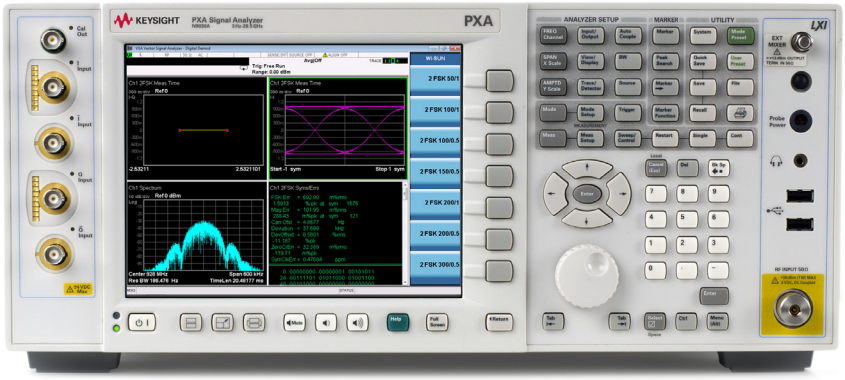
Keysight

VXA Vector Signal Analysis X-Series Measurement Application N9064A and W9064A



Technical Overview

- FFT-based spectrum analysis
- Time-domain analysis tools for burst analysis
- Flexible modulation analysis
- Hardkey/softkey manual user interface or SCPI remote user interface
- Built-in, context-sensitive help
- Transportable license between X-Series signal analyzers

KEYSIGHT TECHNOLOGIES

VXA Vector Signal Analysis Measurement Application

The VXA vector signal analysis measurement application transforms the X-Series signal analyzers into vector signal analyzers by providing a wide range of measurements, demodulation types, and filters to perform comprehensive signal analysis, helping you thoroughly test your designs, ensure product quality, and optimize without compromise.

The VXA vector signal analysis measurement application is just one in a common library of more than 25 measurement applications in the Keysight X-Series, an evolutionary approach to signal analysis that spans instrumentation, measurements, and software. The X-Series analyzers, with upgradable CPU, memory, disk drives, and I/O ports, enable you to keep your test assets current and extend instrument longevity. Proven algorithms, 100% code-compatibility, and a common UI across the X-Series create a consistent measurement framework for signal analysis that ensures repeatable results and measurement integrity so you can leverage your test system software through all phases of product development. In addition to fixed, perpetual licenses for our X-Series measurement applications, we also offer transportable licenses which can increase the value of your investment by allowing to you transport the application to multiple X-Series analyzers.

More about signal analysis

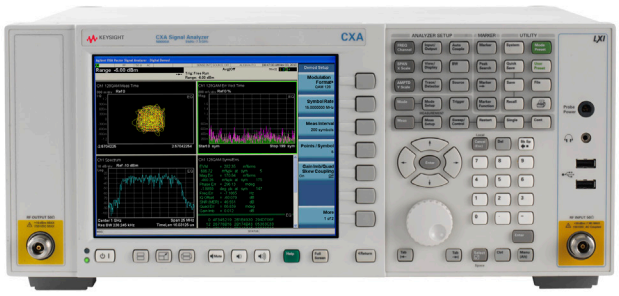
The VXA measurement application is a general-purpose FFT-based spectrum analysis application, with a wide selection of demodulation types and filters to perform flexible digital modulation analysis.

- Bring comprehensive vector signal analysis to the test rack
- Troubleshoot signals with powerful time domain capability
- Use analog demodulation to identify unintentional modulations
- Test when no commercial test standard is available
- Utilize flexible digital modulation analysis capability

Choosing between X-Series applications and 89600 VSA software

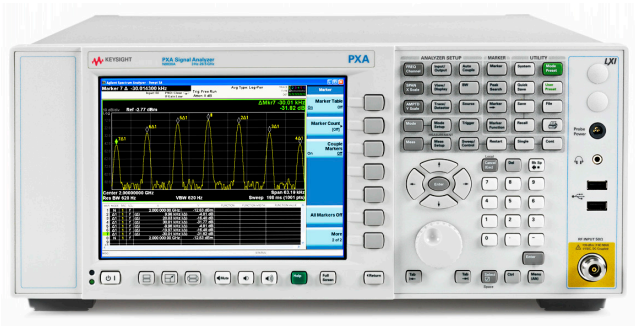
X-Series measurement applications provide embedded format-specific, one-button measurements for X-Series analyzers. With fast measurement speed, SCPI programmability, pass/fail testing and simplicity of operation, these applications are ideally suited for design verification and manufacturing. 89600 VSA software is a comprehensive set of tools for demodulation and vector signal analysis. These tools enable you to explore virtually every facet of a signal and optimize your most advanced designs. Use the 89600 VSA software with a variety of Keysight hardware platforms to pinpoint the answers to signal problems in R&D.

www.keysight.com/find/89600vsa









Vector Signal Analysis Measurement Details

Bringing comprehensive vector signal analysis to the test rack

The vector signal analysis (Option 1FP) is the foundation of all measurement options in the VXA measurement application and is a required option. Each measurement is available simultaneously, in either one, two, three or four user-selected separate trace displays. You have full control of trace data format and scaling.

- Spectrum, instantaneous spectrum
- Time, instantaneous time, raw time
- Time gating
- Time averaging, including continuous repeat max hold, exponential max hold, RMS (video), RMS (video) exponential, time, time exponential
- Band power
- Power spectral density (PSD)
- Power statistics (including gated):
  - Complementary cumulative distribution function (CCDF)
  - Cumulative distribution function (CDF)
  - Probability distribution function (PDF)
- Auto correlation
- Occupied bandwidth (OBW)
- Adjacent channel power (ACP)
- Analog demodulation: AM/FM/PM (includes spectrum, time, gated time, PSD, power statistics)
- Frequency counter
- Signal tracking
- Marker coupling
- Ability to save traces

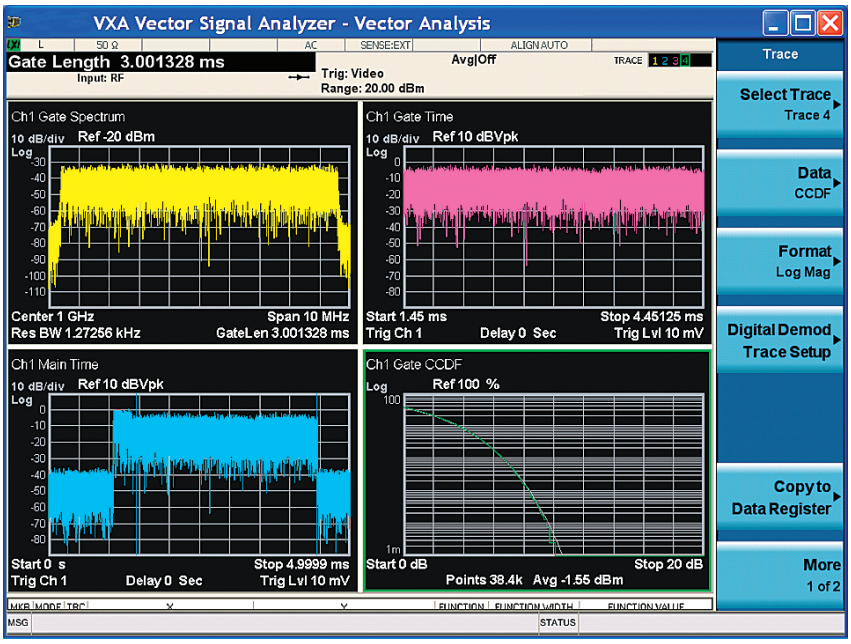


Figure 1. Basic vector signal analysis: The spectrum, time, and CCDF of the gated signal are shown, as well as the full time domain signal (Trace 2, lower left).

Vector Signal Analysis Measurement Details (continued)

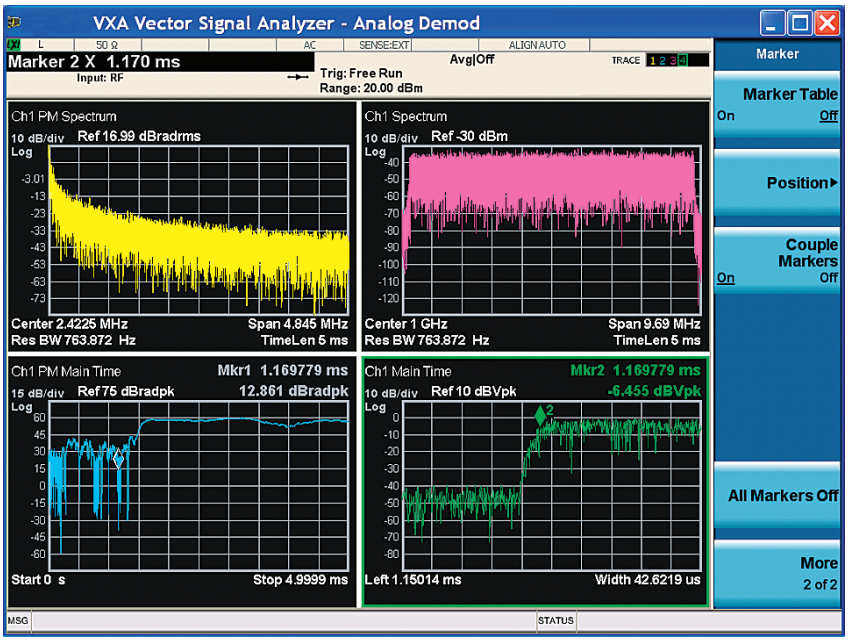


Figure 2. Analog demodulation: PM demodulation showing phase stability of the burst at turn-on; by coupling markers to an expanded time domain trace, we can see that data is sent prior to the phase settling out to a stable value after the burst turn-on occurs.

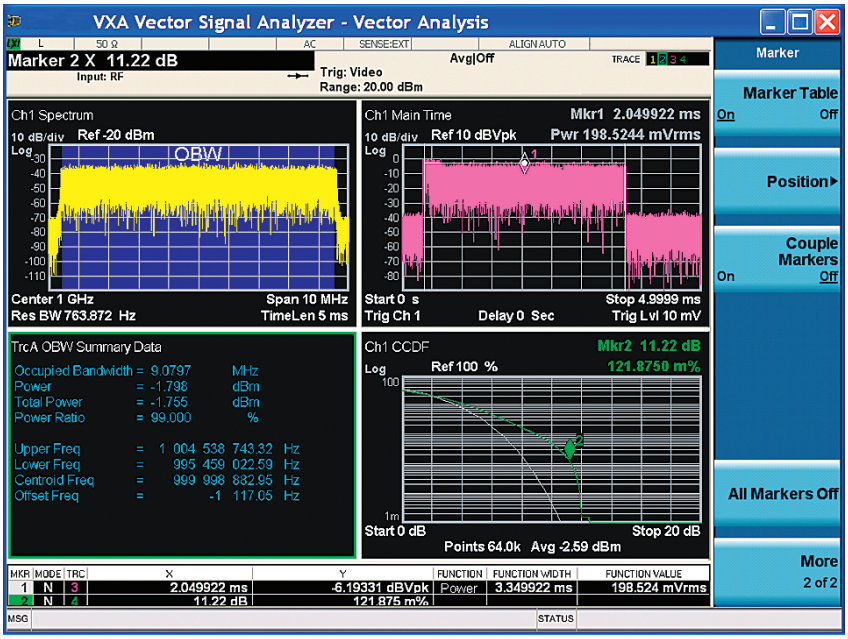


Figure 3. 2x2 grid display showing multiple measurements, markers, and marker table for at-a-glance signal analysis.

View detailed frequency behavior

The VXA measurement application gives you a complete set of tools to maximize the resolution of your spectrum display and the accuracy of the data displayed:

- Up to 409601 frequency points across whatever frequency span you select provides unprecedented frequency resolution to locate the most difficult problem; RBWs of less than 1 millihertz are available
- Automatic selection of highest frequency resolution for a given measurement
- Four different FFT window functions to choose from to meet specific measurement needs—Gaussian filter for high dynamic range measurements, or flat top filter for highest amplitude accuracy measurements amplitude accuracy measurements
- Use the X-axis scaling feature for a better view of the area of interest on the signal; save this display or paste the measurement result into a report to the design team

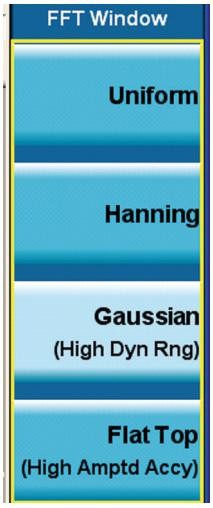


Figure 4. The FFT window filter is applied to each frequency bin, similar to the filter that a spectrum analyzer uses as it sweeps across the frequency span of the measurement; however, with VXA, the filters are applied simultaneously to all frequencies and can be changed.

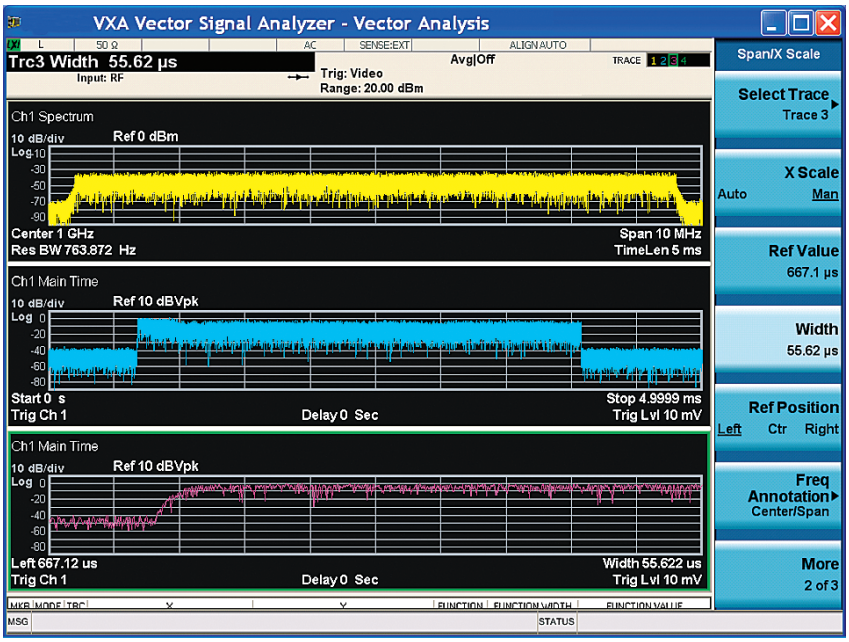


Figure 5. High-resolution frequency and time domain traces; Trace 3 shows the same time with the x-axis expanded to improve resolution of burst turn-on.

Enhance your time to insight for baseband signal quality

The Option 1FP enables the PXA or MXA signal analyzers (with Option BBA installed) to expand the baseband analysis capability for troubleshooting and design verification of RF devices.



Flexible Digital Modulation Analysis

Add powerful analysis options

The flexible digital modulation analysis option, Option 2FP, adds the capability to visualize system performance rapidly and intuitively. Teamed with an Keysight X-Series signal analyzer, you can increase the speed of your measurement tasks with the flexibility this option offers:

- Customize modulation analysis formats including PSK, QAM (16 to 1024QAM), MSK, EDGE, FSK, VSB, DVBQAM, APSK, SOQPSK
- A complete set of more than 30 modulation quality measurements, including overall EVM, peak EVM, EVM vs. symbol time, EVM spectrum, time, spectrum, constellation diagram, vector diagram, IQ parameters, requency and clock error, channel/impulse response with EQ filter, zero crossing error, and symbol clock error
- Convenient measurement presets to cover popular communication formats, such as CDMA, GSM/EDGE, *Bluetooth*®, Zigbee, TETRA, APCO25, and Wi-SUN (MR-FSK PHY)

Testing when no commercial test standard is available

Testing proprietary and custom signals is a challenge. Turnkey test software for those signals is seldom available off-the-shelf, so you have to design and implement the tests yourself. The flexible digital modulation analysis option will help you with that task. It covers the various demands of “do it yourself” testing for single carrier, single modulation signals with a deep set of flexible modulation analysis tools that you can tweak to meet your needs. In addition, these flexible tools are SCPI programmable.

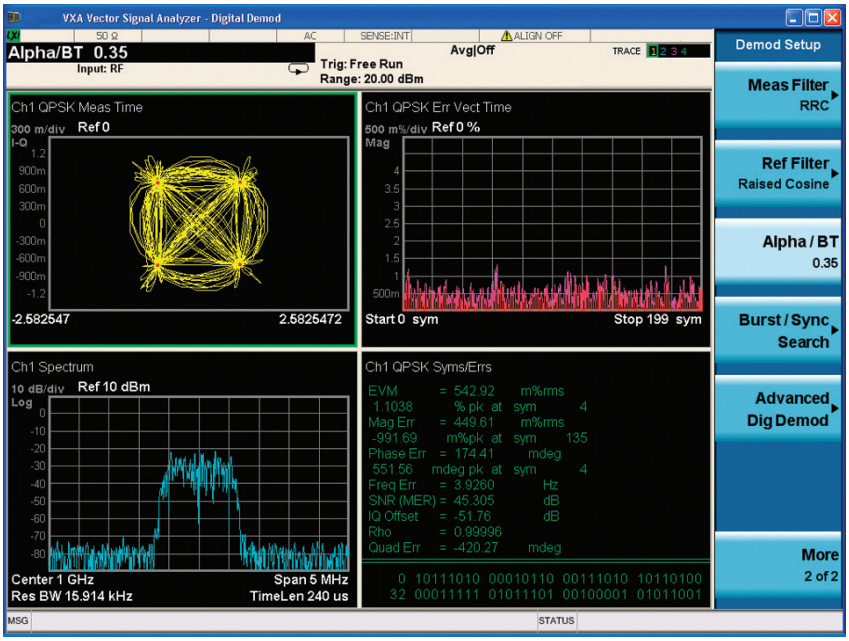


Figure 6. QPSK modulation analysis in default quad view: Trace 1 (upper left), IQ constellation; Trace 2 (lower left), spectrum; Trace 3 (upper right), error vector magnitude versus time (symbol) trace; Trace 4 (lower right), Symbols/Error table.

Key Features of Digital Modulation Analysis

Standard presets (for single carrier)	
Cellular	CDMA (base, mobile), CDPD, EDGE, GSM, NADC, PDC, PHS (PHP), W-CDMA
Wireless networking	*Bluetooth* (Basic Rate), HIPERLAN/1 (HBR, LBR), WLAN (802.11b), ZigBee (802.15.4, 868/915/2450 MHz), Wi-SUN (802.15.4g, MR-FSK PHY)
Digital video	DTV (8, 16), DVB (16, 32, 64, 128, 256), DVB (16APSK, 32APSK)
Other	APCO 25, APCO 25 P2 (HCPM), APCO 25 P2 (HDQPSK), DECT, TETRA, VDL Mode 3, MIL-STD 188-181C, SOQPSK-TG
Modulation formats	
FSK	2, 4, 8, 16 level (including GFSK)
	MSK (including GMSK)
	BPSK, QPSK, OQPSK, DQPSK, D8PSK, π/4DQPSK, 8PSK, 3π/8 8PSK (EDGE), π/8 D8PSK, SOQPSK
QAM (absolute encoding)	16, 32, 64, 128, 256, 512, 1024
QAM (differential encoding per DVB standard)	16, 32, 64, 128, 256
APSK	16, 16 w/DVB, 32, 32 w/DVB
VSB	8, 16
Filter types	Raised cosine, square-root raised cosine, IS-95 compatible, Gaussian, EDGE, 1REC, 3RC, SOQPSK-TG, low pass, rectangular, half-sine, none
Alpha/BT	Continuously adjustable from 0.05 to 10 user-defined filters
Adaptive equalizer	Decision directed, LMS, feed-forward, equalization with adjustable convergence rate; removes the effects of linear distortion (i.e. non-flat frequency response, multipath, etc.) from modulation quality measurements
Symbol rate	Rate = Frequency span / (1+α); maximum symbol rate limited only by the measurement span
Advanced analysis setup	Burst search Pulse search Sync search (with user-selected synchronization word) Adjustable search length and offset timing
Measurements/displays	Eye diagram Trellis diagram Polar diagram Constellation and vector (shows trajectory between symbol times) diagram I and Q versus time Error vector magnitude EVM versus symbol time EVM versus frequency Magnitude and phase error Frequency error (carrier offset frequency) IQ origin offset Quadrature error Gain imbalance Amplitude droop (PSK and MSK formats) SNR (8/16VSB and QAM formats) Symbols table (demodulated bits) Error table with tabular EVM and IQ errors Equalizer channel frequency response Equalizer imipulse response Symbol clock error Zero crossing error

Key Specifications

Definitions

- Specifications describe the performance of parameters covered by the product warranty.
- 95th percentile values indicate the breadth of the population (≈2σ) of performance tolerances expected to be met in 95% of cases with a 95% confidence. These values are not covered by the product warranty.
- Typical values are designated with the abbreviation "typ." These are performance beyond specification that 80% of the units exhibit with a 95% confidence. These values are not covered by the product warranty.
- Nominal values are designated with the abbreviation "nom." These values indicate expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- PXA specifications apply to analyzers with frequency options of 526 and lower. For analyzers with higher frequency options, specifications are not warranted but performance will nominally be close to that shown in this section.

Note: Data subject to change

Option 1FP vector signal analysis option

Description	PXA	MXA	EXA	CXA
Maximum frequency	50 GHz	26.5 GHz	44 GHz	26.5 GHz
External mixing support with Option EXM	Yes	Yes	Yes	N/A
Center frequency tunning resolution	10 µHz	1 mHz	1 mHz	1 mHz
Frequency span	10 MHz (standard); 25 MHz (Option B25) 40 MHz (Option B40) 85 MHz (Option B85) 160 MHz (Option B1X)	25 MHz (standard) 40 MHz (Option B40) 85 MHz (Option B85) 125 MHz (Option B1A) 160 MHz (Option B1X)	25 MHz (standard) 40 MHz (Option B40)	10 MHz (standard) 25 MHz (Option B25)
Frequency point per span	Calibrated points: 51 ~ 409, 601; Displayed points: 51 ~ 524, 288			
Absolute amplitude accuracy (Freq < 3.6 GHz)	± 0.19 dB, 95% confidence accuracy	± 0.23 dB, 95% confidence accuracy	± 0.27 dB, 95% confidence accuracy	± 0.50 dB, (Freq < 3 GHz) 95% confidence accuracy
Third-order intermodulation distortion, two –20 dBfs tones, 400 MHz to 13.6 GHz, (7.5 GHz for CXA) tone separation > 15 kHz	–90 dBc (nom)	–90 dBc (nom)	–84 dBc (nom)	–66 dBc (nom)
Resolution bandwidth	RBWs range from less than 1 Hz to greater than 2.8 MHz (standard); Greater than 7 MHz (with Option B25)			
RBW filter shapes	Flat top, Gaussian top, Hanning, Uniform			
Analog demodulation types	AM, FM, PM			

Key Specifications (continued)

X-Series signal analyzers

Accuracy		PXA	MXA	EXA	CXA	BBIQ [1]
Conditions		Modulation formats include BPSK, D8PSK, DQPSK, QPSK, (16/32/64/128/256/512/1024) QAM, (16/32/64/128/256)DVBQAM, π/4-DQPSK, 8-PSK. EVM normalization reference set to constellation maximum. Transmit filter is root raised cosine with alpha=0.35. Center frequency 1 GHz. Signal amplitude of –16 dBm, analyzer range set to –10 dBm. Result length set to at least 150 symbols, or 3 × {Number of ideal state locations}. RMS style averaging with a count of 10. Phase noise optimization adjusted based on symbol rate of measurement. Available span dependent on analyzer hardware bandwidth options.				
Residual errors	Symbol rate/Span					
Residual EVM	1 Msps/5 MHz	≤ 0.5% rms	≤ 0.7% rms	≤ 0.7% rms	≤ 0.7% rms	≤ 0.5% rms
	10 Msps/25 MHz	≤ 0.5% rms	≤ 0.7% rms	≤ 0.7% rms	≤ 0.9% rms	≤ 0.5% rms
	25 Msps/40 MHz	≤ 0.7% rms	≤ 1.1% rms	≤ 1.1% rms	–	≤ 0.6% rms
	100 Msps/160 MHz	≤ 1.0% rms	≤ 1.3% rms	–	–	–
Magnitude error	1 Msps/5 MHz	≤ 0.4% rms	≤ 0.5% rms	≤ 0.5% rms	≤ 0.5% rms	≤ 0.5% rms
	10 Msps/25 MHz	≤ 0.5% rms	≤ 0.5% rms	≤ 0.5% rms	≤ 0.6% rms	≤ 0.5% rms
	25 Msps/40 MHz	≤ 0.6% rms	≤ 0.8% rms	≤ 0.8% rms	–	≤ 0.6% rms
	100 Msps/160 MHz	≤ 0.9% rms	≤ 1.0% rms	–	–	–
Phase error	1 Msps/5 MHz	≤ 0.5° rms	≤ 0.6° rms	≤ 0.6° rms	≤ 0.7° rms	≤ 0.6° rms
	10 Msps/25 MHz	≤ 0.6° rms	≤ 0.6° rms	≤ 0.6° rms	≤ 0.8° rms	≤ 0.6° rms
	25 Msps/40 MHz	≤ 0.6° rms	≤ 1.1° rms	≤ 1.1° rms	–	≤ 0.6° rms
	100 Msps/160 MHz	≤ 1.0° rms	≤ 1.3° rms	–	–	–
Frequency error	Added to frequency accuracy if applicable			≤ Symbol rate / 500,000		
I/Q origin offset [1]				≤ –60 dB		

Accuracy		PXA	MXA	EXA	CXA	BBIQ [1]
Conditions		Modulation formats include MSK and MSK2. Transmit filter is gaussian with BT=0.3. Center frequency 1 GHz. Signal amplitude of -16 dBm. Analyzer range set to –10 dBm. Result length set to 150 symbols. RMS style averaging with a count of 10. Available span dependent on analyzer hardware bandwidth options.				
Residual errors	Symbol rate/Span					
Residual EVM	10 Msps/25 MHz	≤ 0.5% rms	≤ 0.9% rms	≤ 0.9% rms	≤ 1.0% rms	≤ 0.8% rms
	80 Msps/160 MHz	≤ 1.4% rms	≤ 1.8% rms	–	–	–
Phase error	10 Msps/25 MHz	≤ 0.4° rms	≤ 0.5° rms	≤ 0.5° rms	≤ 0.5° rms	≤ 0.5° rms
	80 Msps/160 MHz	≤ 1.3° rms	≤ 1.3° rms	–	–	–

1. I+jQ measurements performed using signal amplitude and analyzer range near 0 dBm, with a 0 Hz center frequency. I/Q origin offset metric does not include impact of analyzer DC offsets.

For a complete list of specifications refer to the appropriate specifications guide.

PXA: www.keysight.com/find/pxa_specifications
MXA: www.keysight.com/find/mxa_specifications
EXA: www.keysight.com/find/exa_specifications
CXA: www.keysight.com/find/cxa_specifications

Ordering Information

Software licensing and configuration

Choose from two license types:

- Fixed, perpetual license:
  This allows you to run the application in the X-Series analyzer in which it is initially installed.
- Transportable, perpetual license:
  This allows you to run the application in the X-Series analyzer in which it is initially installed, plus it may be transferred from one X-Series analyzer to another.

The table below contains information on our fixed, perpetual licenses. For more information, please visit the product web pages.

N9064A & W9064A VXA vector signal analysis measurement application

Description	Model-Option		Additional information
	PXA, MXA, EXA	CXA	
Vector signal analysis	N9064A-1FP	W9064A-1FP	
Flexible digital modulation	N9064A-2FP	W9064A-2FP	Requires 1FP

Related Literature

Description	Publication number
N9064A & W9064A Vector Signal Analysis, Self-Guided Demonstration	5990-6159EN
N9064A & W9064A Vector Signal Analysis, Measurement Guide	N9064-90004
User's and Programmer's Reference guide is available in the library section of the N9064A and W9064A product pages.	

Web

Product page:
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X-Series Measurement Application Updates

To update a previously purchased N9064A/W9064A measurement application to include the latest feature updates, you can purchase the N9064A-MEU or W9064A-MEU minor enhancement update.

For more information, visit: www.keysight.com/find/N9064A-MEU for PXA, MXA, EXA

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