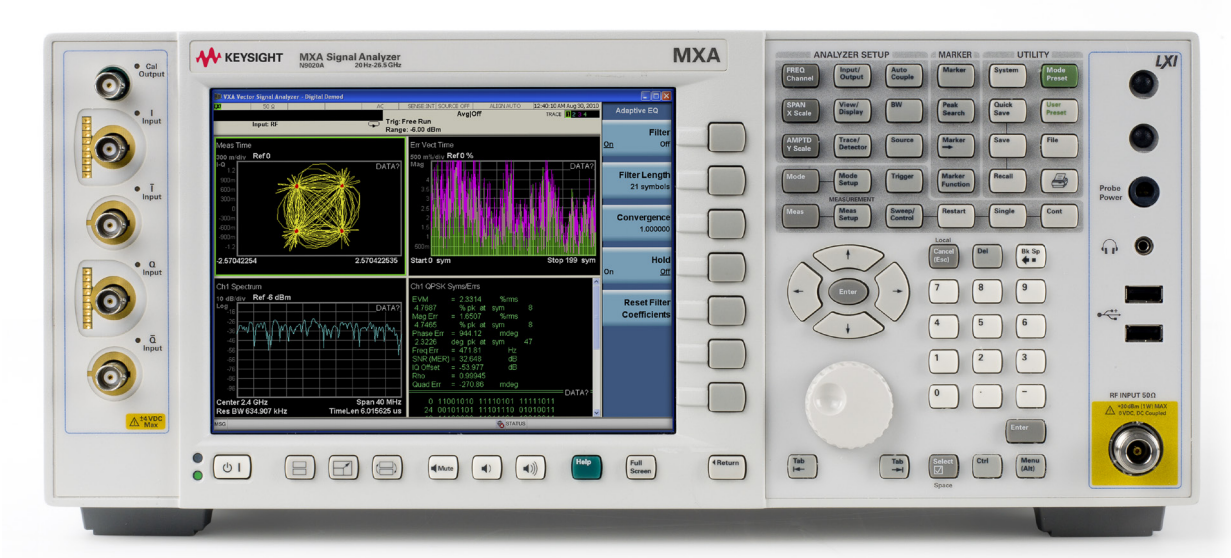
Keysight Technologies

MXA X-Series Signal Analyzer N9020A

10 Hz to 3.6, 8.4, 13.6, or 26.5 GHz

Data Sheet



KEYSIGHT TECHNOLOGIES

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Accelerate to market

Every device demands decisions that require tradeoffs in your goals—customer specs, throughput, yield. With a highly flexible signal analyzer, you can manage and minimize those tradeoffs. Keysight Technologies Inc.'s mid-performance MXA is the ultimate accelerator as your products move from design to the marketplace. It has the flexibility to quickly adapt to your evolving test requirements—today and tomorrow. Maximize your flexibility, and accelerate to market, with the Keysight MXA signal analyzer.

This data sheet is a summary of the specifications and conditions for MXA signal analyzers. For the complete specifications guide, visit: www.keysight.com/find/mxa_specifications

Definitions and Conditions

Specifications describe the performance of parameters covered by the product warranty and apply to the full temperature range of 0 to 55 °C [1], unless otherwise noted.

95th percentile values indicate the breadth of the population (approx. 2 σ) of performance tolerances expected to be met in 95 percent of the cases with a 95 percent confidence, for any ambient temperature in the range of 20 to 30 °C. In addition to the statistical observations of a sample of instruments, these values include the effects of the uncertainties of external calibration references. These values are not warranted. These values are updated occasionally if a significant change in the statistically observed behavior of production instruments is observed.

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 80 percent of the units exhibit with a 95 percent confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.

Nominal values indicate expected performance, or describe product performance that is useful in the application of the product, but are not covered by the product warranty.

The analyzer will meet its specifications when:

- It is within its calibration cycle
- Under auto couple control, except when Auto Sweep Time Rules = Accy
- Signal frequencies < 10 MHz, with DC coupling applied
- The analyzer has been stored at an ambient temperature within the allowed operating range for at least two hours before being turned on; if it had previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range
- The analyzer has been turned on at least 30 minutes with Auto Align set to normal, or, if Auto Align is set to off or partial, alignments must have been run recently enough to prevent an Alert message; if the Alert condition is changed from Time and Temperature to one of the disabled duration choices, the analyzer may fail to meet specifications without informing the user

For the complete specifications guide, visit: www.keysight.com/find/mxa_specifications

1. For earlier instruments (Serial number prefix < MY/SG/US5051), the full temperature ranges from 5 to 50 °C.

Frequency and Time Specifications

Frequency range		**DC coupled**	**AC coupled**
Option 503		10 Hz to 3.6 GHz	10 MHz to 3.6 GHz
Option 508		10 Hz to 8.4 GHz	10 MHz to 8.4 GHz
Option 513		10 Hz to 13.6 GHz	10 MHz to 13.6 GHz
Option 526		10 Hz to 26.5 GHz	10 MHz to 26.5 GHz
Band	**LO multiple (N)**		
0	1	10 Hz to 3.6 GHz	
1	1	3.5 to 8.4 GHz	
2	2	8.3 to 13.6 GHz	
3	2	13.5 to 17.1 GHz	
4	4	17 to 26.5 GHz	
Frequency reference			
Accuracy		± [(time since last adjustment x aging rate) + temperature stability + calibration accuracy] [1]	
Aging rate		Option PFR ± 1 x 10^{-7} / year ± 1.5 x 10^{-7} / 2 years	Standard ± 1 x 10^{-6} / year
Temperature stability – 20 to 30 °C – Full temperature range		Option PFR ± 1.5 x 10^{-8} ± 5 x 10^{-8}	Standard ± 2 x 10^{-6} ± 2 x 10^{-6}
Achievable initial calibration accuracy		Option PFR ± 4 x 10^{-8}	Standard ± 1.4 x 10^{-6}
Example frequency reference accuracy (with Option PFR) 1 year after last adjustment		= ± (1 x 1 x 10^{-7} + 5 x 10^{-8} + 4 x 10^{-8}) = ± 1.9 x 10^{-7}	
Residual FM – Option PFR – Standard		 ≤ (0.25 Hz x N) p-p in 20 ms, nominal ≤ (10 Hz x N) p-p in 20 ms, nominal See band table above for N (LO multiple)	
Frequency readout accuracy (start, stop, center, marker)			
± (marker frequency x frequency reference accuracy + 0.25 % x span + 5 % x RBW + 2 Hz + 0.5 x horizontal resolution [2])			
Marker frequency counter			
Accuracy		± (marker frequency x frequency reference accuracy + 0.100 Hz)	
Delta counter accuracy		± (delta frequency x frequency reference accuracy + 0.141 Hz)	
Counter resolution		0.001 Hz	
Frequency span (FFT and swept mode)			
Range		0 Hz (zero span), 10 Hz to maximum frequency of instrument	
Resolution		2 Hz	
Accuracy – Swept – FFT		 ± (0.25 % x span + horizontal resolution) ± (0.10 % x span + horizontal resolution)	

1. When used with external frequency reference 1 pulse-per-second (PPS), such as the J7203A atomic frequency reference (AFR), the reference tracking accuracy needs to be taken into account for calculation of the overall frequency accuracy. Refer to the MXA signal analyzer specifications guide (part number: N9020-90113) for more details.
2. Horizontal resolution is span/(sweep points – 1).

Frequency and Time Specifications (continued)

Sweep time and triggering		
Range	Span = 0 Hz	1 µs to 6000 s
	Span ≥ 10 Hz	1 ms to 4000 s
Accuracy	Span ≥ 10 Hz, swept	± 0.01 %, nominal
	Span ≥ 10 Hz, FFT	± 40 %, nominal
	Span = 0 Hz	± 0.01 %, nominal
Trigger	Free run, line, video, external 1, external 2, RF burst, periodic timer	
Trigger delay	Span = 0 Hz or FFT	–150 to +500 ms
	Span ≥ 10 Hz, swept	0 to 500 ms
	Resolution	0.1 µs
Time gating		
– Gate methods	Gated LO; gated video; gated FFT	
– Gate length range (except method = FFT)	100.0 ns to 5.0 s	
– Gate delay range	0 to 100.0 s	
– Gate delay jitter	33.3 ns p-p, nominal	
Sweep (trace) point range		
All spans	1 to 40001	
Resolution bandwidth (RBW)		
Range (–3.01 dB bandwidth)	1 Hz to 3 MHz (10 % steps), 4, 5, 6, 8 MHz	
Bandwidth accuracy (power)	1 Hz to 750 kHz	± 1.0 % (± 0.044 dB)
	820 kHz to 1.2 MHz (< 3.6 GHz CF)	± 2.0 % (± 0.088 dB)
	1.3 to 2 MHz (< 3.6 GHz CF)	± 0.07 dB, nominal
	2.2 to 3 MHz (< 3.6 GHz CF)	± 0.15 dB, nominal
	4 to 8 MHz (< 3.6 GHz CF)	± 0.25 dB, nominal
Bandwidth accuracy (–3.01 dB)		
– RBW range	1 Hz to 1.3 MHz	± 2 %, nominal
Selectivity (–60 dB/–3 dB)	4.1:1, nominal	
EMI bandwidth (CISPR compliant)	200 Hz, 9 kHz, 120 kHz, 1 MHz	(Option EMC or N6141A required)
EMI bandwidth (MIL STD 461E compliant)	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz (standard)	(Option EMC or N6141A required)
Analysis bandwidth [1]		
Maximum bandwidth	Option B1X	160 MHz
	Option B1A	125 MHz
	Option B85	85 MHz
	Option B40	40 MHz
	Option B25 (standard)	25 MHz
	Standard	10 MHz
Video bandwidth (VBW)		
Range	1 Hz to 3 MHz (10 % steps), 4, 5, 6, 8 MHz, and wide open (labeled 50 MHz)	
Accuracy	± 6 %, nominal	
Measurement speed [2]	**Standard**	
Local measurement and display update rate	4 ms (250/s) nominal	
Remote measurement and LAN transfer rate	5 ms (200/s) nominal	
Marker peak search	1.5 ms, nominal	
Center frequency tune and transfer (RF)	20 ms, nominal	
Center frequency tune and transfer (µW)	47 ms, nominal	
Measurement/mode switching	39 ms, nominal	

1. Analysis bandwidth is the instantaneous bandwidth available around a center frequency over which the input signal can be digitized for further analysis or processing in the time, frequency, or modulation domain.
2. Sweep points = 101. Apply for instruments with S/N prefix ≥ MY/SG/US4910 or earlier instruments with Option PC2 or PC4. Otherwise, refer to the MXA specification guide.

Amplitude Accuracy and Range Specifications

Amplitude range			
Measurement range			
Preamp Off	Displayed average noise level (DANL) to +30 dBm		
Preamp On			
– RF (Opt 503)	Displayed average noise level (DANL) to +30 dBm		
– Microwave (Opt 508, 513, 526)	Displayed average noise level (DANL) to +24 dBm		
Input attenuator range	0 to 70 dB in 2 dB steps		
Electronic attenuator (Option EA3)			
Frequency range	10 Hz to 3.6 GHz		
Attenuation range			
– Electronic attenuator range	0 to 24 dB, 1 dB steps		
– Full attenuation range (mechanical + electronic)	0 to 94 dB, 1 dB steps		
Maximum safe input level			
Average total power (with and without preamp)	+30 dBm (1 W)		
Peak pulse power	< 10 µs pulse width, < 1 % duty cycle +50 dBm (100 W) and input attenuation ≥ 30 dB		
DC volts			
– DC coupled	± 0.2 Vdc		
– AC coupled	± 100 Vdc		
Display range			
Log scale	0.1 to 1 dB/division in 0.1 dB steps 1 to 20 dB/division in 1 dB steps (10 display divisions)		
Linear scale	10 divisions		
Scale units	dBm, dBmV, dBµV, dBmA, dBµA, V, W, A		
Frequency response		**Specification**	**95th percentile (≈ 2σ)**
(10 dB input attenuation, 20 to 30 °C, preselector centering applied, σ = nominal standard deviation)			
	20 Hz to 10 MHz	± 0.6 dB	± 0.28 dB
	10 MHz [1] to 3.6 GHz	± 0.45 dB	± 0.17 dB
	3.5 to 8.4 GHz	± 1.5 dB	± 0.48 dB
	8.3 to 13.6 GHz	± 2.0 dB	± 0.47 dB
	13.5 to 22.0 GHz	± 2.0 dB	± 0.52 dB
	22.0 to 26.5 GHz	± 2.5 dB	± 0.71 dB
Preamp on (0 dB attenuation) [2]	100 kHz to 3.6 GHz	± 0.75 dB	± 0.28 dB
	3.5 to 8.4 GHz	± 2.0 dB	± 0.67 dB
	8.3 to 13.6 GHz	± 2.3 dB	± 0.73 dB
	13.5 to 17.1 GHz	± 2.5 dB	± 0.97 dB
	17.0 to 22.0 GHz	± 2.5 dB	± 1.36 dB
	22.0 to 26.5 GHz	± 3.5 dB	± 1.48 dB
Input attenuation switching uncertainty		**Specifications**	**Additional information**
Attenuation > 2 dB, preamp off	50 MHz (reference frequency)	± 0.20 dB	± 0.08 dB, typical
Relative to 10 dB (reference setting)	20 Hz to 3.6 GHz		± 0.3 dB, nominal
	3.5 to 8.4 GHz		± 0.5 dB, nominal
	8.3 to 13.6 GHz		± 0.7 dB, nominal
	13.5 to 26.5 GHz		± 0.7 dB, nominal

1. DC coupling required to meet specifications below 50 MHz. With AC coupling, specifications apply at frequencies of 50 MHz and higher. Statistical observations at 10 MHz with AC coupling show that most instruments meet the DC-coupled specifications, however, a small percentage of instruments are expected to have errors exceeding 0.5 dB at 10 MHz at the temperature extreme. The effect at 20 to 50 MHz is negligible but not warranted.
2. Apply for instruments with S/N prefix ≥ MY/SG/US5051. For older instruments, refer to the MXA Specification Guide.

Amplitude Accuracy and Range Specifications (continued)

Total absolute amplitude accuracy		**Specifications**
(10 dB attenuation, 20 to 30 °C, 1 Hz ≤ RBW ≤ 1 MHz, input signal –10 to –50 dBm, all settings auto-coupled except Auto Swp Time = Accy, any reference level, any scale, σ = nominal standard deviation)		
	At 50 MHz	± 0.33 dB
	At all frequencies	± (0.33 dB + frequency response)
	20 Hz to 3.6 GHz	± 0.23 dB (95th Percentile ≈ 2σ)
Preamp on	At all frequencies	± (0.39 dB + frequency response)
Input voltage standing wave ratio (VSWR) (≥ 10 dB input attenuation)		
	10 MHz to 3.6 GHz	< 1.2:1, nominal
	3.6 to 8.4 GHz	< 1.5:1, nominal
	8.4 to 13.6 GHz	< 1.6:1, nominal
	13.6 to 26.5 GHz	< 1.9:1, nominal
Preamp on (0 dB attenuation)	10 MHz to 3.6 GHz	< 1.7:1, nominal
	3.6 to 8.4 GHz	< 1.8:1, nominal
	8.4 to 13.6 GHz	< 2.0:1, nominal
	13.6 to 26.5 GHz	< 2.0:1, nominal
Resolution bandwidth switching uncertainty (referenced to 30 kHz RBW)		
1 Hz to 1.5 MHz RBW	± 0.05 dB	
1.6 MHz to 3 MHz RBW	± 0.10 dB	
4, 5, 6, 8 MHz RBW	± 1.0 dB	
Reference level		
Range		
– Log scale	–170 to +30 dBm in 0.01 dB steps	
– Linear scale	Same as Log (707 pV to 7.07 V)	
Accuracy	0 dB	
Display scale switching uncertainty		
Switching between linear and log	0 dB	
Log scale/div switching	0 dB	
Display scale fidelity		
Between –10 dBm and –80 dBm input mixer level	± 0.10 dB total	
Trace detectors		
Normal, peak, sample, negative peak, log power average, RMS average, and voltage average		
Preamplifier		
Frequency range	Option P03	100 kHz to 3.6 GHz
	Option P08	100 kHz to 8.4 GHz
	Option P13	100 kHz to 13.6 GHz
	Option P26	100 kHz to 26.5 GHz
Gain	100 kHz to 3.6 GHz	+20 dB, nominal
	3.6 to 26.5 GHz	+35 dB, nominal
Noise figure	100 kHz to 3.6 GHz	11 dB, nominal
	3.6 to 8.4 GHz	9 dB, nominal
	8.4 to 13.6 GHz	10 dB, nominal
	13.6 to 26.5 GHz	15 dB, nominal

Dynamic Range Specifications

1 dB gain compression (two-tone)		**Total power at input mixer**	
	20 to 500 MHz	0 dBm	+3 dBm, nominal
	500 MHz to 3.6 GHz	3 dBm	+7 dBm, nominal
	3.6 to 26.5 GHz	0 dBm	+4 dBm, nominal
Preamp on	10 MHz to 3.6 GHz		–10 dBm, nominal
(Option P03, P08, P13, P26)	3.6 to 26.5 GHz		
	– Tone spacing 100 kHz to 20 MHz		–26 dBm, nominal
	– Tone spacing > 70 MHz		–16 dBm, nominal

Displayed average noise level (DANL)			
(Input terminated, sample or average detector, averaging type = Log, 0 dB input attenuation, IF Gain = High, 1 Hz RBW, 20 to 30 °C)			
		Specification	**Typical**
	10 Hz		–95 dBm, nominal
	20 Hz		–105 dBm, nominal
	100 Hz		–110 dBm, nominal
	1 kHz		–120 dBm, nominal
	9 kHz to 1 MHz		–130 dBm
	1 to 10 MHz	–150 dBm	–153 dBm
	10 MHz to 2.1 GHz	–151 dBm	–154 dBm
	2.1 to 3.6 GHz	–149 dBm	–152 dBm
	3.6 to 8.4 GHz	–149 dBm	–153 dBm
	8.4 to 13.6 GHz	–148 dBm	–151 dBm
	13.6 to 17.1 GHz	–144 dBm	–147 dBm
	17.1 to 20.0 GHz	–143 dBm	–146 dBm
	20.0 to 26.5 GHz	–136 dBm	–142 dBm
Preamp on	100 kHz to 1 MHz		–149 dBm, nominal
(Option P03, P08, P13, P26)	1 to 10 MHz	–161 dBm	–163 dBm
	10 MHz to 2.1 GHz	–163 dBm	–166 dBm
	2.1 to 3.6 GHz	–162 dBm	–164 dBm
	3.6 to 8.4 GHz	–162 dBm	–166 dBm
	8.4 to 13.6 GHz	–162 dBm	–165 dBm
	13.6 to 17.1 GHz	–159 dBm	–163 dBm
	17.1 to 20.0 GHz	–157 dBm	–161 dBm
	20.0 to 26.5 GHz	–152 dBm	–157 dBm

DANL with Noise Floor Extension (Option NFE [1]) on	**Improvement @ 95th percentile**	
Frequency band	**Preamp Off**	**Preamp On**
Band 0, f > 20 MHz	9 dB	10 dB
Band 1	8 dB	9 dB
Band 2	10 dB	10 dB
Band 3	9 dB	10 dB
Band 4	9 dB	9 dB

Example of effective DANL @ 20 to 30 °C (Option NFE On)		
Frequency	**Preamp Off**	**Preamp On**
Mid-Band 0 (1.8 GHz)	–159 dBm	–170 dBm
Mid-Band 1 (5.9 GHz)	–157 dBm	–169 dBm
Mid-Band 2 (10.95 GHz)	–157 dBm	–168 dBm
Mid-Band 3 (15.3 GHz)	–151 dBm	–165 dBm
Mid-Band 4 (21.75 GHz)	–146 dBm	–159 dBm

1. Option NFE on MXA is installed as N9020A-NF2, instrument alignment based.

Dynamic Range Specifications (continued)

Spurious responses				
Residual responses (Input terminated and 0 dB attenuation)	200 kHz to 8.4 GHz (swept) Zero span or FFT or other frequencies	–100 dBm –100 dBm, nominal		
Image responses	10 MHz to 3.6 GHz 3.6 to 13.6 GHz 13.6 to 17.1 GHz 17.1 to 22 GHz 22 to 26.5 GHz	–80 dBc (–107 dBc, typical) –78 dBc (–88 dBc, typical) –74 dBc (–85 dBc, typical) –70 dBc (–82 dBc, typical) –68 dBc (–78 dBc, typical)		
LO related spurious (f > 600 MHz from carrier)	10 MHz to 3.6 GHz	–90 dBc + 20xlogN [1] typical		
Other spurious f ≥ 10 MHz from carrier	–80 dBc + 20xlogN [1]			
Second harmonic distortion (SHI)				
	Source frequency	**Mixer level**	**Distortion**	**SHI**
	10 MHz to 1.25 GHz	–15 dBm	–60 dBc	+45 dBm
	1.25 to 1.8 GHz	–15 dBm	–56 dBc	+41 dBm
	1.75 to 7 GHz	–15 dBm	–80 dBc	+65 dBm
	7 to 11 GHz	–15 dBm	–70 dBc	+55 dBm
	11 to 13.25 GHz	–15 dBm	–65 dBc	+50 dBm
		Preamp level	Distortion	SHI
Preamp on (Option P03, P08, P13, P26)	10 MHz to 1.8 GHz 1.8 to 13.25 GHz	–45 dBm –50 dBm	–78 dBc, nominal –60 dBc, nominal	+33 dBm, nominal +10 dBm, nominal
Third-order intermodulation distortion (TOI)				
(Two –30 dBm tones at input mixer with tone separation > 5 times IF prefilter bandwidth, 20 to 30 °C, see Specifications Guide for IF prefilter bandwidths)				
		Distortion	**TOI**	**TOI (typical)**
	10 to 100 MHz	–84 dBc	+12 dBm	+17 dBm
	100 to 400 MHz	–90 dBc	+15 dBm	+20 dBm
	400 MHz to 1.7 GHz	–92 dBc	+16 dBm	+20 dBm
	1.7 to 3.6 GHz	–92 dBc	+16 dBm	+19 dBm
	3.6 to 26.5 GHz	–90 dBc	+15 dBm	+18 dBm
Preamp on (two –45 dBm tones at preamp input)	10 to 500 MHz 500 MHz to 3.6 GHz 3.6 to 26.5 GHz	–98 dBc, nominal –100 dBc, nominal –70 dBc, nominal		+4 dBm, nominal +5 dBm, nominal –15 dBm, nominal

1. N is the LO multiplication factor.

Dynamic Range Specifications (continued)

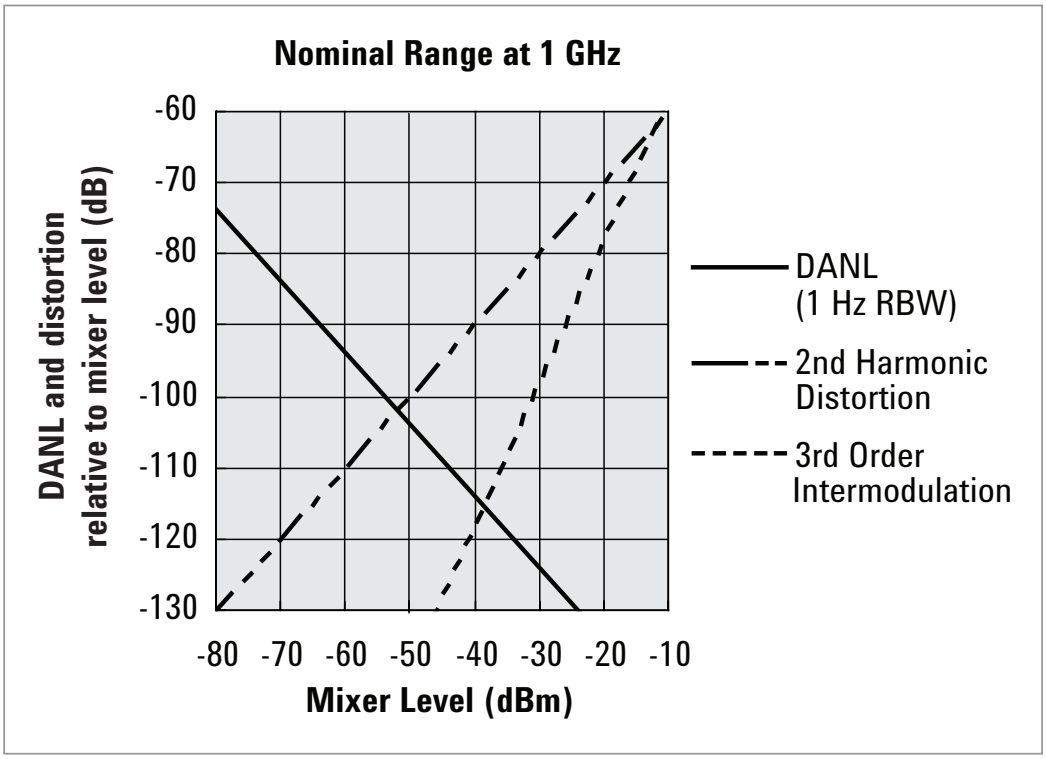

Figure 1. Nominal dynamic range – Band 0, for second and third order distortion, 20 Hz to 3.6 GHz

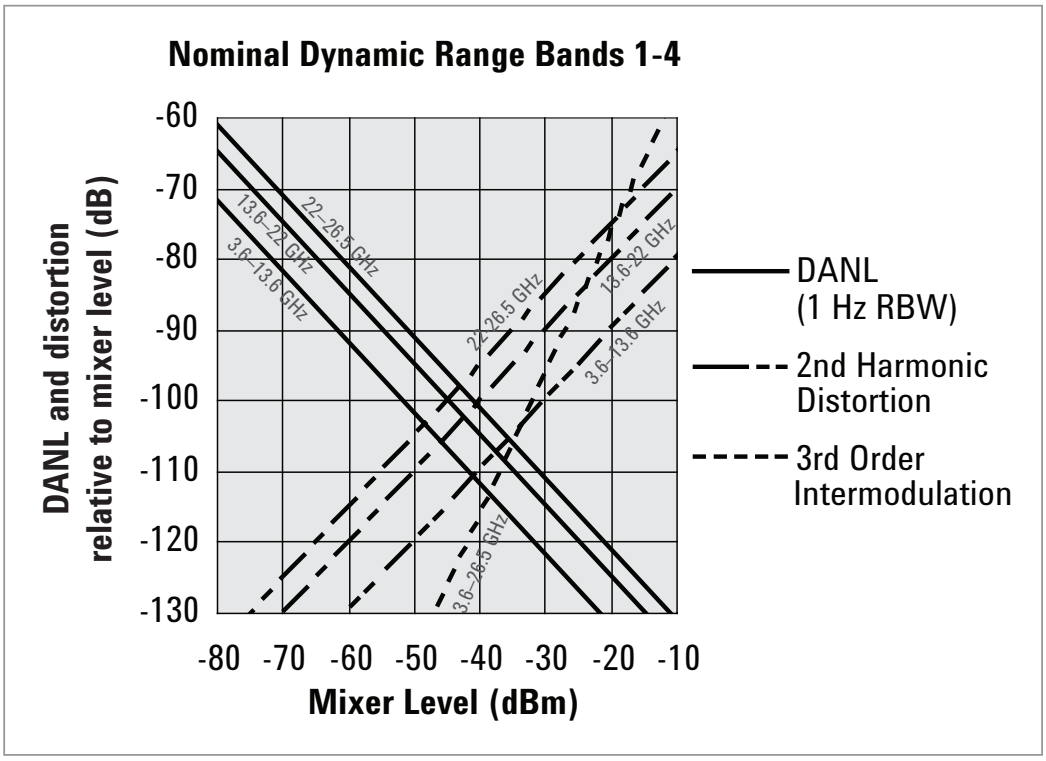

Figure 2. Nominal dynamic range – Bands 1 to 4, for second and third order distortion, 3.6 GHz to 26.5 GHz

Dynamic Range Specifications (continued)

Phase noise [1]	Offset	Specification	Typical
Noise sidebands	10 Hz		–80 dBc/Hz, nominal
(20 to 30 °C, CF = 1 GHz)	100 Hz	–91 dBc/Hz	–100 dBc/Hz
	1 kHz		–112 dBc/Hz, nominal
	10 kHz	–113 dBc/Hz	–114 dBc/Hz
	100 kHz	–116 dBc/Hz	–117 dBc/Hz
	1 MHz	–135 dBc/Hz	–136 dBc/Hz
	10 MHz		–148 dBc/Hz, nominal

1. Applies for instruments with serial number prefix ≥ MY/SG/US5233. Those instruments ship standard with N9020A-EP2 as the identifier. For nominal values at other center frequencies, refer to Figure 3. For earlier instruments, refer to the MXA specifications guide.

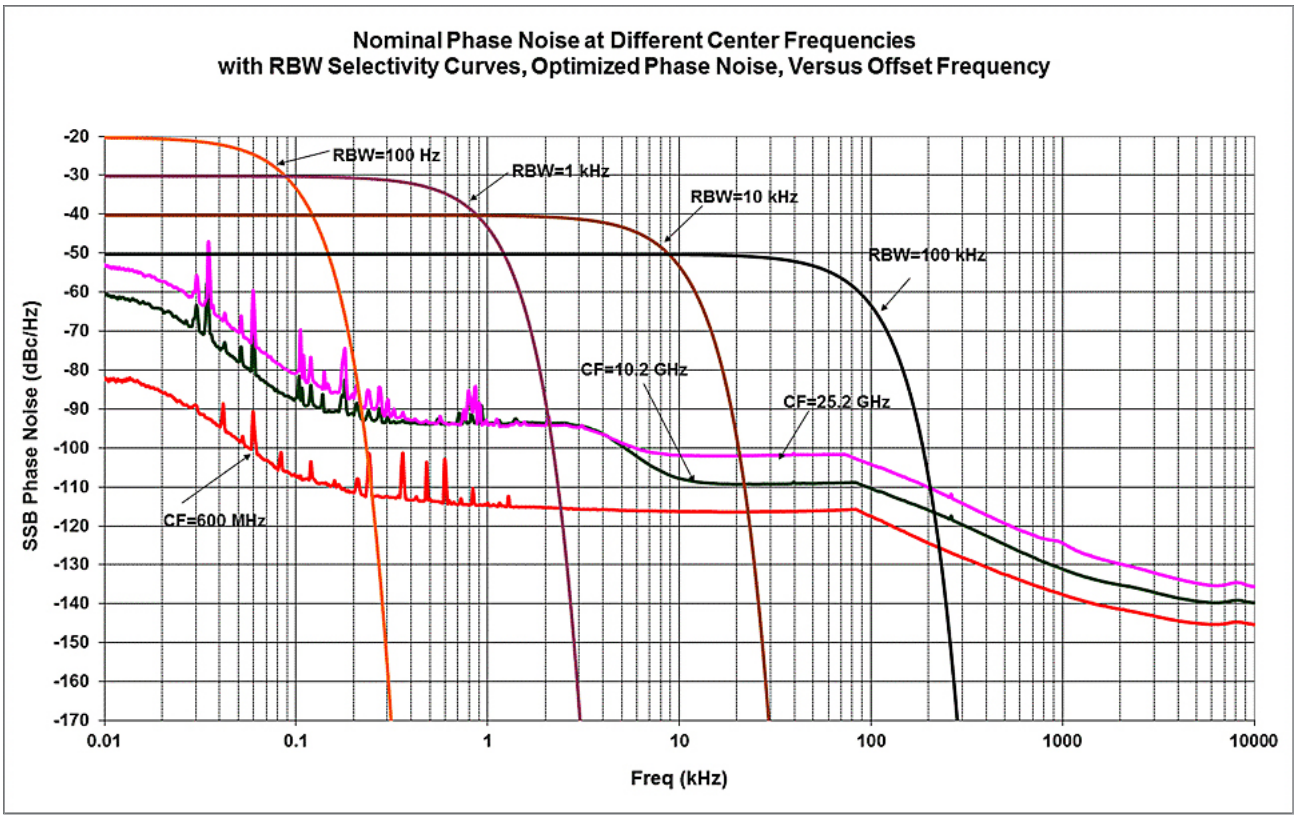

Figure 3. Nominal phase noise at different center frequencies (Applies for instruments with SN prefix ≥ MY/SG/US5233; ships standard with N9020A-EP2)

PowerSuite Measurement Specifications

Channel power		
Amplitude accuracy, W-CDMA or IS95 (20 to 30 °C, attenuation = 10 dB)	± 0.80 dB (± 0.30 dB 95th percentile)	
Occupied bandwidth		
Frequency accuracy	± [span/1000] nominal	
Adjacent channel power	**Adjacent**	**Alternate**
Accuracy, W-CDMA (ACLR) (at specific mixer levels and ACLR ranges)		
– MS	± 0.14 dB	± 0.21 dB
– BTS	± 0.49 dB	± 0.44 dB
Dynamic range (typical)		
– Without noise correction	–73 dB	–79 dB
– With noise correction	–78 dB	–80.5 dB
Offset channel pairs measured	1 to 6	
ACP measurement and transfer time (fast method)	14 ms, nominal (σ = 0.2 dB)	
Multiple number of carriers measured	Up to 12	
Power statistics CCDF		
Histogram resolution	0.01 dB	
Harmonic distortion		
Maximum harmonic number	10th	
Result	Fundamental power (dBm), relative harmonics power (dBc), total harmonic distortion in %	
Intermod (TOI)	Measure the third-order products and intercepts from two tones	
Burst power		
Methods	Power above threshold, power within burst width	
Results	Single burst output power, average output power, maximum power, minimum power within burst, burst width	
Spurious emission		
W-CDMA (1 to 3.6 GHz) table-driven spurious signals; search across regions		
– Dynamic range	96.7 dB	(101.7 dB, typical)
– Absolute sensitivity	–84.4 dBm	(–89.4 dBm, typical)
Spectrum emission mask (SEM)		
cdma2000® (750 kHz offset)		
– Relative dynamic range (30 kHz RBW)	78.9 dB	(85.0 dB, typical)
– Absolute sensitivity	–99.7 dBm	(–104.7 dBm, typical)
– Relative accuracy	± 0.11 dB	
3GPP W-CDMA (2.515 MHz offset)		
– Relative dynamic range (30 kHz RBW)	81.9 dB	(88.2 dB, typical)
– Absolute sensitivity	–99.7 dBm	(–104.7 dBm, typical)
– Relative accuracy	± 0.12 dB	

General Specifications

Temperature range	
Operating	0 to 55 °C
Storage	–40 to 70 °C
EMC	
Complies with European EMC Directive 2004/108/EC – IEC/EN 61326-1 or IEC/EN 61326-2-1 – CISPR Pub 11 Group 1, class A – AS/NZS CISPR 11:2002 – ICES/NMB-001	
This ISM device complies with Canadian ICES-001 Cet appareil ISM est conforme à la norme NMB-001 du Canada	
Safety	
Complies with European Low Voltage Directive 2006/95EC – IEC/EN 61010-1 3rd Edition – Canada: CSA C22.2 No. 61010-1-12 – U.S.A.: UL 61010-1 3rd Edition	
Acoustic statement (European Machinery Directive 2002/42/EC, 1.7.4.2u)	
– Acoustic noise emission – LpA < 70 dB – Operator position – Normal position – Per ISO 7779	
Environmental stress	
Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, vibration, altitude, and power line conditions; test methods are aligned with IEC 60068-2 and levels are similar to MILPRF-28800F Class 3.	
Power requirements	
Voltage and frequency	100 to 120 V, 50/60/400 Hz 220 to 240 V, 50/60 Hz
Power consumption – On – Standby	 465 W maximum 20 W
Display	
Resolution	1024 x 768, XGA
Size	213 mm (8.4 in.) diagonal (nominal)
Data storage	
Internal	≥ 80 GB nominal (removable solid state drive)
External	Supports USB 2.0 compatible memory devices
Weight (without options)	
Net	16 kg (35 lbs), nominal
Shipping	28 kg (62 lbs), nominal
Dimensions	
Height	177 mm (7.0 in)
Width	426 mm (16.8 in)
Length	368 mm (14.5 in)
Warranty	
The MXA signal analyzer is supplied with a standard 3-year warranty	
Calibration cycle	
The recommended calibration cycle is two years; calibration services are available through Keysight service centers	

Inputs and Outputs

Front panel	
RF input	
– Connector	Type-N female, 50 Ω, nominal
External Mixing (Option EXM)	
– Connection port	
– Connector	SMA, female
– Impedance	50 Ω, nominal
– Functions	Triplexed for LO output, IF input, and mixer bias
– Mixer bias range	± 10 mA in 10 µA step
– IF input center frequency	
– Narrowband IF path	322.5 MHz
– 40 MHz BW IF path	250.0 MHz
– 85, 125, or 160 MHz BW IF path	300 MHz
– LO output frequency range	3.75 to 14.0 GHz
Analog baseband IQ inputs (Option BBA) [1]	
– Connectors (I, Q, I-Bar, Q-Bar, and Cal Out)	BNC female
– Cal Out	
– Signal	AC coupled square wave
– Frequency	Selectable between 1 kHz and 250 kHz
– Input impedance (4 connectors: I, Q, I-, Q-)	50 Ω, 1 MΩ (selectable, nominal)
– Probes supported [2]	
– Active probe	1130A, 1131A, 1132A, 1134A
– Passive probe	1161A
– Input return loss	–35 dB (0 to 10 MHz, nominal)
– 50 Ω impedance only selected	–30 dB (10 to 40 MHz, nominal)
Probe power	
– Voltage/current	+15 Vdc, ±7 % at 150 mA max, nominal –12.6 Vdc, ±10 % at 150 mA max, nominal
USB 2.0 ports	
– Master (2 ports)	
– Standard	Compatible with USB 2.0
– Connector	USB type-A female
– Output current	0.5 A, nominal
Rear panel	
10 MHz out	
– Connector	BNC female, 50 Ω, nominal
– Output amplitude	≥ 0 dBm, nominal
– Frequency	10 MHz ± (10 MHz x frequency reference accuracy)
Ext Ref In	
– Connector	BNC female, 50 Ω, nominal
– Input amplitude range	–5 to 10 dBm, nominal
– Input frequency	1 to 50 MHz, nominal
– Frequency lock range	± 2 x 10^{-6} of specified external reference input frequency
Trigger 1 and 2 inputs	
– Connector	BNC female
– Impedance	> 10 kΩ, nominal
– Trigger level range	–5 to 5 V

1. For additional specifications, please refer to the MXA specifications guide.
2. For more details, please refer to the Keysight Probe Configuration Guides, literature numbers 5968-7141EN and 5989-6162EN; probe heads are necessary to attach to your device properly and probe connectivity kits such as E2668B, E2669A. or E2675A are required.

Inputs and Outputs (continued)

Rear panel	
Trigger 1 and 2 outputs	
– Connector	BNC female
– Impedance	50 Ω, nominal
– Level	5 V TTL, nominal
Monitor output	
– Connector	VGA compatible, 15-pin mini D-SUB
– Format	XGA (60 Hz vertical sync rates, non-interlaced) Analog RGB
– Resolution	1024 x 768
Noise source drive +28 V (pulsed)	
– Connector	BNC female
SNS Series noise source	
Analog out	
– Connector	BNC female (used with N9063A analog demod app and Option YAS)
USB 2.0 ports	
– Master (4 ports)	
– Standard	Compatible with USB 2.0
– Connector	USB type-A female
– Output current	0.5 A, nominal
– Slave (1 port)	
– Standard	Compatible with USB 2.0
– Connector	USB type-B female
– Output current	0.5 A, nominal
GPIB interface	
– Connector	IEEE-488 bus connector
– GPIB codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3, C28, DT1, L4, C0
– GPIB mode	Controller or device
LAN TCP/IP interface	
– Standard	1000 Base-T
– Connector	RJ45 Ethertwist
IF output	
– Connector	SMA female, shared by Option CR3 and CRP
– Impedance	50 Ω, nominal
Wideband IF output, Option CR3	
Center frequency	
– SA mode or I/Q analyzer	
– with IF BW ≤ 25 MHz	322.5 MHz
– with Option B40	250 MHz
– with Option B85, B1A, or B1X	300 MHz
Conversion gain	–1 to +4 dB (nominal) plus RF frequency response
Bandwidth	
– Low band	Up to 140 MHz (nominal)
– High band, with preselector	Depends on center frequency
– High band, with preselector bypassed [1]	Up to 410 MHz
Programmable IF output, Option CRP	
Center frequency	
– Range	10 to 75 MHz (user selectable)
– Resolution	0.5 MHz
Conversion gain	–1 to +4 dB (nominal) plus RF frequency response
Bandwidth	
– Output at 70 MHz	100 MHz (nominal)
– Low band or high band with preselector bypassed [1]	Depends on RF center frequency
– Preselected band	Subject to folding
– Lower output frequencies	
Residual output signals	≤ –88 dBm (nominal)

1. Option MPB installed and enabled.

I/Q Analyzer

Resolution bandwidth (spectrum measurement)				
Range				
– Overall	100 mHz to 3 MHz			
– Span = 1 MHz	50 Hz to 1 MHz			
– Span = 10 kHz	1 Hz to 10 kHz			
– Span = 100 Hz	100 mHz to 100 Hz			
Window shapes				
Flat top, Uniform, Hanning, Gaussian, Blackman, Blackman-Harris, Kaiser Bessel (K-B 70 dB, K-B 90 dB and K-B 110 dB)				
Analysis bandwidth				
Standard	10 Hz to 10 MHz			
Option B25 (standard)	10 Hz to 25 MHz			
Option B40	10 Hz to 40 MHz			
Option B85	10 Hz to 85 MHz			
Option B1A	10 Hz to 125 MHz			
Option B1X	10 Hz to 160 MHz			
IF frequency response (standard 10 MHz IF path)				
IF frequency response (demodulation and FFT response relative to the center frequency, 20 to 30 °C)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**	**Max. error**	**RMS (nominal)**
≤ 3.6	≤ 10	NA	± 0.40 dB	0.04 dB
3.6 < f ≤ 26.5	≤ 10	On		0.25 dB
3.6 < f ≤ 26.5	≤ 10	Off [1]	± 0.45 dB	0.04 dB
IF phase linearity (deviation from mean phase linearity, nominal)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**	**Peak-to-peak**	**RMS**
≤ 3.6	≤ 10	NA	0.4 °	0.1 °
3.6 < f ≤ 26.5	≤ 10	On	1.0 °	0.2 °
3.6 < f ≤ 26.5	≤ 10	Off [1]	0.4 °	0.1 °
Data acquisition (10 MHz IF path)				
Time record length				
– IQ analyzer	4,000,000 IQ sample pairs			
Sample rate at ADC				
– Option DP2, B40 or MPB	100 MSa/s			
– None of the above	90 MSa/s			
ADC resolution				
– Option DP2, B40 or MPB	16 bits			
– None of the above	14 bits			
Option B25 (standard) 25 MHz analysis bandwidth				
IF frequency response (demodulation and FFT response relative to the center frequency, 20 to 30 °C)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**	**Max. error**	**RMS (nominal)**
≤ 3.6	10 to ≤ 25	NA	± 0.45 dB	0.051 dB
3.6 < f ≤ 26.5	10 to ≤ 25	On		0.45 dB
3.6 < f ≤ 26.5	10 to ≤ 25	Off [1]	± 0.45 dB	0.05 dB
IF phase linearity (deviation from mean phase linearity, nominal)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**	**Peak-to-peak**	**RMS**
0.02 ≤ f < 3.6	≤ 25	NA	0.6 °	0.14 °
3.6 ≤ f ≤ 26.5	≤ 25	On	4.5 °	1.2 °
3.6 ≤ f ≤ 26.5	≤ 25	Off [1]	1.9 °	0.42 °

1. Option MPB is installed and enabled.

I/Q Analyzer (continued)

Data acquisition (25 MHz IF path)			
Time record length (IQ pairs)			
– IQ Analyzer	4,000,000 IQ sample pairs		
89600 software	**32-bit packing**	**64-bit packing**	**Memory**
Option DP2, B40 or MPB	536 MSa	268 MSa	2 GB
None of the above	4,000,000 IQ sample pairs (independent of data packing)		
Sample rate at ADC			
– Option DP2, B40 or MPB	100 MSa/s		
– None of the above	90 MSa/s		
ADC resolution			
– Option DP2, B40 or MPB	16 bits		
– None of the above	14 bits		

I/Q Analyzer – Option B40

40 MHz analysis bandwidth, Option B40 is automatically included in Option B85, B1A or B1X

Option B40 40 MHz analysis bandwidth				
IF frequency response (demodulation and FFT response relative to the center frequency, 20 to 30 °C)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**		**RMS (nominal)**
0.03 ≤ f < 3.6	≤ 40	NA	± 0.45 dB	± 0.08 dB
3.6 ≤ f ≤ 8.4	≤ 40	Off [1]	± 0.35 dB	± 0.08 dB
8.4 < f ≤ 26.5	≤ 40	Off [1]	± 0.46 dB	± 0.08 dB
IF phase linearity (deviation from mean phase linearity, nominal)				
Center frequency (GHz)	**Span (MHz)**	**Preselector**	**Peak-to-peak**	**RMS**
0.02 ≤ f < 3.6	40	NA	0.2 °	0.05 °
3.6 ≤ f ≤ 26.5	40	Off [1]	5 °	1.4 °
Dynamic range (40 MHz IF path)				
SFDR (Spurious-free dynamic range)				
– Signal frequency within ± 12 MHz of center	–77 dBc, nominal			
Signal frequency anywhere within analysis BW				
– Spurious response within ± 18 MHz of center	–74 dBc, nominal			
– Response anywhere within analysis BW	–74 dBc, nominal			
Data acquisition (40 MHz IF path)				
Time record length (IQ pairs)				
– IQ Analyzer	4,000,000 samples (I/Q pairs)			
89600 VSA software	**32-bit packing**	**64-bit packing**		
Length (IQ sample pairs)	536 MSa	268 MSa	2 GB total memory, nominal	
Length (time units)			Samples/(Span x 1.25), nominal	
Sample rate				
– At ADC	200 Msa/s			
– IQ pairs			Span x 1.25, nominal	
ADC resolution	12 bits			

1. Option MPB is installed and enabled.

I/Q Analyzer – Option B85/B1A/B1X

85/125/160 MHz analysis bandwidth

IF frequency response					
IF frequency response (20 to 30 °C)				Relative to center frequency	
Center freq. (GHz)	**Span (MHz)**	**Preselector**		**Typical**	**RMS (nominal)**
≥ 0.15, < 3.6	≤ 85	NA	± 0.6 dB	± 0.17 dB	0.05 dB
	≤ 140	NA	± 0.6 dB	± 0.25 dB	0.05 dB
	≤ 160	NA		± 0.2 dB (nomimal)	0.07 dB
≥ 3.6, ≤ 8.4	≤ 85	Off [1]	± 0.73 dB	± 0.2 dB	0.06 dB
	≤ 140	Off [1]	± 0.8 dB	± 0.35 dB	0.06 dB
	≤ 160	Off [1]		± 0.3 dB (nomimal)	0.07 dB
> 8.4, ≤ 26.5	≤ 85	Off [1]	± 1.10 dB	± 0.50 dB	0.2 dB
	≤ 140	Off [1]	± 1.40 dB	± 0.76 dB	0.2 dB
	≤ 160	Off [1]		± 0.5 dB (nomimal)	0.12 dB
IF phase linearity (deviation from mean phase linearity, nominal)					
Center freq. (GHz)	**Span (MHz)**	**Preselector**		**Peak-to-peak**	**RMS**
≥ 0.03, < 3.6	≤ 85	NA		1.6°	0.54°
	≤ 140	NA		3.9°	0.85°
	≤ 160	NA		4.7°	1.23°
≥ 3.6	≤ 85	Off [1]		4.2°	0.93°
	≤ 160	Off [1]		5.3°	1.73°
EVM (EVM measurement floor)	Customized settings required, preselector bypassed (Option MPB) is installed and enabled				
Case 1: 802.11ac OFDM signal, 80 MHz bandwidth, MCS8, using 89600 VSA software equalization on, pilot phase tracking post EQ on					
Carrier frequency, 5.21 GHz; input power, 0 dBm	0.23% (–52.7 dB), nominal			(EQ on preamble, pilots, and data)	
	0.35% (–49.1 dB), nominal			(EQ on preamble only)	
Case 2: 802.11ac OFDM signal, 160 MHz bandwidth, MCS8, using 89600 VSA software equalization on, pilot phase tracking post EQ on					
Carrier frequency, 5.25 GHz; input power, 0 dBm	0.30% (–50.4 dB), nominal			(EQ on preamble, pilots, and data)	
	0.40% (–47.9 dB), nominal			(EQ on preamble only)	
Dynamic range					
SFDR (Spurious-free dynamic range)					
– Signal frequency within ± 12 MHz of center	–72 dBc, nominal				
– Signal frequency anywhere within analysis BW					
– Spurious response within ± 63 MHz of center	–71 dBc, nominal				
– Response anywhere within analysis BW	–69 dBc, nominal				
Full scale (ADC clipping)					
Default settings, signal at CF (IF gain = Low: IF gain offset = 0 dB)					
– Band 0	–8 dBm mixer level, nominal				
– Band 1 through 4	–7 dBm mixer level, nominal				
High gain setting, signal at CF (IF gain = High)					
– Band 0	–18 dBm mixer level nominal, subject to gain limitations				
– Band 1 through 4	–17 dBm mixer level nominal, subject to gain limitations				
Effect of signal frequency ≠ CF	Up to ± 3 dB, nominal				

1. Option MPB is installed and enabled.

I/Q Analyzer – Option B85/B1A/B1X (continued)

85/125/160 MHz analysis bandwidth

Data acquisition (85/125/160 MHz IF path)			
Time record length			
– IQ analyzer	4,000,000 IQ sample pairs		
– 89600 VSA software	Data packing		
	32-bit	64-bit	
– Length (IQ sample pairs)	536 MSa (2^{29} Sa)	268 MSa (2^{28} Sa)	2 GB total memory
– Length (time units)	Samples/(span x 1.25)		
Sample rate			
– At ADC	400 Msa/s		
– IQ pairs	Span dependent		
ADC resolution	14 bits		

Real-Time Spectrum Analyzer (RTSA) [1]

Option RT1 or RT2

Real-time analysis		
Real-time analysis bandwidth		
– Option RT1	Up to 160 MHz	Analysis BW option determines the max real-time bandwidth
– Option RT2	Up to 160 MHz	Analysis BW option determines the max real-time bandwidth
Minimum detectable signal duration with > 60 dB StM [2] ratio		
– Option RT1	11.42 ns	
– Option RT2	5.0 ns	
Minimum signal duration with 100% probability of Frequency Mask Triggering (FMT) at full amplitude accuracy		
– Option RT1	17.3 µs	Signal is at mask level
– Option RT2	3.57 µs	Signal is at mask level
Minimum acquisition time	100 µs	
FFT rate	292,969/s	
Supported triggers	Level, Level with time qualified (TQT), Line, External, RF burst, Frame, Frequency mask (FMT), FMT with TQT	

1. For additional RTSA specifications, please refer to Option RT1/RT2 Chapter in the MXA Signal Analyzer specifications guide (part number: N9020-90113)
2. StM = “Signal-to-Mask”

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