DATA SHEET

N9032B PXA X-Series Signal Analyzer, Multi-touch

2 Hz to 8.4, 13.6, or 26.5 GHz

KEYSIGHT TECHNOLOGIES

Table of Contents

Definition and Terms

Specifications describe the performance of parameters covered by the product warranty and apply to temperature ranges 0 to 55 °C, 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 values (typ) describe 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 (nom) 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 that Auto Sweep Time Rules = Accy
- For signal frequencies < 10 MHz, DC coupling applied.
- Analyzer is used in environment that falls within allowed operating range; and has been in that environment at least 2 hours before being turned on.
- Analyzer has been turned on at least 30 minutes with AutoAlign 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. Note that factory default is with the AutoAlign set to Light, which (compared to Normal) allows wider temperature changes before causing Alignments to run automatically. The benefit is that Alignments interrupt less frequently. The user can change AutoAlign to Normal if desired, and this setting will persist after power cycle or PRESET. 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. In practice, the impact of such choices is primarily on Absolute Amplitude Accuracy. If temperature changes are small, the impact of Light vs Normal is negligible. Also, the user may invoke Align All at any time, to get the best possible accuracy.
- The term “mixer level” is used as a condition for many specifications in this document. This term is a conceptual quantity that is defined as follows: Mixer Level (dBm) = RF Input Power Level (dBm) - (Mechanical Attenuation) (dB) - (Electronic Attenuation) (dB).
- The term “attenuation” is used for many specifications in this document; this refers to the Mechanical Attenuator, unless otherwise stated.

Common abbreviations	
BW	bandwidth
FBP	full bypass path
FFT	fast Fourier transform
IQ	in-phase quadrature-phase (sample data)
LNA	low-noise amplifier
LNP	low-noise path
LO	local oscillator
PA	pre-amplifier
MPB	microwave preselector bypass
RBW	resolution bandwidth (filter)
VBW	video bandwidth (filter)

Frequency and Time Specifications

Frequency option		
508	2 Hz to 8.4 GHz	
513	2 Hz to 13.6 GHz	
526	2 Hz to 26.5 GHz	
Minimal frequency	**DC coupled**	**AC coupled**
PA off, LNA off	2 Hz	10 MHz
PA on	9 kHz	10 MHz
LNA on	20 MHz	20 MHz
Frequency reference		
Accuracy (total)	± [(Initial accuracy) + (aging rate x time since last adjustment) + (temperature stability)]	
Initial calibration accuracy (immediately following calibration)	± 3.1 x 10^{-8}	
Aging rate	± 3 x 10^{-8} / year	
Temperature stability	± 4.5 x 10^{-9} over full temperature range	
Residual FM		
Center frequency = 1 GHz, 10 Hz RBW, 10 Hz VBW	≤ (0.25 Hz x N) p–p in 20 ms nominal (N = LO multiple, see band table below)	
Frequency readout accuracy (start, stop, center, marker)		
± (marker frequency x frequency reference accuracy + 0.10 % x span + 5 % x RBW + 2 Hz + 0.5 x horizontal resolution [1])		
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	± (0.1 % x span + horizontal resolution[1])	
FFT	± (0.1 % x span + horizontal resolution[1])	
Sweep (trace) point range		
All spans	1 to 100,001	

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

Triggers and Gating

Triggers are methods to begin acquisition at desired point in time. See trigger types below for overview, with “Y” to indicate each trigger is available for “swept SA”, as a gate source for gated SA, or wide-bandwidth IQ measurements. Note that specific applications can make triggers unavailable, modify their behavior, or add triggers not listed here.

Trigger/Gate sources				
	Swept trigger	Gate source	Wide bandwidth IQ trigger	Supplemental information
Free Run	Y		Y	
External 1 External 2	Y Y	Y Y	Y Y	Jitter up to ~33 ns p-p (nom)
RF burst	Y	Y		
Video (IF Mag)	Y		Y [1]	
ADC			Y	Similar to Video, but operates digitally on mag[I,Q], prior to decimation, filtering, and corrections.
Line	Y	Y	Y	
Periodic	Y	Y	Y	repetitive “frame” trigger, at precise interval, following an External or RF Burst trigger
TV	Y	Y		

1. In 255 MHz IF Path only; at greater bandwidths, ADC trigger is similar.

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% (nom)
	Span ≥ 10 Hz, FFT	± 40% (nom)
	Span = 0 Hz	± 0.01% (nom)
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)	1 µs to 5.0 s	
Gate delay range	0 to 100.0 s	
Gate delay jitter	33.3 ns p-p (nom)	

Swept Spectrum Analysis

These bands apply to swept spectrum analysis and are not applicable to wide-bandwidth IQ analysis.

Swept frequency band	LO multiple (N)	Frequency range	
0	1	2 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	17.0 to 26.5 GHz	
Resolution bandwidth (RBW) filters (see also Wide Bandwidth IQ Analysis section)			
Range (with –3 dB bandwidth, standard)		1 Hz to 3 MHz (10% steps), 4, 5, 6, 8 MHz	
Bandwidth accuracy (power)			
RBW range		1 Hz to 100 kHz	± 0.5% (± 0.022 dB)
		110 kHz to 1.0 MHz (< 3.6 GHz CF)	± 1.0% (± 0.044 dB)
		1.1 to 2 MHz (< 3.6 GHz CF)	± 0.07 dB (nom)
		2.2 to 3 MHz (< 3.6 GHz CF)	0 to –0.2 dB (nom)
		4 to 8 MHz (< 3.6 GHz CF)	0 to –0.4 dB (nom)
Bandwidth accuracy (–3 dB)			
RBW range		1 Hz to 1.3 MHz	± 2% (nom)
Selectivity (–60 dB/–3 dB)			4.1: 1 (nom)
EMI bandwidths (CISPR compliant; requires N90EMEMCB or N6141EM0E)		200 Hz, 9 kHz, 120 kHz, 1 MHz	
EMI bandwidths (MIL-STD-461 compliant; requires N90EMEMCB or N6141EM0E)		10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz	
Video bandwidth (VBW) filters			
Range		1 Hz to 3 MHz (10% steps), 4, 5,6, 8 MHz, and wide open (labeled 50 MHz)	
Accuracy		± 6%, nominal	
Detector types			
Normal, peak, sample, negative peak, log power average, RMS average, and voltage average			

Amplitude Accuracy

Amplitude characteristics vary by user-selectable front-end path. Swept SA measurements are normally made with preselector on (in circuit). These settings impact amplitude accuracy and range.

Front end settings			
1a	Standard path	Preselector	Default selection following power-on, boot-up, or PRESET. Settings provide best dynamic range and lowest internally-generated distortion. Suitable for harmonics, IMD, spurious in presence of large signals, etc. unless noise-limited.
1b		Preselector, LNA on	Requires P08, P13, or P26. Settings provide lower DANL, compared to 1a, while preserving very good dynamic range. Suitable for distortion measurements (harmonics, IMD, etc.) when a lower noise floor is needed.
1c		Preselector, PA on	Requires P08, P13, or P26. Settings provide lower DANL, compared to 1b.
1d		Preselector, LNA on, PA on	Requires P08, P13, or P26. Settings provide lowest possible DANL, compared to 1c. Best for finding low-level spurs, oscillations, etc. near the noise floor. Allows use of wider RBW setting to achieve equivalent noise floors, so can make spur searching faster.
2a	Low-noise path (LNP)	Preselector, LNP	Settings provide the lowest distortion and best dynamic range, yet with lower DANL at higher frequencies, when compared with 1a. Path not active below 3.6 GHz.
2b		Preselector, LNP, LNA on	Requires P08, P13, or P26. Settings provide the lower DANL, compared to 2a, while preserving very good dynamic range. Path not active at below 3.6 GHz.
3a	Microwave Preselector Bypass path (MPB)	MPB	Settings provide very good EVM floor at mid-high input power region (using attenuation), including below 3.6 GHz. Good for wideband digitizer and FFT measurements. Recommend using path 4a if above 3.6 GHz.
3b		LNA on	Requires P08, P13, or P26. Settings provide best EVM at low input power for below 3.6 GHz. Good for wideband digitizer and FFT measurements. Otherwise use path 4b if above 3.6 GHz.
3c		PA on	Requires P08, P13, or P26. Good for wideband digitizer and FFT measurements. Settings allowed only for very low power levels since preselector is bypassed.
3d		LNA on, PA on	Requires P08, P13, or P26. Good for wideband digitizer and FFT measurements. Settings provide best EVM at very low power, including below 3.6 GHz
4a	Full Bypass path (FBP)	LNP, MPB	Settings provide best EVM floor for mid-high input power region (using attenuation) for above 3.6 GHz. Best for wideband digitizer and FFT measurements. Otherwise use path 3a if below 3.6 GHz.
4b		LNP, MPB, LNA on	Requires P08, P13, or P26. Settings provide best EVM floor for low input power region (using attenuation) for above 3.6 GHz. Best for wideband digitizer and FFT measurements. Otherwise use path 3b if below 3.6 GHz.

Absolute amplitude accuracy		
(10 dB attenuation, RBW <=1 MHz, input signal –10 to –50 dBm, all settings auto-=coupled except Auto Swp Time = Accy, any Reference Level, any vertical Scale)		
at 50 MHz PA off (1a & 2a)	± 0.35 dB	± 0.10 dB (typ)
at 50 MHz PA or LNA on (1b, 1c, 1d, & 2b)	± 0.40 dB	± 0.15 dB (typ)

at any frequency, any PA off path	± (0.35 dB + Frequency Response)
10 Hz to 3.6 GHz, LNA off, PA off	± 0.20 dB (95th percentile)
at any frequency, any PA or LNA on setting	± (0.40 dB + Frequency Response)

Frequency response: PA off (1a. Standard path)
10 dB attenuation, relative to reference conditions (50 MHz), preselector centered

Frequency	20 °C to 30 °C	0 °C to 55 °C	Typical
2 Hz to 30 MHz	± 0.40 dB	± 0.50 dB	± 0.15 dB
30 to 50 MHz	± 0.35 dB	± 0.40 dB	± 0.20 dB
50 MHz to 3.6 GHz	± 0.35 dB	± 0.60 dB	± 0.20 dB
3.6 to 8.4 GHz	± 1.50 dB	± 2.50 dB	± 0.60 dB
8.4 to 13.6 GHz	± 1.50 dB	± 2.00 dB	± 0.60 dB
13.6 to 17.1 GHz	± 1.50 dB	± 2.20 dB	± 0.60 dB
17.1 to 22.0 GHz	± 1.50 dB	± 2.30 dB	± 0.60 dB
22.0 to 26.5 GHz	± 2.00 dB	± 2.50 dB	± 0.70 dB

Frequency response: LNA on (1b. Standard path)
0 dB attenuation, relative to reference conditions (50 MHz), preselector centered)

Frequency	20 °C to 30 °C	0 °C to 55 °C	Typical
30 MHz to 3.6 GHz	± 0.50 dB	± 0.70 dB	± 0.20 dB
3.6 to 8.4 GHz	± 1.70 dB	± 2.70 dB	± 0.70 dB
8.4 to 13.6 GHz	± 1.70 dB	± 2.30 dB	± 0.70 dB
13.6 to 17.1 GHz	± 1.70 dB	± 2.30 dB	± 0.70 dB
17.1 to 22.0 GHz	± 1.90 dB	± 2.50 dB	± 0.70 dB
22.0 to 26.5 GHz	± 2.30 dB	± 3.00 dB	± 0.80 dB

Frequency response: PA on (1c. Standard path)
0 dB attenuation, relative to reference conditions (50 MHz), preselector centered

Frequency	20 °C to 30 °C	0 °C to 55 °C	Typical
9 kHz to 100 kHz			± 0.40 dB (nom)
100 kHz to 50 MHz	± 0.68 dB	± 0.80 dB	± 0.35 dB
50 MHz to 3.6 GHz	± 0.60 dB	± 0.80 dB	± 0.20 dB
3.6 to 8.4 GHz	± 2.00 dB	± 2.70 dB	± 0.80 dB
8.4 to 13.6 GHz	± 2.00 dB	± 2.50 dB	± 0.80 dB
13.6 to 17.1 GHz	± 2.00 dB	± 2.50 dB	± 0.95 dB
17.1 to 22.0 GHz	± 2.20 dB	± 2.90 dB	± 0.95 dB
22.0 to 26.5 GHz	± 2.70 dB	± 3.70 dB	± 1.20 dB

Frequency response: LNA on, PA on (1d. Standard path) 0 dB attenuation, relative to reference conditions (50 MHz), preselector centered			
Frequency	**20 °C to 30 °C**	**0 °C to 55 °C**	**Typical**
< 3.6 GHz	(if tuning < 3.6 GHz, then standard path with LNA on is used)		
3.6 to 8.4 GHz	± 1.80 dB	± 2.80 dB	± 0.75 dB
8.4 to 13.6 GHz	± 1.80 dB	± 2.40 dB	± 0.75 dB
13.6 to 17.1 GHz	± 1.80 dB	± 2.40 dB	± 0.75 dB
17.1 to 22.0 GHz	± 2.10 dB	± 2.70 dB	± 0.75 dB
22.0 to 26.5 GHz	± 2.50 dB	± 3.20 dB	± 0.90 dB
Frequency response: PA off (2a. LNP path) 10 dB attenuation, relative to reference conditions (50 MHz), preselector centered			
Frequency	**20 °C to 30 °C**	**0 °C to 55 °C**	**Typical**
< 3.6 GHz	If tuning to <3.6 GHz, then actually using Standard Path		
3.6 to 8.4 GHz	± 1.50 dB	± 2.50 dB	± 0.75 dB
8.4 to 13.6 GHz	± 1.50 dB	± 2.00 dB	± 0.75 dB
13.6 to 17.1 GHz	± 1.50 dB	± 2.00 dB	± 0.75 dB
17.1 to 22.0 GHz	± 2.00 dB	± 2.50 dB	± 0.90 dB
22.0 to 26.5 GHz	± 2.50 dB	± 3.00 dB	± 1.05 dB
Frequency response: LNA on (2b. LNP path) 0 dB attenuation, relative to reference conditions (50 MHz), preselector centered			
Frequency			
< 3.6 GHz	If tuning to <3.6 GHz, then actually using Standard Path with LNA ON		
3.6 to 8.4 GHz	± 0.80 dB (nom)		
8.4 to 17.1 GHz	± 0.70 dB (nom)		
17.1 to 26.5 GHz	± 1.00 dB (nom)		
Frequency response: Electronic attenuator path (Option EA3) 10 dB mechanical attenuation, relative to reference conditions (50 MHz)			
Frequency	**20 °C to 30 °C**	**0 °C to 55 °C**	**Typical**
2 Hz to 9 kHz	± 0.60 dB	± 0.80 dB	± 0.25 dB
9 kHz to 50 MHz	± 0.60 dB	± 0.80 dB	± 0.25 dB
50 MHz to 3.6 GHz	± 0.40 dB	± 0.60 dB	± 0.20 dB
Attenuator switching uncertainty (relative to 10 dB, LNA off, PA off; excludes 0 dB setting)			
50 MHz	± 0.05 dB (nom)		
< 8.4 GHz	± 0.5 dB (nom)		
8.4 to 26.5 GHz	± 0.7 dB (nom)		

VSWR (voltage standing wave ratio) at RF Input (95th percentile)			
Frequency	**1a Std, LNA off, PA off (10 dB attenuation)**	**1c Std, LNA off, PA on (0 dB attenuation)**	**1b Std, LNA on, PA off 1d Std, LNA on, PA on (0 dB attenuation)**
10 MHz to 3.6 GHz	1.2	1.7	1.3
3.6 to 8.4 GHz	1.3	1.6	1.5
8.4 to 13.6 GHz	1.5	1.6	1.6
13.6 to 17.1 GHz	1.6	1.7	1.7
17.1 to 26.5 GHz	1.8	1.8	1.8
RBW switching uncertainty (reference 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		
Display scale switching uncertainty			
Switching between linear and log	0 dB [1]		
Log scale/div switching	0 dB [1]		
Display scale fidelity			
Between –10 and –18 dBm input mixer level	± 0.1 dB		
Below –18 dBm input mixer level	± 0.07 dB		

1. Only affects the display, not the measurement, so it causes no additional error in measurement results from trace data or markers.

Amplitude Range

Describes factors which impact amplitude range over which a measurement can be made; at low levels, noise (DANL) and spurious responses; at high levels, distortion.

Maximum safe input level		
Average total power (with and without preamp)	+30 dBm (1W) max	
Peak pulse power (< 10 us pulse width, < 1% duty cycle, input attenuation ≥ 30 dB)	+50 dBm (100W) max	
DC volts DC coupled AC coupled	 ± 0.2 Vdc ± 100 Vdc	
Amplitude range		
Measurement range		
PA Off	Displayed average noise level (DANL) to +30 dBm	
PA On / LNA On	Displayed average noise level (DANL) to +18 dBm	
Input attenuator		
Mechanical (2 Hz to 26.5 GHz)	0 to 70 dB in 2 dB steps	
Electronic (2 Hz to 3.6 GHz, Option EA3)	0 to 24 dB in 1 dB steps,	
Full attenuation range	0 to 94 dB, 1 dB steps	(Mechanical + Electronic)

Preamplifiers (2 stages: LNA and PA)		
	Low-Noise Amplifier (LNA)	Pre-Amplifier (PA)
Option P08	20 MHz to 8.4 GHz	9 kHz to 8.4 GHz
Option P13	20 MHz to 13.6 GHz	9 kHz to 13.6 GHz
Option P26	20 MHz to 26.5 GHz	9 kHz to 26.5 GHz
Noise figure, LNA	4 to 8 dB (nom)	10 dB (nom)
Gain	20 dB (nom)	30 dB (nom)
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	

DANL (Displayed Average Noise Level)

DANL defined as average indicated power, using RMS detection, with input terminated in 50 Ohm, and Attenuation set to 0 dB; normalized to a 1 Hz bandwidth.

1a. Standard path (swept, preselector on, LNA off, PA off)			
Noise Floor Extension (Option NF2) improves DANL by 8 to 12 dB, for standard path.			
Frequency	**20 °C to 30 °C**	**Full range**	**Typical**
< 10 Hz			–125 dBm (nom)
10 to 100 Hz			–127 dBm (nom)
100 Hz to 1 kHz			–129 dBm (nom)
1 to 9 kHz			–138 dBm (nom)
9 to 100 kHz	–141 dBm	–141 dBm	–146 dBm
100 kHz to 1 MHz	–150 dBm	–148 dBm	–153 dBm
1 to 10 MHz	–153 dBm	–152 dBm	–156 dBm
10 MHz to 1.2 GHz	–152 dBm	–151 dBm	–155 dBm
1.2 to 2.1 GHz	–150 dBm	–148 dBm	–153 dBm
2.1 to 3.6 GHz	–148 dBm	–147 dBm	–150 dBm
3.6 to 6.6 GHz	–150 dBm	–148 dBm	–152 dBm
6.6 to 8.4 GHz	–150 dBm	–148 dBm	–152 dBm
8.4 to 13.6 GHz	–147 dBm	–146 dBm	–151 dBm
13.6 to 17 GHz	–147 dBm	–146 dBm	–151 dBm
17 to 22.5 GHz	–146 dBm	–144 dBm	–150 dBm
22.5 to 26.5 GHz	–142 dBm	–140 dBm	–146 dBm
1b. Standard path, LNA on (swept, preselector on, LNA on, PA off)			

Noise Floor Extension (Option NF2) improves DANL by 10 to 11 dB, for standard path, LNA on

Frequency	20 °C to 30 °C	Full range	Typical
< 20 MHz			Not permitted with LNA on
20 to 40 MHz			–164 dBm (nom)
40 to 500 MHz	–165 dBm	–165 dBm	–167 dBm
500 MHz to 2.5 GHz	–165 dBm	–165 dBm	–167 dBm
2.5 GHz to 3.6 GHz	–163 dBm	–161 dBm	–166 dBm
3.6 to 4.7 GHz	–164 dBm	–163 dBm	–167 dBm
4.7 to 8.4 GHz	–164 dBm	–162 dBm	–166 dBm
8.4 to 13.5 GHz	–163 dBm	–161 dBm	–165 dBm
13.5 to 17.1 GHz	–163 dBm	–161 dBm	–164 dBm
17.1 to 22.5 GHz	–161 dBm	–159 dBm	–163 dBm
22.5 to 26.5 GHz	–156 dBm	–155 dBm	–159 dBm

1c. Standard path, PA on (swept, preselector on, LNA off, PA on)

Noise Floor Extension (Option NF2) improves DANL by 10 to 12 dB, for standard path, PA on.

Frequency	20 °C to 30 °C	Full range	Typical
1 MHz to 2.1 GHz	–163 dBm	–163 dBm	–166 dBm
2.1 to 3.6 GHz	–161 dBm	–160 dBm	–163 dBm
3.6 to 8.4 GHz	–162 dBm	–161 dBm	–164 dBm
8.4 to 13.6 GHz	–162 dBm	–161 dBm	–164 dBm
13.6 to 17.1 GHz	–162 dBm	–160 dBm	–164 dBm
17.1 to 20.0 GHz	–160 dBm	–159 dBm	–163 dBm
20.0 to 26.5 GHz	–156 dBm	–155 dBm	–160 dBm

1d. Standard path, LNA on, PA on (swept, preselector on, LNA on, PA on)

Noise Floor Extension (Option NF2) improves DANL by 9 to 11 dB, for standard path, LNA on, PA on.

Frequency	20 °C to 30 °C	Full range	Typical
< 20 MHz			Not permitted with LNA on
20 to 40 MHz			–164 dBm (nom) [1]
40 to 500 MHz	–165 dBm [1]	–165 dBm [1]	–167 dBm [1]
500 MHz to 2.5 GHz	–165 dBm [1]	–165 dBm [1]	–167 dBm [1]
2.5 to 3.6 GHz	–161 dBm [1]	–161 dBm [1]	–166 dBm [1]
3.6 to 8.4 GHz	–165 dBm	–164 dBm	–167 dBm
8.4 to 13.5 GHz	–164 dBm	–163 dBm	–167 dBm
13.5 to 17.1 GHz	–163 dBm	–161 dBm	–166 dBm
17.1 to 23 GHz	–163 dBm	–161 dBm	–165 dBm
23 to 26.5 GHz	–160 dBm	–158 dBm	–163 dBm

2a. Low-noise path (low-noise path enabled, preselector on, LNA off, PA off)

Noise Floor Extension (Option NF2) improves DANL by 9 to 12 dB, for low-noise path.			
Frequency	**20 °C to 30 °C**	**Full range**	**Typical**
< 3.6 GHz			Not permitted with low noise path
3.6 to 17.1 GHz	–153 dBm	–151 dBm	–155 dBm
17.1 to 23 GHz	–151 dBm	–149 dBm	–154 dBm
23 to 26.5 GHz	–150 dBm	–148 dBm	–153 dBm

1. In the range 20 MHz to 3.6 GHz, when both LNA and PA are set to on, only the LNA is actually in circuit. Therefore, DANL is similar to 1b in this frequency range.

It is possible, but not common, to make swept SA measurements with preselector by-passed. The impact to DANL and TOI is estimated here, relative to comparable paths with preselector.

- DANL for MPB is ~4 dB better than Standard (1a in table).
- DANL for MPB, PA on is ~3 dB worse that Standard, PA on (1c in table).

Third-Order Intercept (TOI)

TOI is a figure of merit for the 3rd order intermodulation distortion in the RF front end.

1a. Standard path (swept, preselector on, LNA off, PA off) Two –16 dBm tones at input mixer with tone separation > 5 times IF prefilter bandwidth			
Frequency	**20 °C to 30 °C**	**Full range**	**Typical**
10 to 200 MHz	+12 dBm	+9 dBm	+18 dBm
> 200 to 600 MHz	+17 dBm	+16 dBm	+20 dBm
> 600 MHz to 2.0 GHz	+19.5 dBm	+18.5 dBm	+22 dBm
> 2.0 to 3.6 GHz	+19.5 dBm	+18.5 dBm	+23 dBm
> 3.6 to 7.1 GHz	+16 dBm	+15 dBm	+18 dBm
> 7.1 to 10 GHz	+15 dBm	+14.5 dBm	+18 dBm
> 10 to 13.6 GHz	+18.5 dBm	17.5 dBm	+22 dBm
> 13.6 to 19 GHz	+9.5 dBm	+7 dBm	+12 dBm
> 19 to 23 GHz	+14 dBm	+12 dBm	+16 dBm
> 23 to 26.5 GHz	+14.5 dBm	+13 dBm	+18 dBm
1b. Standard path (swept, preselector on, LNA on, PA off) Two –34 dBm tones at preamp level with tone separation > 5 times IF prefilter bandwidth			
Frequency	**TOI (nom)**		
30 to 200 MHz	0 dBm		
> 200 to 600 MHz	+1 dBm		
> 600 MHz to 3 GHz	+2.5 dBm		
> 3 to 3.6 GHz	+5 dBm		
> 3.6 to 4 GHz	–1 dBm		
> 4 to 8 GHz	0 dBm		
8 to 13.6 GHz	+2 dBm		

13.6 to 19 GHz	–5 dBm		
19 to 26.5 GHz	0 dBm		
1c. Standard path (swept, preselector on, LNA off, PA on) Two –34 dBm (10 MHz to 3.6 GHz) or –50 dBm (3.6 to 26.5 GHz) tones at preamp level with tone separation > 5 times IF prefilter bandwidth			
Frequency	**TOI (nom)**		
10 to 200 MHz	+2 dBm		
> 200 to 400 MHz	+3 dBm		
> 400 MHz to 1 GHz	+4 dBm		
> 1 to 3.6 GHz	+5 dBm		
> 3.6 to 4 GHz	–14 dBm		
> 4 to 8 GHz	–13 dBm		
> 8 to 13.6 GHz	–8 dBm		
> 13.6 to 19 GHz	–17 dBm		
> 19 to 26.5 GHz	–12 dBm		
1d. Standard path (swept, preselector on, LNA on, PA on) Two –50 dBm tones at preamp level with tone separation > 5 times IF prefilter bandwidth			
Frequency	**TOI (nom)**		
3.6 to 4 GHz	–22 dBm		
4 to 8 GHz	–20 dBm		
8 to 13.6 GHz	–16 dBm		
13.6 to 19 GHz	–24 dBm		
19 to 26.5 GHz	–21 dBm		
2a. Low-noise path (swept, Low-noise path enable, preselector on, LNA off, PA off) Two –16 dBm tones at input mixer with tone separation > 5 times IF prefilter bandwidth			
Frequency	**20 °C to 30 °C**	**Full range**	**Typical**
3.6 to 7.6 GHz	+10 dBm	+9 dBm	+13 dBm
> 7.6 to 10 GHz	+11 dBm	+10 dBm	+14 dBm
> 10 to 13.6 GHz	+12 dBm	+11 dBm	+15 dBm
> 13.6 to 19 GHz	+4 dBm	+2 dBm	+7 dBm
> 19 to 23 GHz	+7 dBm	+6 dBm	+10 dBm
> 23 to 26.5 GHz	+8 dBm	+6 dBm	+10 dBm

Second-Harmonic Intercept (SHI)

SHI is a figure of merit for analyzer distortion at the 2nd harmonic of input signal. Frequency refers to the fundamental signal and extends to ½ the maximum measurable frequency; the 2nd harmonic is at 2*{Freq}.

1a. Standard path (swept, preselector on, LNA off, PA off)			
Frequency of the fundamental	**Mixer level**	**Distortion**	**SHI**
10 MHz to 500 MHz	–15 dBm	–65 dBc	+50 dBm
> 500 MHz to 1.8 GHz	–15 dBm	–60 dBc	+45 dBm
> 1.8 to 3 GHz	–15 dBm	–77 dBc	+62 dBm
> 3 to 4.5 GHz	–15 dBm	–76 dBc	+61 dBm
> 4.5 to 6.5 GHz	–15 dBm	–77 dBc	+62 dBm
> 6.5 to 10 GHz	–15 dBm	–80 dBc	+65 dBm
> 10 to 13.25 GHz	–15 dBm	–80 dBc	+65 dBm
1b. Standard path (swept, preselector on, LNA on, PA off) Preamp Level = Input Level – Input Attenuation			
Frequency of the fundamental	**Preamp level**	**Distortion (nom)**	**SHI (nom)**
15 to 40 MHz	–45 dBm	–65 dBc	+20 dBm
> 40 MHz to 1 GHz	–45 dBm	–63 dBc	+18 dBm
> 1 to 1.8 GHz	–45 dBm	–61 dBc	+16 dBm
> 1.8 to 13.25 GHz	–45 dBm	–63 dBc	+18 dBm
1c. Standard path (swept, preselector on, LNA off, PA on) Preamp Level = Input Level – Input Attenuation			
Frequency of the fundamental	**Preamp level**	**Distortion (nom)**	**SHI (nom)**
10 to 400 MHz	–45 dBm	–78 dBc	+33 dBm
> 400 MHz to 1.8 GHz	–45 dBm	–73 dBc	+28 dBm
> 1.8 to 4 GHz	–50 dBm	–55 dBc	+5 dBm
> 4 to 13.25 GHz	–50 dBm	–60 dBc	+10 dBm
1d. Standard path (swept, preselector on, LNA on, PA on) Preamp Level = Input Level – Input Attenuation			
Frequency of the fundamental	**Preamp level**	**Distortion (nom)**	**SHI (nom)**
1.8 to 4 GHz	–50 dBm	–44 dBc	–6 dBm
4 to 13.25 GHz	–50 dBm	–47 dBc	–3 dBm
2a. Low-noise path: SHI (swept, Low-noise path enable, preselector on, LNA off, PA off)			
Frequency of the fundamental	**Mixer level**	**Distortion**	**SHI**
1.8 to 2.5 GHz	–15 dBm	–95 dBc	+80 dBm
> 2.5 to 10 GHz	–15 dBm	–101 dBc	+86 dBm
> 10 to 13.25 GHz	–15 dBm	–101 dBc	+86 dBm

Gain Compression

Standard path: 1 dB gain compression (swept, standard, preselector on, LNA off) (nom)		
Frequency	**Gain Comp PA off (1a)**	**Gain Comp PA on (1c)**
20 to 40 MHz	+3 dBm	–13 dBm
40 MHz to 3.6 GHz	+6 dBm	–13 dBm
3.6 to 13.5 GHz	+5 dBm	
13.5 to 26.5 GHz	+1 dBm	

Residuals, Images, and Spurious Responses

Residual responses (input terminated, 0 dB attenuation)			
200 kHz to 8.4 GHz (swept)	–100 dBm		
Zero span or FFT or other frequencies	–100 dBm (nom)		
Image responses (standard path, LNA off, PA off, mixer level = –10 dBm)			
Tuned Freq (f)	**Excitation Freq**	**Full range**	**Typical**
10 MHz to 26.5 GHz	f+45 MHz	–80 dBc	–105 dBc
10 MHz to 3.6 GHz	f+10,245 MHz	–80 dBc	–106 dBc
10 MHz to 3.6 GHz	f+645 MHz	–80 dBc	–101 dBc
> 3.6 to 13.6 GHz	f+645 MHz	–78 dBc	–87 dBc
> 13.6 to 17.1 GHz	f+645 MHz	–74 dBc	–84 dBc
> 17.1 to 22 GHz	f+645 MHz	–70 dBc	–82 dBc
> 22 to 26.5 GHz	f+645 MHz	–68 dBc	–75 dBc
Other spurious responses (input-related, standard path, LNA off, PA off)			
	Mixer level	**Response**	
First RF order (f ≥ 10 MHz from carrier)	–10 dBm	–80 dBc + 20 x log(N [1]), including IF feedthrough, LO harmonic mixing responses	
Higher RF order (f ≥ 10 MHz from carrier)	–40 dBm	–80 dBc + 20 x log(N [1]), including higher order mixer responses	
LO-related spurious responses (Offset from carrier 200 Hz to 10 MHz)	–10 dBm	–68 dBc [2] + 20 x log(N [1]) –72 dBc [2] + 20 x log(N [1]) (typ)	
Close-in sidebands spurious response (LO related, offset < 200 MHz)		–73 dBc [2] + 20 × log(N [1]) (nom)	

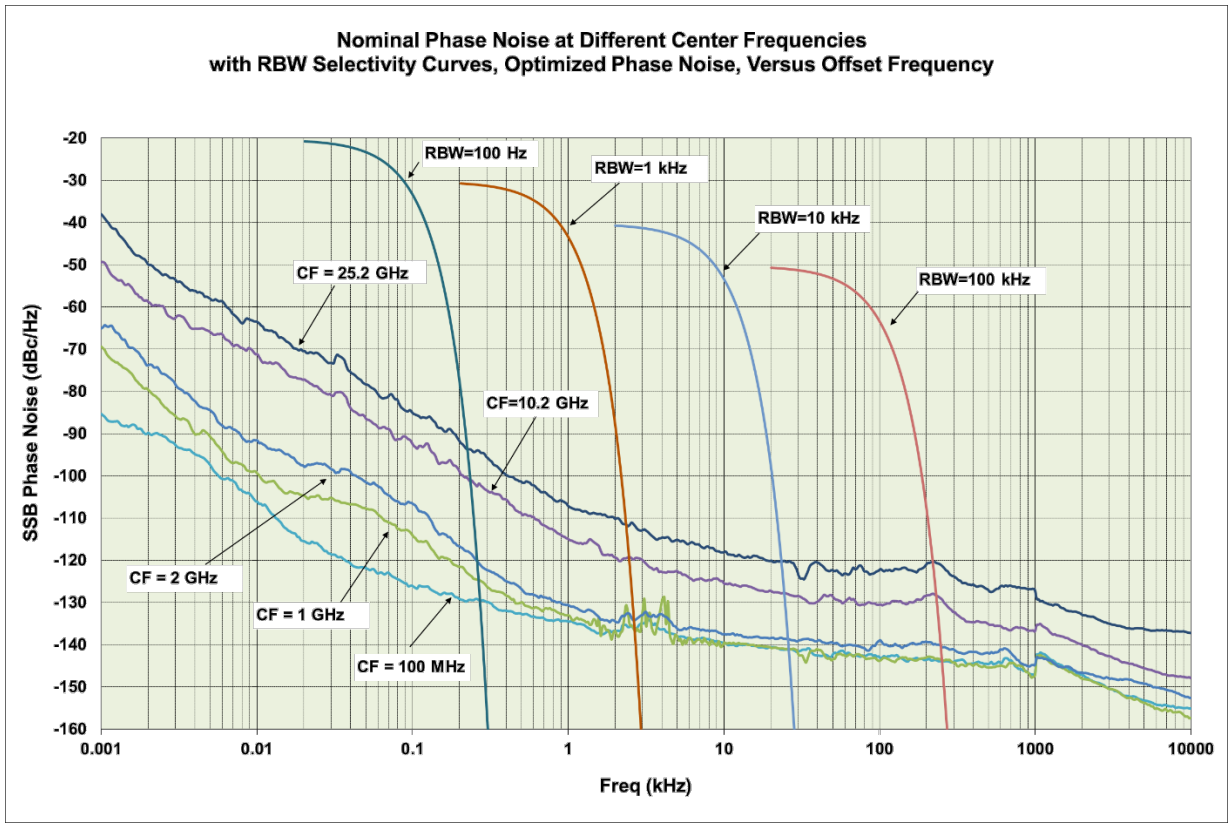
1. N is the LO multiplication factor
2. Nominally −40 dBc under large magnetic (0.38 Gauss rms) or vibrational (0.21 g rms) environmental stimuli.

Performance is nominally the same, with PA on, and in low-noise path (LNP).

Phase Noise (SSB)

Phase noise	Offset	20-30 °C	0-55 °C	
Noise sidebands (CF = 1 GHz)	10 Hz Wide Ref Loop BW Narrow Ref Loop BW			 –93 dBc/Hz (typ) [1] –88 dBc/Hz (nom)
	100 Hz	–107 dBc/Hz	–107 dBc/Hz	–112 dBc/Hz (typ)
	1 kHz	–125 dBc/Hz	–124 dBc/Hz	–129 dBc/Hz (typ)
	10 kHz	–134 dBc/Hz	–132 dBc/Hz	–136 dBc/Hz (typ)
	100 kHz	–139 dBc/Hz	–138 dBc/Hz	–141 dBc/Hz (typ)
	1 MHz	–145 dBc/Hz	–144 dBc/Hz	–146 dBc/Hz (typ)
	10 MHz	–154 dBc/Hz	–154 dBc/Hz	–157 dBc/Hz (typ)

1. The factory test line limit is consistent with a warranted specification of –90 dBc/Hz.



Wide-Bandwidth IQ Analysis (Demod)

Several wide-bandwidth IF paths and digitizers are available to acquire IQ data, with LO tuning fixed (not swept), typically to characterize the modulation quality of intentional transmitters (e.g. EVM).

All specifications based on preselector by-passed (RF Path either Microwave Preselector Bypass or Full Bypass) (except <3.6 GHz), unless otherwise noted.

Bandwidth			
Bandwidth option [1]	**IF path name**	**Analysis bandwidth or span range, max**	**Supplemental Information**
Standard	10 MHz	10 MHz	
Standard	25 MHz	25 MHz	Licensed as B25
Standard	40 MHz	40 MHz	Licensed as B40
Standard	255 MHz	255 MHz	Licensed as B2X
R10	1.0 GHz	1.0 GHz	
R15	1.5 GHz	1.5 GHz	
R20	2.0 GHz	2.0 GHz	

1. IF Paths at 10, 25, 40, and 255 MHz are enabled by any of R10, R15, or R20. Each bandwidth option includes and enables all others with lesser bandwidth; e.g. instruments with R20 also have R15 and R10 licenses, plus B2X, B40, and B25 paths.

5GNR EVM Residuals (“Floor”) vs Power (“Bathtub Curves”)

Example measurement results are demonstrations of performance (not specifications). EVM residual plots include contributions from the signal generator; the N9032B signal analyzer alone would have lower residuals (by ~3 dB, if assume equal contributions).

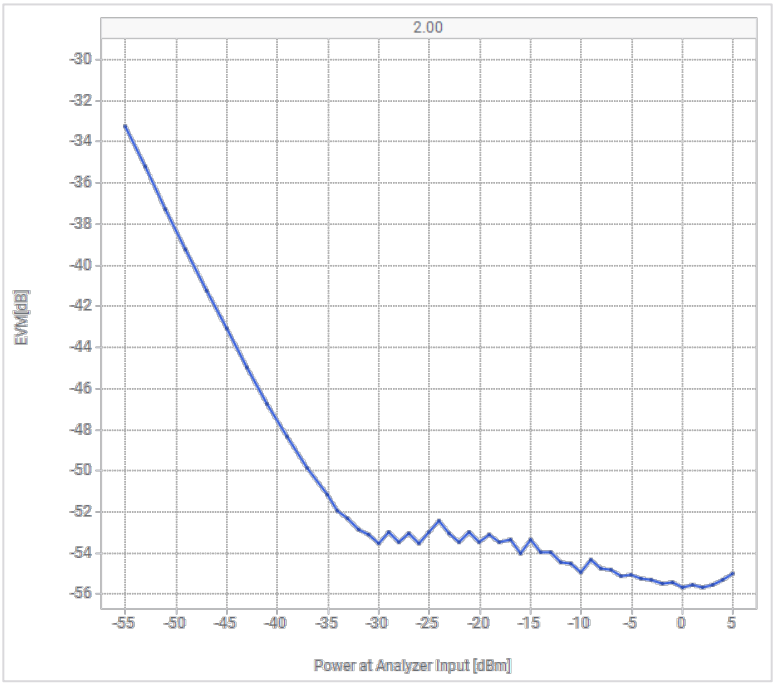


Figure 2. 5G NR FR1, 2.0 GHz carrier, 100 MHz single carrier, 256 QAM, 30 kHz SCS, DC Punc off

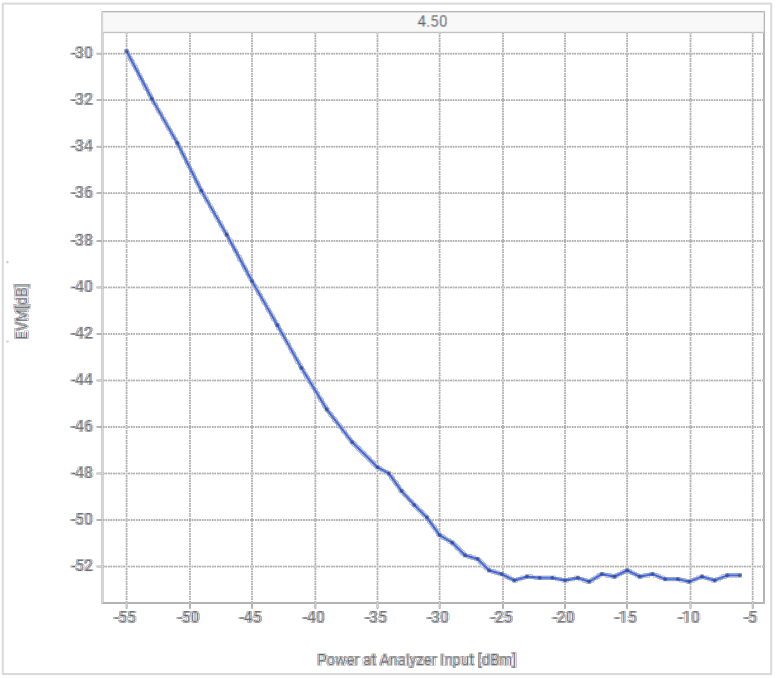


Figure 3. 5G NR FR1, 4.5 GHz carrier, 100 MHz single carrier, 256 QAM, 30 kHz SCS, DC Punc off

10 MHz Analysis Bandwidth

10 MHz analysis bandwidth			
Analysis bandwidth range	10 Hz to 10 MHz		
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified	
IF frequency (center)	322.5 MHz		
IF frequency response and phase linearity, demodulation and FFT response relative to the center frequency (nom)			
Center Frequency	**Preselector**	**IF Freq response**	**IF phase linearity, RMS (nom)**
≥ 0.02 GHz, ≤ 3.6 GHz	N/A	± 0.20 dB ± 0.10 dB (typ) 0.02 dB RMS (nom)	0.037°
3.6 to 26.5 GHz	Off	± 0.25 dB ± 0.10 dB (typ) 0.02 dB RMS (nom)	0.067°
Data Acquisition			
Description	**Data packing**		**Supplemental information**
	32-bit	**64-bit**	
Length (IQ sample pairs)	536 MSa (2^{29} Sa)	268 MSa (2^{28} Sa)	2 GB total memory
Sample Rate (IQ Pairs)	1.25 × IFBW		
ADC Resolution	16 bits		

25 MHz Analysis Bandwidth (licensed as Option B25)

25 MHz analysis bandwidth (licensed as Option B25)			
Analysis bandwidth range	10 Hz to 25 MHz		
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified	
IF frequency (center)	322.5 MHz		
IF frequency response and phase linearity, demodulation and FFT response relative to the center frequency (nom)			
Center Frequency	**Preselector**	**IF Freq response**	**IF phase linearity, RMS (nom)**
≥ 0.02 GHz, ≤ 3.6 GHz	N/A	± 0.30 dB ± 0.20 dB (typ) 0.05 dB RMS (nom)	0.28°
3.6 to 26.5 GHz	Off	± 0.40 dB ± 0.20 dB (typ) 0.05 dB RMS (nom)	0.28°
Full scale (ADC clipping)			
		Mixer Level for IF Gain Low (nom)	**Mixer Level for IF Gain High (nom)**
2 Hz to 26.5 GHz		–8 dBm	–18 dBm

Data Acquisition			
Description	**Data packing**		**Supplemental information**
	32-bit	**64-bit**	
Length (IQ sample pairs)	536 MSa (2^{29} Sa)	268 MSa (2^{28} Sa)	2 GB total memory
Sample Rate (IQ Pairs)	1.25 × IFBW		
ADC Resolution	16 bits		

40 MHz Analysis Bandwidth (licensed as Option B40)

40 MHz analysis bandwidth (licensed as Option B40)			
Analysis bandwidth range	10 Hz to 40 MHz		
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified	
IF frequency (center)	250 MHz		
IF frequency response and phase linearity, demodulation and FFT response relative to the center frequency			
Center Frequency	**Preselector**	**IF Freq response**	**IF phase linearity, RMS (nom)**
≥ 0.03 GHz, ≤ 3.6 GHz	N/A	± 0.40 dB ± 0.20 dB (typ) 0.05 dB RMS (nom)	0.32°
3.6 to 26.5 GHz	Off	± 0.60 dB ± 0.20 dB (typ) 0.05 dB RMS (nom)	0.32°
Full scale (ADC clipping)			
		Mixer level for IF gain low (nom)	**Mixer level for IF gain high (nom)**
2 Hz to 26.5 GHz		–8 dBm	–18 dBm
Data acquisition			
Description	**Data packing**		**Supplemental information**
	32-bit	**64-bit**	
Length (IQ sample pairs)	536 MSa (2^{29} Sa)	268 MSa (2^{28} Sa)	2 GB total memory
Sample Rate (IQ Pairs)	1.25 × IFBW		
ADC Resolution	12 bits		

255 MHz Analysis Bandwidth (licensed as option B2X)

Specifications on this bandwidth apply with center frequencies of 400 MHz and higher.

255 MHz analysis bandwidth (licensed as Option B2X)			
Analysis bandwidth range	10 Hz to 255 MHz		
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified.	
IF frequency (center)	690 MHz		
ADC sample rate	4.8 GSa/sec		
ADC resolution	14 bits		
Final data format	I & Q pairs, 32 bits ea, 64 bits/Sa		
IQ-pair sample rate	1.25*BW		
Capture memory	16 GB		
Capture time (time record length)	7158 msec at full 255 MHz BW		
IF frequency response and phase linearity, demodulation and FFT response relative to the center frequency			
Center frequency	**Preselector**	**IF Freq response RMS (nom)**	**IF phase linearity RMS (nom)**
3.3 to 26.5 GHz	Off	0.20 dB	1.50°
IF dynamic range			
SFDR (spurious-free dynamic range) (ADC related spurious)	–78 dBc (nom)	Signal at –27 dBFS, anywhere in full IF width	
Full scale (ADC clipping) (preselector bypassed, LNA off, PA off) [1]			
	Mixer level for IF gain low (nom)	**Mixer level for IF gain high (nom)**	
< 3.3 GHz	–15 dBm	–15 dBm	
3.3 to 13.3 GHz	–8 dBm	–17 dBm	
13.3 to 26.5 GHz	–10 dBm	–17 dBm	

1. Full scale (ADC clipping level) is a rough estimate of the signal level at which ADC overload occurs. Actual clipping levels vary significantly; this is only a guide. Mixer level is RF Input level less attenuation setting.

1 GHz Analysis Bandwidth (Option R10)

Specifications on this bandwidth apply with center frequencies of 700 MHz and higher

1 GHz analysis bandwidth (Option R10)		
Analysis bandwidth range	10 Hz to 1.0 GHz	
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified
IF frequency (center)	690 MHz	
ADC sample rate	4.8 GSa/sec	
ADC resolution	14 bits	
Final data format	I & Q pairs, 32 bits ea, 64 bits/Sa	
IQ-pair sample rate	1.25*BW	
Capture memory	16 GB	
Capture time (time record length)	1660 ms at full 1.0 GHz BW	Capture time increases with each full power-of-2 decrease in BW
IF frequency response		
IF frequency response (amplitude flatness); across 1.0 GHz span; relative to amplitude at center of span; for microwave preselector bypass and full bypass paths, with LNA off or LNA on		
	Microwave preselector bypass	**Full bypass**
< 3.3 GHz	± 0.50 dB (nom), LNA off [1] ± 0.50 dB (nom), LNA on [2]	NA
3.3 to 26.5 GHz	± 0.75 dB (nom), LNA off ± 0.75 dB (nom), LNA on	± 1.00 dB (nom), LNA off ± 1.00 dB (nom), LNA on
1. ± 0.75 dB at 1.4 GHz ± 500 MHz 2. ± 0.75 dB at 1.4 GHz ± 500 MHz		
IF phase linearity; over 1.0 GHz span; peak-to-peak phase, around best-fit straight-line phase (nom)		
< 3.3 GHz	30 deg p-p, 8 deg RMS	
3.3 to 26.5 GHz	15 deg p-p, 3 deg RMS	
IF dynamic range		
SFDR (spurious-free dynamic range) (ADC related spurious)	–61 dBc (nom)	Signal at –27 dBFS, anywhere in full IF width
Full scale (ADC clipping) (preselector bypassed, LNA off, PA off) (nom) [1]		
	Mixer level for IF gain Low	**Mixer level for IF gain High**
< 3.3 GHz	–10 dBm	–10 dBm
3.3 to 13.3 GHz	–8 dBm	–17 dBm
13.3 to 26.5 GHz	–10 dBm	–17 dBm
TOI (3rd-order intermodulation distortion, in the IF; 2 tones of equal level, –27 dBFS, 10 MHz tone separation; preselector bypass, IF Gain high) (nom)		
< 3.3 GHz	–74 dBc	
3.3 to 20 GHz	–74 dBc	
20 to 26.5 GHz	–72 dBc	

IF residual responses (relative to Full Scale; input terminated; IF Gain = High) (nom)		
< 13.3 GHz	–93 dBFS	
13.3 to 26.5 GHz	–89 dBFS	
RF residual responses (input terminated, but varies with tuning, generally LO-related) (nom)		
	–88 dBm	
Noise density in IF (characterized at center of RF band, and center of IF [2]) (nom)		
	IF gain low	**IF gain high**
< 3.3 GHz	–149 dBm/Hz	–149 dBm/Hz
3.3 to 8.6 GHz	–154 dBm/Hz	–156 dBm/Hz
8.6 to 13.3 GHz	–153 dBm/Hz	–154 dBm/Hz
13.3 to 26.5 GHz	–149 dBm/Hz	–150 dBm/Hz

1. Full scale (ADC clipping level) is a rough estimate of the signal level at which ADC overload occurs. Actual clipping levels vary significantly; this is only a guide. Mixer level is RF Input level less attenuation setting.
2. IF noise up to 5.5 dB worse to either side of IF center.

1.5 GHz Analysis Bandwidth (Option R15)

Specifications on this bandwidth apply with center frequencies of 900 MHz and higher.

1.5 GHz analysis bandwidth (Option R15)		
Analysis bandwidth range	10 Hz to 1.5 GHz	
Tuning range	2 Hz to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified
IF frequency (center)	950 (Band 0) or 1200 MHz for Band 1 to 4	
ADC sample rate	4.8 GSa/sec	
ADC resolution	14 bits	
Final data format	I & Q pairs, 32 bits ea, 64 bits/Sa	
IQ-pair sample rate	1.25*BW	
Capture memory	16 GB	
Capture time (time record length)	894 ms at full 1.5 GHz BW	Capture time increases with each full power-of-2 decrease in bandwidth
IF frequency response	Similar to 2 GHz analysis bandwidth at >3.5 GHz	See 2 GHz Analysis Bandwidth section below
IF dynamic range	Similar to 2 GHz analysis bandwidth at >3.5 GHz	See 2 GHz Analysis Bandwidth section below

2 GHz Analysis Bandwidth (Option R20)

Assumes Microwave Preselector Bypass Path with center frequencies of 3500 MHz and higher, unless otherwise stated.

2 GHz analysis bandwidth (Option R20)		
Analysis bandwidth range	10 Hz to 2.0 GHz	
Tuning range	3.5 to 26.5 GHz	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 27 GHz allowed, but without corrections, performance not specified
IF frequency (center)	1200 MHz	
ADC sample rate	4.8 GSa/sec	
ADC resolution	14 bits	
Final data format	I & Q pairs, 32 bits ea, 64 bits/Sa	
IQ-pair sample rate	1.25*bandwidth	
Capture memory	16 GB	
Capture time (time record length)	830 ms at full 2.0 GHz BW	Capture time increases with each full power-of-2 decrease in bandwidth
IF frequency response		
IF frequency response (amplitude flatness); across 2.0 GHz span; relative to amplitude at center of span; for microwave preselector bypass and full bypass paths, with LNA off or LNA on		
	Microwave preselector bypass	**Full bypass**
3.5 to 26.5 GHz	± 0.75 dB (nom), LNA off ± 1.00 dB (nom), LNA on	± 1.00 dB (nom), LNA off [1] ± 1.00 dB (nom), LNA on [2]
1. ± 2.00 dB at 3.75 GHz ± 500 MHz 2. ± 2.50 dB at 3.75 GHz ± 500 MHz		
IF phase linearity; over 2.0 GHz span; peak-to-peak phase, around best-fit straight-line phase (nom)		
3.5 to 26.5 GHz	25 deg p-p, 6 deg RMS	
IF dynamic range		
SFDR (spurious-free dynamic range) (ADC related spurious)	–54 dBc (nom)	Signal at –22 dBFS, anywhere in full IF width
Full scale (ADC clipping) (preselector bypassed, LNA off, PA off) (nom) [1]		
	Mixer level for IF Gain Low	**Mixer level for IF Gain High**
3.5 to 26.5 GHz	–8 dBm	–18 dBm
TOI (3rd-order intermodulation distortion, in the IF; 2 tones of equal level, –19 dBFS, 10 MHz tone separation; preselector bypass, IF gain high) (nom)		
3.5 to 20 GHz	–75 dBc	
20 to 26.5 GHz	–70 dBc	
IF residual responses (input terminated; IF Gain = High) (nom)		
3.5 to 26.5 GHz	–86 dBFS	

RF residual responses (input terminated, but varies with tuning, generally LO-related) (nom)		
	–80 dBm	
Noise density in IF (characterized at center of RF band, and center of IF [2]) (nom)		
	IF Gain Low	IF Gain High
3.6 to 8.9 GHz	–155 dBm/Hz	–157 dBm/Hz
8.9 to 26.5 GHz	–151 dBm/Hz	–151 dBm/Hz

1. Full scale (ADC clipping level) is a rough estimate of the signal level at which ADC overload occurs. Actual clipping levels vary significantly; this is only a guide. Mixer level is RF Input level less attenuation setting.
2. IF noise up to 5.5 dB worse to either side of IF center.

Inputs and Outputs

Front panel

RF input	
Standard (Option 508, 513, 526) Option C35 (with Option 526 only)	Type-N female, 50 Ω nominal 3.5 mm male, 50 Ω nominal
External mixing (Option EXM)	
Connector	SMA, female, 50 Ω, nominal
Functions	LO output, IF input
IF center frequency	322.5 MHz, for IF bandwidth path ≤ 25 MHz 250.0 MHz, for IF bandwidth path = 40 MHz 690.0 MHz, for IF bandwidth path = 255 MHz 690.0 MHz, for IF bandwidth path = 1 GHz
LO output frequency range	3.75 to 14.1 GHz
Output Power 3.75 to 8.72 GHz 7.8 to 14.1 GHz	 +16 to +17 dBm (nominal) +16 to +17 dBm (nominal)
Internal calibrator output	
Cal out	SMA female, 10 MHz to 26.5 GHz internal calibrator output
Probe power	
Voltage/Current	+15 Vdc, ± 7% at 150 mA max (nominal) −12.6 Vdc, ± 10% at 150 mA max (nominal) GND

USB ports			
Type	**Description**	**Connector**	**Output Current**
Standard (3)	Compatible with USB 2.0	USB Type-A female	0.5 A (nom) for ports not marked with lightning bolt 1.2 A (nom) for port marked with lightning bolt

Headphone Jack	
Connector	Miniature stereo audio jack 3.5 mm

Rear Panel

10 MHz out	
Connector	BNC female, 50 Ω (nominal)
Output amplitude	≥ 0 dBm (nominal)
Frequency	10 MHz × (1+ frequency reference accuracy)
Ext ref in	
Connector	BNC female, 50 Ω (nominal)
Input amplitude range	Sine wave: –5 to 10 dBm (nominal) Square wave: 0.2 to 1.5 V peak-to-peak (nominal)
Input frequency	1 to 50 MHz (nominal) (selectable to 1 Hz resolution)
Frequency lock range	± 2 x 10^{-6} of specified external reference input frequency
Trigger 1 and 2 inputs	
Connector	BNC female,10 kΩ (nominal)
Trigger level range	–5 to +5 V
Trigger 1 and 2 outputs	
Connector	BNC female, 50 Ω (nominal)
Trigger level range	0 to 5 V (CMOS) (nominal)
VGA (monitor output 1)	
Connector	VGA compatible, 15-pin mini D-SUB
Format	XGA (60 Hz vertical sync rates, non-interlaced) analog RGB
Resolution	1024 x 768
DisplayPort (monitor output 2)	
Connector	Mini display port
Resolution	1024 x 768
Noise source drive +28 V (pulsed)	
Connector	BNC female
Output Voltage On	28.0 ± 0.1 V
Output Voltage Off	< 1.0 V
SNS series noise source	**For use with Keysight Technologies SNS series noise sources**
Connector	12 pin circular
Analog out	
Connector	BNC female, 50 Ω (nominal)
USB ports	
USB 3.0 (host, superspeed; 2 ports)	
Standard	Compatible with USB 3.0
Connector	USB Type-A female
Output current	0.9 A (nominal)
USB 2.0 (1 port)	
Standard	Compatible with USB 2.0
Connector	USB Type-A female
Output current	0.5 A (nominal)

USB 3.0 (device; 1 port)	
Standard	Compatible with USB 3.0
Connector	USB Type-B female
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
PCIe X4 interface	
Connector	PCIe X4, female
Digital Bus interface	
Connector	MDR-80 This port is intended for use with the Agilent/Keysight N5105 and N5106 products only. It is not available for general purpose use.
LAN TCP/IP interface	
Standard	1000Base-T
Connector	RJ45 Ethertwist
AUX IF output	
Connector	SMA female, shared by CR3, CRP and ALV
Impedance	50 Ω nominal
AUX IF output, second IF output (Option CR3)	
SA mode	322.5 MHz center frequency
IQ analyzer with IF bandwidth ≤ 25 MHz	322.5 MHz center frequency
IQ analyzer with IF path 40 MHz	250 MHz center frequency
IQ analyzer with IF path 255 MHz or 1 GHz	690 MHz center frequency
IQ analyzer with IF path 1.5 GHz	950 MHz (band 0), 1200 MHz (band 1 to 4)
IQ analyzer with IF path 2 GHz	1200 MHz center frequency
Conversion gain (SA mode and up to 40 MHz bandwidth)	−1 to +4 dB (nominal) plus RF frequency response
Bandwidth	
< 3.6 GHz	Up to 160 MHz nominal
> 3.6 GHz, with preselector	Depends on RF center frequency
> 3.6 GHz, with preselector bypass	100-800 MHz ±3 dB nominal
AUX IF output, programmable (Option CRP)	
Bandwidth	
Highpass corner frequency	5 MHz (nominal) at −3dB
Lowpass corner frequency	120 MHz (nominal) at −3dB
Output at 70 MHz	
< 3.6 GHz or >3.6 GHz with preselector bypassed	100 MHz nominal
Preselected band	Depends on RF center frequency
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

Lower output frequencies	Subject to folding	
Residual output signals	≤ −88 dBm (nominal)	
AUX IF output, Fast Log Video (Option ALV)		
General port specifications		
Connector	SMA female	Shared with other options
Impedance	50 Ω nominal	
Fast Log Video Output		
Output voltage	Open-circuit voltages	
Maximum	1.6 V at –10 dBm nominal	
Slope	25 ± 1 mV/dB nominal	
Y-axis video output (Option YAV)		
General port specifications		
Connector	BNC female	Shared with other options
Impedance	50 Ω nominal	
Screen video		
Operating conditions		
Display scale types	Log or Lin	“Lin” is linear in voltage
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	± 1% of full scale (nominal)	
Gain accuracy	± 1% of output voltage (nominal)	
Log video (log envelope) output		
Amplitude range (terminated with 50 Ω)		
Maximum	1.0 V (nominal) for –10 dBm at the mixer	
Scale factor	Output changes 1 V per 192.66 dB change in the signal envelope	
Bandwidth	Set by RBW	
Operating conditions	Select Sweep Type = Swept	
Linear video (AM demod) 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	

General Specifications

Temperature range		
Operating Altitude ≤ 2,300 m Altitude = 4,600 m Derating	 0 to 55 °C 0 to 47 °C The maximum operating temperature derates linearly from altitude of 4,600 m to 2,300 m	
Storage	–40 to +70 °C	
Altitude	4,600 m (approx. 15,000 feet)	
Maximum Relative humidity	95% RH for temperatures up to 40 °C, decreasing linearly to 45% RH at 55 °C. From 40 °C to 55 °C, the maximum % Relative Humidity follows the line of constant dew point.	
Environment		
Indoor use		
Power requirements		
Voltage and frequency (nominal)	100/120 V, 50/60/400 Hz 220/240 V, 50/60 Hz	The instruments can operate with mains supply voltage fluctuations up to ± 10% of the nominal voltage
Power consumption, On	630W maximum	
Power Consumption, Standby	45 W	
Display		
Resolution	1280 x 768	
Size	269 mm (10.6 in.) diagonal (nominal) capacitive multi-touch screen	
Data storage		
Internal	Removable solid-state drive with 256GB (256GB Micron 1300 2.5-in SSD)	
External	Supports USB 3.0/2.0 compatible memory devices	
Weight (without options)		
Net	27 kg (59 lbs) (nominal)	
Shipping	39 kg (86 lbs) (nominal)	
Dimensions		
Height	177 mm (7.0 in)	
Width	426 mm (16.8 in)	
Length	556 mm (21.9 in)	
CPU	Modular, upgradeable; Intel i7, 6-core, 1.9 GHz clock, 32 GB DDR4 DRAM; includes secure memory for instrument calibration data	
Operating system	Windows-10, Enterprise	
Calibration cycle		
The recommended calibration cycle is one year; calibration services are available through Keysight service centers.		

Regulatory Information

This product is designed for use in INSTALLATION CATEGORY II and POLLUTION DEGREE 2 and MEASUREMENT CATEGORY NONE per IEC 61010 3rd ed, and 664 respectively.

This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

This product is intended for indoor use.

Regulatory information	
CE	The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven). This product complies with all relevant directives.
ccr.keysight@keysight.com	The Keysight email address is required by EU directives applicable to our product.
CAN ICES/NMB-001(A)	“This ISM device complies with Canadian ICES-001.” “Cet appareil ISM est conforme a la norme NMB du Canada.”
ISM 1-A (GRP.1 CLASS A)	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)
c SA us	The CSA mark is a registered trademark of the CSA International.
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
UK CA	UK conformity mark is a UK government owned mark. When affixed to the product is declaring all applicable Directives and Regulations have been met in full.
	This symbol indicates separate collection for electrical and electronic equipment mandated under EU law as of August 13, 2005. All electric and electronic equipment are required to be separated from normal waste for disposal (Reference WEEE Directive 2002/96/EC).
40	China RoHS regulations include requirements related to packaging, and require compliance to China standard GB18455-2001.

	This symbol indicates compliance with the China RoHS regulations for paper/fiberboard packaging.
	More than one person is required to safely lift or carry this instrument. Alternately a mechanical lift can be used to eliminate the risk of personal injury.
	South Korean Certification (KC) mark; includes the marking's identifier code: R-R-Kst-xxxxxxx
Regulatory, environmental and certifications	
EMC	Complies with the essential requirements of the European EMC Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): IEC/EN 61326-1 CISPR 11 Group 1, Class A AS/NZS CISPR 11 ICES/NMB-001 UKCA This ISM device complies with Canadian ICES-001 Cet appareil ISM est conforme a la norme NMB-001 du Canada
	NOTE: This is a sensitive measurement apparatus by design and may have some performance loss (up to 40 dBm in the range 80 MHz to 6 GHz; above the Spurious Responses, Residual Responses specification of –100 dBm) when in the presence of ambient electromagnetic field of 3V/m.
South Korean Class A EMC declaration	This equipment has been conformity assessed for use in business environments. In a residential environment this equipment may cause radio interference. This EMC statement applies to the equipment only for use in business environment. 사 용 자 안 내 문 이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다. ※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.
Safety	Complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity): IEC/EN 61010-1 Canada: CSA C22.2 No. 61010-1 USA: UL std no. 61010-1

Acoustic statement (European Machinery Directive)	Acoustic noise emission LpA < 70 dB Operator position Normal operation mode per ISO 7779 **Acoustic noise - more information** (Values given are per ISO 7779 standard in the “Operator Sitting” position) Ambient temperature (< 40 °C) Nominally under 55 dBA Sound Pressure. 55 dBA is generally considered suitable for use in quiet office environment Ambient temperature (≥ 40 °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.

To find a current **Declaration of Conformity** for a specific Keysight product, go to:

http://www.keysight.com/go/conformity

Additional Resources

The N9032B PXA X-Series signal analyzer isn't the only thing that will bring you to RF breakthroughs. Powerful software drives your measurements while finely-tuned hardware takes them to new heights. In order to move the measurement plane to your device under test, reach even higher levels of measurement accuracy, and achieve 2 GHz of signal analysis and generation, the N9032B PXA partners with the:

- PathWave X-Series measurement applications and PathWave Vector Signal Analysis (VSA)
- U9361 RCal receiver calibrator for improved receiver test system accuracy by 10X
- M9383B VXG signal generator for wideband stimulus and response testing

N9032B PXA Signal Analyzer Configuration Guide (3121-1216.EN)

www.keysight.com/find/N9032B

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

KEYSIGHT TECHNOLOGIES