DATA SHEET

M9415A
VXT PXIe Vector Transceiver
380 MHz to 12.3 GHz

KEYSIGHT TECHNOLOGIES

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Technical Specifications

Definitions and conditions

Specifications describe the warranted performance of calibrated instruments. Data represented in this document are specifications under the following conditions unless otherwise noted.

- Specifications are valid from 45 to 75 °C for individual module temperature, as reported by the module, and 20 to 35 °C for environment temperature unless otherwise noted
- Calibrated instrument has been stored for a minimum of 2 hours within the allowed operating range
- If instrument has previously been stored at a temperature range inside the allowed storage range, but outside the allowed operating range, instrument must have been stored for a minimum of 2 hours within the allowed operating range before turn-on
- 45-minute warm-up time with the Modular TRX application running
- Calibration cycle maintained
- When used with Keysight M9300A frequency reference and Keysight interconnect cables
- An “All Alignment” has been run within the previous 7 days
- A “Fast Alignment” has been run:
  - Within the previous 8 hours
  - If the environmental temperature has changed more than 5°C from the previous Fast Alignment

Typical describes additional product performance information that is not covered by the product warranty. It is performance beyond specifications that 95 percent of the units exhibit with a 95 percent confidence level. This data does not include measurement uncertainty and is valid only at room temperature (approximately 25 °C) after alignment within the stated alignment time and temperature limits.

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

Recommended best practices in use

- Use slot blockers and EMC filler panels in empty module slots to ensure proper operating temperatures. Keysight chassis and slot blockers optimize module temperature performance and reliability of test.
- Set chassis fan to high at environmental temperatures above 35 °C.

Vector Signal Analyzer

Performance		
Capture depth		
Standard (Option M02)	256 MSa of IQ data	
Option M05	512 MSa of IQ data	
Frequency		
Frequency range		
Option F06	380 MHz to 6 GHz	
Option F08	380 MHz to 8 GHz	
Option F12	380 MHz to 12.3 GHz	
Frequency reference		
Accuracy, aging rate, stability	Refer to M9300A specifications	
Frequency readout accuracy		
CW	± (marker frequency x frequency reference accuracy + 0.10% x span + 5% x RBW + 2 Hz + 0.5 x horizontal resolution)	
Demodulation	± (center frequency × frequency reference accuracy + 1 Hz)	
Resolution	1 Hz	
Analysis Bandwidth		
Standard (Option B4X)	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 12.3 GHz	400 MHz
Option B8X	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12.3 GHz	800 MHz
Option B12	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12.3 GHz	1.2 GHz
Triggering		
Trigger		
IQ analyzer	Free run, External 1, External 2, RF burst, Video, Periodic, PXI, Internal	
Trigger delay range	–150 to 500 ms	
Resolution	1/sample rate	
Maximum safe input level		
Average power input		
RF input port	+27 dBm	
Option HDX, Half duplex port	+27 dBm	
DC volts		
RF input port	30 Vdc	
Option HDX, Half duplex port	30 Vdc	

Absolute Amplitude Accuracy (CW mode) [1]			
RF input port			
Frequency Range	–70 dBm ≤ Input level < +10 dBm	+10 dBm ≤ Input level ≤ +20 dBm	+20 dBm < Input level ≤ +27 dBm
380 MHz to 1.31 GHz	< ± 0.50 dB, *< ± 0.20 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 1.00 dB, *< ± 0.70 dB typical*
1.31 to 4.3 GHz	< ± 0.60 dB, *< ± 0.25 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 1.00 dB, *< ± 0.65 dB typical*
4.3 to 8.4 GHz	< ± 0.55 dB, *< ± 0.25 dB typical*	< ± 0.55 dB, *< ± 0.25 dB typical*	< ± 0.75 dB, *< ± 0.40 dB typical*
8.4 to 11.4 GHz	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 0.80 dB, *< ± 0.40 dB typical*	< ± 0.90 dB, *< ± 0.50 dB typical*
11.4 to 12.3 GHz	< ± 0.70 dB, *< ± 0.35 dB typical*	< ± 0.85 dB, *< ± 0.45 dB typical*	< ± 1.25 dB, *< ± 0.70 dB typical*
Half duplex port, Option HDX			
Frequency Range	–70 dBm ≤ Input level < +10 dBm	+10 dBm ≤ Input level ≤ +20 dBm	+20 dBm < Input level ≤ +27 dBm
380 MHz to 1.31 GHz	< ± 0.50 dB, *< ± 0.25 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 1.15 dB, *< ± 0.85 dB typical*
1.31 to 4.3 GHz	< ± 0.60 dB, *< ± 0.25 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 1.30 dB, *< ± 0.80 dB typical*
4.3 to 8.4 GHz	< ± 0.70 dB, *< ± 0.30 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 0.85 dB, *< ± 0.50 dB typical*
8.4 to 11.4 GHz	< ± 0.75 dB, *< ± 0.40 dB typical*	< ± 0.75 dB, *< ± 0.35 dB typical*	< ± 0.95 dB, *< ± 0.55 dB typical*
11.4 to 12.3 GHz	< ± 0.80 dB, *< ± 0.40 dB typical*	< ± 0.90 dB, *< ± 0.45 dB typical*	< ± 1.15 dB, *< ± 0.65 dB typical*

Input Voltage Standing Wave Ratio (VSWR)		
	RF input port	**Half Duplex Port (configured to input mode)**
380 MHz to 4.3 GHz	< 1.55:1, *< 1.4:1 typical*	< 1.55:1, *< 1.4:1 typical*
4.3 to 5.8 GHz	< 1.4:1, *< 1.3:1 typical*	< 1.55:1, *< 1.4:1 typical*
5.8 to 7.2 GHz	< 1.8:1, *< 1.6:1 typical*	< 1.9:1, *< 1.7:1 typical*
7.2 to 10.2 GHz	< 1.6:1, *< 1.4:1 typical*	< 1.6:1, *< 1.4:1 typical*
10.2 to 12.3 GHz	< 2.0:1, *< 1.9:1 typical*	< 2.0:1, *< 1.9:1 typical*

Displayed Average Noise Floor (DANL) [2]		
	RF input port, with analyzer ranged to –70 dBm	**Half duplex port, Option HDX, with analyzer ranged to –70 dBm**
380 MHz to 4.3 GHz	–165 dBm, *–167 dBm typical*	–160 dBm, *–162 dBm typical*
4.3 to 10.2 GHz	–165 dBm, *–167 dBm typical*	–158 dBm, *–161 dBm typical*
10.2 to 12.3 GHz	–162 dBm, *–165 dBm typical*	–155 dBm, *–157 dBm typical*

Third-order Intermodulation Distortion (TOI, with analyzer ranged to +10 dBm)	
380 MHz to 4.3 GHz	+30 dBm, *+32 dBm typical*
4.3 to 6 GHz	+28 dBm, *+30 dBm typical*
6 to 12.3 GHz	+27 dBm, *+29 dBm typical*

1. Signal is measured at 1.1 MHz offset from the center frequency, Otherwise, an IF flatness error must be added.
2. Input terminated, LNA on, log power average, and normalized to 1 Hz bandwidth.

Phase Noise Sidebands (CF = 1 GHz)	
1 kHz offset	–114 dBc/Hz, *–116 dBc/Hz typical*
10 kHz offset	–128 dBc/Hz, *–130 dBc/Hz typical*
100 kHz offset	–132 dBc/Hz, *–134 dBc/Hz typical*
1 MHz offset	–135 dBc/Hz, *–137 dBc/Hz typical*
10 MHz offset	–139 dBc/Hz, *–141 dBc/Hz typical*

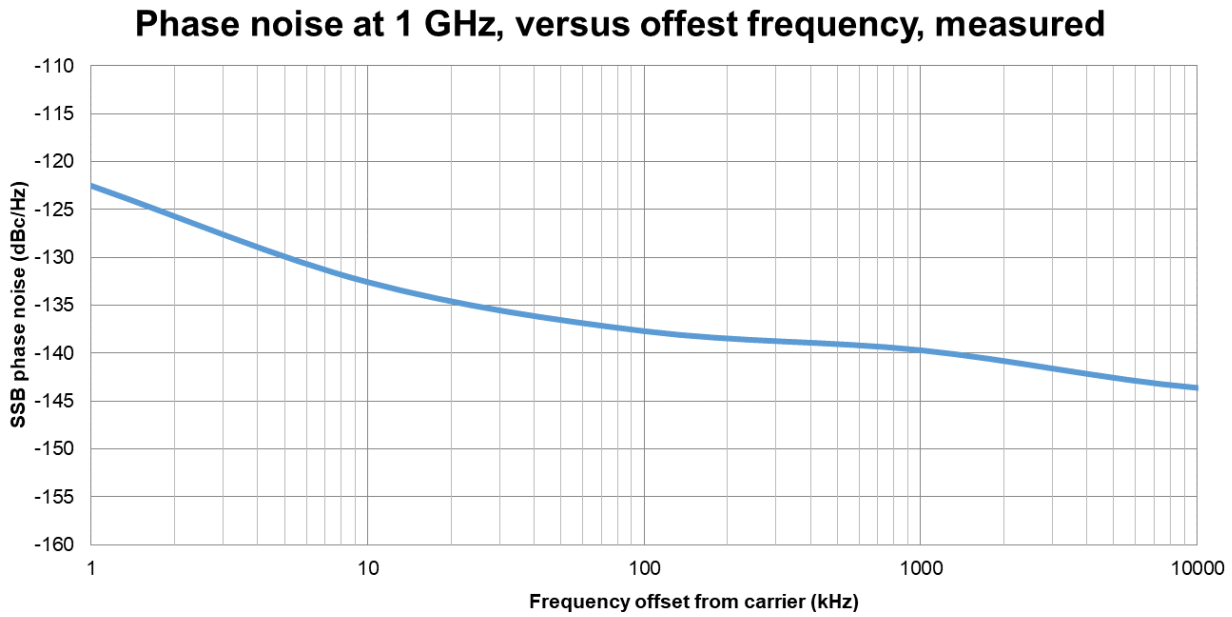

Figure 1. Phase noise from 1 kHz to 10 MHz offset at 1 GHz

Spurious Responses						
Residual responses						
RF input port; Option HDX, half duplex port; with analyzer ranged to +10 dBm; offset from 10 MHz to 1/2 × analysis bandwidth						
380 MHz to 9 GHz	< –79 dBm, < *–82 dBm typical*					
9 to 9.6 GHz	< –76 dBm, < *–80 dBm typical*					
9.6 to 12.3 GHz	< –81 dBm, < *–83 dBm typical*					
Image responses, nominal						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	–63 dBc	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	–62 dBc	–60 dBc	N/A	N/A	N/A	N/A
s1.31 to 2 GHz	–62 dBc	–60 dBc	–60 dBc	–60 dBc	N/A	N/A
2 to 4.3 GHz	–62 dBc	–60 dBc	–60 dBc	–60 dBc	–58 dBc	–56 dBc
4.3 to 4.6 GHz	–63 dBc	–63 dBc	–60 dBc	–60 dBc	–58 dBc	–56 dBc
4.6 to 12.3 GHz	–63 dBc	–63 dBc	–60 dBc	–60 dBc	–59 dBc	–58 dBc
Sideband spurs, nominal						
1 kHz to 10 MHz offset	–85 dBc					

LO Feedthrough (dBr [1])						
	RF input port, with analyzer ranged from –30 to +27 dBm			**Option HDX, half duplex port, with analyzer ranged from –25 to +27 dBm**		
380 MHz to 12.3 GHz	–52 dBr, *–62 dBr typical*			–52 dBr, *–62 dBr typical*		
IF Flatness						
RF input port, –25 dBm ≤ Input level ≤ +10 dBm, typical indicated by *italics*						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.90 dB, *± 0.50 dB*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	± 0.70 dB, *± 0.35 dB*	± 0.70 dB, *± 0.40 dB*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.70 dB, *± 0.35 dB*	± 0.70 dB, *± 0.40 dB*	± 1.20 dB, *± 0.70 dB*	± 1.50 dB, *± 0.95 dB*	N/A	N/A
1.62 to 2 GHz	± 0.70 dB, *± 0.35 dB*	± 0.70 dB, *± 0.40 dB*	± 0.65 dB, *± 0.30 dB*	± 0.65 dB, *± 0.30 dB*	N/A	N/A
2 to 3.5 GHz	± 0.50 dB, *± 0.15 dB*	± 0.55 dB, *± 0.25 dB*	± 0.65 dB, *± 0.30 dB*	± 0.65 dB, *± 0.30 dB*	± 0.60 dB, *± 0.25 dB*	± 0.75 dB, *± 0.35 dB*
3.5 to 4.3 GHz	± 0.55 dB, *± 0.20 dB*	± 0.55 dB, *± 0.25 dB*	± 0.80 dB, *± 0.40 dB*	± 0.80 dB, *± 0.40 dB*	± 0.80 dB, *± 0.40 dB*	± 0.85 dB, *± 0.45 dB*
4.3 to 12.3 GHz	± 1.00 dB, *± 0.50 dB*	± 1.00 dB, *± 0.50 dB*	± 1.10 dB, *± 0.65 dB*	± 1.15 dB, *± 0.70 dB*	± 1.15 dB, *± 0.70 dB*	± 1.25 dB, *± 0.80 dB*
Half duplex port, Option HDX, –25 dBm ≤ Input level ≤ +10 dBm, typical indicated by *italics*						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.90 dB, *± 0.55 dB*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	± 0.70 dB, *± 0.35 dB*	± 0.80 dB, *± 0.40 dB*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.70 dB, *± 0.35 dB*	± 0.80 dB, *± 0.40 dB*	± 1.15 dB, *± 0.70 dB*	± 1.55 dB, *± 0.95 dB*	N/A	N/A
1.62 to 2 GHz	± 0.70 dB, *± 0.35 dB*	± 0.80 dB, *± 0.40 dB*	± 0.60 dB, *± 0.30 dB*	± 0.60 dB, *± 0.30 dB*	N/A	N/A
2 to 3.5 GHz	± 0.45 dB, *± 0.15 dB*	± 0.55 dB, ± 0.25 dB	± 0.60 dB, *± 0.25 dB*	± 0.60 dB, *± 0.25 dB*	± 0.65 dB, *± 0.30 dB*	± 0.70 dB, *± 0.35 dB*
3.5 to 4.3 GHz	± 0.50 dB, *± 0.20 dB*	± 0.60 dB, *± 0.20 dB*	± 0.75 dB, *± 0.40 dB*	± 0.75 dB, *± 0.40 dB*	± 1.00 dB, *± 0.55 dB*	± 1.35 dB, *± 0.80 dB*
4.3 to 12.3 GHz	± 0.85 dB, *± 0.40 dB*	± 1.00 dB, *± 0.50 dB*	± 1.10 dB, *± 0.60 dB*	± 1.25 dB, *± 0.70 dB*	± 1.30 dB, *± 0.75 dB*	± 1.35 dB, *± 0.80 dB*

1. dBr is LO feedthrough power relative to the range level of the receiver.

Vector Signal Generator

Performance		
Arb sample memory (storage capacity)		
Standard (Option M02)	256 MSa of IQ data	
Option M05	512 MSa of IQ data	
Frequency range		
Option F06	380 MHz to 6 GHz	
Option F08	380 MHz to 8 GHz	
Option F12	380 MHz to 12.3 GHz	
Frequency reference		
Accuracy, aging rate, stability	Refer to M9300A specifications	
Frequency accuracy		
± (output frequency × frequency reference accuracy + 0.001 Hz)		
Frequency switching speed [1]		
SCPI mode	≤ 14 ms nominal	
IVI mode	≤ 6 ms nominal	
Signal generation bandwidth		
	Center frequency	**Maximum bandwidth**
Standard (Option B4X)	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 12.3 GHz	400 MHz
Option B8X	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12.3 GHz	800 MHz
Option B12	380 to 550 MHz	100 MHz
	550 MHz to 1.31 GHz	200 MHz
	1.31 to 2 GHz	600 MHz
	2 to 12.3 GHz	1.2 GHz
Output level range (CW mode)		
RF output port		
380 MHz to 12.3 GHz	–120 to +5 dBm	
Option HDX, half duplex port (configured to output mode)		
380 MHz to 12.3 GHz	–120 to +5 dBm	
RF output port, Option 1EA		
380 MHz to 12.3 GHz	–120 to +20 dBm, +25 dBm settable	
Option HDX, half duplex port (configured to output mode), Option 1EA		
380 MHz to 12.3 GHz	–120 to +10 dBm	
Maximum reverse power		
Average power input	+27 dBm	
DC volts	30 Vdc	
Amplitude switching speed [1]		
SCPI mode	≤ 10 ms nominal	
IVI mode	≤ 5 ms nominal	

1. Switching speed depends highly upon the hardware and controller that is used. Measurements were made with the M9415A in an M9018B chassis with the M9037A embedded controller, Windows 10 Operating System.

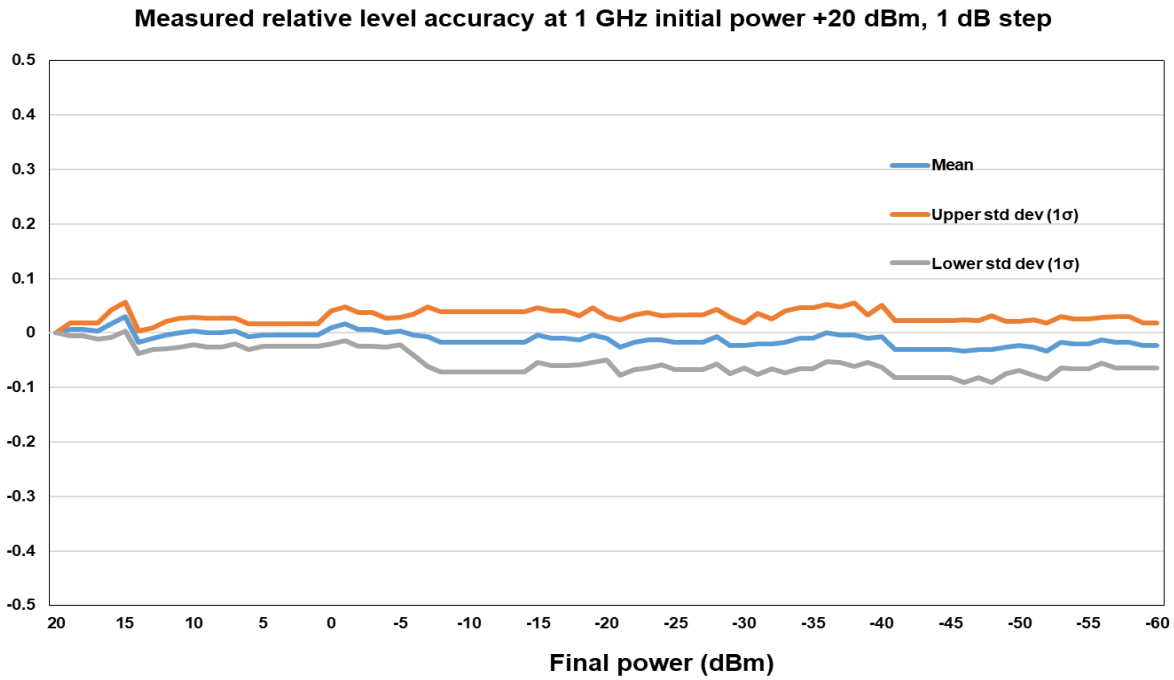

Figure 2. Measured relative level accuracy at 1 GHz

Absolute level accuracy (CW mode)						
RF output port, typical indicated by *italics*						
Frequency range	380 to 550 MHz	550 MHz to 4.3 GHz	4.3 to 6 GHz	6 to 7.8 GHz	7.8 to 10.2 GHz	10.2 to 12.3 GHz
+10 dBm < Level ≤ +20 dBm	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.90 dB, < ± *0.45 dB*	< ± 1.00 dB, < ± *0.45 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.85 dB, < ± *0.45 dB*
0 dBm < Level ≤ +10 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.80 dB, < ± *0.40 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.65 dB, < ± *0.30 dB*
–60 dBm ≤ Level ≤ 0 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± 0.20 dB	< ± 0.75 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.20 dB*
–90 dBm ≤ Level < –60 dBm	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.95 dB, < ± *0.50 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 1.00 dB, < ± *0.50 dB*
–100 dBm ≤ Level < –90 dBm	< ± 0.75 dB, < ± *0.35 dB*	< ± 0.75 dB, < ± *0.40 dB*	< ± 0.70 dB, < ± *0.30 dB*	< ± 0.95 dB, < ± *0.50 dB*	< ± 0.75 dB, < ± *0.35 dB*	< ± 1.10 dB, < ± *0.50 dB*
–110 dBm ≤ Level < –100 dBm	< ± 0.85 dB, < ± *0.45 dB*	< ± 0.90 dB, < ± *0.55 dB*	< ± 0.90 dB, < ± *0.50 dB*	< ± 0.95 dB, < ± *0.55 dB*	< ± 0.85 dB, < ± *0.45 dB*	< ± 1.10 dB, < ± *0.60 dB*

Option HDX, half duplex port, typical indicated by *italics*						
Frequency range	380 to 550 MHz	550 MHz to 4.3 GHz	4.3 to 6 GHz	6 to 7.8 GHz	7.8 to 10.2 GHz	10.2 to 12.3 GHz
0 dBm < Level ≤ +10 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.40 dB*
–60 dBm ≤ Level ≤ 0 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.50 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.25 dB*	< ± 0.70 dB, < ± *0.30 dB*
–90 dBm ≤ Level < –60 dBm	< ± 0.50 dB, < ± *0.20 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.65 dB, < ± *0.30 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.25 dB*
–100 dBm ≤ Level < –90 dBm	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.65 dB, < ± *0.35 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.55 dB, < ± *0.25 dB*	< ± 0.60 dB, < ± *0.30 dB*
–110 dBm ≤ Level < –100 dBm	< ± 0.80 dB, < ± *0.40 dB*	< ± 0.95 dB, < ± *0.55 dB*	< ± 0.70 dB, < ± *0.40 dB*	< ± 0.70 dB, < ± *0.40 dB*	< ± 0.65 dB, < ± *0.40 dB*	< ± 0.80 dB, < ± *0.50 dB*

Measured amplitude repeatability	
RF output port, 0 dBm output power, 1 GHz, 25 °C	
Delta from initial value	< ± 0.10 dB nominal
Setting resolution	
0.01 dB	
Output Voltage Standing Wave Ratio (VSWR)	
RF output port	
380 MHz to 1.31 GHz	< 1.90:1, < *1.70:1 typical*
1.31 to 7.8 GHz	< 1.75:1, < *1.65:1 typical*
7.8 to 10.2 GHz	< 1.75:1, < *1.60:1 typical*
10.2 to 12.3 GHz	< 2.00:1, < *1.70:1 typical*
Option HDX, half duplex port (configured to output mode)	
380 MHz to 1.31 GHz	< 1.90:1, < *1.75:1 typical*
1.31 to 6 GHz	< 1.75:1, < *1.40:1 typical*
6 to 10.2 GHz	< 1.65:1, < *1.50:1 typical*
10.2 to 12.3 GHz	< 1.90:1, < *1.55:1 typical*
Harmonics	
RF output port	
0 dBm output power	
380 MHz to 4.3 GHz	< –41 dBc, < *–45 dBc typical*
4.3 to 5.8 GHz	< –36 dBc, < *–42 dBc typical*
5.8 to 10.2 GHz	< –34 dBc, < *–39 dBc typical*
10.2 to 12.3 GHz	< –41 dBc, < *–46 dBc typical*
+10 dBm output power, with Option 1EA	
380 MHz to 4.3 GHz	< –31 dBc, < *–35 dBc typical*
4.3 to 5.8 GHz	< –27 dBc, < *–33 dBc typical*
5.8 to 9 GHz	< –26 dBc, < *–31 dBc typical*
9 to 10.2 GHz	< –24 dBc, < *–29 dBc typical*
10.2 to 12.3 GHz	< –29.5 dBc, < *–35 dBc typical*

Option HDX, half duplex port, –5 dBm output power	
380 MHz to 4.3 GHz	< –36 dBc, < *–40 dBc typical*
4.3 to 5.8 GHz	< –33 dBc, < *–38 dBc typical*
5.8 to 10.2 GHz	< –32 dBc, < *–37 dBc typical*
10.2 to 12.3 GHz	< –36 dBc, < *–42 dBc typical*
Non-harmonic spurious (CW mode)	
RF output port, Option HDX, half duplex port, 0 dBm output power	
380 MHz to 4.3 GHz	< –65 dBc, < *–70 dBc typical*
4.3 to 6.5 GHz	< –47 dBc, < *–52 dBc typical*
6.5 to 9.6 GHz	< –57 dBc, < *–62 dBc typical*
9.6 to 11.4 GHz	< –50 dBc, < *–56 dBc typical*
11.4 to 12.3 GHz	< –51 dBc, < *–60 dBc typical*
LO feedthrough	
RF output port, Option HDX, half duplex port, 0 dBm output power	
380 MHz to 1.31 GHz	–51 dBc, *–65 dBc typical*
1.31 to 1.62 GHz	–46 dBc, *–59 dBc typical*
1.62 to 2 GHz	–44 dBc, *–58 dBc typical*
2 to 4.3 GHz	–42 dBc, *–54 dBc typical*
4.3 to 12.3 GHz	–46 dBc, *–52 dBc typical*

Image responses

RF output port, 0 dBm output power, typical indicated by *italics*

Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	–55 dBc, *–61 dBc*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	–54 dBc, *–60 dBc*	–54 dBc, *–59 dBc*	N/A	N/A	N/A	N/A
1.31 to 2 GHz	–53 dBc, *–59 dBc*	–52 dBc, *–58 dBc*	–51 dBc, *–57 dBc*	–49 dBc, *–54 dBc*	N/A	N/A
2 to 12.3 GHz	–52 dBc, *–58 dBc*	–51 dBc, *–57 dBc*	–51 dBc, *–54 dBc*	–50 dBc, *–54 dBc*	–49 dBc, *–53 dBc*	–46 dBc, *–50 dBc*

Option HDX, half duplex port, 0 dBm output power, typical indicated by *italics*

Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	–55 dBc, *–61 dBc*	N/A	N/A	N/A	N/A	N/A
550 MHz to 1.31 GHz	–54 dBc, *–60 dBc*	–53 dBc, *–57 dBc*	N/A	N/A	N/A	N/A
1.31 to 2 GHz	–51 dBc, *–58 dBc*	–50 dBc, *–57 dBc*	–50 dBc, *–56 dBc*	–49 dBc, *–55 dBc*	N/A	N/A
2 to 12.3 GHz	–51 dBc, *–57 dBc*	–49 dBc, *–58 dBc*	–48 dBc, *–54 dBc*	–48 dBc, *–53 dBc*	–47 dBc, *–51 dBc*	–45 dBc, *–48 dBc*

Sideband spurious				
Offset	380 MHz to 4.3 GHz	4.3 to 6 GHz	6 to 10.2 GHz	10.2 to 12.3 GHz
1 to 100 kHz	–70 dBc, *–76 dBc typical*	–66 dBc, *–72 dBc typical*	–62 dBc, *–69 dBc typical*	–60 dBc, *–65 dBc typical*
100 kHz to 1 MHz	–89 dBc, *–95 dBc typical*	–86 dBc, *–92 dBc typical*	–84 dBc, *–89 dBc typical*	–70 dBc, *–75 dBc typical*
1 to 10 MHz	–90 dBc, *–96 dBc typical*	–88 dBc, *–94 dBc typical*	–87 dBc, *–93 dBc typical*	–81 dBc, *–86 dBc typical*

Phase noise	
RF output port, 0 dBm; Option HDX, half duplex port, 0 dBm; Option 1EA, +10 dBm; Center frequency = 1 GHz	
1 kHz offset	–105 dBc/Hz, *–115 dBc/Hz typical*
10 kHz offset	–126 dBc/Hz, *–133 dBc/Hz typical*
100 kHz offset	–134 dBc/Hz, *–139 dBc/Hz typical*
1 MHz offset	–141 dBc/Hz, *–145 dBc/Hz typical*
10 MHz offset	–142 dBc/Hz, *–145 dBc/Hz typical*

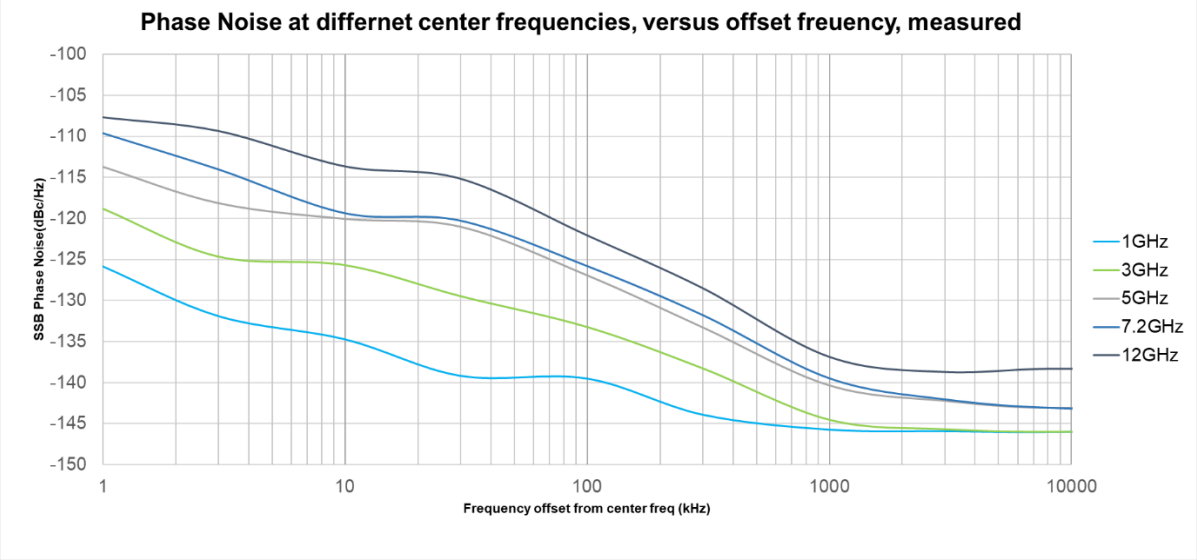

Figure 3. Measured phase noise from 1 kHz to 10 MHz offset at 1, 3, 5, 7.2 and 12 GHz

Broadband noise floor [1]	
RF output port, output level = 0 dBm	
380 to 550 MHz	–131 dBm/Hz, *–135 dBm/Hz typical*
550 MHz to 4.3 GHz	–133 dBm/Hz, *–137 dBm/Hz typical*
4.3 to 10.2 GHz	–131 dBm/Hz, *–135 dBm/Hz typical*
10.2 to 12.3 GHz	–133 dBm/Hz, *–136 dBm/Hz typical*
Option HDX, half duplex port, output level = –10 dBm	
380 to 550 MHz	–142 dBm/Hz, *–147 dBm/Hz typical*
550 MHz to 4.3 GHz	–143 dBm/Hz, *–147 dBm/Hz typical*
4.3 to 10.2 GHz	–139 dBm/Hz, *–144 dBm/Hz typical*
10.2 to 12.3 GHz	–141 dBm/Hz, *–145 dBm/Hz typical*

1. Measured at 10.1 MHz offset from the center frequency.

Third-order Intermodulation distortion (TOI)						
RF output port, output level = 0 dBm						
380 MHz to 7.8 GHz	+24 dBm, *+27 dBm typical*					
7.8 to 10.2 GHz	+23 dBm, *+25 dBm typical*					
10.2 to 12.3 GHz	+21 dBm, *+24 dBm typical*					
Option HDX, half duplex port, output level = 0 dBm						
380 to 550 MHz	+25 dBm, *+28 dBm typical*					
550 MHz to 4.3 GHz	+23 dBm, *+26 dBm typical*					
4.3 to 7.8 GHz	+20 dBm, *+24 dBm typical*					
7.8 to 10.2 GHz	+18 dBm, *+22 dBm typical*					
10.2 to 12.3 GHz	+17 dBm, *+20 dBm typical*					
IF flatness						
RF output port, –30 dBm ≤ Level ≤ +10 dBm, sample rate = 1.25 x bandwidth, typical indicated by *italics*						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.80 dB, *± 0.35 dB*	N/A	N/A	N/A	N/A	N/A
550 to 680 MHz	± 0.75 dB, *± 0.25 dB*	± 0.80 dB, *± 0.40 dB*	N/A	N/A	N/A	N/A
680 to 730 MHz	± 0.75 dB, *± 0.25 dB*	± 0.80 dB, *± 0.45 dB*	N/A	N/A	N/A	N/A
730 MHz to 1.31 GHz	± 0.65 dB, *± 0.40 dB*	± 0.75 dB, *± 0.45 dB*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.75 dB, *± 0.40 dB*	± 0.80 dB, *± 0.40 dB*	± 1.10 dB, *± 0.75 dB*	± 1.25 dB, *± 0.90 dB*	N/A	N/A
1.62 to 2 GHz	± 0.65 dB, *± 0.20 dB*	± 0.65 dB, *± 0.30 dB*	± 0.65 dB, *± 0.25 dB*	± 0.80 dB, *± 0.45 dB*	N/A	N/A
2 to 3.5 GHz	± 0.65 dB, *± 0.30 dB*	± 0.75 dB, *± 0.45 dB*	± 0.75 dB, *± 0.45 dB*	± 0.75 dB, *± 0.45 dB*	± 0.75 dB, *± 0.45 dB*	± 0.85 dB, *± 0.55 dB*
3.5 to 4.3 GHz	± 0.65 dB, *± 0.25 dB*	± 0.65 dB, *± 0.25 dB*	± 0.90 dB, *± 0.60 dB*	± 1.25 dB, *± 0.85 dB*	± 1.25 dB, *± 0.85 dB*	± 1.30 dB, *± 0.90 dB*
4.3 to 6 GHz	± 0.80 dB, *± 0.40 dB*	± 0.80 dB, *± 0.45 dB*	± 0.85 dB, *± 0.50 dB*	± 0.80 dB, *± 0.55 dB*	± 0.80 dB, *± 0.55 dB*	± 1.20 dB, *± 0.85 dB*
6 to 9 GHz	± 0.75 dB, *± 0.30 dB*	± 0.75 dB, *± 0.30 dB*	± 0.75 dB, *± 0.30 dB*	± 0.70 dB, *± 0.40 dB*	± 0.75 dB, *± 0.40 dB*	± 0.80 dB, *± 0.50 dB*
9 to 10.2 GHz	± 0.65 dB, *± 0.20 dB*	± 0.70 dB, *± 0.25 dB*	± 0.70 dB, *± 0.35 dB*	± 0.80 dB, *± 0.40 dB*	± 0.85 dB, *± 0.45 dB*	± 1.30 dB, *± 0.75 dB*
10.2 to 12.3 GHz	± 0.80 dB, *± 0.40 dB*	± 0.80 dB, *± 0.45 dB*	± 0.85 dB, *± 0.50 dB*	± 0.90 dB, *± 0.60 dB*	± 0.90 dB, *± 0.60 dB*	± 0.90 dB, *± 0.60 dB*

Half duplex port, Option HDX, –20 dBm ≤ Level ≤ +5 dBm, sample rate = 1.25 x bandwidth, typical indicated by *italics*						
Center frequency	100 MHz BW	200 MHz BW	400 MHz BW	600 MHz BW	800 MHz BW	1.2 GHz BW
380 to 550 MHz	± 0.70 dB, *± 0.35 dB*	N/A	N/A	N/A	N/A	N/A
550 to 680 MHz	± 0.60 dB, *± 0.25 dB*	± 0.70 dB, *± 0.40 dB*	N/A	N/A	N/A	N/A
680 to 730 MHz	± 0.60 dB, *± 0.25 dB*	± 0.70 dB, *± 0.40 dB*	N/A	N/A	N/A	N/A
730 MHz to 1.31 GHz	± 0.65 dB, *± 0.45 dB*	± 0.75 dB, *± 0.50 dB*	N/A	N/A	N/A	N/A
1.31 to 1.62 GHz	± 0.70 dB, *± 0.35 dB*	± 0.75 dB, *± 0.40 dB*	± 1.00 dB, *± 0.70 dB*	± 1.15 dB, *± 0.85 dB*	N/A	N/A
1.62 to 2 GHz	± 0.60 dB, *± 0.25 dB*	± 0.65 dB, *± 0.25 dB*	± 0.60 dB, *± 0.20 dB*	± 0.50 dB, *± 0.35 dB*	N/A	N/A
2 to 3.5 GHz	± 0.60 dB, *± 0.30 dB*	± 0.65 dB, *± 0.40 dB*	± 0.65 dB, *± 0.40 dB*	± 0.65 dB, *± 0.45 dB*	± 0.65 dB, *± 0.45 dB*	± 0.65 dB, *± 0.45 dB*
3.5 to 4.3 GHz	± 0.60 dB, *± 0.35 dB*	± 0.65 dB, *± 0.35 dB*	± 0.70 dB, *± 0.45 dB*	± 0.75 dB, *± 0.50 dB*	± 0.80 dB, *± 0.55 dB*	± 0.80 dB, *± 0.55 dB*
4.3 to 6 GHz	± 0.65 dB, *± 0.30 dB*	± 0.70 dB, *± 0.45 dB*	± 0.85 dB, *± 0.50 dB*	± 0.75 dB, *± 0.55 dB*	± 0.75 dB, *± 0.55 dB*	± 1.10 dB, *± 0.85 dB*
6 to 9 GHz	± 0.65 dB, *± 0.35 dB*	± 0.65 dB, *± 0.35 dB*	± 0.70 dB, *± 0.40 dB*	± 0.70 dB, *± 0.40 dB*	± 0.70 dB, *± 0.45 dB*	± 0.75 dB, *± 0.50 dB*
9 to 10.2 GHz	± 0.55 dB, *± 0.20 dB*	± 0.65 dB, *± 0.30 dB*	± 0.80 dB, *± 0.55 dB*	± 0.80 dB, *± 0.65 dB*	± 1.00 dB, *± 0.75 dB*	± 1.15 dB, *± 0.75 dB*
10.2 to 12.3 GHz	± 0.55 dB, *± 0.20 dB*	± 0.65 dB, *± 0.30 dB*	± 0.80 dB, *± 0.45 dB*	± 0.75 dB, *± 0.50 dB*	± 0.80 dB, *± 0.55 dB*	± 0.80 dB, *± 0.50 dB*

General Specifications

Environmental characteristics	
Operating temperature	0 to +45 °C
Storage temperature	–40 to +65 °C
EMC	Complies with European EMC Directive 2014/30/EU • IEC/EN 61326-1 • CISPR 11, Group 1, Class A • AS/NZS CISPR 11 • ICES/NMB-001 This ISM device complies with Canadian ICES-001 Cet appareil ISM est conforme a la norme NMB-001 du Canada
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.
Maximum power consumption	
M9415A	126 W nominal
Weight	
Net	1.5 kg (3.3 lbs)
Dimension	
H x W x D	130.2 mm x 60.5 mm x 209.6 mm
Warranty	
The VXT PXIe vector transceiver is supplied with a 1-year warranty	
Calibration cycle	
The recommended calibration cycle is one year; calibration services are available through Keysight service centers	

Front Panel

Reference	
Ref In, Ref Out	Frequency: 100 MHz
	Connector: MMPX female, 50 Ω nominal
	Lock range: ± 1 ppm, nominal
	Input amplitude: >+10 dBm, nominal
	Output amplitude: >+10 dBm, nominal
LO reference	
2.4 GHz In, 2.4 GHz Out	Connector: MMPX female, 50 Ω nominal
	Input amplitude: >+10 dBm, nominal
	Output amplitude: >+12 dBm, nominal
RF connections	
RF Input	Connector: 3.5 mm female, 50 Ω nominal
RF Output	Connector: 3.5 mm female, 50 Ω nominal
Half Duplex	Connector: 3.5 mm female, 50 Ω nominal
Trigger connections	
Trigger 1, Trigger 2 (Input/Output, selectable)	Connector: MMPX female
	Input impedance: 1 kΩ or 50 Ω nominal
	Input level range: 0 to +3.3 V
	Output impedance: 50 Ω nominal
	Output level range: 3.3 V LVTTL
DIO connections	
Ctrl M, Ctrl S	Connector: Micro-HDMI female
	Level range: 3.3 V LVTTL, LVDS

Spectrum Analyzer Measurement Application Key Specifications

Absolute amplitude accuracy (CW mode)			
RF input port, input level from –70 dBm to +27 dBm			
Frequency Range	–70 dBm ≤ Input level < +10 dBm	+10 dBm ≤ Input level ≤ +20 dBm	+20 dBm < Input level ≤ +27 dBm
380 MHz to 1.31 GHz	< ± 0.50 dB, *< ± 0.25 dB typical*	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 1.15 dB, *< ± 0.75 dB typical*
1.31 to 4.3 GHz	< ± 0.60 dB, *< ± 0.30 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 0.85 dB, *< ± 0.55 dB typical*
4.3 to 8.4 GHz	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 0.65 dB, *< ± 0.30 dB typical*	< ± 0.80 dB, *< ± 0.45 dB typical*
8.4 to 12.3 GHz	< ± 0.75 dB, *< ± 0.40 dB typical*	< ± 0.80 dB, *< ± 0.40 dB typical*	< ± 1.10 dB, *< ± 0.65 dB typical*
Input Voltage Standing Wave Ratio (VSWR)			
RF input port			
380 MHz to 4.3 GHz	< 1.55:1, *< 1.4:1 typical*		
4.3 to 5.8 GHz	< 1.4:1, *< 1.3:1 typical*		
5.8 to 7.2 GHz	< 1.8:1, *< 1.6:1 typical*		
7.2 to 10.2 GHz	< 1.6:1, *< 1.4:1 typical*		
10.2 to 12.3 GHz	< 2.0:1, *< 1.9:1 typical*		
Phase noise sidebands (CF = 1 GHz)			
1 kHz offset	–116 dBc/Hz, *–118 dBc/Hz typical*		
10 kHz offset	–132 dBc/Hz, *–134 dBc/Hz typical*		
100 kHz offset	–136 dBc/Hz, *–138 dBc/Hz typical*		
1 MHz offset	–136 dBc/Hz, *–139 dBc/Hz typical*		
10 MHz offset	–141 dBc/Hz, *–143 dBc/Hz typical*		
Residual responses			
RF input port, with analyzer ranged to +10 dBm			
380 MHz to 9 GHz	< –84 dBm, *< –90 dBm typical*		
9 to 9.6 GHz	< –84 dBm, *< –93 dBm typical*		
9.6 to 12.3 GHz	< –95 dBm, *< –100 dBm typical*		
Displayed Average Noise Floor (DANL) [1]			
RF input port, with analyzer ranged to –70 dBm			
380 MHz to 4.3 GHz	–167 dBm/Hz, *–168 dBm/Hz typical*		
4.3 to 10.2 GHz	–166 dBm/Hz, *–167 dBm/Hz typical*		
10.2 to 12.3 GHz	–165 dBm/Hz, *–166 dBm/Hz typical*		
Third-order Intermodulation distortion (TOI)			
RF input port, with analyzer ranged to 0 dBm			
380 MHz to 4.3 GHz	+23 dBm, *+25 dBm typical*		
4.3 to 6 GHz	+23 dBm, *+25 dBm typical*		
6 to 12.3 GHz	+21 dBm, *+23 dBm typical*		

1. Input terminated, log power average, SW preselection off, and normalized to 1 Hz bandwidth.

Noise Figure Measurement Application Key Specifications

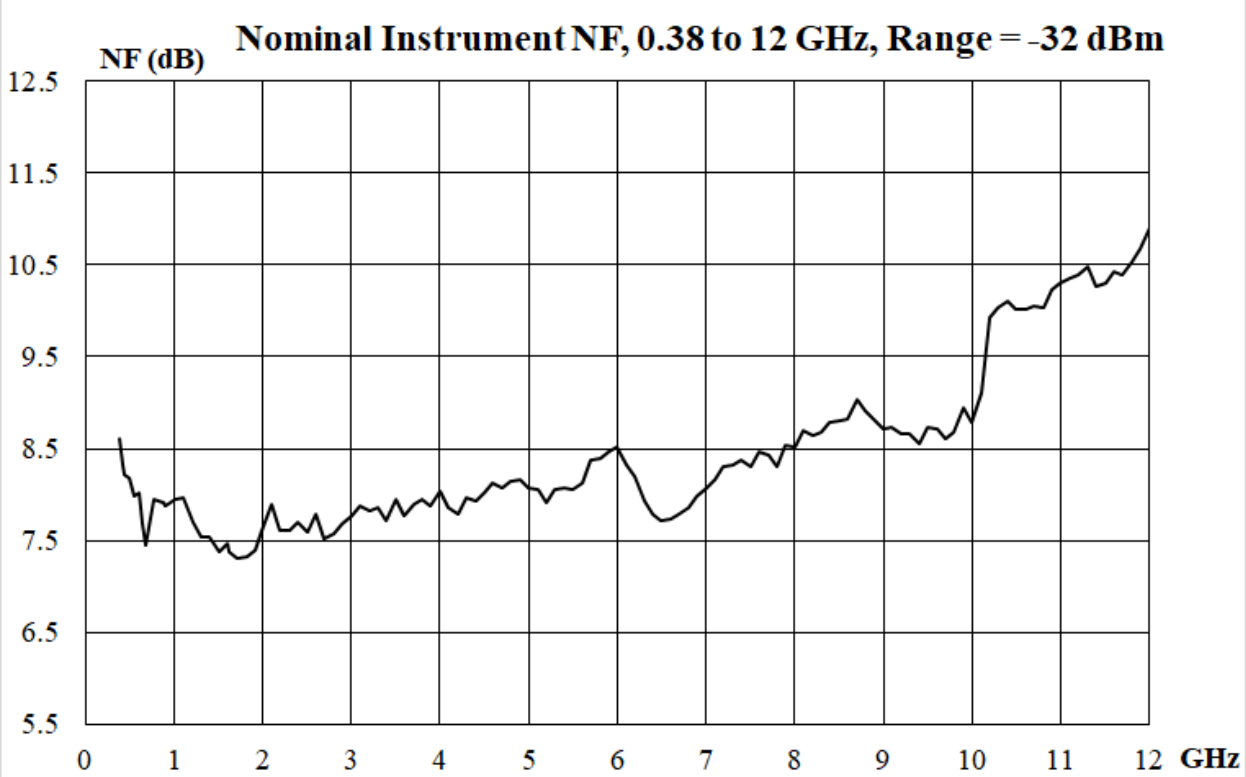

Figure 4. Nominal instrument noise figure

GSM/EDGE/Evo Measurement Application Key Specifications [1]

Power versus time (PvT)	
Absolute power accuracy	± 0.28 dB nominal at 0 dBm input power
Phase error (GMSK modulation)	
Average floor	0.4º nominal at 0 dBm input power
EDGE error vector magnitude (EVM)	
RMS floor	0.30% nominal at 0 dBm input power
Peak floor	0.37% nominal at 0 dBm input power
Output RF spectrum (ORFS for GMSK and 8PSk modulation)	
Residual relative power, spectrum due to modulation, at 0 dBm input power	
Offset frequency	
600 kHz	–80 dBc nominal
1.2 MHz	–83 dBc nominal
1.8 MHz	–79 dBc nominal
Residual relative power, spectrum due to switching, at 0 dBm input power	
Offset frequency	
600 kHz	–73 dBc nominal
1.2 MHz	–75 dBc nominal
1.8 MHz	–76 dBc nominal

GSM/EDGE/Evo Source Key Specifications [2]

Signal quality	
Phase error (GMSK), RF output port, Half duplex port	
RMS	< 0.2° nominal at 0 dBm output power
Peak	< 0.3° nominal at 0 dBm output power
EVM (EDGE)	
RMS	< 0.1% nominal at 0 dBm output power
Output RF spectrum (ORFS for GMSK and 8PSK modulation)	
Residual relative power, spectrum due to modulation, RF output port, Half duplex port, at 0 dBm output power	
Offset	GSM
200 kHz	–34 dBc nominal
400 kHz	–68 dBc nominal
600 kHz	–77 dBc nominal
1200 kHz	–75 dBc nominal
1800 kHz	–71 dBc nominal

1. For frequencies from 450 to 490 MHz, 820 to 920 MHz, and 1710 to 1790 MHz.
2. For frequencies from 380 to 490 MHz, 695 to 960 MHz, and 1425 to 2180 MHz.

W-CDMA/HSPA+ Measurement Application Key Specifications [1]

Channel power	
Absolute power accuracy	±0.1 dB nominal at 0 dBm input power
QPSK EVM	
Residual EVM	0.7% nominal at –10 dBm input power
Adjacent Channel Power Ratio (ACPR)	
Residual relative power in 3.84 MHz BW	
5 MHz offset	–66 dBc nominal at 0 dBm input power
Spectrum Emission Mask (SEM)	
Residual relative power (offset), at 0 dBm input power	
Downlink	
2.515 to 2.715 MHz	–83 dBc nominal in a 30 kHz BW
2.715 to 3.515 MHz	–85 dBc nominal in a 1 MHz BW
3.515 to 4 MHz	–85 dBc nominal in a 1 MHz BW
4 to 8 MHz	–71 dBc nominal in a 1 MHz BW
8 to 12.5 MHz	–72 dBc nominal in a 1 MHz BW
Uplink	
2.515 to 3.485 MHz	–84 dBc nominal in a 30 kHz BW
4 to 7.5 MHz	–72 dBc nominal in a 1 MHz BW
7.5 to 8.5 MHz	–73 dBc nominal in a 1 MHz BW
8.5 to 12 MHz	–73 dBc nominal in a 1 MHz BW

W-CDMA/HSPA+ Source Key Specifications

Error Vector Magnitude (EVM) [1]			
Composite EVM, RF output port, half duplex port, at 0 dBm output power			
RMS	< 0.6% nominal		
Adjacent Channel Leakage Ratio (ACLR), RF output port, half duplex port, at 0 dBm output power			
Offset	**Configuration**	**Frequency (MHz)**	**ACLR**
Adjacent 5 MHz	1 DPCH 1 carrier	900	–66 dB nominal
Adjacent 10 MHz			–69 dB nominal
Adjacent 5 MHz		1800 to 2000	–65 dB nominal
Adjacent 10 MHz			–71 dB nominal
Adjacent 5 MHz	64 DPCH 1 carrier	900	–67 dB nominal
Adjacent 10 MHz			–69 dB nominal
Adjacent 5 MHz		1800 to 2000	–66 dB nominal
Adjacent 10 MHz			–72 dB nominal

1. For frequencies from 730 MHz to 2650 MHz.

LTE/LTE-Advanced FDD & LTE/LTE-Advanced TDD Measurement Application Specifications [1]

Error Vector Magnitude (EVM)				
Residual EVM, at –10 dBm or 0 dBm input power				
900 MHz	5 MHz bandwidth	0.21% downlink, 0.19% uplink		
	20 MHz bandwidth	0.24% downlink, 0.26% uplink		
2000 MHz	5 MHz bandwidth	0.21% downlink, 0.22% uplink		
	20 MHz bandwidth	0.29% downlink, 0.26% uplink		
Adjacent channel power				
RF input port; Option HDX, half duplex port; at –10 dBm or 0 dBm input power				
FDD	E-UTRA (Uplink and downlink)	900 MHz, 2000 MHz	5 MHz bandwidth, 20 MHz bandwidth	*–63 dBc typical*
FDD	UTRA (Uplink and downlink)	900 MHz, 2000 MHz	5 MHz bandwidth, 20 MHz bandwidth	*–69 dBc typical*
TDD	E-UTRA (Uplink and downlink)	900 MHz, 2000 MHz	5 MHz bandwidth, 20 MHz bandwidth	*–62 dBc typical*
TDD	UTRA (Uplink and downlink)	900 MHz, 2000 MHz	5 MHz bandwidth, 20 MHz bandwidth	*–68 dBc typical*

1. For frequencies from 695 to 3800 MHz.

LTE Source Key Specifications

Modulated signal level accuracy				
410 MHz to 3.3 GHz			±0.51 dB	
3.3 to 5.8 GHz			±0.66 dB	
Error Vector Magnitude (EVM)				
Composite EVM, RF output port, half duplex port, at –10 dBm or 0 dBm output power				
FDD	900 MHz	5 MHz bandwidth	< 0.24%	
		20 MHz bandwidth	< 0.35%	
	2000 MHz	5 MHz bandwidth	< 0.28%	
		20 MHz bandwidth	< 0.39%	
TDD	900 MHz	5 MHz bandwidth	< 0.32%	
		20 MHz bandwidth	< 0.29%	
	2000 MHz	5 MHz bandwidth	< 0.35%	
		20 MHz bandwidth	< 0.34%	
Adjacent channel power				
RF output port, half duplex port, at –10 dBm output power			**Adjacent**	**Alternate**
FDD	900 MHz	5 MHz bandwidth	–67 dBc	–69 dBc
		20 MHz bandwidth	–62 dBc	–63 dBc
	2000 MHz	5 MHz bandwidth	–66 dBc	–70 dBc
		20 MHz bandwidth	–65 dBc	–66 dBc
TDD	900 MHz	5 MHz bandwidth	–66 dBc	–68 dBc
		20 MHz bandwidth	–62 dBc	–63 dBc
	2000 MHz	5 MHz bandwidth	–65 dBc	–69 dBc
		20 MHz bandwidth	–64 dBc	–66 dBc
RF output port, half duplex port, at 0 dBm output power			**Adjacent**	**Alternate**
FDD	900 MHz	5 MHz bandwidth	–64 dBc	–68 dBc
		20 MHz bandwidth	–62 dBc	–62 dBc
	2000 MHz	5 MHz bandwidth	–63 dBc	–70 dBc
		20 MHz bandwidth	–62 dBc	–66 dBc
TDD	900 MHz	5 MHz bandwidth	–63 dBc	–68 dBc
		20 MHz bandwidth	–62 dBc	–63 dBc
	2000 MHz	5 MHz bandwidth	–62 dBc	–70 dBc
		20 MHz bandwidth	–62 dBc	–66 dBc

WLAN Measurement Application Key Specifications

Modulated power		
Absolute power accuracy		
	± 0.4 dB nominal at 0 dBm input power	
Error Vector Magnitude (EVM)		
EVM floor conditions Phase Tracking on, Eq Smoothing on, Eq Training Seq only, RF output loopback to RF input, at –20 dBm input power, optimized range, rms-EVM, nominal		
802.11ac 5.8 GHz 80 MHz	< –51 dB	
802.11ac 5.8 GHz 160 MHz	< –50 dB	
802.11ax 5.8 GHz 80 MHz	< –52 dB	
802.11ax 5.8 GHz 160 MHz	< –50 dB	
802.11ax 7 GHz 80 MHz	< –51 dB	
802.11ax 7 GHz 160 MHz	< –50 dB	
EVM floor conditions Phase Tracking on, Eq Smoothing on, Eq Training Seq only, RF output loopback to RF input, at –15 dBm input power, optimized range, nominal		
	rms-EVM	nc-EVM [1]
802.11be, 5 GHz, 160 MHz, 1024 QAM	< –50 dB	
802.11be, 5.8 GHz, 160 MHz, 1024 QAM	< –51 dB	
802.11be, 7 GHz, 160 MHz, 1024 QAM	< –50 dB	
802.11be, 5 GHz, 320 MHz, 4096 QAM	< –46 dB	< –51.9 dB
802.11be, 5.8 GHz, 320 MHz, 4096 QAM	< –47 dB	< –52.0 dB
802.11be, 7 GHz, 320 MHz, 4096 QAM	< –47 dB	< –51.9 dB

WLAN Source Key Specifications

Error Vector Magnitude (EVM)		
RF output port, at –5 dBm to –15 dBm output power, nominal		
802.11ac 5.8 GHz 80 MHz	< –51 dB	
802.11ac 5.8 GHz 160 MHz	< –50 dB	
802.11ax 5.8 GHz 80 MHz	< –52 dB	
802.11ax 5.8 GHz 160 MHz	< –50 dB	
802.11ax 7 GHz 80 MHz	< –51 dB	
802.11ax 7 GHz 160 MHz	< –49 dB	
EVM floor conditions Phase Tracking on, Eq Smoothing on, Eq Training Seq only, RF output loopback to RF input, at –15 dBm input power, optimized range, nominal		
	rms-EVM	nc-EVM
802.11be, 5 GHz, 160 MHz, 1024 QAM	< –50 dB	
802.11be, 5.8 GHz, 160 MHz, 1024 QAM	< –51 dB	
802.11be, 7 GHz, 160 MHz, 1024 QAM	< –50 dB	
802.11be, 5 GHz, 320 MHz, 4096 QAM	< –46 dB	< –51.9 dB
802.11be, 5.8 GHz, 320 MHz, 4096 QAM	< –47 dB	< –52.0 dB
802.11be, 7 GHz, 320 MHz, 4096 QAM	< –47 dB	< –51.9 dB

1. nc-EVM: noise corrected EVM, is a technique to improve EVM by compensating analyzer's noise in EVM domain.

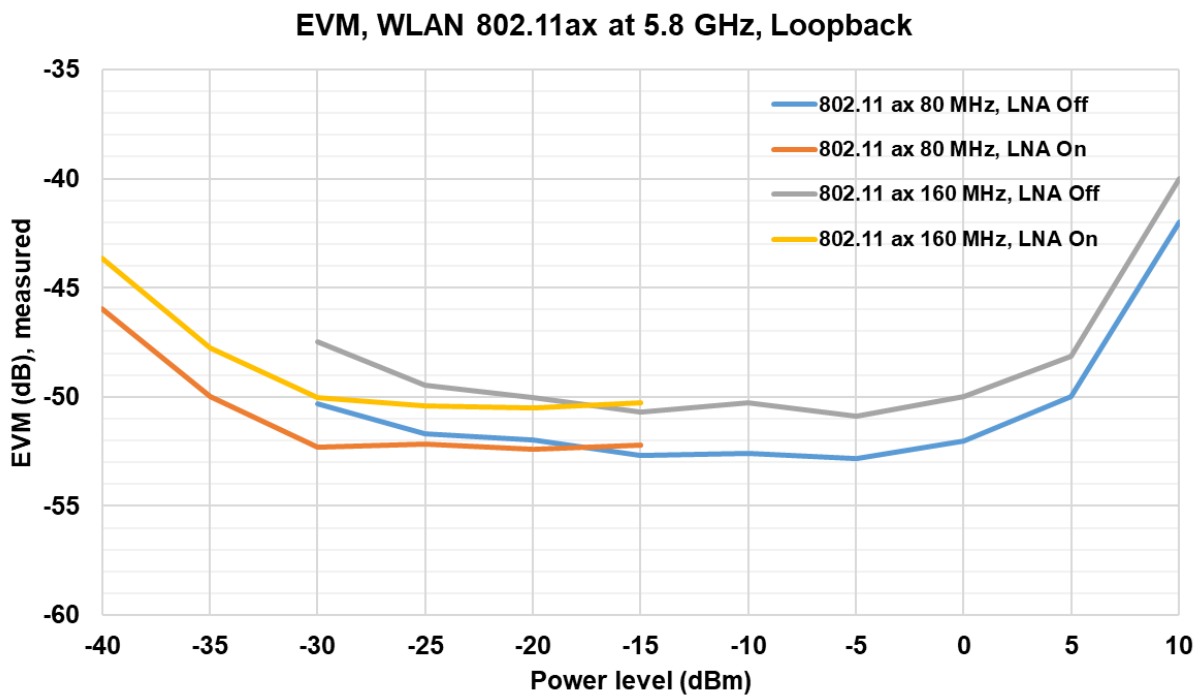

Figure 5. WLAN 802.11ax EVM vs. output power level at 5.8 GHz, loopback

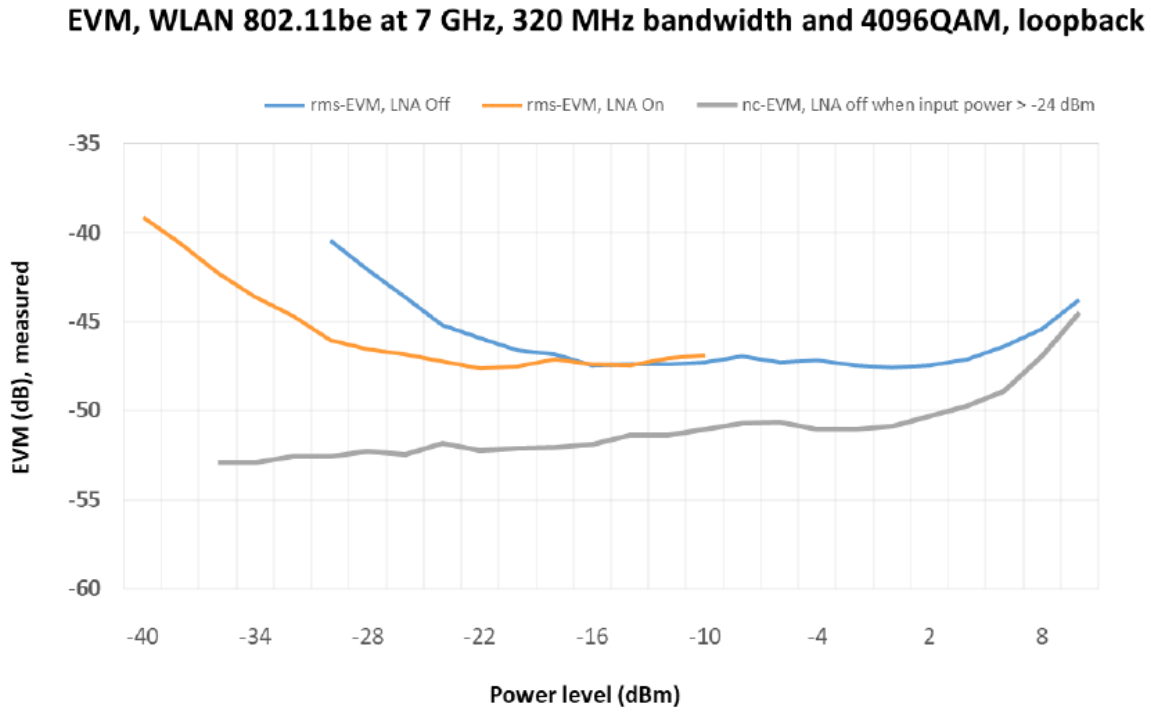

Figure 6. WLAN 802.11be EVM vs. output power level at 7 GHz, loopback

5G NR Measurement Application Specifications

Transmit power	
Absolute power accuracy	± 0.35 dB nominal at 0 dBm input power
Error Vector Magnitude (EVM)	
Residual EVM, at –10 dBm or 0 dBm input power	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	0.33%
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	0.38%
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	0.46%
30 kHz SCS, 12 GHz, 100 MHz (256QAM)	0.42%
Residual EVM, RF output loopback to RF input, at –5 dBm input power	
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	0.28% nominal
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	0.36% nominal
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	0.35% nominal
120 kHz SCS, 12.3 GHz, 200 MHz (256QAM)	0.41% nominal
Residual EVM, RF output loopback to RF input, at –10 dBm input power	
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	0.42% nominal
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	0.50% nominal
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	0.43% nominal
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	0.50% nominal
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	0.65% nominal
120 kHz SCS, 12.3 GHz, 100 MHz 8CC (256QAM)	0.74% nominal
Adjacent channel power	
RF input port, at –10 dBm or 0 dBm input power, LNA off, noise correction on	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	*–66 dBc typical*
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	*–66 dBc typical*

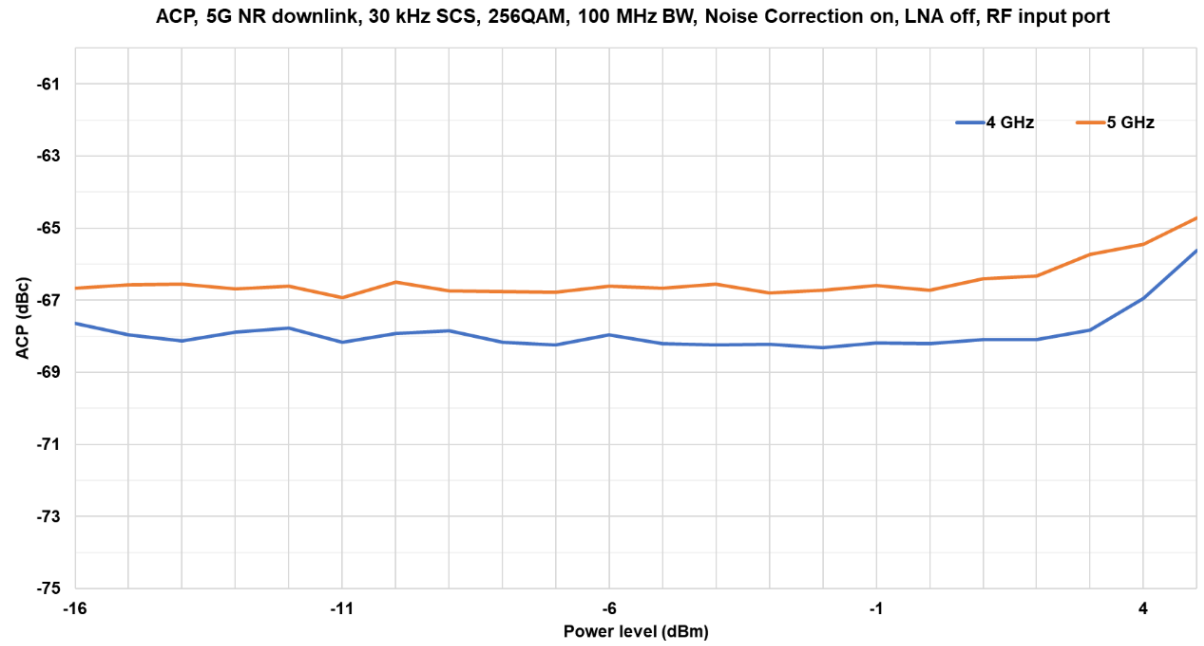

Figure 6. 5G NR downlink ACP vs. input power level, noise correction on, LNA off, 100 MHz bandwidth, 30 kHz SCS, 256QAM

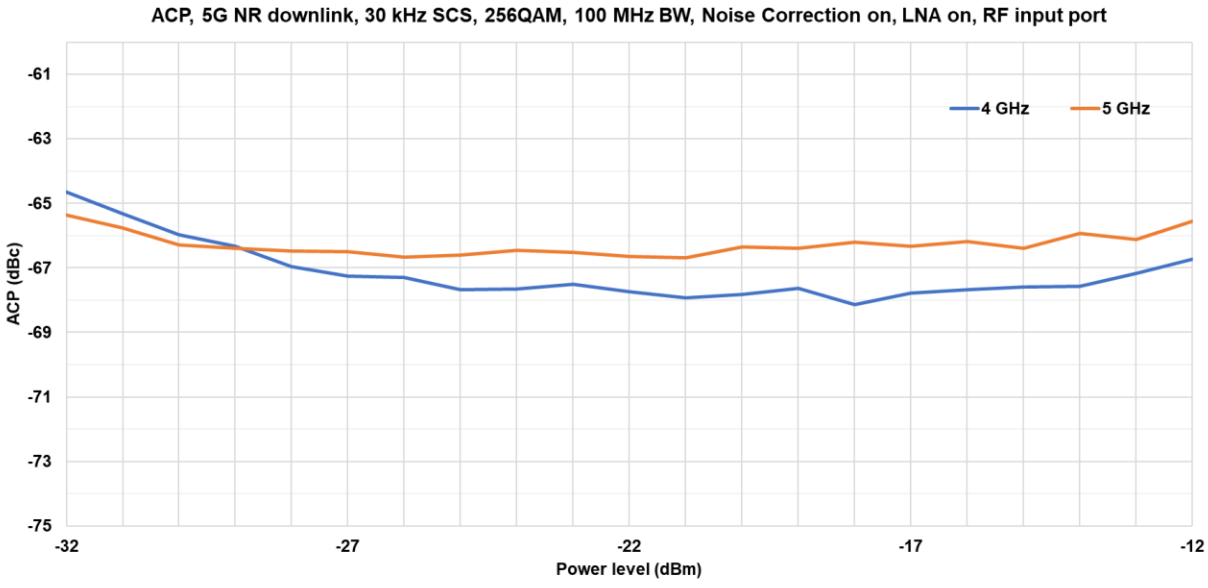

Figure 7. 5G NR downlink ACP vs. input power level, noise correction on, LNA on, 100 MHz bandwidth, 30 kHz SCS, 256QAM

5G NR Source Key Specifications

Modulated signal level accuracy	
600 MHz to 12.3 GHz	±0.45 dB
Error Vector Magnitude (EVM)	
Composite EVM, RF output port, half duplex port, at –10 dBm output power	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	0.28%, *0.24% typical*
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	0.28%, *0.26% typical*
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	0.30%, *0.27% typical*
30 kHz SCS, 12 GHz, 100 MHz (256QAM)	0.40%, *0.35% typical*
Composite EVM, RF output port, at 0 dBm output power	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	0.33%, *0.28% typical*
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	0.33%, *0.29% typical*
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	0.33%, *0.29% typical*
30 kHz SCS, 12 GHz, 100 MHz (256QAM)	0.67%, *0.56% typical*
Composite EVM, RF output loopback to RF input, at –5 dBm output power	
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	0.28% nominal
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	0.36% nominal
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	0.35% nominal
120 kHz SCS, 12.3 GHz, 200 MHz (256QAM)	0.41% nominal
Composite EVM, RF output loopback to RF input, at –10 dBm output power	
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	0.42% nominal
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	0.50% nominal
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	0.43% nominal
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	0.50% nominal
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	0.65% nominal
120 kHz SCS, 12.3 GHz, 100 MHz 8CC (256QAM)	0.74% nominal

Adjacent channel power	
RF output port, at –10 dBm output power	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	–59.5 dBc, *–60.5 dBc typical*
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	–55.0 dBc, *–56.0 dBc typical*
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	–57.0 dBc, *–58.0 dBc typical*
30 kHz SCS, 12 GHz, 100 MHz (256QAM)	–53.0 dBc, *–55.5 dBc typical*
RF output port, at 0 dBm output power	
30 kHz SCS, 4 GHz, 100 MHz (256QAM)	–57.0 dBc, *–58.5 dBc typical*
30 kHz SCS, 5 GHz, 100 MHz (256QAM)	–55.0 dBc, *–56.0 dBc typical*
30 kHz SCS, 7 GHz, 100 MHz (256QAM)	–55.5 dBc, *–56.5 dBc typical*
30 kHz SCS, 12 GHz, 100 MHz (256QAM)	–49.0 dBc, *–50.5 dBc typical*
RF output port, at –10 dBm output power	
120 kHz SCS, 4 GHz, 200 MHz (256QAM)	–58.0 dBc nominal
120 kHz SCS, 5 GHz, 200 MHz (256QAM)	–54.0 dBc nominal
120 kHz SCS, 7 GHz, 200 MHz (256QAM)	–56.5 dBc nominal
120 kHz SCS, 11 GHz, 200 MHz (256QAM)	–54.5 dBc nominal
120 kHz SCS, 4 GHz, 400 MHz (256QAM)	–54.0 dBc nominal
120 kHz SCS, 5 GHz, 400 MHz (256QAM)	–51.0 dBc nominal
120 kHz SCS, 7 GHz, 400 MHz (256QAM)	–52.0 dBc nominal
120 kHz SCS, 11 GHz, 400 MHz (256QAM)	–52.0 dBc nominal
120 kHz SCS, 7 GHz, 100 MHz 8CC (256QAM)	–50.5 dBc nominal
120 kHz SCS, 11 GHz, 100 MHz 8CC (256QAM)	–49.0 dBc nominal

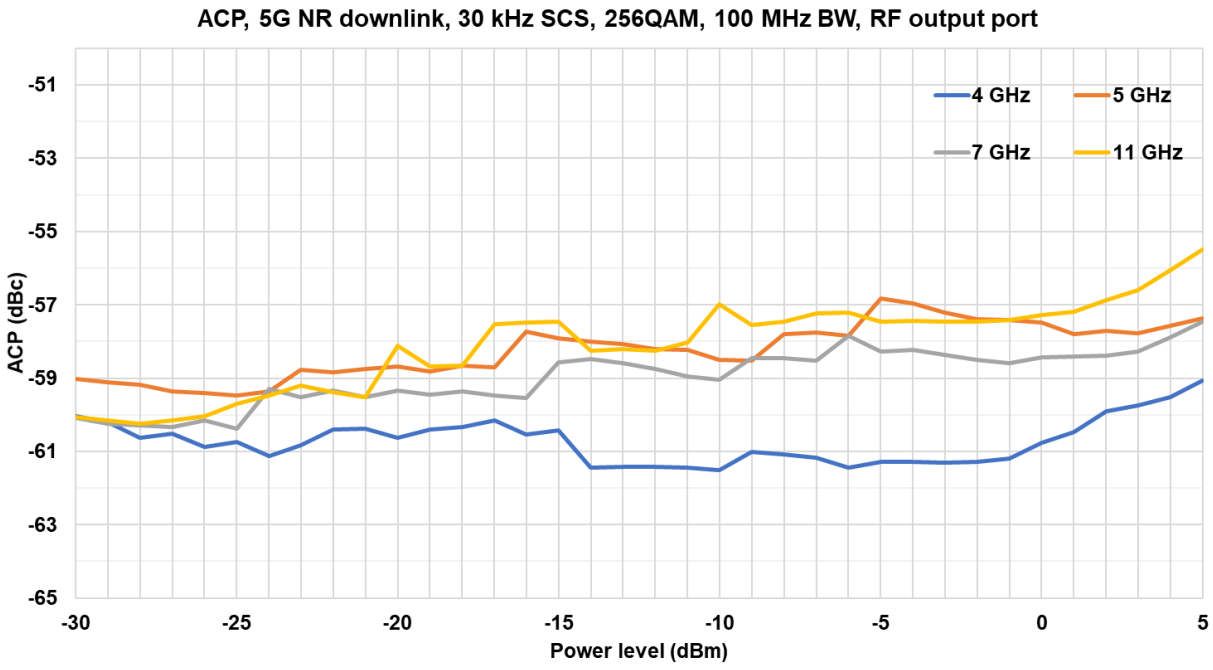

Figure 8. 5G NR downlink ACP vs. output power level, 100 MHz bandwidth, 30 kHz SCS, 256QAM

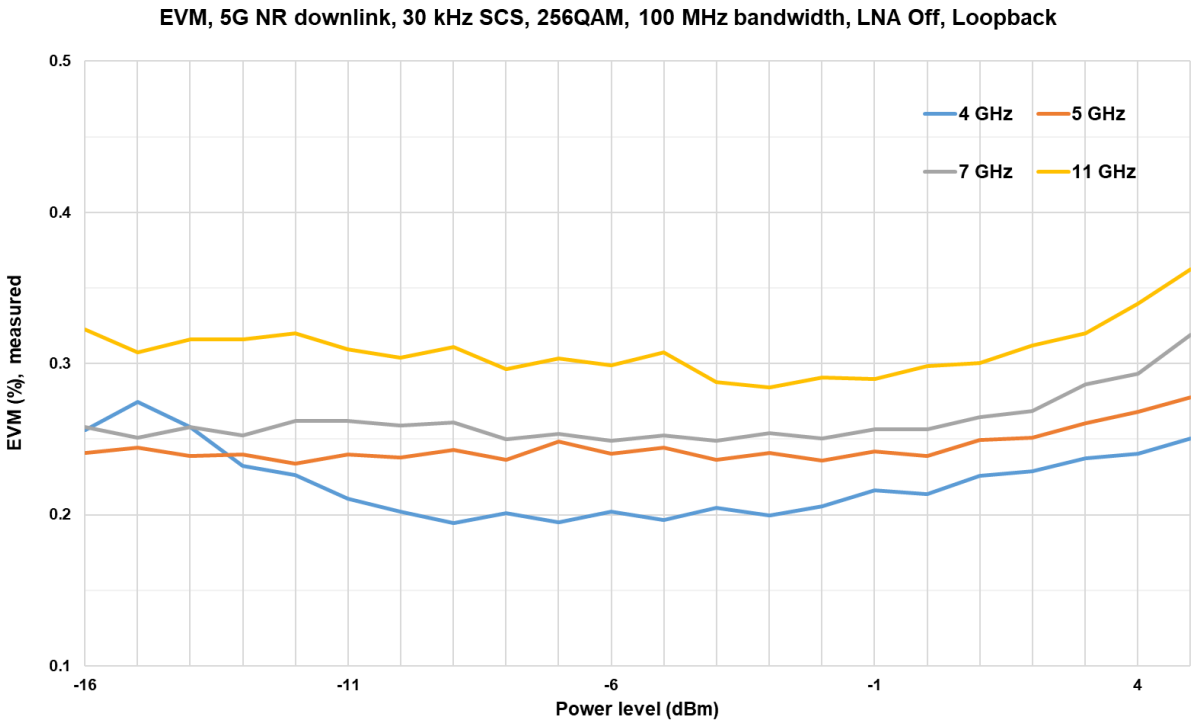

Figure 9. 5G NR downlink EVM vs. output power level, LNA off, loopback, with 100 MHz bandwidth, 30 kHz SCS, 256QAM

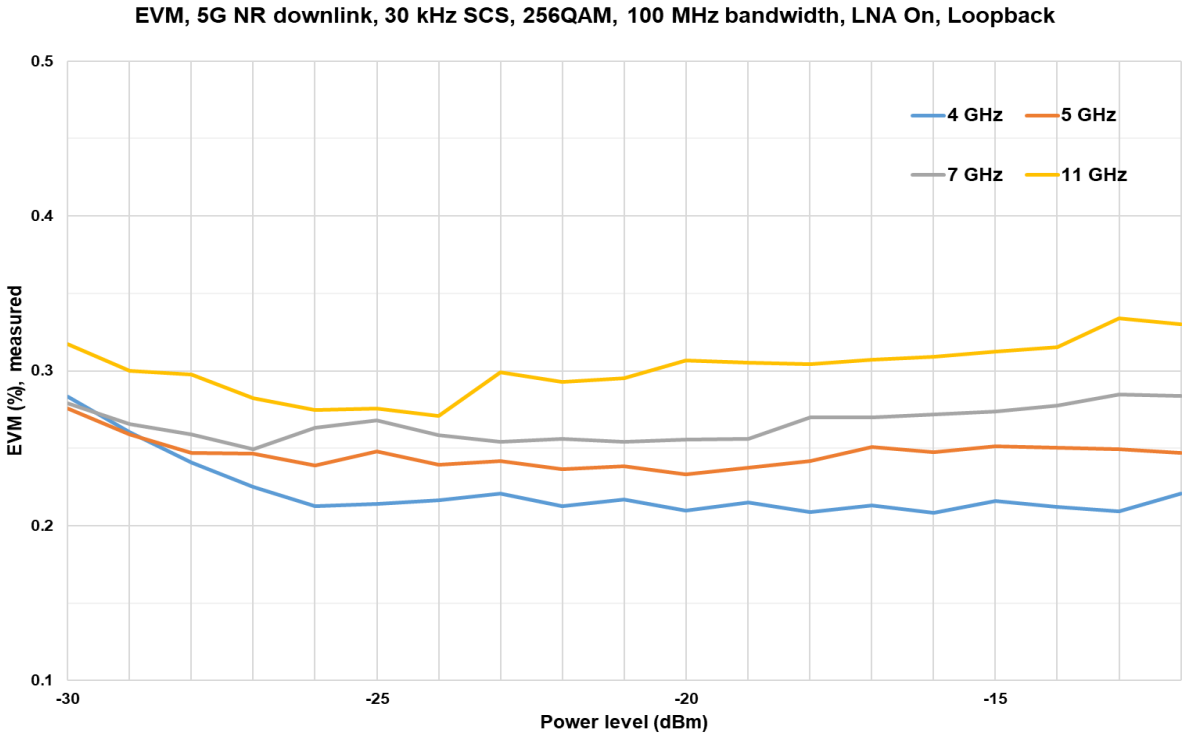

Figure 10. 5G NR downlink EVM vs. output power level, LNA on, loopback, with 100 MHz bandwidth, 30 kHz SCS, 256QAM

Related Literature

For more detailed product and specification information refer to the following literature and web pages:

- M9415A VXT PXIe Vector Transceiver Configuration Guide (literature no. 3120-1477EN)
- M9018B PXIe 18 slot Chassis Data Sheet (literature no. 5992-1481EN)
- M9037A PXIe High Performance Embedded Controller Data Sheet (literature no. 5991-3661EN)
- X-Series Measurement Applications Brochure (literature no. 5989-8019EN)
- Signal Studio Software Brochure (literature no. 5989-6448EN)

Web

Product page:

- www.keysight.com/find/M9415A

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