

Keysight N9040B

UXA X-Series Signal Analyzer

LXI Class Certified

Available frequency ranges

N9040B-508 3 Hz to 8.4 GHz
N9040B-513 3 Hz to 13.6 GHz
N9040B-526 3 Hz to 26.5 GHz

Data Sheet

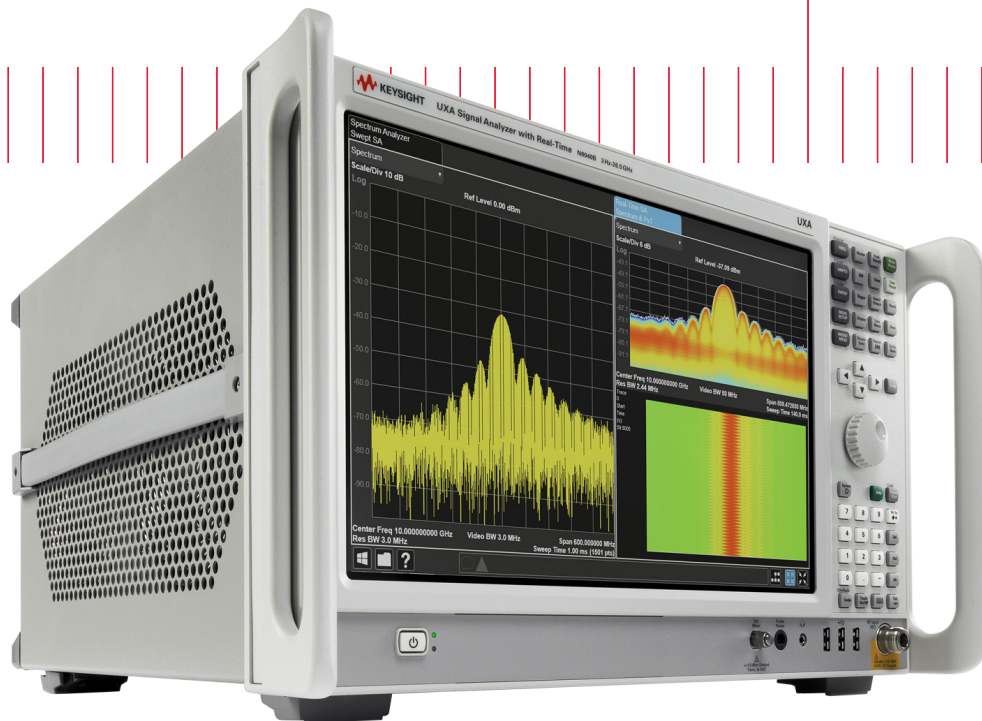


Table of Contents

Frequency and Time Specifications	3
Amplitude Accuracy and Range Specifications	6
Dynamic Range Specifications	9
General Specifications	13
Inputs and Outputs	15
Other Optional Outputs	17
I/Q Analyzer	19
I/Q Analyzer - Option B25	20
I/Q Analyzer - Option B40	21
I/Q Analyzer - Option B2X	22
I/Q Analyzer - Option B5X	23
Real-time Spectrum Analyzer (RTSA)	25
Related Literature	25

Frequency and Time Specifications

Frequency range	DC coupled	AC coupled
Option 508	3 Hz to 8.4 GHz	10 MHz to 8.4 GHz
Option 513	3 Hz to 13.6 GHz	10 MHz to 13.6 GHz
Option 526	3 Hz to 26.5 GHz	10 MHz to 26.5 GHz
Frequency band	LO multiple (N)	Frequency range
0	1	3 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	\pm [(time since last adjustment x aging rate) + temperature stability + calibration accuracy]
Aging rate	Standard $\pm 3 \times 10^{-8}$ / year
Temperature stability Full temperature range	Standard $\pm 4.5 \times 10^{-9}$
Achievable initial calibration accuracy	Standard $\pm 3.1 \times 10^{-8}$
Example frequency reference accuracy (standard)	$= \pm (3 \times 10^{-8} + 4.5 \times 10^{-9} + 3.1 \times 10^{-8})$
1 year after last adjustment	$= \pm 6.6 \times 10^{-8}$
Residual FM Center frequency = 1 GHz 10 Hz RBW, 10 Hz VBW	$\leq (0.25 \text{ Hz} \times N)$ p-p in 20 ms nominal See band table above for N (LO multiple)

Frequency readout accuracy (start, stop, center, marker)
\pm (marker frequency x frequency reference accuracy + 0.1% x span + 5 % x RBW + 2 Hz + 0.5 x horizontal resolution ¹)

¹ Horizontal resolution is span/(sweep points - 1).

Frequency and Time Specifications (continued)

Marker frequency counter

Accuracy	\pm (marker frequency x frequency reference accuracy + 0.100 Hz)
Delta counter accuracy	\pm (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	\pm (0.1% x span + horizontal resolution)
FFT	\pm (0.1% x span + horizontal resolution)

Sweep time and triggering

Range	Span = 0 Hz	1 μ s to 6000 s
	Span \geq 10 Hz	1 ms to 4000 s
Accuracy	Span \geq 10 Hz, swept	\pm 0.01% nominal
	Span \geq 10 Hz, FFT	\pm 40% nominal
	Span = 0 Hz	\pm 0.01% nominal
Sweep 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 \geq 10 Hz, swept	0 to 500 ms
	Resolution	0.1 μ s

Time gating

Gate methods	Gated LO; gated video; gated FFT
Gate length range (except method = FFT)	1 μ s 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 40,001
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Resolution bandwidth (RBW)

Range (-3.01 dB bandwidth)	1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz	
Bandwidth accuracy (power)		
RBW range	1 Hz to 100 kHz	\pm 0.5% (\pm 0.022 dB)
	110 kHz to 1.0 MHz (< 3.6 GHz CF)	\pm 1.0% (\pm 0.044 dB)
	1.1 to 2 MHz (< 3.6 GHz CF)	\pm 0.07 dB nominal
	2.2 to 3 MHz (< 3.6 GHz CF)	\pm 0.10 dB nominal
	4 to 8 MHz (< 3.6 GHz CF)	\pm 0.20 dB nominal
Bandwidth accuracy (-3.01 dB)		
RBW range	1 Hz to 1.3 MHz	\pm 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 required)
EMI bandwidth (MIL STD 461E compliant)	10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz	(Option EMC required)

Frequency and Time Specifications (continued)

Analysis bandwidth²

Maximum bandwidth	Standard	10 MHz
	Option B25	25 MHz
	Option B40	40 MHz
	Option B2X	255 MHz
	Option B5X	510 MHz

Video bandwidth (VBW)

Range	1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz, and wide open (labeled 50 MHz)
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Accuracy	± 6% nominal (in swept mode and zero span)
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² 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.

Amplitude Accuracy and Range Specifications

Amplitude range	
Measurement range	Displayed average noise level (DANL) to +30 dBm (for preamp Off) Displayed average noise level (DANL) to +24 dB (for preamp On)
Input mechanical attenuator range (3 Hz to 26.5 GHz)	0 to 70 dB in 2 dB steps
Electronic attenuator (Option EA3)	
Frequency range	3 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	+30 dBm (1 W)
Peak pulse power	< 10 μ s pulse width, < 1% duty cycle +50 dBm (100 W) and input attenuation \geq 30 dB
DC volts	
DC coupled	\pm 0.2 Vdc
AC coupled	\pm 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, dB μ V, dBmA, dB μ A, V, W, A

Frequency response	Specifications	95th percentile ($\approx 2\sigma$)	
(10 dB input attenuation, 20 to 30 °C, preselector centering applied above 3.6 GHz)			
Option 508, 513, 526	3 Hz to 10 MHz	\pm 0.46 dB	
	10 to 50 MHz	\pm 0.35 dB	\pm 0.19 dB
	50 MHz to 3.6 GHz	\pm 0.35 dB	\pm 0.14 dB
	3.5 to 8.4 GHz	\pm 1.5 dB	\pm 0.50 dB
	8.3 to 13.6 GHz	\pm 2.0 dB	\pm 0.51 dB
	13.5 to 17.1 GHz	\pm 2.0 dB	\pm 0.57 dB
	17.0 GHz to 22 GHz	\pm 2.0 dB	\pm 0.65 dB
	22.0 to 26.5 GHz	\pm 2.5 dB	\pm 0.87 dB
Preamp on (0 dB attenuation) (Option P08, P13, P26)			
	9 to 100 kHz	\pm 0.38 dB	
	100 kHz to 50 MHz	\pm 0.68 dB	\pm 0.32 dB
	50 MHz to 3.6 GHz	\pm 0.55 dB	\pm 0.28 dB
	3.5 to 8.4 GHz	\pm 2.0 dB	\pm 0.64 dB
	8.3 to 13.6 GHz	\pm 2.3 dB	\pm 0.69 dB
	13.5 to 17.1 GHz	\pm 2.5 dB	\pm 0.84 dB
	17.0 to 22.0 GHz	\pm 3.0 dB	\pm 1.13 dB
	22.0 to 26.5 GHz	\pm 3.5 dB	\pm 1.48 dB

Amplitude Accuracy and Range Specifications (continued)

Input attenuation switching uncertainty		Specifications	Supplemental information
Relative to 10 dB and preamp off			
At 50 MHz (reference frequency)	attenuation 12 to 40 dB	± 0.14 dB	± 0.04 dB typical
	attenuation 2 to 8 dB	± 0.18 dB	± 0.06 dB typical
	attenuation 0 dB		± 0.05 dB nominal
Attenuation > 2 dB			
3 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

Total absolute amplitude accuracy	Specifications
(10 dB attenuation, 20 to 30°C, 1 Hz \leq RBW \leq 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
	± 0.24 dB
	At all frequencies
	$\pm (0.24 \text{ dB} + \text{frequency response})$
	10 Hz to 3.6 GHz
	± 0.16 dB (95th Percentile approx. 2σ)
Preamp on (Option P08, P13, and P26)	At all frequencies
	$\pm (0.36 \text{ dB} + \text{frequency response})$

Input voltage standing wave ratio (VSWR)	95th percentile
(10 dB input attenuation)	
50 MHz	1.07:1 nominal
10 MHz to 3.6 GHz	1.101
3.5 to 8.4 GHz	1.278
8.3 to 13.6 GHz	1.341
13.5 to 17.1 GHz	1.57
17.0 to 26.5 GHz	1.59
Preamp on (Option P08, P13, or P26)	
(0 dB input attenuation)	
10 MHz to 3.6 GHz	1.56
3.5 to 8.4 GHz	1.47
8.3 to 13.6 GHz	1.57
13.5 to 17.1 GHz	1.72
17.0 to 26.5 GHz	1.69

Amplitude Accuracy and Range Specifications (continued)

Resolution bandwidth switching uncertainty (referenced to 30 kHz RBW)

1 Hz to 1.5 MHz RBW	± 0.03 dB
1.6 MHz to 2.7 MHz RBW	± 0.05 dB
3 MHz RBW	± 0.10 dB
4, 5, 6, 8 MHz RBW	± 0.30 dB

Reference level

Range	± 0.03 dB
Log scale	-170 to +30 dBm in 0.01 dB steps
Linear scale	707 pV to 7.07 V with 0.11% (0.01 dB) resolution

Accuracy	0 dB
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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	± 0.04 dB typical
Below -18 dBm input mixer level	± 0.07 dB	± 0.02 dB typical

Trace detectors

Standard	Normal, peak, sample, negative peak, log power average, RMS average, and voltage average
With Option EMC	Add quasi-peak to above

Preamplifier

Frequency range ⁴	Option P08	9 kHz to 8.4 GHz
	Option P13	9 kHz to 13.6 GHz
	Option P26	9 kHz to 26.5 GHz
Gain	9 kHz to 3.6 GHz	+20 dB nominal
	3.6 to 26.5 GHz	+35 dB nominal

⁴ Below 100 kHz, only 95th percentile (approx. 2σ) value for frequency response is provided

Dynamic Range Specifications

1 dB gain compression (two-tone)		Maximum power at input mixer	
(At 1 kHz RBW with 100 kHz tone spacing, 20 to 30 °C)			
	20 to 40 MHz	-3 dBm	0 dBm typical
	40 to 200 MHz	+1 dBm	+3 dBm typical
	200 MHz to 3.6 GHz	+3 dBm	+5 dBm typical
	3.6 to 16 GHz	+1 dBm	+5 dBm typical
	16 to 26.5 GHz	-1 dBm	+5 dBm typical
Preamp On (Option 508, 513, or 526)	10 MHz to 3.6 GHz		-14 dBm nominal
	3.6 to 26.5 GHz		
	Tone spacing 100 kHz to 20 MHz		-28 dBm nominal
	Tone spacing > 70 MHz		-10 dBm nominal

Displayed average noise level (DANL) ⁵	Specifications	Typical	
(Input terminated, sample or average detector, averaging type = Log, 0 dB input attenuation, IF Gain = High, 1 Hz RBW, 20 to 30 °C)			
	LNP Off/LNP On ⁶	LNP Off/LNP On ⁶	
	3 to 10 Hz	-100 dBm/NA nominal	
	10 to 100 Hz	-125 dBm/NA nominal	
	100 Hz to 1 kHz	-130 dBm/NA nominal	
	1 to 9 kHz	-137 dBm/NA nominal	
	9 to 100 kHz	-141 dBm/NA	-146 dBm/NA typical
	100 kHz to 1 MHz	-150 dBm/NA	-155 dBm/NA typical
	1 to 10 MHz	-155 dBm/NA	-157 dBm/NA typical
	10 MHz to 1.2 GHz	-155 dBm/NA	-156 dBm/NA typical
	1.2 to 2.1 GHz	-153 dBm/NA	-155 dBm/NA typical
	2.1 to 3.0 GHz	-152 dBm/NA	-153 dBm/NA typical
	3.0 to 3.6 GHz	-151 dBm/NA	-152 dBm/NA typical
	3.5 to 4.2 GHz	-149 dBm/-154 dBm	-152 dBm/-155 dBm typical
	4.2 to 8.4 GHz	-150 dBm/-155 dBm	-152 dBm/-156 dBm typical
	8.3 to 13.6 GHz	-149 dBm/-155 dBm	-151 dBm/-156 dBm typical
	13.5 to 16.9 GHz	-145 dBm/-152 dBm	-147 dBm/-155 dBm typical
	16.9 to 20.0 GHz	-143 dBm/-151 dBm	-146 dBm/-154 dBm typical
	20.0 to 26.5 GHz	-136 dBm/-148 dBm	-139 dBm/-151 dBm typical
Preamp On ⁷ (Option 508, 513, or 526)	100 to 200 kHz	-152 dBm/NA	-159 dBm/NA typical
	200 to 500 kHz	-155 dBm/NA	-161 dBm/NA typical
	0.5 to 1 MHz	-159 dBm/NA	-164 dBm/NA typical
	1 to 10 MHz	-161 dBm/NA	-166 dBm/NA typical
	10 MHz to 2.1 GHz	-165 dBm/NA	-166 dBm/NA typical
	2.1 to 3.6 GHz	-163 dBm/NA	-164 dBm/NA typical
	3.5 to 8.4 GHz	-164 dBm/NA	-166 dBm/NA typical
	8.3 to 13.6 GHz	-163 dBm/NA	-165 dBm/NA typical
	13.5 to 16.9 GHz	-161 dBm/NA	-163 dBm/NA typical
	16.9 to 20.0 GHz	-159 dBm/NA	-161 dBm/NA typical
	20.0 to 26.5 GHz	-155 dBm/NA	-158 dBm/NA typical

⁵ With the NFE (Noise Floor Extension) "Off".

⁶ LNP (Low Noise Path) is standard for the UXA.

⁷ At higher frequency bands (beyond 3.6 GHz), Preamp "On" supersedes "LNP enabled". LNP cannot operate simultaneously with preamp.

Dynamic Range Specifications (continued)

Displayed average noise level (DANL) with noise floor extension (NF2) on	Improvement @ 95th percentile		
	Preamp Off	Preamp On	LNP On
Band 0, $f > 20$ MHz	9 dB	10 dB	NA
Band 1	10 dB	9 dB	10 dB
Band 2	10 dB	10 dB	10 dB
Band 3	9 dB	9 dB	10 dB
Band 4	9 dB	8 dB	9 dB
Examples of effective DANL (1 Hz RBW)	Preamp Off	Preamp On	LNP On
Mid-Band 0 (1.8 GHz)	-161 dBm	-171 dBm	NA
Mid-Band 1 (5.95 GHz)	-158 dBm	-172 dBm	-162 dBm
Mid-Band 2 (10.95 GHz)	-159 dBm	-168 dBm	-162 dBm
Mid-Band 3 (15.3 GHz)	-152 dBm	-165 dBm	-160 dBm
Mid-Band 4 (21.75 GHz)	-149 dBm	-160 dBm	-160 dBm

Residues, images, and spurious responses			
Residual responses (Input terminated and 0 dB attenuation)		200 kHz to 8.4 GHz Zero span or FFT or other frequencies	-100 dBm -100 dBm nominal
Image responses (Mixer level at -10 dBm)	Tuned Freq (f)	Excitation Freq	Response
	10 MHz to 26.5 GHz	f+45 MHz	-80 dBc -105 dBc typical
	10 MHz to 3.6 GHz	f+10,245 MHz	-80 dBc -106 dBc typical
	10 MHz to 3.6 GHz	f+645 MHz	-80 dBc -101 dBc typical
	3.5 to 13.6 GHz	f+645 MHz	-78 dBc -86 dBc typical
	13.5 to 17.1 GHz	f+645 MHz	-74 dBc -84 dBc typical
	17.0 to 22 GHz	f+645 MHz	-70 dBc -78 dBc typical
	22 to 26.5 GHz	f+645 MHz	-66 dBc -75 dBc typical
Other spurious responses	Mixer level	Response	
Carrier frequency ≤ 26.5 GHz			
First RF order ($f \geq 10$ MHz from carrier)	-10 dBm	-80 dBc + $20\log(N^9)$ Including IF feedthrough, LO harmonic mixing responses -165 dBm	
Higher RF order ($f \geq 10$ MHz from carrier)	-40 dBm	-80 dBc + $20\log(N^9)$ Including higher order mixer responses	
LO-related spurious responses ($200 \text{ Hz} \leq f < 10 \text{ MHz}$ from carrier), Mixer level at -10 dBm		-68 dBc ⁸ + $20\log(N^9)$	
Line-related spurious responses		-73 dBc ⁸ + $20\log(N^9)$ (nominal)	

⁸ Nominally -40 dBc under large magnetic (0.38 Gauss rms) or vibrational (0.21 g rms) environmental stimuli.

⁹ N is the LO multiplication factor. Refer to page 4 for the N value verses frequency ranges.

Dynamic Range Specifications (continued)

Second harmonic distortion (SHI)				
	Source frequency	Mixer level	Distortion (LNP Off/LNP On)	SHI (LNP Off/LNP On)
	10 MHz to 1.8 GHz	-15 dBm	-60 dBc/NA	+45 dBm/NA
	1.75 to 2.5 GHz	-15 dBm	-77 dBc/-95 dBc	+62 dBm/+80 dBm
	2.5 to 4 GHz	-15 dBm	-77 dBc/-101 dBc	+62 dBm/+86 dBm
	4 to 6.5 GHz	-15 dBm	-77 dBc/-105 dBc	+62 dBm/+90 dBm
	6.5 to 10 GHz	-15 dBm	-70 dBc/-105 dBc	+55 dBm/+90 dBm
	10 to 13.25 GHz	-15 dBm	-62 dBc/-105 dBc	+47 dBm/+90 dBm
	Source frequency	Preamp level	Distortion	SHI
Preamp On (Option P08, P13, or P26)	10 MHz to 1.8 GHz	-45 dBm	-78 dBc nominal	+33 dBm nominal
	1.8 to 13.25 GHz	-50 dBm	-60 dBc nominal	+10 dBm nominal

Third-order intermodulation distortion (TOI)			
(two -16 dBm tones at input mixer with tone separation > 5 times IF prefilter bandwidth, 20 to 30 °C)			
	10 to 300 MHz	+13.5 dBm	+16 dBm typical
	300 to 600 MHz	+18 dBm	+21 dBm typical
	0.6 to 1.5 GHz	+20 dBm	+22 dBm typical
	1.5 to 3.6 GHz	+21 dBm	+23 dBm typical
	3.5 to 8.4 GHz	+19 dBm	+22 dBm typical
	8.3 to 13.6 GHz	+19 dBm	+23 dBm typical
	13.5 to 17.1 GHz	+18 dBm	+23 dBm typical
	17.0 to 26.5 GHz	+19 dBm	+24 dBm typical
Preamp On (Option P08, P13, or P26)			
Tones at preamp input			
(two -45 dBm)	10 to 500 MHz		+4 dBm nominal
(two -45 dBm)	500 MHz to 3.6 GHz		+4.5 dBm nominal
(two -50 dBm)	3.6 to 26.5 GHz		-15 dBm nominal

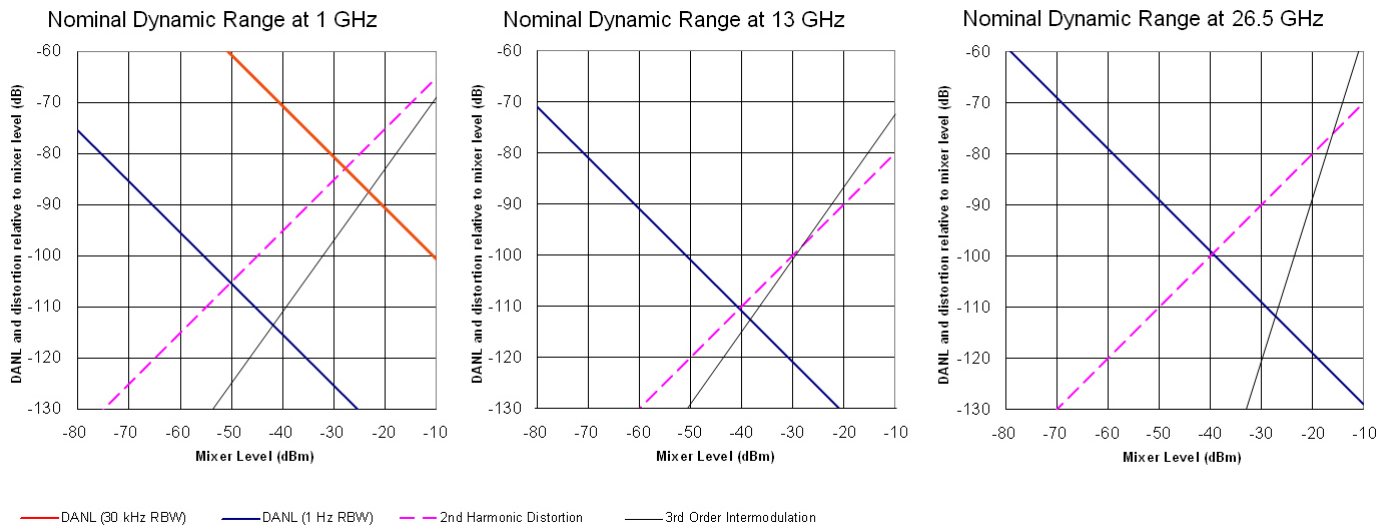


Figure 1. Nominal second- and third-order dynamic range plots at different frequencies

Dynamic Range Specifications (continued)

Phase noise			
	Offset	Specifications	Typical
Noise sidebands (20 to 30 °C, CF = 1 GHz)	10 Hz	–	–88 or –97 dBc/Hz nominal ¹⁰
	100 Hz	–107 dBc/Hz	–112 dBc/Hz typical
	1 kHz	–125 dBc/Hz	–129 dBc/Hz typical
	10 kHz	–134 dBc/Hz	–136 dBc/Hz typical
	100 kHz	–139 dBc/Hz	–142 dBc/Hz typical
	1 MHz	–145 dBc/Hz	–147 dBc/Hz typical
	10 MHz	–155 dBc/Hz	–157 dBc/Hz typical

¹⁰ For narrow and wide reference loop BW, respectively.

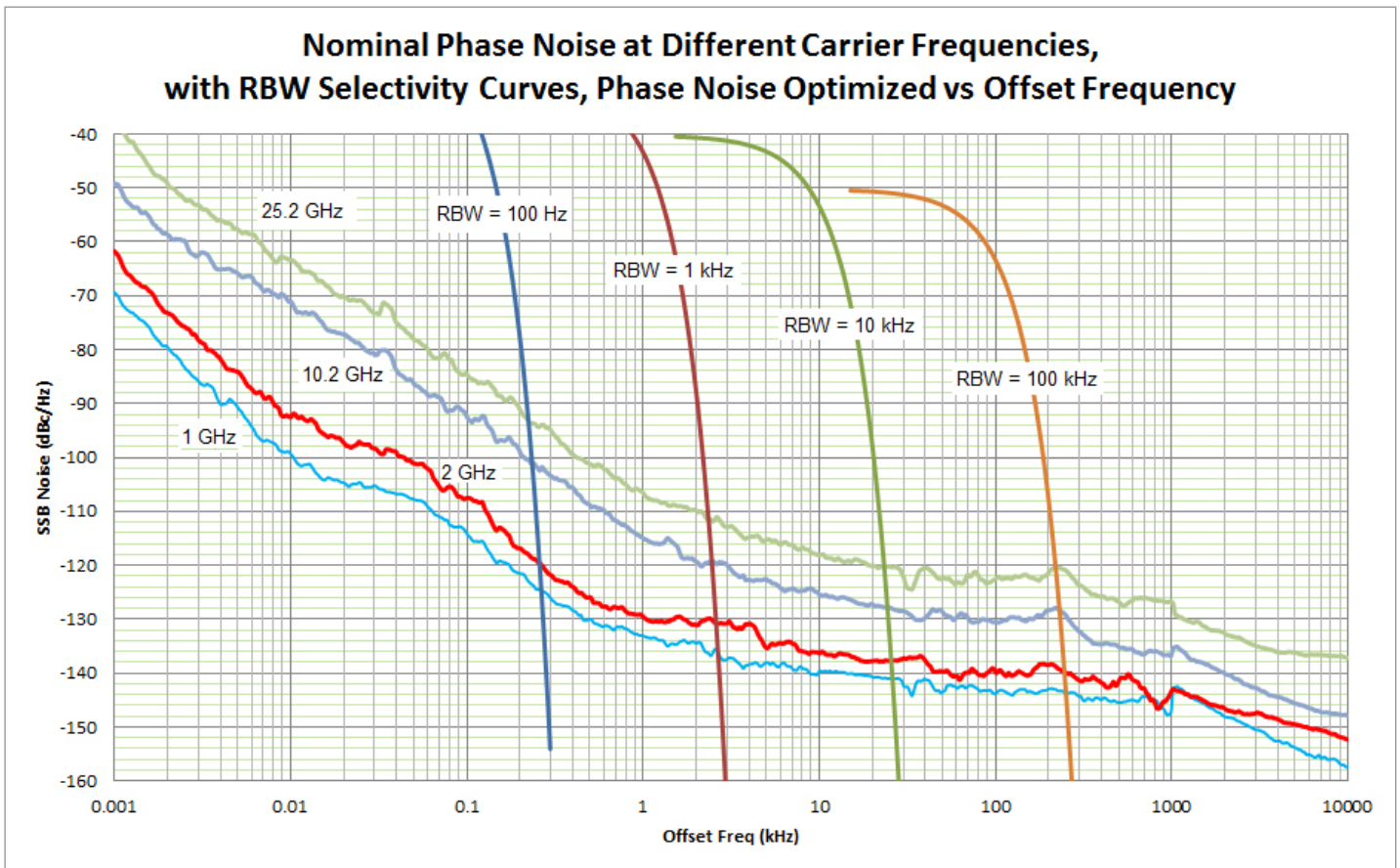


Figure 2. Nominal UXA phase noise at various center frequencies

General Specifications

Temperature range

Operating	0 to 55 °C
Storage	-40 to +70 °C

Altitude

4,500 meters (approx. 15,000 feet)

EMC

Complies with European EMC Directive 2004/108/EC

- IEC/EN 61326-1
- CISPR Pub 11 Group 1, class A 1
- AS/NZS CISPR 11
- 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 2006/95/EC

- IEC/EN 61010-1 3rd Edition
- Canada: CSA C22.2 No. 61010-1-12
- USA: 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

Acoustic noise - more information

Values given are per ISO 7779 standard in the "Operator Sitting" position

Ambient temperature

< 35 °C

Nominally under 55 dBA Sound Pressure. 55 dBA is generally considered suitable for use in quiet office environment

≥ 35 °C

Nominally under 65 dBA Sound Pressure. 65 dBA is generally considered suitable for use in noisy office environment

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
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Power consumption

On	850 W (Maximum)
Standby	25 W

General Specifications (continued)

Display

Resolution	1,280 x 800
Size	357 mm (14.1 in.) diagonal (nominal) Capacitive multi-touch screen

Data storage

Internal	Removable solid state drive (\geq 80 GB) and secure digital (SD) memory device
External	Supports USB 3.0/2.0 compatible memory devices

Weight (Basic configuration)

Net	30.9 kg (68 lbs) nominal
Shipping	39.5 kg (87 lbs) nominal

Dimensions

Height	280 mm (11 in)
Width	459 mm (18 in)
Length	500 mm (19.8 in)

Warranty

The UXA signal analyzer is supplied with a 3-year standard warranty

Calibration cycle

The recommended calibration cycle is one year. Calibration services are available through Keysight service centers

Inputs and Outputs

Front panel	
RF input Connector	
Standard	Type-N female, 50 Ω nominal
Option C35 (with Option 526 only)	APC 3.5 mm male, 50 Ω nominal
Probe power	+15 Vdc, \pm 7% at 150 mA max nominal
Voltage/current	-12.6 Vdc, \pm 10% at 150 mA max nominal
USB ports	
Master (3 ports)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Output current	0.5 A nominal
Headphone jack	Miniature stereo audio jack (3.5 mm, also known as "1/8 inch")
External mixing	
Connection port	
Connector	SMA, female
Impedance	50 Ω nominal
Functions	Triplexed for mixer bias, IF input and LO output
Mixer bias range	\pm 10 mA in 10 μ A step
IF center frequency	
\leq 25 MHz IF path	322.5 MHz
40 MHz BW IF path	250.0 MHz
255 MHz BW IF path	750.0 MHz
510 MHz BW IF path	877.1484375 MHz
LO output frequency range	3.75 to 14.1 GHz
Rear panel	
10 MHz out	
Connector	BNC female, 50 Ω nominal
Output amplitude	\geq 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 (selectable to 1 Hz resolution)
Frequency lock range	$\pm 2 \times 10^{-6}$ of specified external reference input frequency
Trigger 1 and 2 inputs	
Connector	BNC female
Impedance	$>$ 10 k Ω nominal
Trigger level range	-5 to +5 V (TTL) factory preset
Trigger 1 and 2 outputs	
Connector	BNC female
Impedance	50 Ω nominal
Level	0 to 5 V (CMOS) nominal
Sync (reserved for future use)	
Connector	BNC female
Monitor output 1	
Connector	VGA compatible, 15-pin mini D-SUB
Format	XGA (60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	1,280x800

Monitor output 2	
Connector	Mini DisplayPort
Resolution	1,280x800
Noise source drive +28 V (pulsed)	
Connector	BNC female
Output voltage	On 28.0 ± 0.1 V (60 mA maximum) Off < 1 V
SNS series noise source	For use with the Agilent/Keysight SNS Series noise sources
Digital bus	
Connector	MDR-80
Analog out	
Connector	BNC female
USB ports	
Master (3 ports)	
Standard	Two ports (stacked with each other) are compatible with USB 3.0; one (stacked with LAN port) with USB 2.0
Connector	USB Type-A female
Output current	0.5 A nominal
Slave (1 port)	
Standard	Compatible with USB 3.0
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, PPO, DC1, C1, C2, C3, C28, DT1, L4, C0
GPIB mode	Controller or device
LAN TCP/IP interface	
Standard	1000Base-T
Connector	RJ45 Ethertwist
IF output	
Connector	SMA female, shared by the second IF out (wideband, standard) and Opt CRP, and ALV
Impedance	50 Ω nominal
2nd IF output	
Center frequency	
SA mode or I/Q analyzer with IF BW ≤ 25 MHz	322.5 MHz
with Option B40	250 MHz
with Option B2X	750 MHz
with Option B5X	877.1484375 MHz
Conversion gain	1 dB nominal
Bandwidth	
Low band	
IF Path ≤ 40 MHz	Up to 160 MHz nominal
IF Path 255 MHz	255 MHz nominal
IF Path ≤ 40 MHz	510 MHz nominal
High band, with preselector bypassed	Up to 800 MHz (nominal); expandable to 1200 MHz with corrections

Other Optional Output

Option ALV log video out

General port specifications		
Connector	SMA female	Shared with other options
Impedance		50 Ω nominal
Fast log video output		
Output voltage	Open-circuit voltages shown	
Maximum	1.6 V at -10 dBm nominal	
Slope	25 \pm 1 mV/dB nominal	
Log fidelity		
Range	49 dB (nominal) with input frequency at 1 GHz	
Accuracy within range	\pm 1.0 dB nominal	
Rise time	15 ns nominal	
Fall time		
Bands 1-4 with Option MPB	40 ns nominal best case,	
Other cases	Depends on bandwidth	

Option CRP programmable IF output

General port specifications		
Connector	SMA female	Shared with other options
Impedance		50 Ω nominal
Programmable IF output		
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		
Low band or high band with preselector bypassed	100 MHz (nominal)	
Preselected band	Depends on RF center frequency	
Lower output frequencies	Subject to folding	
Residual output signals	\leq -88 dBm (nominal)	

Other Optional Output (continued)

Option YAV Y-axis output

General port specifications

Connector Impedance	SMA female	Shared with other options 50 Ω nominal
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Screen video

Operating conditions		"Lin" is linear in voltage
Display scale types	Log or Lin	
Log scales	All (0.1 to 20 dB/div)	
Modes	Spectrum analyzer only	
Gating	Gating must be off	
Output scaling	0 to 1.0 V open circuit, representing bottom to top of screen	
Offset		
Gain accuracy	$\pm 1\%$ of full scale nominal $\pm 1\%$ of output voltage nominal	

Log video (Log envelope) output

Amplitude range (terminated with 50 Ω)	
Maximum	V nominal for -10 dBm at the mixer
Scale factor	1 V per 192.66 dB
Bandwidth	Set by RBW
Operating conditions	Select Sweep Type = SweptSpectrum analyzer only

Linear video output

Amplitude range (terminated with 50 Ω)	
Maximum	1.0 V nominal for signal envelope at the reference level
Minimum	0 V
Scale factor	If carrier level is set to half the reference level in volts, the scale factor is 200% of carrier level per volt. Regardless of the carrier level, the scale factor is 100% of reference level per volt.
Bandwidth	Set by RBW
Operating conditions	Select Sweep Type = Swept

I/Q Analyzer

Frequency					
Frequency span					
Standard	10 Hz to 10 MHz				
Option B25	10 Hz to 25 MHz				
Option B40	10 Hz to 40 MHz				
Option B2X	10 Hz to 255 MHz				
Option B5X	10 Hz to 510 MHz				
Resolution bandwidth (spectrum measurement)					
Range					
Overall	100 mHz to 3 MHz				
Span = 1 MHz	50 Hz to 3 MHz				
Span = 10 kHz	1 Hz to 10 kHz				
Span = 100 Hz	100 mHz to 100 Hz				
Window shapes	Flat Top, Uniform, Hanning, Hamming, Gaussian, Blackman, Blackman-Harris, Kaiser Bessel (K-B 70 dB, K-B 90 dB and K-B 110 dB)				
Analysis bandwidth (waveform measurement)					
Standard instrument	10 Hz to 10 MHz				
Option B25	10 Hz to 25 MHz				
Option B40	10 Hz to 40 MHz				
Option B2X	10 Hz to 255 MHz				
Option B5X	10 Hz to 510 MHz				
IF frequency response (standard 10 MHz IF path)					
IF frequency response (demodulation and FFT response relative to the center frequency)					
Frequency (GHz)	Analysis BW (MHz)	Max error	Midwidth error (95th percentile)	Slope (dB/MHz) (95th percentile)	RMS (nominal)
≤ 3.6	≤ 10	± 0.20 dB	± 0.12 dB	± 0.10 dB	0.02 dB
3.6 to 26.5	≤ 10 (preselector On)				0.23 dB
3.6 to 26.5	≤ 10 (preselector Off ¹¹)	± 0.25 dB	± 0.12 dB	± 0.10 dB	0.02 dB
IF phase linearity					
Center freq (GHz)	Span (MHz)	Preselector	Peak-to-peak (nominal)	RMS (nominal)	
≥ 0.02, < 3.6	≤ 10	NA	0.14°	0.032°	
≥ 3.6 to ≤ 26.5	≤ 10	Off ¹¹	0.27°	0.057°	
≥ 3.6	≤ 10	On	0.93°	0.17°	
Dynamic range (standard 10 MHz IF path)					
Clipping-to-noise dynamic range			Excluding residuals and spurious responses		
Clipping level at mixer			Center frequency ≥ 20 MHz		
IF gain = Low	-10 dBm		-8 dBm nominal		
IF gain = High	-20 dBm		-17.5 dBm nominal		
Noise density at mixer at center frequency	(DANL + IF Gain effect) + 2.25 dB				

¹¹ MPB (microwave preselector bypass) is enabled. All UXAs ship with MPB as a standard feature.

I/Q Analyzer (continued)

Data acquisition (standard 10 MHz IF path)			
Time record length			
Analysis tool			
IQ analyzer	8,000,000 IQ sample pairs	Waveform measurement	
Advanced tool	Data packing	With 89600 VSA or fast capture	
	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/Sample rate (IQ pairs)		
Sample rate			
IQ pairs	1.25 x IFBW		
ADC resolution	16 bits		

Option B25 25 MHz analysis bandwidth (Option B25 is automatically included in Option B40, B2X or B5X)

IF frequency response (25 MHz IF path)					
IF frequency response (demodulation and FFT response relative to the center frequency)					
Freq (GHz)	Analysis BW (MHz)	Max error	Midwidth error (95th percentile)	Slope (dB/MHz) (95th percentile)	RMS (nominal)
< 3.6	10 to ≤ 25	± 0.30 dB	± 0.12 dB	± 0.1 dB	0.02 dB
3.6 to 26.5	10 to ≤ 25 (preselector On)				0.50 dB
3.6 to 26.5	10 to ≤ 25 (preselector Off ¹²)	± 0.40 dB	± 0.12 dB	± 0.1 dB	0.03 dB
IF phase linearity					
Center freq (GHz)	Span (MHz)	Preselector	Peak-to-peak (nominal)	RMS (nominal)	
≥ 0.02, < 3.6	≤ 25	NA	0.41°	0.11°	
≥ 3.6	≤ 25	Off ¹²	1.0°	0.27°	

Dynamic range (25 MHz IF path)	
Full scale (ADC clipping)	
Default settings, signal at CF	
(IF gain = Low)	
Band 0	-8 dBm mixer level nominal
Bands 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
Bands 1 through 4	-17 dBm mixer level nominal, subject to gain limitations
Effect of signal frequency ≠ CF	Up to ± 3 dB nominal

¹² MPB (microwave preselector bypass) is enabled. All UXAs ship with MPB as a standard feature.

I/Q Analyzer (continued)

Data acquisition (25 MHz IF path)			
Time record length			
Analysis tool			
IQ analyzer	8,000,000 IQ sample pairs	Waveform measurement	
Advanced tool	Data packing		With 89600 VSA or fast capture
	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/Sample rate (IQ pairs)		
Sample rate			
IQ pairs	1.25 x IF BW		
ADC resolution	16 bits		

Option B40 40 MHz analysis bandwidth (Option B40 is automatically included in Option B2X or B5X)

IF frequency response (40 MHz IF path)					
IF frequency response (relative to center)					
Freq (GHz)	Span (MHz)	Preselector		Typical	RMS (nominal)
$\geq 0.03, < 3.6$	≤ 40	NA	± 0.37 dB	± 0.22 dB	0.07 dB
$\geq 3.6, \leq 8.4$	≤ 40	Off ¹³	± 0.4 dB	± 0.13 dB	0.05 dB
$> 8.4, \leq 26.5$	≤ 40	Off ¹³	± 0.51 dB	± 0.14 dB	0.05 dB

IF phase linearity				
Center freq (GHz)	Span (MHz)	Preselector	Peak-to-peak (nominal)	RMS (nominal)
$\geq 0.03, < 3.6$	≤ 40	NA	0.36°	0.083°
≥ 3.6	≤ 40	Off ¹³	1.0°	0.24°

Dynamic range (40 MHz IF path)	
SFDR	
(Spurious-free dynamic range)	
Signal frequency within ± 12 MHz of center	-80 dBc nominal
Signal frequency anywhere within analysis BW	
Spurious response within ± 18 MHz of center	-79 dBc nominal
Response anywhere within analysis BW	-77 dBc nominal
Full scale (ADC clipping)	
Default settings, signal at CF (IF gain = Low)	
Band 0	-8 dBm mixer level nominal
Bands 1 through 4	-6 dBm mixer level nominal
High gain setting, signal at CF (IF gain = High)	
Band 0	-16 dBm mixer level nominal, subject to gain limitations
Bands 1 through 2	-9 dBm mixer level nominal, subject to gain limitations
Effect of signal frequency \neq CF	Up to ± 3 dB nominal

¹³ MPB (microwave preselector bypass) is enabled. All UXAs ship with MPB as a standard feature.

I/Q Analyzer (continued)

Data acquisition (40 MHz IF path)			
Time record length			
Analysis tool			
IQ analyzer	8,000,000 IQ sample pairs	Waveform measurement	
Advanced tool	Data packing		With 89600 VSA software or fast capture
	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/Sample rate (IQ pairs)		
Sample rate			
IQ pairs	1.25 x IF BW		
ADC resolution	12 bits		

Option B2X 255 MHz analysis bandwidth

IF frequency response				
Center Freq (GHz)	Span (MHz)	Preselector	Typical	RMS (nominal)
≥ 0.4, < 3.6	≤ 255	NA	± 0.74 dB	± 0.3 dB
> 3.6, ≤ 8.4	≤ 255	Off ¹⁴	± 0.82 dB	± 0.34 dB
> 8.4, ≤ 26.5	≤ 255	Off ¹⁴	± 0.6 dB nominal	0.2 dB
IF phase linearity				
Center Freq (GHz)	Span (MHz)	Preselector	Pk-to-pk (nominal)	RMS (nominal)
≥ 0.4, < 3.6	≤ 255	NA	2.4°	0.56°
> 3.6, ≤ 26.5	≤ 255	Off ¹⁴	6.9°	1.4°
Dynamic range				
Suprious-free dynamic range (SFDR) Anywhere within the analysis BW			-78 dBc nominal	
Full scale (ADC clipping)				
Default setting, signal at CF				
Band 0			+2 dBm mixer level, nominal	
Band 1 through 4			+4 dBm mixer level, nominal	
High gain setting, signal at CF				
Band 0			-4 dBm mixer level, nominal	
Band 1 through 2			+2 dBm mixer level, nominal	
Band 3 through 4			+4 dBm mixer level, nominal	
Effect of signal frequency ≠ CF			Up to ± 4 dB nominal	
IF residual responses across the full BW				
Band 0		Preselector off ¹⁴	-110 dBFS nominal	
Band 1			-108 dBFS nominal	
Third-order intermodulation distortion (Two tones of equal level, 1 MHz separation, each tone -19 dB relative to full scale (ADC clipping))				
Band 0			-82 dBc nominal	
Band 1		Preselector off ¹⁴	-82 dBc nominal	
Band 2 through 4		Preselector off ¹⁴	-80 dBc nominal	

Noise density			
Band	Frequency (GHz)	IF gain = Low	IF gain = High
0	1.80	-145 dBm/Hz	-147 dBm/Hz
1	6.00	-141 dBm/Hz	-142 dBm/Hz
2	10.80	-140 dBm/Hz	-141 dBm/Hz
3	15.15	-137 dBm/Hz	-137 dBm/Hz
4	21.80	-135 dBm/Hz	-135 dBm/Hz

Data acquisition			
Time record length	8,000,000 IQ sample pairs	Waveform measurement	
Advanced tools	Data packing	89600 VSA or fast capture	
	32-bit	64-bit	
Length (IQ sample pairs)	536 MSa (2 ²⁹ Sa)	268 MSa (2 ²⁸ Sa)	
Maximum IQ capture time (89600 VSA and fast capture)	Length of IQ sample pairs/sample rate (IQ pairs)		
Sample rate (IQ pairs)	Minimum of (1.25 x IFBW, 300 MSa/s)		
ADC resolution	14 bits		

14 MPB (microwave preselector bypass) is enabled. All UXA ship with MPB as a standard feature.

Option B5X 510 MHz analysis bandwidth

IF frequency response					
Center Freq (GHz)	Span (MHz)	Preselector		Typical	RMS (nominal)
≥ 0.6, < 3.6	≤ 500	NA	± 1.0 dB	± 0.41 dB	0.06 dB
≥ 0.6, < 3.6	≤ 510	NA		± 0.3 dB nominal	0.06 dB
> 3.6, ≤ 8.4	≤ 500	Off ¹⁵	± 1.25 dB	± 0.42 dB	0.3 dB
> 3.6, ≤ 8.4	≤ 510	Off ¹⁵		± 0.3 dB nominal	
> 8.4, ≤ 26.5	≤ 510	Off ¹⁵		± 0.8 dB nominal	

IF phase linearity				
Center Freq (GHz)	Span (MHz)	Preselector	Pk-to-pk (nominal)	RMS (nominal)
≥ 0.4, < 3.6	≤ 510	NA	3.4°	0.72°

Dynamic range	
Spurious-free dynamic range (SFDR) Anywhere within the analysis BW	-78 dBc nominal
Full scale (ADC clipping)	
Default setting, signal at CF	
Band 0	+2 dBm mixer level, nominal
Band 1 through 4	+2 dBm mixer level, nominal
High gain setting, signal at CF	
Band 0	-3 dBm mixer level, nominal
Band 1 through 2	0 dBm mixer level, nominal
Band 3 through 4	+2 dBm mixer level, nominal
Effect of signal frequency ≠ CF	Up to ± 4 dB nominal
IF residual responses across the full BW	
Band 0	Preselector off ¹⁵ -104 dBFS nominal
Band 1	-103 dBFS nominal

Third-order intermodulation distortion

(Two tones of equal level, 1 MHz separation, each tone -19 dB relative to full scale (ADC clipping))

Band 0		-82 dBc nominal
Band 1	Preselector off ¹⁵	-82 dBc nominal
Band 2 through 4	Preselector off ¹⁵	-80 dBc nominal

Noise density

Band	Frequency (GHz)	IF gain = Low	IF gain = High
0	1.80	-144 dBm/Hz	-146 dBm/Hz
1	6.00	-140 dBm/Hz	-142 dBm/Hz
2	10.80	-140 dBm/Hz	-141 dBm/Hz
3	15.15	-137 dBm/Hz	-137 dBm/Hz
4	21.80	-135 dBm/Hz	-135 dBm/Hz

Data acquisition

Time record length	8,000,000 IQ sample pairs	Waveform measurement
IQ analyzer		

Advanced tools	Data packing		89600 VSA or fast capture
Length (IQ sample pairs)	32-bit	64-bit	
IFBW ≤ 255.176 MHz	536 MSa (2 ²⁹ Sa)	268 MSa (2 ²⁸ Sa)	
IFBW > 255.176 MHz	1,073 MSa (2 ³⁰ Sa)	536 MSa (2 ²⁹ Sa)	

Maximum IQ capture time (89600 VSA and fast capture)	Length of IQ sample pairs/sample rate (IQ pairs)
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Sample rate (IQ pairs)	
IFBW ≤ 255.176 MHz	Minimum of (1.25 x IFBW, 300 MSa/s)
IFBW > 255.176 MHz	Minimum of (1.25 x IFBW, 600 MSa/s)

ADC resolution	14 bits
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15 MPB (microwave preselector bypass) is enabled. All UXA ship with MPB as a standard feature

Real-time Spectrum Analyzer (RTSA)

Option RT1 real-time spectrum analyzer, basic detection,
or RT2 Real-time spectrum analyzer, optimal detection

Real-time analysis

Real-time analysis bandwidth

Option RT1	Up to 509.47 MHz	Analysis BW option determines the max real-time BW
Option RT2	Up to 509.47 MHz	Analysis BW option determines the max real-time BW

Minimum detectable signal duration
with > 60 dB StM¹⁶ ratio

Option RT1	11.42 ns
Option RT2	3.33 ns

Minimum signal duration with 100%
probability of intercept (POI) at full
amplitude accuracy

For Frequency Mask Triggering (FMT)

Option RT1	17.17 μs	Signal is at mask level
Option RT2	3.51 μs	Signal is at mask level, span > 85 MHz

Minimum acquisition time
FFT rate

100 μs
292,969/s

Supported Detectors
Number of Traces

Peak, Negative Peak, Sample, Average
6

Number of Markers
Supported Markers

12
Normal, Delta, Noise, Band Power

Supported triggers

Level, Level with Time Qualified (TQT), Line, External, RF burst, Frame, Frequency Mask (FMT), FMT with TQT

16 "StM" = "Signal-to-Mask"

Related Literature

UXA Brochure, 5992-0089EN
UXA Configuration Guide, 5992-0043EN
UXA Specifications Guide, N9040-90002

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