace and defense environment with 50/60/ 400 Hz power input.



Upgradable CPU module

Removable solid-state drive for instrument security.
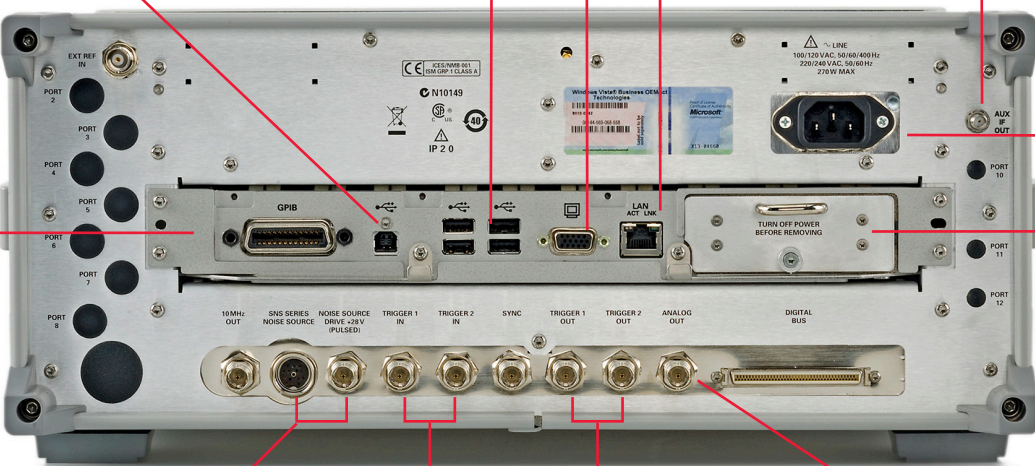
Evaluate noise figure using SNS or 346 Series noise sources and the N9069A measurement application.

Start measurements based on a specific incident using an external trigger input signal.

Synchronize with other test equipment using the external trigger output signals.

Y-axis screen video output via the analog output port.

# Related Literature

## Keysight MXA Signal Generators

| | |
|---|---|
| *Data Sheet* | **5989-4942EN** |
| *Configuration Guide* | **5989-4943EN** |
| *X-Series Measurement Applications Brochure* | **5989-8019EN** |
| *X-Series Signal Analysis Brochure* | **5990-7998EN** |

www.keysight.com/find/mxa

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