SPECIFICATIONS

PXIe-5830

12 GHz, 1 GHz Bandwidth PXI Vector Signal Transceiver

These specifications apply to the PXIe-5830 Vector Signal Transceiver.

The PXIe-5830 instrument configuration comprises the following modules:

- PXIe-5820 Vector Signal Transceiver
- PXIe-3621 Vector Signal Up/Down Converter

There is no single instrument labeled "PXIe-5830."

Contents

Definitions

The terms *IF*, *IF Input*, and *IF Output* refer to the specifications applicable to the IF IN/OUT ports. *Leveled power* refers to an output power level setting that has been adjusted to meet the published amplitude accuracy specifications.

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty. Warranted specifications account for measurement uncertainties, temperature drift, and aging. Warranted specifications are ensured by design or verified during production and calibration.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- *Typical* specifications describe the performance met by a majority of models.
- *Typical-95* specifications describe the performance met by 95% (≈2σ) of models with a 95% confidence.
- *Nominal* specifications describe an attribute that is based on design, conformance testing, or supplemental testing.
- *Measured* specifications describe the measured performance of a representative model.

Specifications are *Warranted* unless otherwise noted.

Push into Definitions Topic

Conditions

All specifications are valid under the following conditions unless otherwise noted.

- 30 minutes warm-up time
- Self-calibration is performed after the specified warm-up period has completed
- Environment temperature is within the ambient range, and temperatures for individual PXIe-5820 and PXIe-3621 modules, as reported by their onboard temperature sensors,

are within ±5 °C of the last self-calibration temperature, and temperature correction is enabled (default driver behavior)

- Calibration cycle is maintained
- Proper connector care and maintenance has been performed
- Modules are installed in an NI chassis with slot cooling capacity = 82 W
- The chassis fan mode is set to Auto and Cooling Profile is set to 58 W/82 W in NI Measurement & Automation Explorer (MAX)
- Empty chassis slots contain slot blockers and EMC filler panels to minimize temperature drift and reduce emissions
- Modules are connected with NI cables as shown in the *PXIe-5830 Getting Started Guide*
- RFmx, NI-RFSA 19.6 or later, or NI-RFSG 19.6 or later instrument driver is used, and driver default settings are used unless otherwise noted
- Calibration IP is used properly during the creation of custom FPGA bitfiles
- LO Step Size is set to the default value and the LO Source is set to Onboard
- Acquisition Type is set to IQ

Warranted specifications are valid under the following condition unless otherwise noted.

- Over ambient temperature ranges of 0 °C to 45 °C

Typical and Typical-95 specifications are valid under the following condition unless otherwise noted.

- Over ambient temperature ranges of 23 °C ± 5 °C

Measured specifications do not include measurement uncertainty and are measured immediately after a device self-calibration is performed.

Typical specifications do not include measurement uncertainty.

Instrument Terminology

Refer to the following list for definitions of common PXIe-5830 instrument terms used throughout this document.

Table 1. Instrument Terminology Definitions

Term	Definition
IF IN/OUT Ports	Refers to the IF IN/OUT 0 and IF IN/OUT 1 connectors on the PXIe-3621 front panel for IF signals. These are the primary RF input/output ports for RF signals 5-12 GHz. These ports are named as IF ports because the hardware topography is the same as that found on the PXIe-3622.
LO2	Refers to the local oscillator internal to the PXIe-3621 that executes the up or down conversion from baseband.
Onboard	Refers to the value of the **LO Source** property and changes purpose depending on your instrument configuration. The PXIe-5830 refers to the LO2 of the PXIe-3621 module as the onboard LO.
Offset Mode is Automatic	Refers to the NI-RFSA **Downconverter Frequency Offset Mode** property or NI-RFSG **Upconverter Frequency Offset Mode** property set to Automatic. The PXIe-5830 contains a direct conversion architecture. Offset mode allows the instrument to operate in low IF mode, which increases the separation between the signal of interest and the residual sideband image and residual LO leakage power. However, low IF mode limits the available instantaneous bandwidth. A setting of Automatic allows the driver to enable low IF mode when the signal bandwidth is small enough to allow it. Automatic is the default value. NI recommends keeping offset mode set to the default value.
Offset Mode is Enabled	Refers to the NI-RFSA **Downconverter Frequency Offset Mode** property or NI-RFSG **Upconverter Frequency Offset Mode** property set to Enabled. The PXIe-5830 contains a direct conversion architecture. Offset mode allows the instrument to operate in low IF mode, which increases the separation between the signal of interest and the residual sideband image and residual LO leakage power.

Table 1. Instrument Terminology Definitions (Continued)

Term	Definition
Offset Mode is User-Defined	Refers to the NI-RFSA **Downconverter Frequency Offset Mode** property or NI-RFSG **Upconverter Frequency Offset Mode** property set to User-Defined. Offset Mode set to User-Defined allows the instrument to operate with maximum instantaneous bandwidth. By default, the offset is minimized to maximize the available instantaneous bandwidth.
dBr	For receivers, dBr refers to the power of a received signal with respect to the instrument's configured reference level. For example, if the reference level is set to -10 dBm but the received tone is -7 dBr, the actual power of the received CW is -17 dBm. For transmitters, dBr refers to the generated power of a CW with respect to the instrument's peak power setting. For example, with a peak power level setting of +5 dBm and a -3 dBr setting, the power of the transmitted CW is +2 dBm.

Related Information

Refer to the PXIe-5830 section of the NI RF Vector Signal Transceivers Help for more information about instrument terminology.

Frequency

IF IN/OUT 0, IF IN/OUT 1 frequency range[1]	5 GHz to 12 GHz
Frequency bandwidth	1 GHz within the specified frequency ranges
Tuning resolution[2]	4.45 µHz

[1] *Frequency range* refers to the range of upconverter or downconverter center frequencies. The actual frequency coverage extends beyond the upconverter or downconverter frequency by up to half of the frequency bandwidth.

[2] Tuning resolution combines LO step size capability and frequency shift DSP implemented on the FPGA.

Table 2. Default LO Step Size[3,4]

Frequency Range	Step Size, Onboard
5 GHz to 12 GHz	2 MHz

Frequency Settling Time

Table 3. PXIe-5830 Frequency Settling Time (LO2), Typical

Settling Accuracy (Relative to Final Frequency)	Settling Time (ms), Onboard
1.0×10^{-6}	0.50
0.1×10^{-6}	0.80
0.01×10^{-6}	1.00
The LO2 frequency settling time includes the frequency lock time and settling time.	

Internal Frequency Reference

LO2 source (Onboard)	
Initial adjustment accuracy	$\pm 5 \times 10^{-6}$
Temperature stability	$\pm 1 \times 10^{-6}$, maximum
Aging	$\pm 1 \times 10^{-6}$ per year, maximum
Accuracy	*Initial adjustment accuracy* ± *Aging* ± *Temperature stability*

Spectral Purity

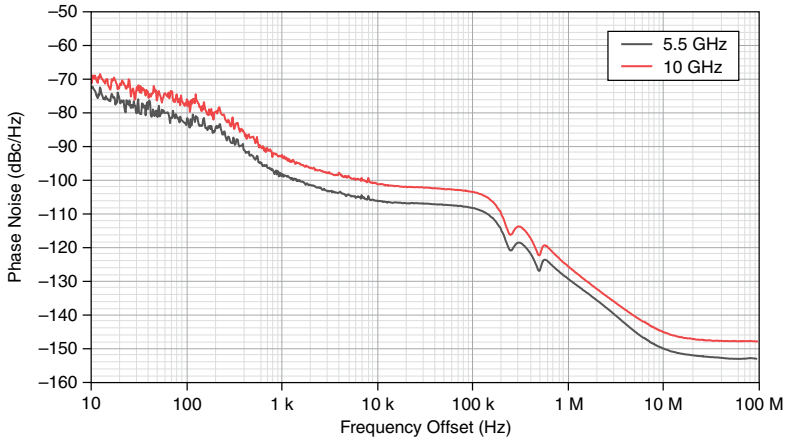
Table 4. IF Single Sideband Phase Noise (IF IN/OUT Ports), Typical

Frequency	Phase Noise (dBc/Hz, Single Sideband)
5 GHz to 7.1 GHz	-103
>7.1 GHz to 12 GHz	-97
Conditions: 20 kHz offset; self-calibration °C ± 5 °C ; LO2 LO Source: Onboard.	

[3] The worst case LO spurious content degrades for smaller LO step sizes and improves for larger LO step sizes that are multiples of 2 MHz and 10 MHz.

[4] LO step size can be set using the driver software.

Figure 1. Onboard Phase Noise at 5.5 GHz and 10 GHz, Measured (Spurs Not Shown)



Transmit (IF IN/OUT Ports)

IF Output Amplitude Range

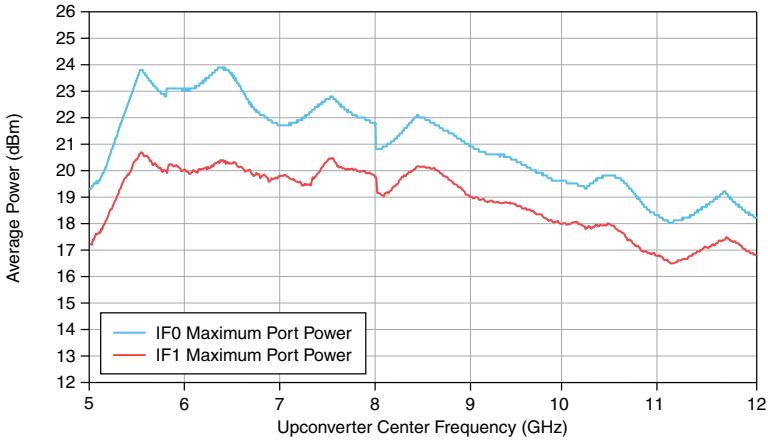
Table 5. IF Output Maximum Power (dBm), CW

Upconverter Center Frequency	Leveled Power, Specification		Unleveled Power, Typical	
	IF0	IF1	IF0	IF1
5 GHz to 8 GHz	12	12	17	16
>8 GHz to 12 GHz	12	12	15	14
Conditions: Valid over 23 °C ± 5 °C with the last self-calibration performed at 23°C. Measured with a tone 10 MHz offset from upconverter center frequency. For 0 °C to 45 °C, the leveled power specification output powers are 3 dB less than that of 23 °C ± 5 °C.				

Minimum output power	Noise floor
Output attenuator (analog power) resolution	1 dB, nominal
Digital attenuation resolution[5]	<0.1 dB

[5] Average output power ≥ -40 dBm.

Figure 2. IF Output Maximum CW Average Power, Measured



IF Output Amplitude Settling Time[6]

<0.5 dB of final value	27 µs, nominal
<0.1 dB of final value	40 µs, nominal

[6] Refers to the time it takes to switch between two analog gain states with frequency unchanged once the hardware receives the amplitude change. The additional time due to software-initiated amplitude changes is not included and varies by computer. When changing frequencies, reconfiguration time is dominated by the frequency settling. Refer to *Frequency Settling Time* for more information.

IF Output Amplitude Accuracy

Table 6. IF Output Absolute Amplitude Accuracy (dB) (Offset Mode is User-Defined)

Upconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	±1.2	±0.8	±0.5	±1.9
>8 GHz to 12 GHz	±1.4	±1.0	±0.6	±2.1

Conditions: Peak power level -30 dBm to IF Output maximum leveled power specification; measured with a CW signal at 10 MHz offset from the configured upconverter center frequency; Upconverter/Downconverter Frequency Offset Mode: User-Defined; measurement performed after the PXIe-5830 has settled.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with its onboard temperature sensors.

Table 7. IF Output Absolute Amplitude Accuracy (dB) (Offset Mode is Enabled)

Upconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	±1.2	±0.8	±0.5	±2.0
>8 GHz to 12 GHz	±1.4	±1.0	±0.6	±2.1

Conditions: Peak power level -30 dBm to IF Output maximum leveled power specification; measured with a CW signal at I/Q center frequency, where I/Q center frequency is offset 257.5 MHz offset from the configured upconverter center frequency where the driver automatically applies a 257.5 MHz offset for signals with 450 MHz bandwidth or less. Upconverter/Downconverter Frequency Offset Mode: Enabled; measurement performed after the PXIe-5830 has settled.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with its onboard temperature sensors.

Table 8. IF Output Relative Amplitude Accuracy (Offset Mode is User-Defined), Typical

Upconverter Center Frequency	Relative Amplitude Accuracy (dB)
5 GHz to 8 GHz	±0.25
>8 GHz to 12 GHz	±0.30

Conditions: Peak power level -30 dBm to IF Output maximum leveled power specification; measured with a CW signal at 10 MHz offset from the configured upconverter center frequency; Upconverter/Downconverter Frequency Offset Mode: User-Defined; measurement performed after the PXIe-5830 has settled.

Relative accuracy describes the residual absolute accuracy error when compared to the absolute accuracy error at 0 dBm.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with its onboard temperature sensors.

Table 9. IF Output Relative Amplitude Accuracy (Offset Mode is Enabled), Typical

Upconverter Center Frequency	Relative Amplitude Accuracy (dB)
5 GHz to 8 GHz	±0.25
>8 GHz to 12 GHz	±0.30

Conditions: Peak power level -30 dBm to IF Output maximum leveled power specification; measured with a CW signal at I/Q center frequency, where I/Q center frequency is offset 257.5 MHz offset from the configured upconverter center frequency; Upconverter/Downconverter Frequency Offset Mode: Enabled; measurement performed after the PXIe-5830 has settled.

Relative accuracy describes the residual absolute accuracy error when compared to the absolute accuracy error at 0 dBm.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with the onboard temperature sensors.

IF Output Frequency Response

Table 10. IF Output Frequency Response (dB)

Upconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	1.45	0.95	0.80	1.90
>8 GHz to 12 GHz	1.45	0.85	0.75	1.95

Conditions: Peak power level -30 dBm to IF Output maximum leveled power specification; module temperature within ±5 °C of last self-calibration temperature.

Frequency response is defined as the maximum relative amplitude deviation from the reference offset frequency over the instantaneous bandwidth. For the PXIe-5830 IF output, the reference offset frequency is 10 MHz higher than the upconverter center frequency. For the absolute amplitude accuracy at the reference offset, refer to the *IF Output Amplitude Accuracy* section.

Figure 3. IF Output Frequency Response, 0 dBm, Peak Output Power Level, Equalized, Measured

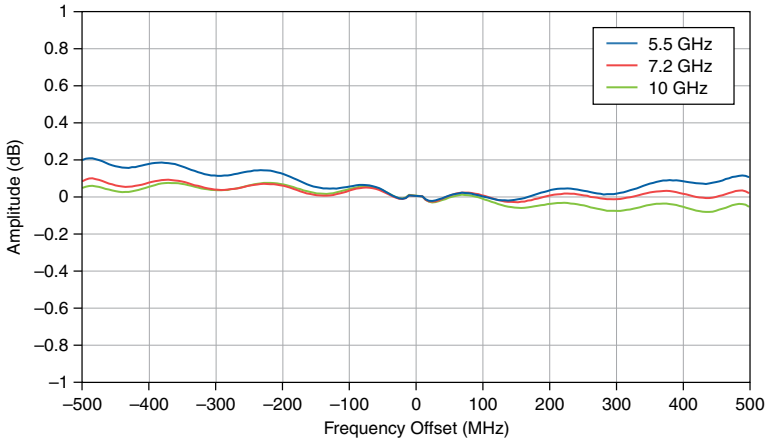
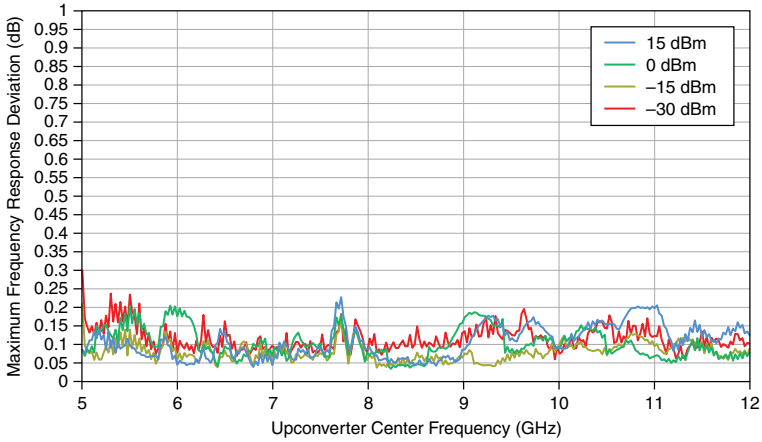


Figure 4. Maximum IF Output Frequency Response Deviation versus Upconverter Center Frequency, Measured



IF Output Average Noise Density

Table 11. Output Average Noise Density (dBm/Hz), Typical

Upconverter Center Frequency	Output Power Level Setting		
	-10 dBm	0 dBm	15 dBm
5 GHz to 8 GHz	-156	-149	-135
>8 GHz to 12 GHz	-154	-148	-135

Conditions: 10 averages; 40 dB baseband signal attenuation; noise measurement frequency offset by 200 MHz from the upconverter center frequency; the instrument driver is in peak mode.

Measured on the PXIe-3621 IF IN/OUT 1 port. The IF IN/OUT 0 port has a 1 dB to 5 dB degradation compared to the IF IN/OUT 1 port.

IF Output Third-Order Intermodulation

Table 12. IF Output Third-Order Intermodulation Distortion (IMD_3) (dBc), Typical

Upconverter Center Frequency	IF IN/OUT 0			IF IN/OUT 1		
	Output Power Level Setting			Output Power Level Setting		
	-30 dBm	0 dBm	15 dBm	-30 dBm	0 dBm	15 dBm
5 GHz to 8 GHz	-56	-56	-49	-45	-46	-46
>8 GHz to 12 GHz	-58	-57	-41	-53	-52	-39

Conditions: Measured by generating two -7 dBr tones at +95 MHz and +105 MHz off from the upconverter center frequency. The nominal peak envelope power is 1 dB below the *Output Power Level Setting*; the instrument driver is in peak mode.

IF Output Harmonic Spurs

Table 13. IF Output Out of Band Spur Levels, Measured

Upconverter Center Frequency	Harmonic Level (dBc)
5 GHz to 8 GHz	-32
>8 GHz to 12 GHz	-34

Conditions: Peak power level 0 dBm; measured with a CW signal at 100 MHz offset from the configured upconverter center frequency; Upconverter/Downconverter Frequency Offset Mode: User-Defined; measurement performed after the PXIe-5830 has settled.

Includes CW and LO harmonics.

Measured at 23 °C ambient within ±5 °C from the last self-calibration temperature.

IF Output Nonharmonic Spurs

Table 14. IF Output Nonharmonic Spurs (dBc) (Default LO Step Size), Typical

Upconverter Center Frequency	Offset ≤ 500 kHz	500 kHz < Offset ≤ 20 MHz	Offset > 20 MHz
5 GHz to 8 GHz	-62	-44	<-70
>8 GHz to 12 GHz	-59	-51	<-70

Conditions: Measured relative to a 0 dBm output tone.

The maximum offset is limited to the instantaneous 1 GHz bandwidth at the referenced upconverter center frequency.

Note Offset refers to ± desired signal offset (Hz) around the current upconverter center frequency.

Table 15. IF Output Nonharmonic Spurs (dBc) (1 MHz LO Step Size), Measured

Upconverter Center Frequency	0 Hz ≤ Offset ≤ 5 MHz
5 GHz to 7.1 GHz	-64
>7.1 GHz to 12 GHz	-46

Conditions: Measured relative to a 0 dBm output tone.

Note Offset refers to ± desired signal offset (Hz) around the current upconverter center frequency.

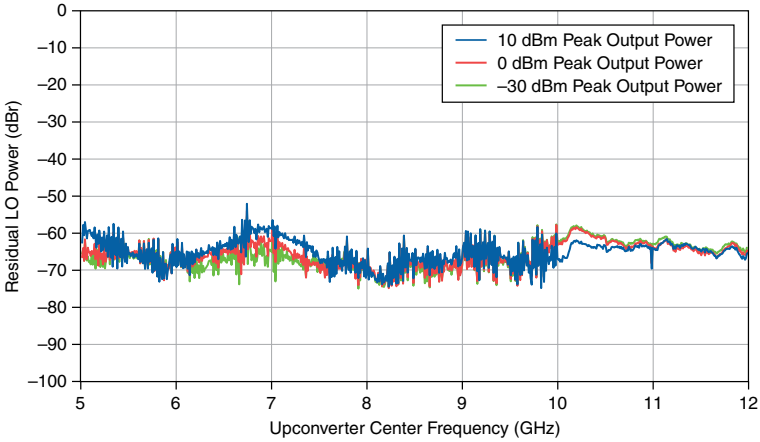
IF Output LO Residual Power

Table 16. IF Output LO Residual Power (dBr), Typical

Upconverter Center Frequency	Self-Calibration °C ± 1 °C	Self-Calibration °C ± 5 °C
5 GHz to 8 GHz	-50	-47
>8 GHz to 12 GHz	-48	-36

Conditions: Peak output power levels -30 dBm up to the IF Output maximum leveled power specifications. The transmit output tone power at a maximum of -3 dBr. LO2 **LO Source** property set to Onboard.

Figure 5. IF Output LO Residual Power, Measured



IF Output Residual Sideband Image

Table 17. IF Output Residual Sideband Image (dBc), Typical

Upconverter Center Frequency	Self-Calibration °C ± 1 °C	Self-Calibration °C ± 5 °C
5 GHz to 8 GHz	-39	-34
>8 GHz to 12 GHz	-48	-41

Conditions: Peak output power levels -30 dBm up to the IF Output maximum leveled power specifications. Output tone power at a maximum of -3 dBr. LO2 **LO Source** property set to Onboard.

This specification describes the maximum residual sideband image within the 1 GHz device instantaneous bandwidth.

Figure 6. IF Output Residual Sideband Image, 0 dBm Peak Power, Measured

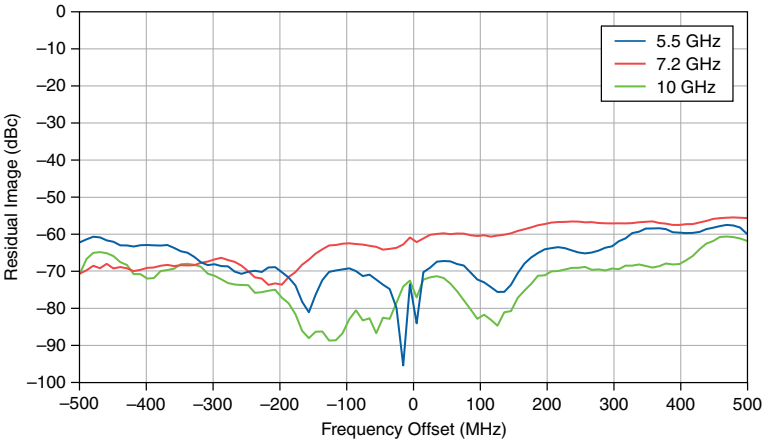
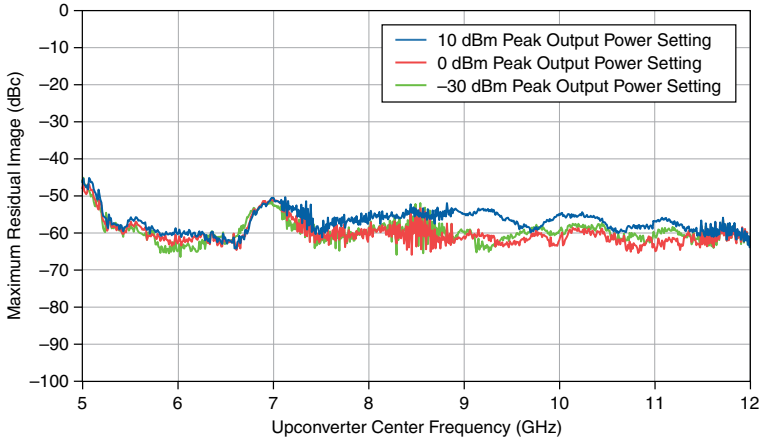


Figure 7. Maximum IF Output Residual Sideband Image Versus Upconverter Center Frequency, Measured



Receive (IF IN/OUT Ports)

IF Input Amplitude Range

Amplitude range	Average noise level to +20 dBm (CW RMS)
Gain resolution	1 dB, nominal

Table 18. IF Input Analog Gain Range, Nominal

Downconverter Center Frequency	IF Analog Gain Range (dB)
5 GHz to 8 GHz	≥61
>8 GHz to 12 GHz	≥57

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IF Input Amplitude Accuracy

Table 19. IF Input Absolute Amplitude Accuracy (dB) (Offset Mode is User-Defined)

Downconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	±1.2	±0.8	±0.5	±1.6
>8 GHz to 12 GHz	±1.4	±1.0	±0.7	±1.6

Conditions: Reference level -30 dBm to 0 dBm for specification; -30 dBm to 20 dBm for typical; measured with a CW signal at 10 MHz offset from the configured downconverter center frequency when a user-defined frequency offset is not applied; Upconverter/Downconverter Frequency Offset Mode: User-Defined; measurement performed after the PXIe-5830 has settled.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with the onboard temperature sensors.

Table 20. IF Input Absolute Amplitude Accuracy (dB) (Offset Mode is Enabled)

Downconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	±1.2	±0.9	±0.5	±1.7
>8 GHz to 12 GHz	±1.4	±1.0	±0.7	±1.9

Conditions: Reference level -30 dBm to 0 dBm for specification; -30 dBm to 20 dBm for typical; measured with a CW signal at the I/Q center frequency, where the I/Q center frequency is 257.5 MHz offset from the configured downconverter center frequency where the driver automatically applies a 257.5 MHz offset for signals with 450 MHz bandwidth and less; Upconverter/Downconverter Frequency Offset Mode: Enabled; measurement performed after the PXIe-5830 has settled.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with the onboard temperature sensors.

Table 21. IF Input Relative Amplitude Accuracy (Offset Mode is User-Defined), Typical

Downconverter Center Frequency	Relative Amplitude Accuracy (dB)
5 GHz to 8 GHz	±0.25
>8 GHz to 12 GHz	±0.40

Conditions: Reference level -30 dBm to +20 dBm; measured with a CW signal at 10 MHz offset from the configured downconverter center frequency; Upconverter/Downconverter Frequency Offset Mode: User-Defined; measurement performed after the PXIe-5830 has settled.

Relative accuracy describes the residual absolute accuracy error when compared to the absolute accuracy at 0 dBm.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with the onboard temperature sensors.

Table 22. IF Input Relative Amplitude Accuracy (Offset Mode is Enabled), Typical

Downconverter Center Frequency	Relative Amplitude Accuracy (dB)
5 GHz to 8 GHz	±0.25
>8 GHz to 12 GHz	±0.40

Conditions: Reference level -30 dBm to +20 dBm; measured with a CW signal at ±257.5 MHz offset from the configured downconverter center frequency where the driver automatically applies at the I/Q center frequency, where the I/Q center frequency is 257.5 MHz offset for signals with 450 MHz bandwidth and less; Upconverter/ Downconverter Frequency Offset Mode: Enabled; measurement performed after the PXIe-5830 has settled.

Relative accuracy describes the residual absolute accuracy error when compared to the absolute accuracy at 0 dBm.

This specification is valid only when the instrument is operating within the specified ambient temperature range and each module is within ±5 °C from the last self-calibration temperature, as measured with the onboard temperature sensors.

IF Input Frequency Response

Table 23. IF Input Frequency Response (dB)

Downconverter Center Frequency	23 °C ± 5 °C			0 °C to 45 °C
	Specification	Typical-95	Typical	Specification
5 GHz to 8 GHz	2.2	1.8	1.2	2.8
>8 GHz to 12 GHz	2.3	2.0	1.1	3.2

Conditions: Reference level -30 dBm to 0 dBm for specification; -30 dBm to 20 dBm for typical; module temperatures within ±5 °C of last self-calibration temperature.

Frequency response is defined as the maximum relative amplitude deviation from the reference offset frequency over the instantaneous bandwidth. For the PXIe-5830 IF input, the reference offset frequency is 10 MHz higher than the downconverter center frequency. For the absolute amplitude accuracy at the reference offset, refer to the *IF Input Amplitude Accuracy* section.

Figure 8. IF Input Frequency Response, 0 dBm, Reference Level, Equalized, Measured

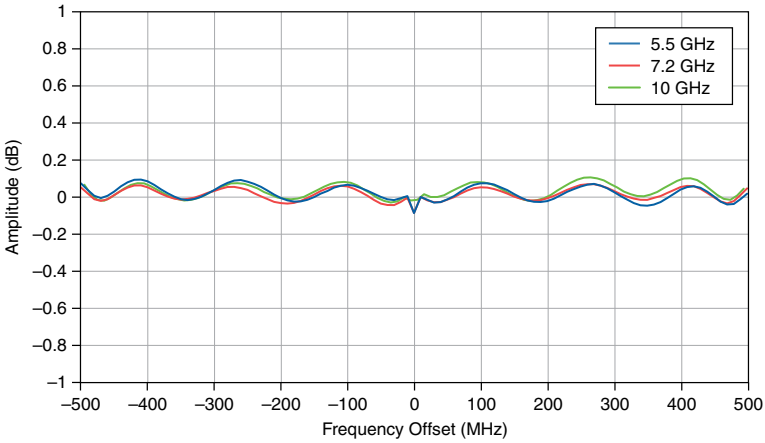
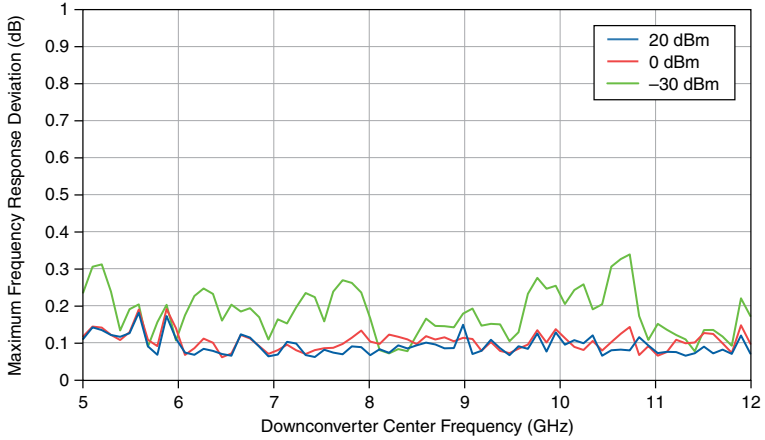


Figure 9. Maximum IF Input Frequency Response Deviation versus Downconverter Center Frequency, Measured



IF Input Average Noise Density

Table 24. Input Average Noise Density (dBm/Hz), Typical

Downconverter Center Frequency	-30 dBm Reference Level	0 dBm Reference Level
5 GHz to 8 GHz	-162	-142
>8 GHz to 12 GHz	-162	-142
Conditions: Input terminated with a 50 Ω load; 10 averages; noise measurement frequency offset by 6 MHz from the downconverter center frequency. Measured on the PXIe-3621 IF IN/OUT 1 port. The IF IN/OUT 0 port has a 2 dB degradation compared to the IF IN/OUT 1 port.		

IF Input Third-Order Intermodulation

Table 25. IF Input Third-Order Intercept Point (IIP_3), Typical

Downconverter Center Frequency	Reference Level		
	-30 dBm	0 dBm	15 dBm
5 GHz to 8 GHz	-6	20	35
>8 GHz to 12 GHz	-4	19	33
Conditions: Measured with two -6 dBr tones applied at +95 MHz and +105 MHz offset from the downconverter center frequency.			

IF Input Residual Spurs

Table 26. IF Input Residual Spurs (dBm), Typical

Downconverter Center Frequency	60 kHz ≤ Offset ≤ 60 kHz	Offset ≥ 60 MHz[7]
5 GHz to 8 GHz	-74	-74
>8 GHz to 12 GHz	-75	-75

Conditions : Reference level 0 dBm. Measured with the IF IN 1 port terminated with 50 Ω.

The maximum offset is limited to the instantaneous bandwidth at the referenced downconverter center frequency.

Note Offset refers to ± desired signal offset (Hz) around the current downconverter center frequency.

IF Input LO Residual Power

Table 27. IF Input LO Residual Power (dBr[8]), Typical

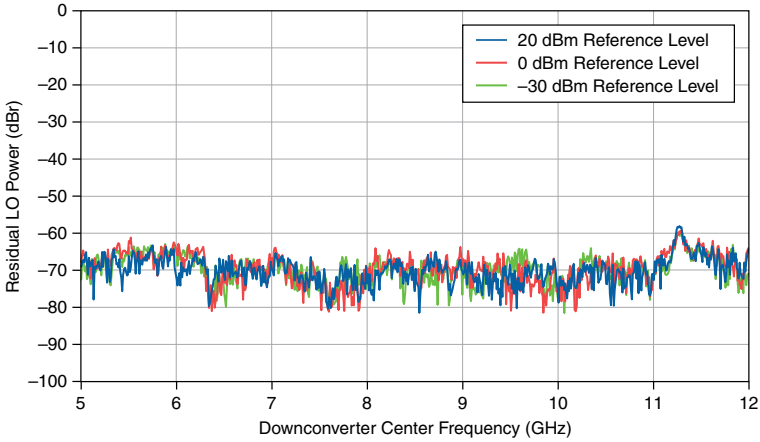
Downconverter Center Frequency	Self-Calibration °C ± 1 °C	Self-Calibration °C ± 5 °C
5 GHz to 8 GHz	-54	-44
>8 GHz to 12 GHz	-47	-38

Conditions: Reference level is -30 dBm to +15 dBm. Input tone power at a maximum of -3 dBr. LO2 **LO Source** property set to Onboard.

[7] The maximum offset is limited to within the equalized bandwidth of the referenced downconverter center frequency.

[8] dBr is relative to the full scale of the configured reference level.

Figure 10. IF Input LO Residual Power, Measured



IF Input Residual Sideband Image

Table 28. IF Input Residual Sideband Image (dBc), Typical

Downconverter Center Frequency	Self-Calibration °C ± 1 °C	Self-Calibration °C ± 5 °C
5 GHz to 8 GHz	-47	-39
>8 GHz to 12 GHz	-51	-42

Conditions: Reference Level is -30 dBm to +15 dBm. LO2 **LO Source** property set to Onboard.

This specification describes the maximum residual sideband image within the 1 GHz device instantaneous bandwidth.

Figure 11. IF Input Residual Sideband Image, 0 dBm, Reference Level, Measured

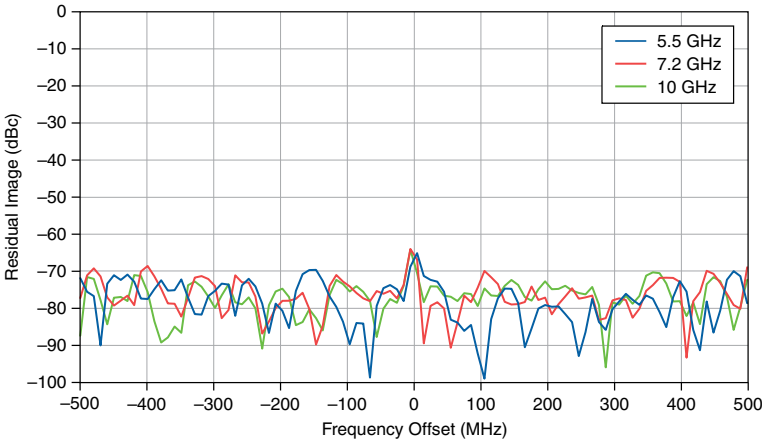
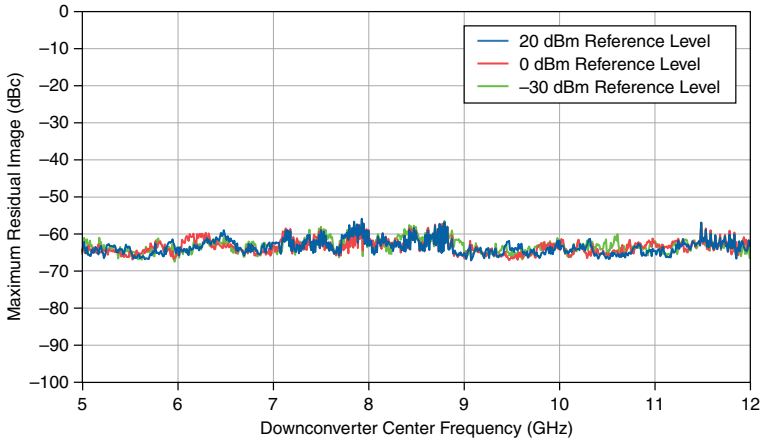


Figure 12. Maximum IF Input Residual Sideband Image Versus Downconverter Center Frequency, Measured



Application-Specific Modulation Quality

WLAN 802.11ax

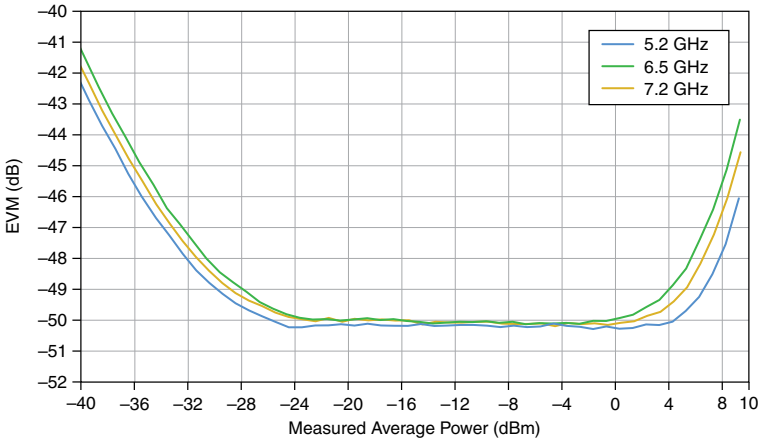
IF IN/OUT Ports

The following measurements were taken using RFmx and corresponding RFmx default values.

Table 29. WLAN 802.11ax RMS EVM (dB), Shared Onboard LO2, Nominal[9,10]

I/Q Carrier Frequency	Signal Bandwidth	
	80 MHz	160 MHz
5.1 GHz to 7.2 GHz	-50	-47

Figure 13. WLAN 802.11ax RMS EVM Versus Average Power, Measured[9]



[9] Conditions: IF0 loopback to IF1; waveform bandwidth: 80 MHz; waveform PAPR: 10.55 dB; MCS Index: 11; 16 OFDM data symbols; 20 packet averages; Channel Estimation Type: Ch Estimation Ref (Preamble); Upconverter/Downconverter Frequency Offset Mode: Enabled; LO2 LO Source: SG_SA_Shared; Reference Level: Average Power Level + Waveform PAPR; Reference Level Headroom: 0 dB.

[10] EVM shown is the average of RF output power levels including -24 dBm to 0 dBm.

Figure 14. WLAN 802.11ax RMS EVM Versus Frequency, Nominal[9,10]

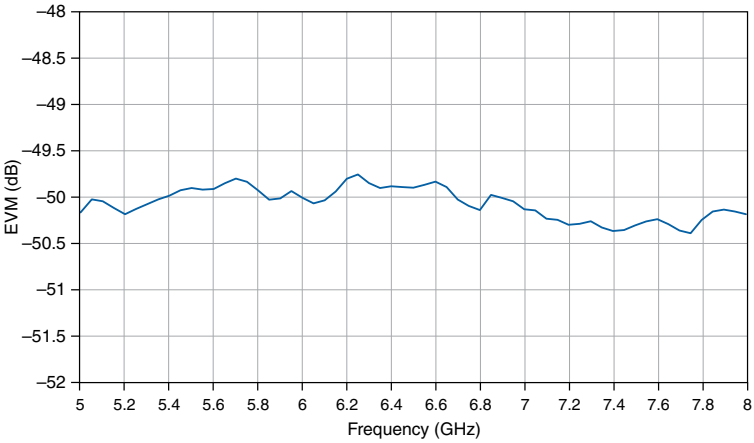
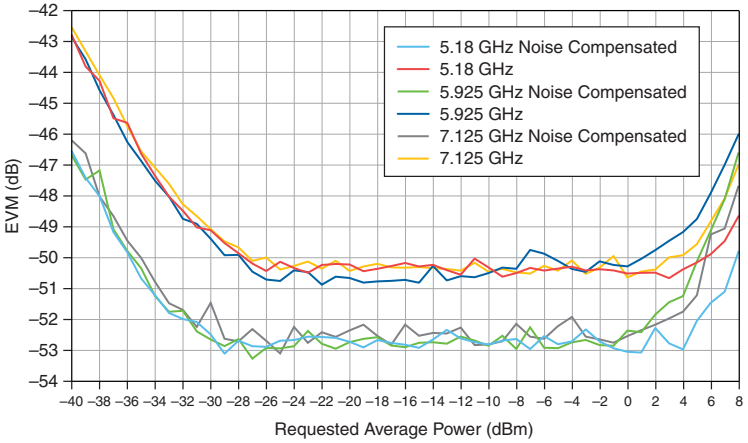


Figure 15. WLAN 802.11ax 80 MHz RMS EVM Versus Average Power, Measured [11,12]



[11] All measurements are taken in loopback from IF0 output to IF1 input (generator and analyzer combined performance) on the front panel representing effects from both IF Out and IF IN except IF OUT EVM in the figure titled *WLAN 802.11ax 80 MHz RMS EVM Versus Average Power (Loopback vs IF Out EVM), Measured*, which shows only the IF OUT effects (generator only performance). Standard: 802.11ax, MCS:11 . Equalization = Preamble only. Local Oscillators: Shared.

[12] *Noise Compensated* refers to measurements taken while compensating for receiver noise. Return loss for DUT is 6 dB or better.

Figure 16. WLAN 802.11ax 160 MHz RMS EVM Versus Average Power, Measured [11,12]

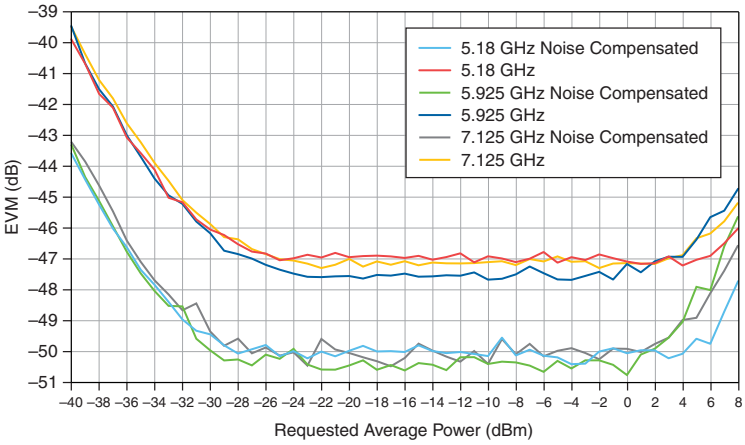
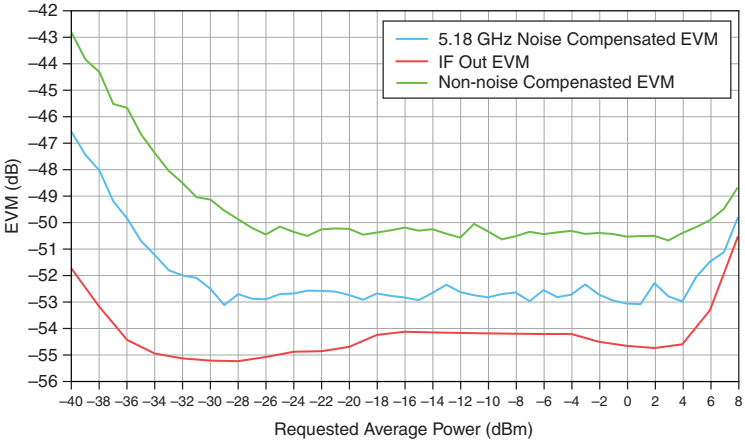


Figure 17. WLAN 802.11ax 80 MHz RMS EVM Versus Average Power (Loopback vs IF Out EVM), Measured [11,12]



5G New Radio (NR)

IF IN/OUT Ports

Table 30. IF 5G NR EVM (dB), Shared Onboard LO2, Typical[13]

I/Q Carrier Frequency	NR Carrier Configuration		
	1 x 100 MHz [14]	2 x 100 MHz [15]	1 x 400 MHz [16]
5 GHz to 8 GHz	-50	-47	-43
>8 GHz to 12 GHz	-49	-46	-43
Conditions: IF average power level is -25 dBm to 0 dBm. LO2 LO Source: SG_SA_Shared.			

Table 31. IF 5G NR EVM (dB), Independent Onboard LO2, Typical[13]

I/Q Carrier Frequency	1 x 100 MHz[14]	2 x 100 MHz[15]	1 x 400 MHz[16]
5 GHz to 8 GHz	-41	-41	-40
>8 GHz to 12 GHz	-39	-39	-38
Conditions: IF average power level is -25 dBm to 0 dBm. LO2 LO Source: Onboard.			

[13] Conditions: NR Downlink, FDD, FR2, 64-QAM, Fully Filled Resource Blocks; IF0 loopback to IF1; Upconverter/Downconverter Frequency Offset Mode: Automatic; Reference Level: Average Power Level + Waveform PAPR; Reference Level Headroom: 0 dB; 2 slots analyzed; 1 packet averages.

[14] 1 x 100 MHz Carrier: 60 kHz Subcarrier Spacing, 11.23 dB PAPR.

[15] 2 x 100 MHz Carrier: 60 kHz Subcarrier Spacing, 11.06 dB PAPR; CC 0 or 1.

[16] 1 x 400 MHz Carrier: 120 kHz Subcarrier Spacing, 11.41 dB PAPR.

Figure 18. IF 5G NR 1 CC x 100 MHz RMS EVM versus Average Power, Measured[13,14]

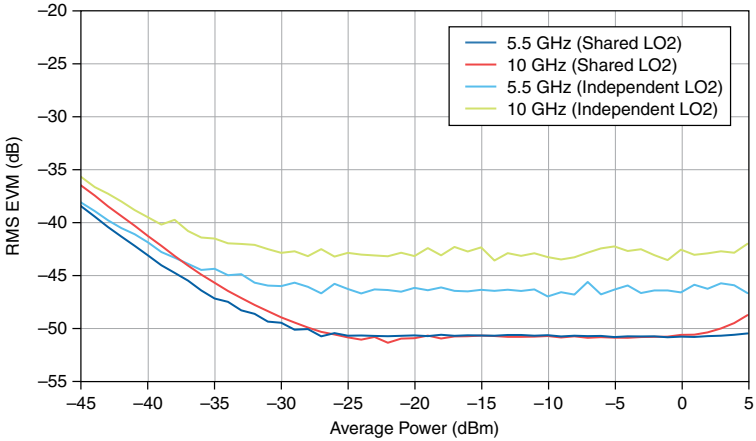


Figure 19. IF 5G NR 2 CC x 100 MHz RMS EVM versus Average Power, Measured[13,15]

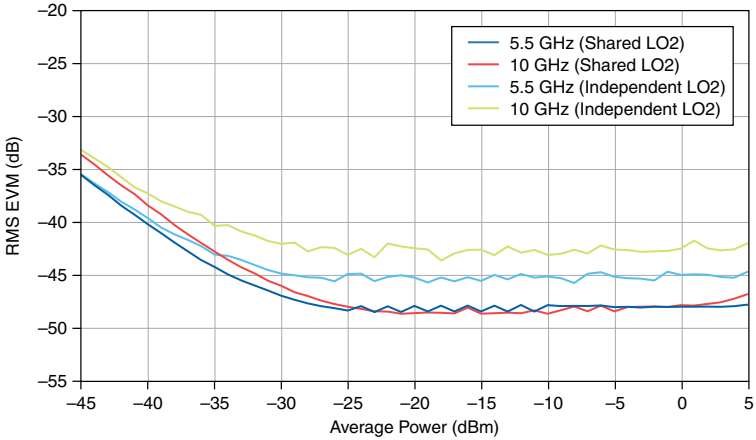


Figure 20. IF 5G NR 1 CC x 400 MHz RMS EVM versus Average Power, Measured[13, 16]

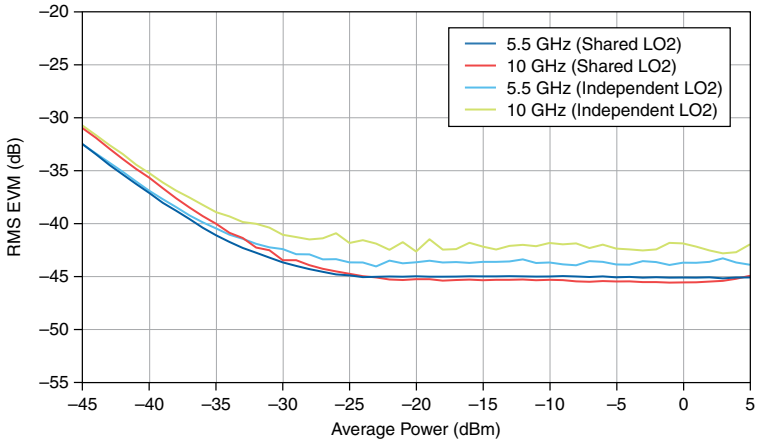
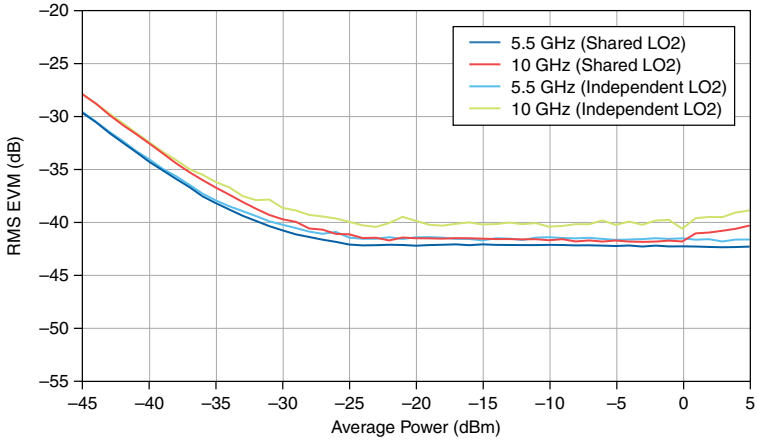


Figure 21. IF 5G NR 2 CC x 400 MHz RMS EVM versus Average Power, Measured[13, 17]



[17] 2 x 400 MHz Carriers: 120 kHz Subcarrier Spacing, 11.88 dB PAPR; CC 0.

Figure 22. IF 5G NR RMS EVM versus Frequency (Shared LO2), Measured[13, 18, 19]

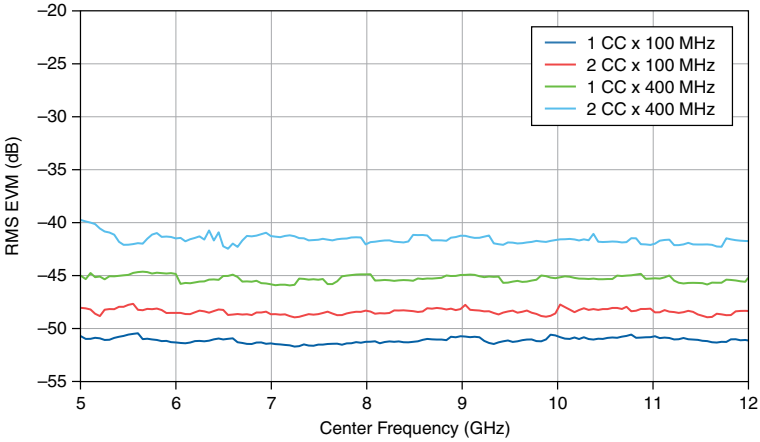
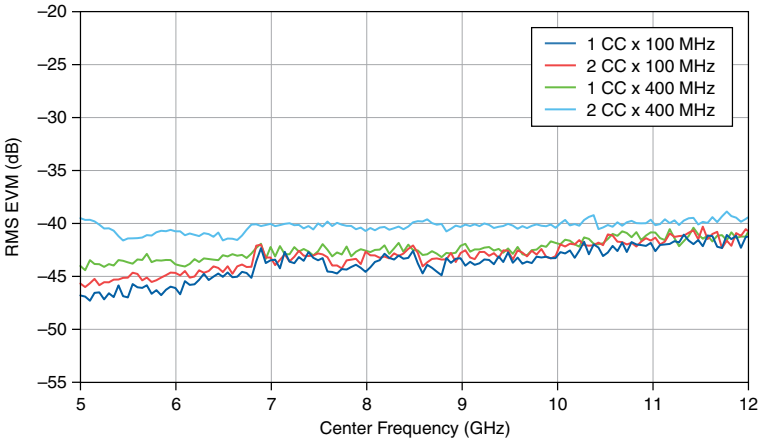


Figure 23. IF 5G NR RMS EVM versus Frequency (Independent LO2), Measured[13, 18, 19]



18 1 x 100 MHz Carrier: 60 kHz Subcarrier Spacing, 11.23 dB PAPR. 2 x 100 MHz Carrier: 60 kHz Subcarrier Spacing, 11.06 dB PAPR; CC 0.1 x 400 MHz Carrier: 120 kHz Subcarrier Spacing, 11.41 dB PAPR. 2 x 400 MHz Carriers: 120 kHz Subcarrier Spacing, 11.88 dB PAPR; CC 0.

19 IF output average power level is -10 dBm.

Front Panel I/O

PXIe-5820

Refer to the *PXIe-5820 Specifications* for more information about characteristics of the PXIe-5820 front panel input and output.

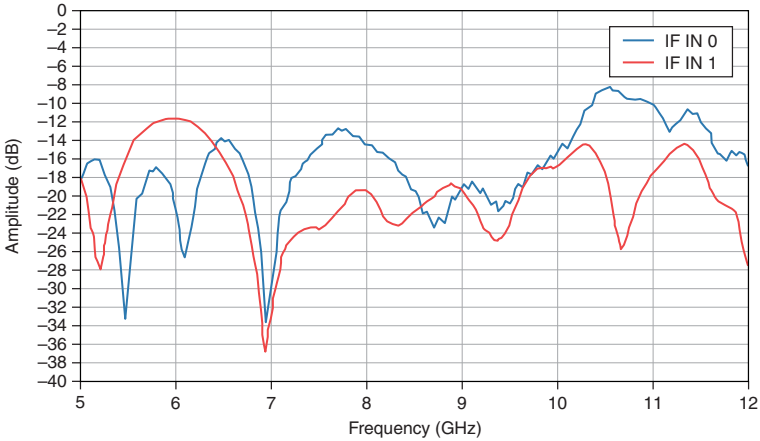
PXIe-3621

I/Q IN	
Connectors	MMPX (female)
Input coupling, per terminal	DC
Input type	Differential
Number of channels	2
Differential impedance	100 Ω
I/Q OUT	
Connectors	MMPX (female)
Output coupling, per terminal	DC
Output type	Differential
Number of channels	2
Impedance	100 Ω
LO2 IN	
Connectors	MMPX (female)
Frequency range	3.55 GHz to 7.1 GHz
Input power range[20]	+6 dBm to +10 dBm, nominal
Input return loss	10 dB, nominal
Absolute maximum input power	+10 dBm
LO2 coupling	DC coupled to ground
Impedance	50 Ω
LO2 OUT	
Connectors	MMPX (female)
Frequency range	3.55 GHz to 7.1 GHz
Absolute maximum output power	+10 dBm

[20] The PXIe-5830 supports receiving an external LO with a range of signal power levels. To properly configure the PXIe-5830 LO signal path for the provided level, set `NIRFSA_ATTR_LO_IN_POWER` or `NIRFSG_ATTR_LO_IN_POWER`.

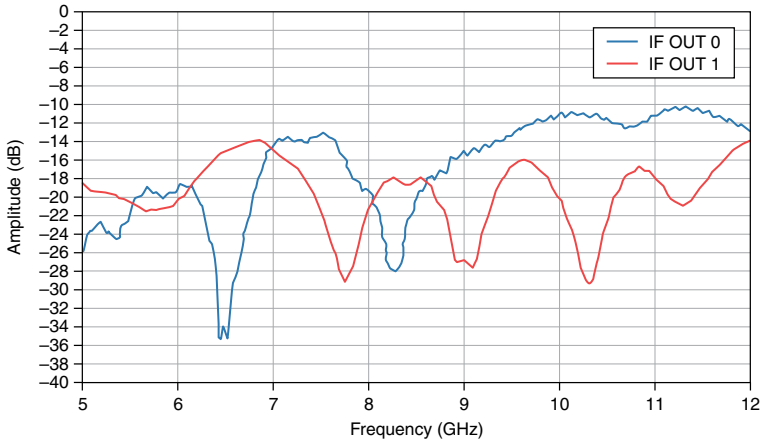
LO2 Coupling	DC coupled to ground
Output power resolution[21]	0.5 dB, nominal
Impedance	50 Ω
Output return loss	10 dB, nominal
DIO	
Connector	Mini HDMI
IF IN/OUT	
Connectors	SMA 27 GHz (female)
Impedance	50 Ω
Coupling	AC coupled
Absolute maximum input power	+25 dBm
Absolute maximum reverse power	Not to exceed the active RF output power setting

Figure 24. PXIe-3621 IF IN Port Return Loss, Measured



[21] Output power resolution refers to the RF attenuator step size used to compensate for the LO output frequency response.

Figure 25. PXIe-3621 IF OUT Port Return Loss, Measured



REF IN/OUT	
Connectors	MMPX (female)
Frequency	10 MHz
Input tolerance[22]	$\pm 10 \times 10^{-6}$
Input amplitude[23]	0.7 V pk-pk to 3.3 V pk-pk , typical
Coupling	DC
Output amplitude	1.65 V pk-pk into 50 Ω, nominal
Impedance	50 Ω

Power Requirements

Table 32. PXIe-5830 Power Requirements, Nominal

Module	+3.3 VDC	+12 VDC	Total Power (W)
PXIe-5820	3.3 A (10.89 W)	6.0 A (72.0 W)	82.89
PXIe-3621	5.0 A (6.93 W)	5.0 A (67.2 W)	74.13
PXIe-5830 (combined instrument)	—	—	157.02

[22] *Frequency Accuracy = Input Tolerance × Reference Frequency*
[23] Jitter performance improves with increased slew rate of input signal.

Calibration

Interval	1 year

Physical Characteristics

Table 33. PXIe-5830 Physical Characteristics, Nominal

Module	Dimensions	Weight	
		Grams	Ounces
PXIe-5820	3U, 2 slots	795	28.0
PXIe-3621	3U, 2 slots	1,066	37.6
PXIe-5830 (combined instrument)	3U 4 slots	1,861	65.6

Environmental Characteristics

Temperature	
Operating	0 °C to 45 °C
Storage	-41 °C to 71 °C
Humidity	
Operating	10% to 90%, noncondensing
Storage	5% to 95%, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Commitment to the Environment* web page at *ni.com/environment*. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

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EU Customers At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

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