DATA SHEET

N9042B UXA X-Series Signal Analyzer, Multi-touch

2 Hz to 26.5, 44, or 50 GHz

with V3050A Signal Analyzer Frequency Extender
50 GHz to 67, 90, or 110 GHz

KEYSIGHT TECHNOLOGIES

Table of Contents

Introduction

The N9042B Signal Analyzer sets a new level of performance for high frequency measurements. Frequency options up to 50 GHz cover the current 5GNR FR1 and FR2 bands, as well as most radar, EW, and satellite bands. Analysis bandwidth can be configured to 1 GHz; 1.5 GHz, 2 GHz, 4 GHz; and even up to 11 GHz bandwidth using an external digitizer. A completely new front end provides low-noise performance and high-dynamic range, addressing applications in Tx test, such as EVM and other modulation quality tests – while also excelling at measurements of low-level and unknown signals.

The V3050A Frequency Extender can be combined with the N9042B, to extend the maximum frequency up to 110 GHz. The V3050A features a low-noise design for outstanding sensitivity; a preselector filter-bank to eliminate image responses; fundamental mixing for high dynamic range; and a “remote head” form-factor that interfaces seamlessly to the N9042B.

The N9042B supports the X-series family of multi-touch applications, as well as the 89600 VSA software. A new CPU performs compute-intensive measurements, such as demodulation and EVM, up to 40% faster than prior analyzers.

Upgrades in both frequency and bandwidth are planned.

Data Sheet Definition and Terms

This data sheet provides preliminary performance information for Keysight N9042B Signal Analyzers and V3050A Frequency Extenders. It will be replaced by updates as more complete information becomes available. Most performance information tagged here as “nominal” will be replaced by warranted ("hard”) specifications or typical specifications in the future. Most performance information here applies at. at “room temperature” (20 to 30 degC); future updates will cover the full temperature range.

Specifications describe the performance of parameters covered by the product warranty and apply to temperature ranges 20 to 30 °C deg 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 when Auto Sweep Time Rules = Accy
- 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 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. Note that factory default is Light; user can change to Normal, 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.
- 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)
IVL	Individual validated license (for export to restricted countries)
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	
526	2 Hz to 26.5 GHz
544	2 Hz to 44 GHz
550	2 Hz to 50 GHz
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	
Stepped/Swept	± (0.1 % x span + horizontal resolution[1])
FFT	± (0.1 % x span + horizontal resolution[1])
Sweep (trace) point range	
All spans	3 to 100,001

1. Horizontal resolution is Span/(SweepPoints –1)

Phase Noise (SSB)

Phase noise (SSB)			
Phase noise	**Offset**	**Specifications**	**Typical**
Noise sidebands (20 to 30 °C, CF = 1 GHz)	10 Hz		−93 dBc/Hz[1]
	100 Hz	–107 dBc/Hz	–112 dBc/Hz
	1 kHz	−124 dBc/Hz	–127 dBc/Hz
	10 kHz	–134 dBc/Hz	−135 dBc/Hz
	100 kHz	–139 dBc/Hz	−141 dBc/Hz
	1 MHz	–145 dBc/Hz	–146 dBc/Hz
	10 MHz	–155 dBc/Hz	–157 dBc/Hz

1. For wide reference loop bandwidth.

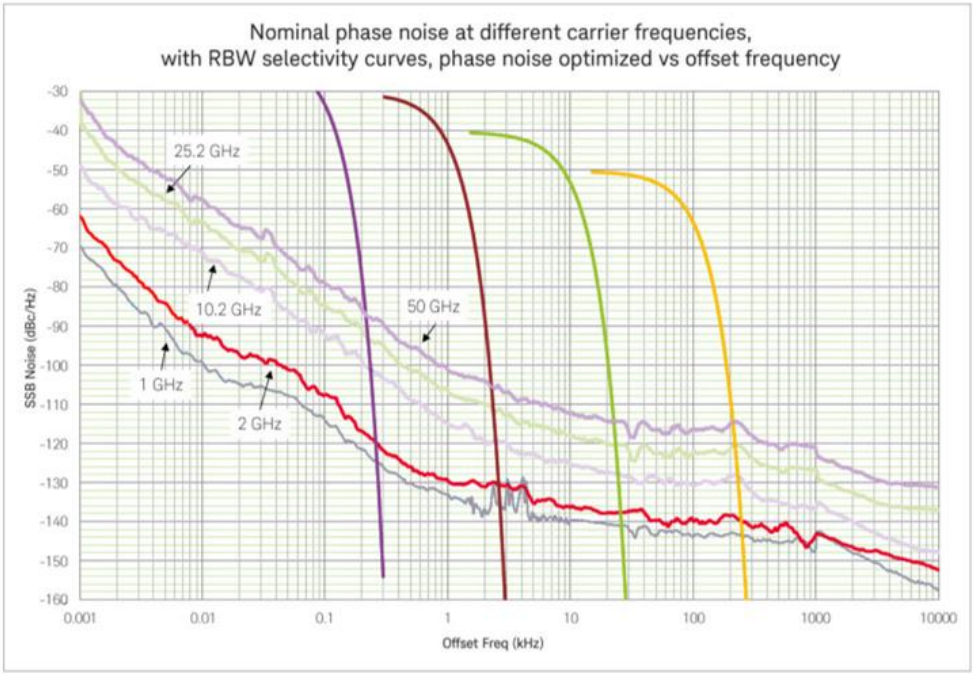

Figure 1. Nominal UXA phase noise at various center frequencies. 50 GHz curve is the predicted phase noise computed from the 25.2 GHz observation. RBW curves added to show impact of analyzer phase noise in resolving two closely-spaced signals for various RBW filter choices.

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)
External 3			Y	Jitter < 20 ps (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		
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% nominal
	Span ≥ 10 Hz, FFT	± 40% nominal
	Span = 0 Hz	± 0.01% nominal
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 nominal	

Swept Spectrum Analysis

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
5	4	26.4 to 34.5 GHz
6	8	34.4 to 50 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 (-3 dB)	1 Hz to 1.3 MHz	± 2% (nominal)
Selectivity (-60 dB/-3 dB)		4.1: 1 (nominal)
EMI bandwidths (CISPR compliant)	200 Hz, 9 kHz, 120 kHz, 1 MHz	
EMI bandwidths (Mil STD 461 compliant)	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, quasi-eak, EMI average		

Amplitude Accuracy

Amplitude characteristics vary by user-selectable front-end path. Swept SA measurements are normally made with preselector on (in circuit). There are 2 associated RF Paths; plus LNA (Low-Noise Amplifier) and/or PA (Pre-Amplifier) settings; total of 6 possible front-end settings. 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 P26, P44, P4L, P50, or P5L. 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. Operates down to 10-20 MHz
1c		Preselector, PA on	Requires P26, P44, P4L, P50, or P5L. Settings provide lower DANL, compared to 1b. Similar noise and gain compared to other X-SA with only one Pre-Amp stage. Allows tuning down to 100 kHz.
1d		Preselector, LNA on, PA on	Requires P26, P44, P4L, P50, or P5L. 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	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 at <3.6 GHz.
2b		Preselector, LNP, LNA on	Settings provide the lower DANL, compared to 2a, while preserving very good dynamic range. Path not active at <3.6 GHz.

Total 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	+/-0.12 dB (nom)
at any frequency, any path, any LNA or PA setting	+/-(0.12 dB + **Frequency Response**) (nom)

Frequency response (nom)
Standard path (10 dB attenuation, relative to reference conditions (50 MHz), preselector centered)

Frequency	**1a. Std**	**1b. Std, LNA on**	**1c. Std, PA on**	**1d. Std, LNA on, PA on**
9 kHz to 50 MHz	+/-0.12 dB	+/-0.15 dB	+/-0.25 dB	(if tuning <3.6 GHz, then standard with PA on is used)
50 MHz to 3.6 GHz	+/-0.15 dB	+/-0.15 dB	+/-0.12 dB	
3.5 to 8.4 GHz	+/-0.50 dB	+/-0.75 dB	+/-0.70 dB	+/-0.75 dB
8.3 to 13.6 GHz	+/-0.45 dB	+/-0.75 dB	+/-0.50 dB	+/-0.75 dB
13.5 to 17.1 GHz	+/-0.45 dB	+/-0.70 dB	+/-0.50 dB	+/-0.75 dB
17.0 to 26.5 GHz	+/-0.50 dB	+/-0.75 dB	+/-0.65 dB	+/-0.75 dB
26.5 to 34.5 GHz	+/-0.65 dB	+/-0.75 dB	+/-0.85 dB	+/-0.80 dB
34.4 to 50 GHz	+/-0.80 dB	+/-1.00 dB	+/-1.00 dB	+/-1.10 dB

Frequency response (nom) Low-noise path (10 dB attenuation, relative to reference conditions (50 MHz), preselector centered)		
Frequency	**2a. LNP**	**2b. LNP, LNA on**
<3.6 GHz	(if tuning to <3.6 GHz, then actually using Standard Path)	(if tuning to <3.6 GHz, then actually using Standard Path with LNA on)
3.5 to 8.4 GHz	+/-0.60 dB	+/-0.80 dB
8.3 to 13.6 GHz	+/-0.50 dB	+/-0.70 dB
13.5 to 17.1 GHz	+/-0.50 dB	+/-0.70 dB
17.0 to 26.5 GHz	+/-0.50 dB	+/-0.70 dB
26.5 to 34.5 GHz	+/-0.60 dB	+/-1.0 dB
34.4 to 50 GHz	+/-0.80 dB	+/-1.4 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)
8.3 to 26.5 GHz	+/-0.7 dB (nom)
26.4 to 50 GHz	+/-1.0 dB (nom)

VSWR (voltage standing wave ratio) at RF Input (10 dB attenuation, LNA off, PA off) (nom)	
2 Hz to 12 GHz	1.2
12 GHz to 22 GHz	1.3
22 to 28 GHz	1.4
28 to 43 GHz	1.7
43 to 50 GHz	2.1

RBW switching uncertainty (reference to 30 kHz RWB)	
1 Hz to 1.5 MHz RBW	<+/-0.03 dB
1.6 MHz to 2.7 MHz RBW	<+/-0.05 dB
3 MHz RBW	+/-0.1 dB
4,5,6,8 MHz RBW	+/-0.3 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	± 0.04 dB (nom)
Below -18 dBm input mixer level	± 0.02 dB (nom)

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.

RF input limits (max applied to RF input connector)		
RF power, max	+30 dBm (1W) MAX	Damage level; includes LNA on and PA on conditions
DC Bias at RF Input	0 VDC MAX (DC coupled)	Use external DC block as needed
Amplitude range		
Measurement range	DANL to +30 dBm, LNA off, PA off	
Input attenuator		
Mechanical (2 Hz to 50 GHz)	0 to 70 dB in 2 dB steps	
Electronic (2 Hz to 3.6 GHz)	0 to 24 dB in 1 dB steps,	
Full attenuation range	0 to 94 dB, 1 dB steps	(Mechanical + Electronic)
Preamplifiers (2 stages: Low-Noise Amplifier LNA, Pre-Amplifier PA)		
	Low-Noise Amplifier (LNA)	**Pre-Amplifier (PA)**
Option P26	20 MHz to 26.5 GHz	10 MHz to 26.5 GHz
Option P44, P4L	20 MHz to 44 GHz	10 MHz to 44 GHz
Option P50, P5L	20 MHz to 50 GHz	10 MHz to 50 GHz
Noise figure, LNA	4 to 8 dB (nom) (see DANL)	
Gain, LNA	20 dB	
Gain, Pre-Amp	30 dB	
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 DANL (swept, preselector on, LNA off, PA off)	
Noise Floor Extension (Option NF2) improves DANL by 8 to 11 dB, for standard path.	
Frequency	**DANL (nom)**
<10 Hz	-90 dBm
10 to 100 Hz	-115 dBm
100 Hz to 1 kHz	-130 dBm
1 to 9 kHz	-137 dBm
9 to 100 kHz	-146 dBm
100 kHz to 1 MHz	-156 dBm
1 to 10 MHz	-157 dBm
10 MHz to 1.2 GHz	-156 dBm
1.2 to 2.1 GHz	-154 dBm
2.1 to 3.6 GHz	-152 dBm
3.5 to 6.6 GHz	-150 dBm
6.6 to 8.4 GHz	-151 dBm
8.3 to 13.6 GHz	-150 dBm
13.5 to 17 GHz	-149 dBm
17.0 to 22.5 GHz	-146 dBm
22.5 to 26.5 GHz	-142 dBm
26.4 to 30 GHz	-140 dBm
30 to 34 GHz	-138 dBm
33.9 to 37 GHz	-135 dBm
37 to 40 GHz	-134 dBm
40 to 45 GHz	-132 dBm
45 to 50 GHz	-127 dBm

1b. Standard path, LNA on DANL (swept, preselector on, LNA on, PA off)		
Noise Floor Extension (Option NF2) improves DANL by 9 to 10 dB, for standard path, LNA on		
Frequency	**DANL (nom)**	
<10 MHz		Not permitted with LNA on
10 to 40 MHz	-158 dBm	
40 to 500 MHz	-166 dBm	
500 MHz to 2.5 GHz	-168 dBm	
2.5 GHz to 3.6 GHz	-167 dBm	
3.5 to 4.7 GHz	-166 dBm	
4.7 to 8.4 GHz	-165 dBm	
8.4 to 13.5 GHz	-166 dBm	
13.5 to 17.1 GHz	-165 dBm	
17.1 to 22.5 GHz	-162 dBm	
22.5 to 26.5 GHz	-159 dBm	
26.5 to 27.5 GHz	-158 dBm	
27.5 to 34.5 GHz	-154 dBm	
34.4 to 43.5 GHz	-148 dBm	
43.5 to 47.5 GHz	-144 dBm	
47.5 to 50 GHz	-141 dBm	

1c. Standard path, PA on DANL (swept, preselector on, LNA off, PA on)		
Noise Floor Extension (Option NF2) improves DANL by 7 to 9 dB, for standard path, PA on.		
Frequency	**DANL (nom)**	
<100 kHz		Not permitted with PA on
100 to 200 kHz	-160 dBm	
200 to 500 kHz	-162 dBm	
500 kHz to 1 MHz	-164 dBm	
1 MHz to 2.1 GHz	-166 dBm	
2.1 to 3.6 GHz	-164 dBm	
3.5 to 17.1 GHz	-166 dBm	
17.0 to 20.0 GHz	-165 dBm	
20.0 to 26.5 GHz	-163 dBm	
26.4 to 30 GHz	-162 dBm	
30 to 34 GHz	-161 dBm	
33.9 to 37 GHz	-160 dBm	
37 to 41 GHz	-158 dBm	
41 to 46 GHz	-155 dBm	
46 to 50 GHz	-154 dBm	

1d. Standard path, LNA on, PA on DANL (swept, preselector on, LNA on, PA on)		
Noise Floor Extension (Option NF2) improves DANL by 9 to 10 dB, for standard path, LNA on, PA on.		
Frequency	**DANL (nom)**	
<10 MHz		Not permitted with LNA on
10 to 40 MHz	-158 dBm[1]	
40 to 500 MHz	-166 dBm[1]	
500 MHz to 2.5 GHz	-168 dBm[1]	
2.5 GHz to 3.6 GHz	-167 dBm[1]	
3.6 to 8.4 GHz	-168 dBm	
8.3 to 13.5 GHz	-169 dBm	
13.5 to 17.1 GHz	-168 dBm	
17.0 to 23 GHz	-167 dBm	
23 to 27 GHz	-166 dBm	
27 to 36.5 GHz	-164 dBm	
36.5 to 43.5 GHz	-162 dBm	
43.5 to 47 GHz	-160 dBm[2]	
47 to 50 GHz	-159 dBm[2]	

1. In the range 10 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.
2. Option P5L is a varient of Option P50. These both provide use of both LNA and PreAmp (PA) to 50 GHz. However, only P50 allows use of PNA and PA *together* (simultaneously) to 50 GHz; while P5L actually by-passes the PA (uses LNA only) in the tuning range >43.5 to 50 GHz. See DANL for path 1b for LNA-only DANL in this range. Likewise, P44 and P4L to 44 GHz.

2a. Low-noise path (low-noise path enable, preselector on, LNA off, PA off)		
Noise Floor Extension (Option NF2) improves DANL by 9 to 11 dB, for low-noise path.		
Frequency	**DANL (nom)**	
<3.6 GHz		Not permitted with low noise path
3.6 to 17.1 GHz	-154 dBm	
17.1 to 23 GHz	-152 dBm	
23 to 26.5 GHz	-149 dBm	
26.5 to 29 GHz	-148 dBm	
29 to 34.5 GHz	-146 dBm	
34.5 to 45 GHz	-142 dBm	
45 to 50 GHz	-138 dBm	

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 (3a) is ~6 dB better than Std (1a).
- DANL for MPB, PA on (3c) is ~3 dB worse that Std, PA on (1c).

TOI

Third-Order Intercept (TOI) is a figure of merit for the 3rd-order intermodulation distortion in the RF front end.

1a. Standard path TOI (swept, preselector on, LNA off, PA off)	
State following power-on, boot-up, or PRESET.	
Frequency	**TOI (nom)**
10 to 350 MHz	+18 dBm
350 MHz to 2.2 GHz	+20 dBm
2.2 Gz to 2.8 GHz	+19 dBm
2.8 GHz to 3.0 GHz	+20 dBm
3.0 to 3.6 GHz	+22 dBm
3.6 to 8.4 GHz	+19 dBm
8.4 to 13.6 GHz	+22 dBm
13.6 to 21 GHz	+15 dBm
21 to 26.5 GHz	+22 dBm
26.4 to 34.5 GHz	+20 dBm
34.5 to 50 GHz	+17 dBm
1b. Standard path, LNA On TOI (swept, preselector on, LNA on, PA off)	
Frequency	**TOI (nom)**
10 to 500 MHz	-2 dBm
500 MHz to 2 GHz	0 dBm
2 to 3.6 GHz	+3 dBm
3.6 to 13.6 GHz	0 dBm
13.6 to 21 GHz	-4 dBm
21 to 26.5 GHz	+2 dBm
26.5 to 34 GHz	+3 dBm
34 to 50 GHz	-3 dBm
1c. Standard path, PA on TOI (swept, preselector on, LNA off, PA on)	
Frequency	**TOI (nom)**
10 to 400 MHz	0 dBm
400 to 800 MHz	+1 dBm
800 MHz to 3 GHz	+2 dBm
3 to 3.6 GHz	+3 dBm

SHI

Second-Harmonic Intercept (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: SHI (swept, preselector on, LNA off, PA off)	
Frequency of the fundamental	**SHI (nom)**
10 MHz to 1.8 GHz	+47 dBm
1.8 to 3 GHz	+62 dBm
3 to 6.5 GHz	+66 dBm
6.5 to 10 GHz	+72 dBm
10 to 13.5 GHz	+67 dBm
13.5 to 25 GHz	+60 dBm
1b. Standard path: SHI (swept, preselector on, LNA on, PA off)	
Frequency of the fundamental	**SHI (nom)**
10 MHz to 1.8 GHz	+12 dBm
1.8 to 13.5 GHz	+15 dBm
1c. Standard path: SHI (swept, preselector on, LNA off, PA on)	
Frequency of the fundamental	**SHI (nom)**
10 MHz to 1.8 GHz	+28 dBm
1.8 to 13.5 GHz	+5 dBm
2a. Low-noise path: SHI (swept, Low-noise path enable, preselector on, LNA off, PA off)	
Frequency of the fundamental	**SHI (nom)**
1.75 to 2.5 GHz	+87 dBm
2.5 to 5 GHz	+92 dBm
5 to 13.5 GHz	+96 dBm
13.5 to 25 GHz	+85 dBm

Gain Compression

1a. Standard path: 1 dB gain compression (swept, standard, preselector on, LNA off, PA on or off)		
Frequency	**Gain Comp (nom) PA Off**	**Gain Comp (nom) PA On**
20 to 40 MHz	+2 dBm	-14 dBm (nom)
40 MHz to 3.6 GHz	+5 dBm	-14 dBm (nom)
3.6 to 13.5 GHz	+8 dBm	
13.5 to 26.5 GHz	+3 dBm	

Residuals, Images, and Spurious Responses

Residual responses (input terminated, 0 dB attenuation)	
Residuals	-100 dBm (nom)
Spurious responses (input-related, standard path, LNA off, PA off)	
Image, 10 MHz to 35 GHz	-90 dBc (nom)
Image, 35 to 50 GHz	-70 dBm (nom)
Other input-related spurious	-85 dBm (nom)

Nominally the same, with PA on, and in low-noise path.

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**	**Comments**
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	
R40	4.0 GHz	4.0 GHz	
	External	Up to 11.0 GHz	Requires Options EDC and CRW. Requires M8131A Digitizer.

1. IF Paths at 10, 25, 40, and 255 MHz are enabled by any of R10, R15, R20, or R40. Each bandwidth option includes and enables all others with lesser bandwidth (except External Digitizer); 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 N9042B signal analyzer *alone* would have lower residuals (by ~3 dB, if assume equal contributions).

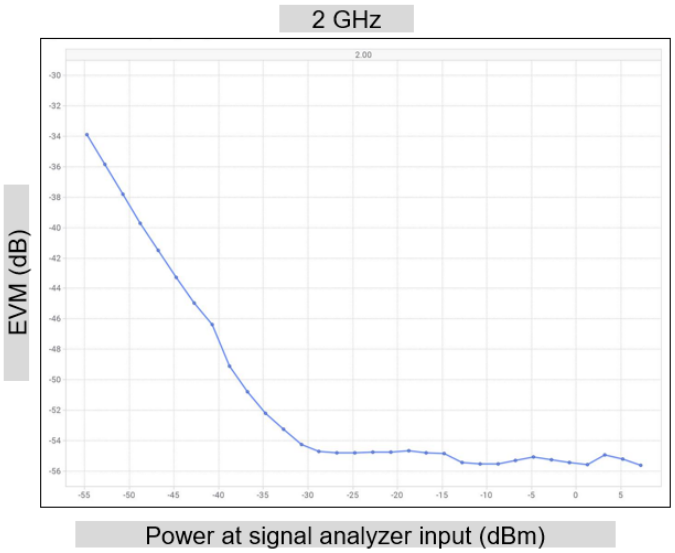

Figure 2. 5GNR FR1, 2.0 GHz carrier, 100 MHz single carrier, 256 QAM, 30 kHz SCS, DC Punc off

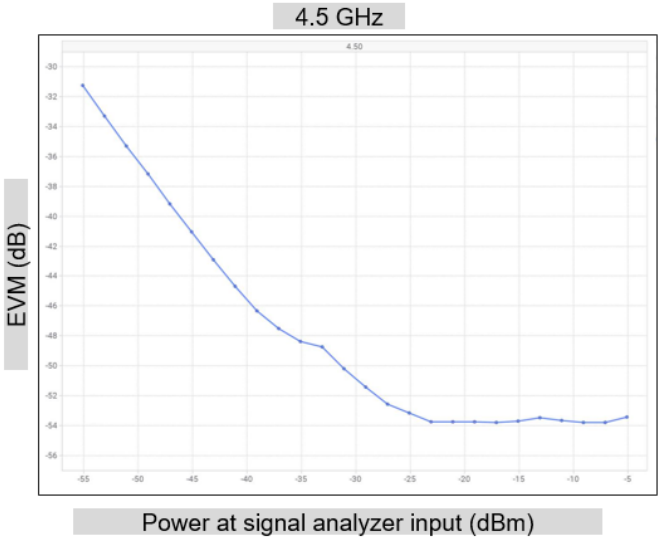

Figure 3. 5GNR FR1, 4.5 GHz carrier, 100 MHz single carrier, 256 QAM, 30 kHz SCS, DC Punc off

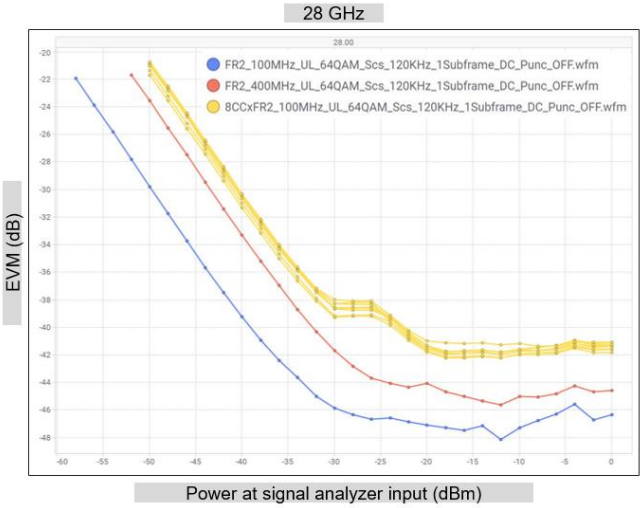

Figure 4. 5GNR FR2, 28 GHz carrier, CP-OFDM Uplink, 1x100 MHz (blue) and 1x400 MHz (red) and 8x100 MHz (yellow), 64 QAM, 120 kHz SCS

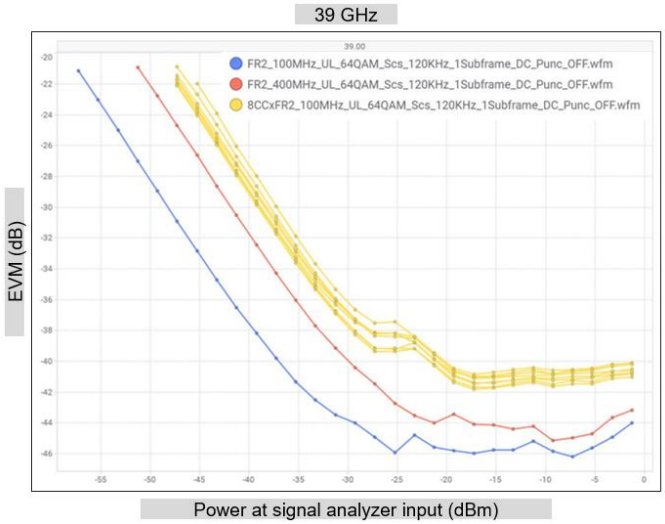

Figure 5. FR2, 39 GHz carrier, CP-OFDM Uplink, 1x100 MHz (blue) and 1x400 MHz (red) and 8x100 MHz (yellow), 64 QAM, 120 kHz SCS

1 GHz Analysis Bandwidth (option R10)

1 GHz analysis bandwidth (option R10)		
Analysis bandwidth range	10 Hz to 1.0 GHz	
Tuning range	2 Hz to 50.0 GHz 50.0 to 110 GHz w/ V3050A	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough. Over-range tuning to 50.5 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 msec at full 1.0 GHz BW	Capture time increases with each full power-of-2 decrease in BW
IF frequency response	Similar to or better than 2 GHz analysis bandwidth	See 2 GHz Analysis Bandwidth section below

IF dynamic range		
SFDR (spurious-free dynamic range) (ADC related spurious)	-65 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	+7 dBm	-3 dBm
3.3 to 13.3 GHz	-6 dBm	-12 dBm
13.3 to 50 GHz	-7 dBm	-13 dBm
TOI (3rd-order intermodulation distortion, in the IF; 2 tones of equal level, -27dBFS, 10 MHz tone separation; preselector bypass, IF Gain high, signal levels and attenuation to minimize TOI in front end mixers) (nom)		
<3.3 GHz	-74 dBc	
3.6 to 13.3 GHz	-74 dBc	
13.3 to 50 GHz	-69 dBc	
IF residual responses (relative to Full Scale; input terminated; IF Gain = High) (nom)		
<13.3 GHz	-99 dBFS	
13.3 to 50 GHz	-95 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	-144 dBm/Hz	-150 dBm/Hz
3.3 to 8.6 GHz	-155 dBm/Hz	-155 dBm/Hz
8.6 to 13.3 GHz	-153 dBm/Hz	-153 dBm/Hz
13.3 to 24.5 GHz	-150 dBm/Hz	-150 dBm/Hz
24.5 to 50 GHz	-144 dBm/Hz	-144 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.

Amplitude accuracy, absolute, 1 GHz IF path (nom) Microwave preselector bypass path (10 dB attenuation)				
Frequency	**3a. MPB**	**3b. LNA on**	**3c. PA on**	**3d. LNA on, PA on**
<3.3 GHz	+/-0.8 dB	+/-0.5 dB [1]	+/-0.5 dB [1]	
3.3 to 8.6 GHz	+/-0.6 dB	+/-0.6 dB	+/-0.5 dB	+/-0.6 dB
8.6 to 13.3 GHz	+/-0.8 dB	+/-0.6 dB	+/-0.7 dB	+/-0.6 dB
13.3 to 24.5 GHz	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB	+/-1.0 dB
24.5 to 50 GHz	+/-1.0 dB	+/-1.3 dB	+/-1.2 dB	+/-1.3 dB

1. Degraded by factor of ~2 in region <600 MHz.

Amplitude accuracy, absolute, 1 GHz IF path (nom) Full bypass path (10 dB attenuation)		
Frequency	**4a. FBP**	**4b. FBP, LNA on**
3.3 to 8.6 GHz	+/-0.8 dB	+/-0.8 dB
8.6 to 13.3 GHz	+/-1.0 dB	+/-0.7 dB
13.3 to 24 GHz	+/-1.0 dB	+/-1.0 dB
24 to 50 GHz	+/-1.0 dB	+/-1.2 dB

1.5 GHz Analysis Bandwidth (option R15)

1.5 GHz analysis bandwidth (option R15)		
Analysis bandwidth range	10 Hz to 1.5 GHz	
Tuning range	2 Hz to 50.0 GHz 50.0 to 110 GHz w/ V3050A	In practice, low end of tuning range limited to < (½*BW), by image folding and LO feedthrough.
IF frequency (center)	950 (Band-0) or 1200 MHz for	
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)	830 msec at full 1.0 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	See 2 GHz Analysis Bandwidth section below

Amplitude Accuracy (Wide Bandwidth) for 1.5 GHz similar to 1 GHz.

2 GHz Analysis Bandwidth (opt R20)

Assumes Microwave Preselector Bypass Path, unless otherwise stated.

2 GHz Analysis Bandwidth (option R20)		
Analysis bandwidth range	10 Hz to 2.0 GHz	
Tuning range	3.3 to 50 GHz 50.0 to 110 GHz with V3050A	
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 msec 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 8.9 GHz	+/- 0.5 dB (nom), LNA off +/- 0.5 dB (nom), LNA on [2,4]	+/- 0.4 dB (nom), LNA off [1] +/- 0.4 dB (nom), LNA on [3,5]
8.9 to 24 GHz	+/- 0.4 dB (nom), LNA off +/- 0.45 dB (nom), LNA on [7,9]	+/- 0.4 dB (nom), LNA off [6] +/- 0.5 dB (nom), LNA on [8,10]
24 to 50 GHz	+/- 0.6 dB (nom), LNA off +/- 0.6 dB (nom), LNA on [11]	+/- 0.6 dB (nom), LNA off +/- 0.6 dB (nom), LNA on [12]
IF phase linearity; over 2.0 GHz span; peak-to-peak phase, around best-fit straight-line phase		
<3.5 GHz	30 deg p-p, 8 deg RMS	
3.5 to 8.9 GHz	15 deg p-p, 3 deg RMS	
8.9 to 50 GHz	15 deg p-p, 3 deg RMS	

1,2,3 +/-2.5 dB at 3.75 GHz +/- 250 MHz

4,5 +/-0.6 dB at 8.4 GHz +/- 500 MHz

6,7,8 +/-1.2 dB at 23.7 GHz +/- 300 MHz

9,10 +/-1.5 dB at 9.2 GHz +/- 300 MHz

11,12 +/-1.5 dB at 24.05 GHz +/- 50 MHz

IF dynamic range		
SFDR (spurious-free dynamic range) (ADC related spurious)	-60 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 GHz	+7 dBm	-4 dBm
3.5 to 8.9 GHz	-4 dBm	-15 dBm
8.9 to 24 GHz	-7 dBm	-17 dBm
24 to 50 GHz	-7 dBm	-13 dBm
TOI (3rd-order intermodulation distortion, in the IF; 2 tones of equal level, -19dBFS, 10 MHz tone separation; preselector bypass, IF gain high, signal levels and attenuation to minimize TOI in front end mixers) (nom)		
<3.5 GHz	-79 dBc	
3.5 to 8.9 GHz	-75 dBc	
8.9 to 50 GHz	-69 dBc	
IF residual responses (input terminated; IF Gain = High) (nom)		
<3.5 GHz	-97 dBFS	
3.5 to 50 GHz	-91 dBFS	
RF residual responses (input terminated, but varies with tuning, generally LO-related) (nom)		
	-83 dBm	
Noise density in IF (characterized at center of RF band, and center of IF [2]) (nom)		
	IF Gain Low	IF Gain High
<3.5 GHz	-143 dBm/Hz	-149 dBm/Hz
3.6 to 8.9 GHz	-153 dBm/Hz	-155 dBm/Hz
8.9 to 24 GHz	-152 dBm/Hz	-153 dBm/Hz
24 to 50 GHz	-144 dBm/Hz	-144 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.

Amplitude Accuracy (Wide Bandwidth) for 2 GHz similar to 1 GHz.

Inputs and Outputs

Front Panel

RF input			
Option 526, 544, 550	2.4mm male, 50 Ω (nominal) (standard) Adapter 2.4mm to 3.5mm included with Option 526		
External frequency extender, wide-bandwidth (option EXW), interface for use with V3050A			
High LO Out	2.4mm female; option EXW connection to V3050A signal analyzer frequency extender		
High IF In	SMA, female; option EXW connection to V3050A signal analyzer frequency extender		
External mixing (option EXM)			
Connector	SMA, female, 50 Ω, nominal		
Functions	Triplexed for LO output, IF input, and mixer bias		
Mixer bias range	± 10 mA in 10 µA step		
IF frequency	322.5 MHz, for IF bandwidth path <= 25 MHz 250.0 MHz (center), for IF bandwidth path = 40 MHz		
LO output frequency range	3.75 to 14.0 GHz		
Internal calibrator output			
Cal Out	2.4mm female, 10 MHz to 50 GHz internal calibrator output		
USB ports			
Type	**Description**	**Connector**	**Output Current**
Standard (2)	Compatible with USB 2.0	USB Type-A female	0.5 A (nom) for ports not marked
USB 3.0 (2)	Compatible with USB 3.0	USB Type-A female (blue)	1.2 A (nom) for ports
USB C (1)	Compatible with USB Type-C	USB Type-C female	3.0 A at 15 V
Wide IF out (enabled by option CRW)			
Connector	SMA, female, 50 Ω nominal		

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	–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, 10 kΩ (nominal)
Trigger level range	–5 to 5 V
Trigger 3 input (precision, for wide-bandwidth measurements only)	
Connector	SMA, female, 50 Ω (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	1280 x 800
DisplayPort (monitor output 2)	
Connector	Mini DisplayPort
Resolution	1280 x 800
Noise source drive +28 V (pulsed)	
Connector	BNC female
SNS series noise source	**For use with Keysight Technologies' SNS series noise sources**
Connector	12 pin circular
Analog out	
Connector	BNC female
USB ports	
USB 3.0 (2 ports)	
Standard	Compatible with USB 3.0
Connector	USB Type-A female
Output current	1.2 A (nominal)
USB 2.0 (1 port)	
Standard	Compatible with USB 2.0
Connector	USB Type-A 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
PCIe X4 interface	
Connector	PCIe X4, female
Digital Bus interface	
Connector	MDR-80
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, licensed as option CR3 (standard)	
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
Conversion gain	-1 to +4 dB (nominal) plus RF frequency response

Bandwidth		
<3.6 GHz	Up to 1 GHz nominal	
>3.6 GHz, with preselector bypass	Depends on RF center frequency	
AUX IF output, programmable, licensed as 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, licensed as 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 shown	
Maximum	1.6 V at –10 dBm nominal	
Slope	25 ± 1 mV/dB nominal	
Option YAV Y-axis video output		
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	0 to 40 °C	
Altitude	4,600 m (approx. 15,000 feet)	
Maximum relative humidity	95% non-condensing	
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
Rated output power	850W	
Display		
Resolution	1280 x 800	
Size	357 mm (14.1 in.) diagonal (nominal) capacitive multi-touch screen	
Data storage		
Internal	Removable solid-state drive (≥ 256 GB)	
External	Supports USB 3.0/2.0 compatible memory devices	
Weight (without options)		
Net	38.6 kg (nominal)	
Shipping	53.9 kg (119 lbs) (nominal)	
Dimensions		
Height	281 mm (11 in)	
Width	459 mm (18 in)	
Length	575 mm (22.6)	
CPU	Modular, upgradeable; Intel i7, 6-core, 1.9 GHz clock, 8 GB DDR4 DRAM; includes secure memory for instrument cal data	
SSD (solid-state drive)	256 GB, removeable	
Operating system	Windows-10, Enterprise	
Calibration cycle		
The recommended calibration cycle is one year; calibration services are available through Keysight service centers.		

V3050A Signal Analyzer Frequency Extender

The V3050A Frequency Extender is usable with the N9042B X-Series Signal Analyzer only and extends its frequency range. N9042B-EXW is required to enable V3050A support. Specifications apply with standard 1-meter cable supplied.

Preliminary data covers swept (narrow-bandwidth) operation. The V3050A is capable of wide-bandwidth measurements; specifications to be provided in future updates.

V3050A can be connected to N9042B in two ways.

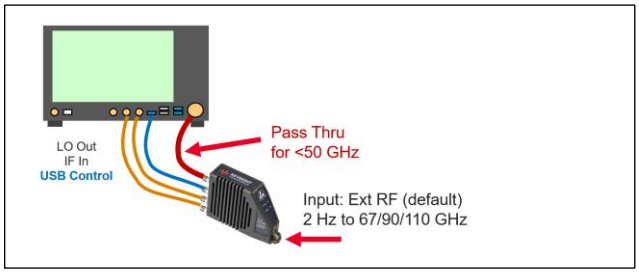

Figure 6: Configuration 1, single input.

Configuration 1 requires N9042B-550 and N9042B-EXW. Pass Thru output from V3050A is connected to N9042B RF Input. All signals to be measured are connected to a single port - the V3050A input. Frequencies <50 GHz are routed to Pass Thru; frequencies >50 GHz are down-converted inside V3050A and routed as an IF to the N9042B. The user can freely sweep frequency anywhere from 2 Hz up to 110 GHz, including sweeps through 50 GHz. The losses of the Pass Thru path impact performance (see Insertion Loss of Thru-Path); however, absolute amplitude readings are corrected using stored calibration factors.

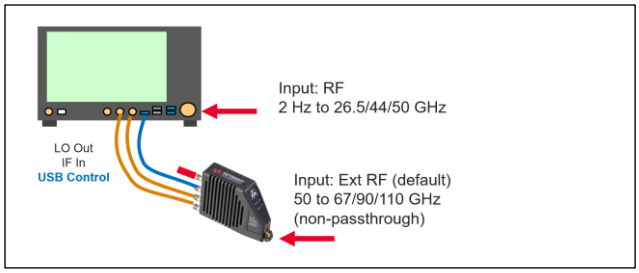

Figure 7: Configuration 2, dual inputs

Configuration 2 requires N9042B-EXW only. Pass Thru output from V3050A is terminated by 50 Ohm load (provided) and not connected to N9042B. The signal analyzer measurement system now has two inputs, operated one at a time.

1. Signals at N9042B RF Input can be measured 2 Hz up to 50 GHz
2. Signals at the V3050A Input are measured from 50 GHz to the maximum frequency of the V3050A signal analyzer frequency extender.

Frequency

V3050A frequency range (applies to config 2; for config 1, lower frequency extends down to 2 Hz) (input terminated, RMS detection, normalized to 1 Hz)	
Option	**Frequency range**
F06	50 to 67 GHz
F09	50 to 90 GHz[1]
F11	50 to 110 GHz[2]

1. Option F09 conforms to limitations governing export to restricted countries (does not require IVL). When used for wide-bandwidth analysis (IQ), the highest allowed frequency (at center of bandwidth) is reduced by ½ of the maximum bandwidth that is configured (optional licenses) for a given instrument. For example, with option R20 licensed (2 GHz analysis bandwidth), the maximum center frequency allowed is 89 GHz.
2. IVL required for export to restricted countries.

Frequency accuracy, marker accuracy, resolution, etc. based on N9042B frequency and time-base specifications, times the LO multiplier factor in table below.

V3050A bands (simplified)			
Band	Frequency range (approx.)	LO multiplier	Pre-Selection filter, 1 dB BW (nom)
A	50 to 58 GHz	8	48.7 to 59 GHz
B	58 to 65 GHz	12	56.5 to 66.7 GHz
C	65 to 72 GHz	12	64.2 to 74.2 GHz
D	72 to 80 GHz	16	71.7 to 81.6 GHz
E	80 to 87.5 GHz	12,16	79.1 to 90.0 GHz
BP	87.5 to 110 GHz[1]	16,18	

1. "Software preselection" methods (multiple acquisitions) used for image suppression in this band.

Phase Noise

V3050A Phase noise, when combined with N9042B (SSB, normalized to 1 Hz) (nom)				
Frequency	Offset			
	10 kHz	100 kHz	1 MHz	10 MHz
55 GHz	-104 dBc/Hz	-108 dBc/Hz	-120 dBc/Hz	-125 dBc/Hz
67 GHz	-104 dBc/Hz	-108 dBc/Hz	-120 dBc/Hz	-125 dBc/Hz

Amplitude

Power / Amplitude	
Input power, max	+18 dBm (63 mW), CW or pulsed 0 VDC
Attenuator	0 to 26 dB, in 2 dB steps, electronic switching [1]
Amplitude accuracy	+/- 3 dB (nom), 50 to 110 GHz [2]
Measurement range	Nominally from {DANL + Attenuator + 10*log*RBW} to {(1 dB Gain Compression) + Attenuator}

1. The V3050A attenuator acts on signals >50 GHz; the attenuation for signals <50 GHz resides inside N9042B, and can be set independently, for both Config-1 and Config-2.
2. Nominal system absolute amplitude uncertainty, including contributions from V3050A calibration accuracy (cal data), EXW port amplitude accuracy, IF cables loss, and IF mismatch uncertainty. Note: V3050A supports use of U9361 RCal calibrator.

DANL (Displayed Average Noise Level)

V3050A DANL (applies to config 1 and config 2) (input terminated, 0 dB attenuation, RMS detection, normalized to 1 Hz) (nom)	
Frequency	**DANL (nom)**
50 to 52 GHz	-143 dBm/Hz
52 to 54 GHz	-146 dBm/Hz
54 to 78 GHz	-149 dBm/Hz
78 to 92 GHz	-146 dBm/Hz
92 to 102 GHz	-139 dBm/Hz
102 to 106 GHz	-135 dBm/Hz
106 to 108 GHz	-130 dBm/Hz
108 to 110 GHz	-100 dBm/Hz

Insertion Loss of Pass-Thru Path

Config-1 will route signals <50 GHz thru the V3050A and Pass Thru cable to N9042A RF Input. The insertion loss will impact performance for frequencies <50 GHz, described in N9042B section, *when referenced to the V3050A Input connector*:

- DANL will be increased (degraded) by factors in this table
- TOI and 1dB compression will be increased (improved) by these factors
- Dynamic range stays the same
- Absolute amplitude accuracy stays the same (uses correction factors to compensate)

V3050A throughpath insertion loss (mismatch not included) (nom) ("Spot" frequency points are given; approximate other frequencies with straight-line interpolation)			
Frequency point	**Insertion loss, V3050A input to pass-thru output**	**Insertion loss, 1-meter Pass Thru cable + 2.4mm adapter**	**Insertion loss, combined**
100 MHz	3.1 dB	0.2 dB	3.3 dB
1 GHz	3.5 dB	0.7 dB	4.2 dB
5 GHz	4.0 dB	1.0 dB	5.0 dB
10 GHz	4.5 dB	1.5 dB	6.0 dB
20 GHz	5.5 dB	2.1 dB	7.6 dB
30 GHz	7.0 dB	2.6 dB	9.6 dB
40 GHz	7.5 dB	3.1 dB	10.6 dB
50 GHz	12.0 dB	3.5 dB	15.5 dB

1 dB Gain Compression

Gain Compression (RF input to IF output, with 0 dB attenuation, absolute power level where converter linearity deviates by more than 1 dB from straight line) (another figure-of-merit for analyzer distortion is TOI; it can be estimated as 10 dB higher than values below)	
Freq range	**1 dB compression level (nom)**
50 to 60 GHz	>-15 dBm
60 to 102 GHz	>-20 dBm
102 to 110 GHz	>-12 dBm

V3050A General and Supplemental Information

Power / Amplitude ranges	
LO input level	>=0 dBm (nom), to achieve nom. conversion loss and cal accuracy (not user controllable) (-10 dBm leads to changes of 1 to 2.5 dB in conversion loss) (nom) +18 dBm max (damage level)
Preselector type	5-band, electronically switched, band-pass filter; see table above
Image rejection	>60 dB (nom), 50 to 88 GHz >30 dB (nom), 88 to 110 GHz; supplemented with software pre-selection
Spurious responses	<-80 dBm (nom), for input signals at –20 dBm, anywhere in 50 to 110 GHz
Input Connector	1.0mm (m), ruggedized
Input match (nom)	<-10 dB return loss (1.9 VSWR), at 50 to 90 GHz, Attenuation 10 dB <-5 dB return loss (3.5 VSWR), at 90 to 110 GHz, Attenuation 10 dB
Rear connectors (listed top to bottom)	LO Out: 2.4mm (f) <reserved for future use> LO In: 2.4mm (f) IF Out: 3.5mm (f) Pass Thru <50 GHz: 1.85mm (f) (can be mated with 2.4mm)
USB connector	USB C PD: USB Type-C with Power Delivery (requires 15V, 1.75A, 27 W minimum)
IF frequency out	7.5225 GHz (in swept)
Data storage	Factory cal data stored in non-volatile memory, read by N9042B (not user-accessible)
Dimensions:	Length: 93 mm (3.66in), without connectors; 128 mm (5.04in), with connector Height: 81 mm (3.19 in) Width (Thickness): 36 mm (1.42 in)
Weight	0.42 kg (0.19 lbs)
Mounting points	4 ea threaded holes for M3 x 0.5
Accessories included	Adapter, 1.0mm to 1.0 mm (connector saver) with Opt F09 and F11 Adapter, 1.0mm to 1.85mm with Opt F06 Adapter locking collar (V3050-60006) Adapter, 2.4mm (33311-82005) (for Pass-Thru at N9042B Input) Torque wrench, 14mm, torque 10 in-lb and 4 in-lb Interface cable bundle, 4 cables, ~1 meter long (V3050-60004) Base plate (press fit, weighted for stabilization) (V3050-60005)
Environmental and Certifications	
Temperature range	Operating: 20 to 30 °C
	Storage: 20 to 30 °C
Cooling	Active forced-air fan cooling; must maintain 5 cm (2 in) of clearance around faces of V3050A with vents

Additional Resources

The N9042B UXA 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 4 GHz of signal analysis and generation, the N9042B UXA partners with the:

- PathWave X-Series measurement applications and PathWave Vector Signal Analysis (VSA)
- V3050A frequency extender for an unbanded, preselected frequency range to 110 GHz
- U9361 RCal receiver calibrator for improved receiver test system accuracy by 10X
- M9383B VXG signal generator for wideband stimulus and response testing
- N9042B UXA Signal Analyzer Configuration Guide (3121-1036.EN)

www.keysight.com/find/N9042B

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