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SPECIFICATIONS

PXIe-5667 (7 GHz)

Vector Signal Analyzer

These specifications apply to the PXIe-5667 (7 GHz) Vector Signal Analyzer.

The PXIe-5667 (7 GHz) comprises the following modules:

- PXIe-5622 IF Digitizer
- PXIe-5694 IF Conditioning Module
- PXIe-5605 RF Signal Downconverter
- PXIe-5653 RF Analog Signal Generator
- PXIe-5693 RF Preselector Module

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Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

The following characteristic specifications 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.

Specifications are *Warranted* unless otherwise noted.

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Conditions

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

- 30 minute warm-up time.
- Calibration cycle is maintained.
- Chassis fan speed is set to High. In addition, NI recommends using slot blockers and EMC filler panels in empty module slots to minimize temperature drift.
- The PXIe-5653 onboard 100 MHz clock is used as the Reference Clock for the PXIe-5622.
- The PXIe-5653 REF OUT (10 MHz) connector is connected to the PXIe-5694 REF IN connector.
- The PXIe-5653 and the chassis are locked to the same reference, or the PXIe-5653 onboard 10 MHz clock is used as the Reference Clock for the chassis reference input.
- The PXIe-5622 IF digitizer module is revision C or later.
- Modules are connected with NI cables as shown in the *NI 5667 (7 GHz) Spectrum Monitoring Receiver Getting Started Guide*.
- NI-RFSA instrument driver is used.
- Self-calibration is performed after instrument temperature is stable.
- IF output power is set to the default value of -2 dBm.

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

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

Frequency

Frequency Range

Table 1. PXIe-5667 (7 GHz) Frequency Range (Nominal)

Path	Input Frequency
Low-frequency bypass path (DC-coupled)	N/A
Low-frequency bypass path (AC-coupled)	10 kHz to 30 MHz

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Table 1. PXIe-5667 (7 GHz) Frequency Range (Nominal) (Continued)

Path	Input Frequency
Preselector filter path	20 MHz to 7 GHz
External filter path	87 MHz to 3 GHz

Tuning resolution[1], set by the LO source 533 nHz, nominal

Bandwidth

Equalized bandwidth[2]

- Standard configuration 25 MHz, typical
- Optional configuration 50 MHz, typical

3 dB resolution bandwidth Fully adjustable

Bandwidth range

- Standard configuration <1 Hz to 25 MHz, typical
- Optional configuration <1 Hz to 50 MHz, typical

Table 2. FFT Window Shape Factor

Window Function	60 dB : 6 dB Ratio
4-term Blackman-Harris	2.5
7-term Blackman Harris	4.1
Uniform	1.57
Hanning	1.94
Hamming	2.13
Exact Blackman	2.52
Flat Top	2.0
Low Side Lobe	2.78

[1] Tuning resolution refers to the digital downconversion (DDC) tuning resolution of the PXIe-5622 IF digitizer.

[2] Self-calibration was performed using the NI-RFSA instrument driver with the PXIe-5605 RF Signal Downconverter preselector disabled. The signal is not equalized when using the PXIe-5605 downconverter preselector. Equalization is performed by digital filters in the PXIe-5622 IF Digitizer. Equalization applies only to the PXIe-5694 IF signal conditioning bypass path, which is valid for instantaneous bandwidths greater than 20 MHz.

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PXIe-5694 Analog IF Filters

Table 3. PXIe-5694 Analog IF Filter Configurations (Typical)

Instantaneous Bandwidth[3]	PXIe-5694 IF Conditioning Filter Path	Minimum 3 dB Bandwidth	Final IF Center Frequency	Filter Technology[4]
>20 MHz to 50 MHz	IF Bypass	50 MHz[5]	187.5 MHz	LC
>5 MHz to 20 MHz	20 MHz	20 MHz	193.6 MHz	LC
>1.4 MHz to 5 MHz	5 MHz	5 MHz	193.6 MHz or 21.4 MHz	LC
>400 kHz to 1.4 MHz	1.4 MHz	1.4 MHz	193.6 MHz or 21.4 MHz	SAW
≤400 kHz[6]	400 kHz	400 kHz	193.6 MHz	SAW
>30 kHz to 400 kHz[7]	400 kHz	400 kHz	21.4 MHz	SAW
≤30 kHz[7]	30 kHz	30 kHz	21.4 MHz	Quartz crystal

Frequency Reference[8]

All values given are typical unless otherwise stated.

Internal frequency reference	
Frequency	10 MHz
Initial calibration accuracy	$\pm 50 \times 10^{-9}$, (15 °C to 35 °C)
Temperature stability	
0 °C to 55 °C	$\pm 50 \times 10^{-9}$
15 °C to 35 °C	$\pm 10 \times 10^{-9}$, maximum

[3] Instantaneous bandwidth is specified with the **Device Instantaneous Bandwidth** property.
[4] *LC* refers to discrete component filters, and *SAW* refers to surface acoustic wave filters.
[5] The bandwidth is set by the PXIe-5622 digitizer.
[6] The PXIe-5694 IF conditioning downconversion is disabled.
[7] The PXIe-5694 IF conditioning downconversion is enabled.
[8] The PXIe-5653 reference oscillator determines these values.

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Aging	
Per day	±0.5 × 10^{-9}, after 30 days
Per year	±100 × 10^{-9}, after 30 days
Accuracy	*Initial calibration accuracy* ± *aging* ± *temperature stability*
External frequency reference input (REF IN)	
Frequency	5 MHz to 100 MHz in 1 MHz steps
Lock range	±0.2 × 10^{-6}
Amplitude	0.5 V_{pk-pk} to 2.0 V_{pk-pk} into 50 Ω (≥1 V_{pk-pk} recommended)
Absolute maximum amplitude	5 V_{pk-pk}
Input impedance	50 Ω, nominal
Coupling	AC coupled
Connector	SMA
10 MHz reference output (REF OUT (10 MHz))	
Accuracy	10 MHz × *Frequency reference accuracy*
Amplitude	
Maximum	1.5 V_{pk-pk} into 50 Ω
Typical	1.0 V_{pk-pk} into 50 Ω
Coupling	AC coupled
Connector	SMA
100 MHz reference output (REF OUT (100 MHz))	
Accuracy	100 MHz × *Frequency reference accuracy*
Amplitude	
Maximum	1.5 V_{pk-pk} into 50 Ω
Typical	1.0 V_{pk-pk} into 50 Ω
Coupling	AC coupled
Connector	SMA

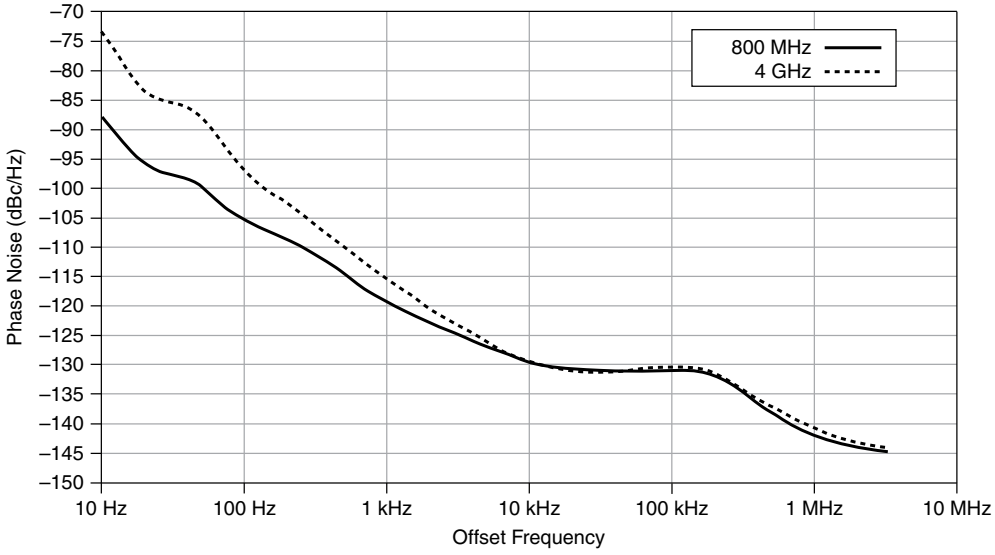
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Spectral Purity

Table 4. PXIe-5667 Single Sideband (SSB) Phase Noise (Typical)[9]

Offset Frequency	Single Sideband Phase Noise (dBc/Hz)	
	23 °C ± 5 °C	0 °C to 55 °C
10 Hz	N/A	-80, nominal
100 Hz	-100	-98
1 kHz	-114	-112
10 kHz	-126	-124
100 kHz	-128	-127
1 MHz	-140	-140

Figure 1. PXIe-5667 (7 GHz) Phase Noise at 800 MHz and 4 GHz Center Frequency (Nominal)



[9] This specification is based on an RF center frequency of 800 MHz that uses the internal reference of the PXIe-5653. This specification is valid when the PXIe-5667 IF filter bandwidth is set to 5 MHz, the PXIe-5622 Sample Clock is locked to the PXIe-5653 100 MHz reference output, and the PXIe-5653 LO YIG main coil drive is set to normal.

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Residual FM (RMS) at 800 MHz

10 Hz to 10 kHz	<0.5 Hz, typical

PXIe-5693 Preselector Filters

Figure 2. PXIe-5693 Preselector Filter Definition

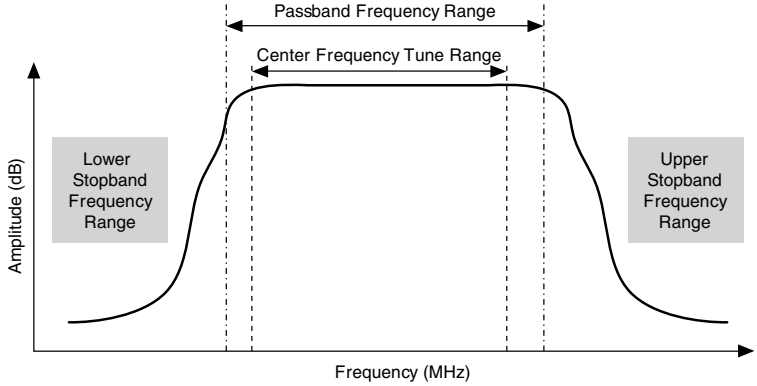


Table 5. PXIe-5693 Preselector Filters Characteristics (Nominal)

Preselector Filter Band	Center Frequency Tune Range[10] (MHz)	Passband Frequency Range[11] (MHz)	Lower Stopband Frequency Range (MHz)	Upper Stopband Frequency Range (MHz)	Stopband Rejection (dB)
1	20 to 34	19 to 35	<14	>42	>20
2	>34 to 60	33 to 61	<27	>70	>20
3	>60 to 100	59 to 110	<49	>128	>20
4	>100 to 160	90 to 170	<75	>185	>20
5	>160 to 225	140 to 245	<115	>285	>20
6	>225 to 350	205 to 370	<170	>420	>20
7	>350 to 555	330 to 575	<280	>660	>20

[10] The PXIe-5693 preselector filter band selection is based on the center frequency tune range. The lowest frequency preselector band is selected at the band-crossing frequencies.

[11] *Passband Frequency Range* is the calibrated range of the preselector filter band.

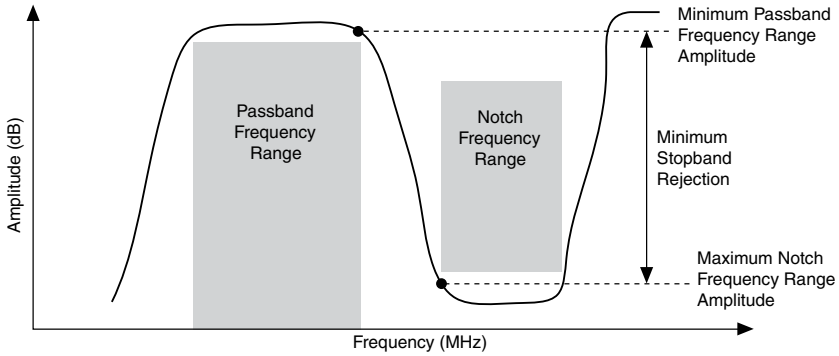
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Table 5. PXIe-5693 Preselector Filters Characteristics (Nominal) (Continued)

Preselector Filter Band	Center Frequency Tune Range[10] (MHz)	Passband Frequency Range[11] (MHz)	Lower Stopband Frequency Range (MHz)	Upper Stopband Frequency Range (MHz)	Stopband Rejection (dB)
8	>555 to 950	530 to 975	<450	>1,120	>20
9	>950 to 1,560	910 to 1,640	<775	>1,920	>20
10	>1,560 to 2,000	1,520 to 2,040	<1,350	>2,320	>20
11	>2,000 to 2,500	1,960 to 2,540	<1,700	>2,860	>20
12	>2,500 to 3,000	2,460 to 3,040	<2,140	>3,460	>20
13	>3,000 to 3,600	2,960 to 3,840	<2,650	>4,350	>20
14	>3,600 to 4,600	3,560 to 4,640	<3,350	>5,050	>20
15	>4,600 to 5,800	4,560 to 5,840	<3,850	>6,550	>20
16	>5,800 to 7,000	5,760 to 7,040	<4,900	>8,250	>20

Notch Filters

Figure 3. PXIe-5693 Notch Filter Frequency Range Definition



[10] The PXIe-5693 preselector filter band selection is based on the center frequency tune range. The lowest frequency preselector band is selected at the band-crossing frequencies.

[11] *Passband Frequency Range* is the calibrated range of the preselector filter band.

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Table 6. PXIe-5693 Notch Filter Characteristics (Nominal)

Notch Filter Band	Passband Frequency Range (MHz)	Notch Frequency Range (MHz)	Notch Filter Rejection (dB)[12]	Preselector Filter Band[12]
N1	32 to 44	55 to 80	>38	2
N2	60 to 77	88 to 108	>25	3
N3	90 to 110	50 to 80	>40	3
N4	120 to 166	88 to 108	>23	4

Amplitude

Amplitude Range

Amplitude range	
Preselector path	Average noise level to +10 dBm, nominal
Low-frequency bypass path[13]	Average noise level to +30 dBm, nominal
External filter path	Average noise level to +10 dBm, nominal

Average Noise Level

Table 7. Average Noise Level for Preselector and Low-Frequency Bypass Paths (Typical)[14]

Center Frequency	IF Conditioning Bypass Path (dBm/Hz)		IF Conditioning, Downconversion Enabled, and Disabled Paths (dBm/Hz)	
	23 °C ± 5 °C	0 °C to 55 °C	23 °C ± 5 °C	0 °C to 55 °C
10 kHz to 1 MHz[15]	-100	-100	-100	-100
>1 MHz to 10 MHz[15]	-127	-125	-127	-125

[12] Notch filter bands are a cascade of a preselector filter and a notch filter. Stopband rejection specifications for the preselector filter band apply in the notch filter bands.

[13] The maximum amplitude range is limited by the PXIe-5605.

[14] This specification is based on the termination of the PXIe-5693 RF IN connector and a reference level of ≤-50 dBm with ≥10 RMS averages.

[15] This specification is valid when the PXIe-5693 low-frequency bypass path is enabled on the DC coupled path and the IF filter bandwidth is set to 300 kHz.

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Table 7. Average Noise Level for Preselector and Low-Frequency Bypass Paths (Typical)[14] (Continued)

Center Frequency	IF Conditioning Bypass Path (dBm/Hz)		IF Conditioning, Downconversion Enabled, and Disabled Paths (dBm/Hz)	
	23 °C ± 5 °C	0 °C to 55 °C	23 °C ± 5 °C	0 °C to 55 °C
>10 MHz to 30 MHz[15]	-128	-128	-128	-128
>20 MHz to 87 MHz[16]	-153	-151	-158	-156
>87 MHz to 1.5 GHz[16]	-161	-159	-162	-161
1.5 GHz to 3.6 GHz[16]	-160	-158	-160	-159
>3.6 GHz to 7 GHz[17]	-158	-156	-158	-157

Noise Figure

Table 8. Noise Figure for Preselector Paths (Nominal)[18]

Center Frequency	IF Conditioning Bypass Path (dB)		IF Conditioning, Downconversion Enabled, and Disabled Paths (dB)	
	23 °C ± 5 °C	0 °C to 55 °C	23 °C ± 5 °C	0 °C to 55 °C
>20 MHz to 87 MHz[19]	21	23	16	18
>87 MHz to 1.5 GHz[19]	13	15	12	14
>1.5 GHz to 3.6 GHz	14	16	14	15
>3.6 GHz to 7 GHz[17]	16	18	16	17

16 This specification is valid when the PXIe-5693 preselector filter path is enabled.
17 This specification is based on enabling the PXIe-5605 downconverter preselector.
18 This specification is computed from the *Average Noise Level* measurement. *Noise Figure* equals *Average Noise Level* + 174 dB.
19 This specification is valid when the PXIe-5693 low-frequency bypass path is enabled on the DC coupled path and the IF filter bandwidth is set to 300 kHz.
20 This specification is valid when the PXIe-5693 preselector filter path is enabled.

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Table 9. Noise Figure for Low-Frequency Bypass Paths (Nominal)[21]

Center Frequency	IF Conditioning Bypass Path (dB)		IF Conditioning, Downconversion Enabled, and Disabled Paths (dB)	
	23 °C ± 5 °C	0 °C to 55 °C	23 °C ± 5 °C	0 °C to 55 °C
>10 kHz to 1 MHz[22]	74	74	74	74
>1 MHz to 10 MHz[22]	47	49	47	49
>10 MHz to 30 MHz[22]	46	46	46	46

Absolute Amplitude Accuracy

Table 10. Absolute Amplitude Accuracy for the Preselector Path[23]

Center Frequency	Absolute Amplitude Accuracy (dB)	
	23 °C ± 5 °C	0 °C to 55 °C
20 MHz to 40 MHz	±1.5	±1.8
	±0.4, typical	±1.1, typical
>40 MHz to 2.5 GHz	±1.3	±1.6
	±0.6, typical	±1.0, typical
>2.5 GHz to 3.6 GHz	±1.5	±1.8
	±0.7, typical	±1.2, typical
>3.6 GHz to 7 GHz[17]	±4.0	±5.0
	±1.5, typical	±2.2, typical

IF path switching uncertainty[24] ±0.16 dB, typical

[21] This specification is computed from the *Average Noise Level* measurement. *Noise Figure* equals *Average Noise Level* + 174 dB.

[22] This specification is valid when the low-frequency bypass path is enabled on the DC coupled path and the IF filter bandwidth is set to 300 kHz.

[23] This specification is based on a reference level of -50 dBm to -10 dBm and is valid when the IF filter bandwidth is set to 5 MHz, IF conditioning downconversion is disabled, and the signal power value is set to the reference level value. This specification is measured at the center frequency and is within ±5 °C the temperature at the last self-calibration.

[24] When the **IF Conditioning Downconversion Enabled** property is disabled and a 5 MHz IF path is used, an amplitude error occurs between the property/attribute and all other paths and filters within the PXIe-5694. This specification is valid when the center frequency is set to 612.5 MHz.

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IF Amplitude Response

Table 11. PXIe-5667 (7 GHz) IF Amplitude Response (Typical)[25]

PXIe-5694 IF Conditioning Filter Path	Measurement Bandwidth	IF Amplitude Response (dB)		
		Center Frequency 20 MHz to 200 MHz 23 °C ± 5 °C	Center Frequency >200 MHz to 3.6 GHz 23 °C ± 5 °C	Center Frequency >3.6 GHz to 7 GHz 23 °C ± 5 °C
IF bypass	≤50 MHz	±0.8	±0.5	±1.0
	≤25 MHz	±0.4	±0.4	±0.5
	≤5 MHz	±0.1	±0.1	±0.2
20 MHz[26]	≤20 MHz	±0.5	±0.5	±0.5
5 MHz	≤5 MHz	±0.6	±0.6	±0.8
1.4 MHz	≤1.4 MHz	±0.4	±0.4	±0.4
400 kHz	≤400 kHz	±0.4	±0.4	±0.4
30 kHz[27]	≤30 kHz	±0.4	±0.4	±0.4

IF Phase Linearity (Deviation from Linear Phase)

Table 12. PXIe-5667 (7 GHz) IF Phase Linearity (Deviation from Linear Phase) (Typical)[28]

PXIe-5694 IF Conditioning Filter Path	Measurement Bandwidth	Deviation from Linear Phase (degrees) (23 °C)		
		Center Frequency 20 MHz to 200 MHz	Center Frequency >200 MHz to 3.6 GHz	Center Frequency >3.6 GHz to 7 GHz
IF Bypass	≤50 MHz	±7.0	±5.0	±4.0
	≤25 MHz	±1.0	±1.3	±1.0
	≤5 MHz	±0.0	±0.1	±0.1

25 The IF passband response is relative to the IF center frequency. This specification applies when self-calibration is performed with digital IF equalization enabled.

26 This specification is valid when IF conditioning downconversion is disabled.

27 This specification is valid when IF conditioning downconversion is enabled.

28 The IF passband response is relative to the IF center frequency on the IF bypass path. This specification has a reference level of -40 dBm to 0 dBm and applies when self-calibration is performed with digital IF equalization enabled.

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Phase Synchronous Paths

IF BW for multi channel phase-coherent measurements	5 MHz, 20 MHz, 50 MHz, nominal

Spurious Responses

Non-Input Related (Residual) Spurs[29]

Non-input related (residual) spurs at 23 °C ± 5 °C

Center frequency 20 MHz to 200 MHz	-110 dBm, typical
Center frequency >200 MHz to 3.6 GHz	-115 dBm, typical
Center frequency >3.6 GHz to 7 GHz[17]	-112 dBm, typical

RF Input Port Emissions Level[30]

RF input port emissions level at 23 °C ± 5 °C

Center frequency >20 MHz to 3.6 GHz	-92 dBm, typical
Center frequency >3.6 GHz to 7 GHz[17]	-120 dBm, typical

Image Rejection[31]

Image rejection at 23 °C ± 5 °C

Center frequency >20 MHz to 1 GHz	-90 dBc, typical
Center frequency >1 GHz to 3.6 GHz	-80 dBc, typical
Center frequency >3.6 GHz to 7 GHz[17]	-94 dBc, typical

[29] This specification has a reference level of -50 dBm and is valid when the device instantaneous bandwidth is set to >20 MHz when the FFT width is set to <24 MHz, when the device instantaneous bandwidth is set to ≤20 MHz when the FFT width is set to <12.8 MHz, and when the PXIe-5693 preselector filter path is used.

[30] This specification applies under normal operations and not during system self-calibration.

[31] This specification is based on a 0 dBm input signal level with a reference level of 0 dBm and includes images from all conversion stages. This specification is valid when the PXIe-5693 preselector filter path is used.

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IF Rejection

Table 13. IF Rejection (Typical)[32]

Center Frequency	IF Rejection (dBc)			
	IF1	IF2	IF3	IF4
100 MHz to 3.6 GHz	59	92	92	90
>3.6 GHz to 7 GHz	87	92	N/A	90

Linearity

Third-Order Intermodulation Distortion

Table 14. Third-Order Intermodulation Distortion Preselector Path In-Band (Typical)

Center Frequency	Third-Order Intercept Point (dBm)			
	23 °C ± 5 °C		0 °C to 55 °C	
	Preamp Disabled[33]	Preamp Enabled[34]	Preamp Disabled[33]	Preamp Enabled[34]
>80 MHz to 1 GHz	+20	+1	+19	0
>1 GHz to 3 GHz	+21	0	+21	-1
>3 GHz to 3.6 GHz	+20	+2	+19	+1
>3.6 GHz to 7 GHz	+18	+2	+17	+1

[32] IF rejection is the suppression of an input signal at the IF frequency when the RF signal analyzer is tuned elsewhere. This specification is based on a 0 dBm input signal level with a reference level of 0 dBm, and is valid when the PXIe-5693 preselector filter path is used.

[33] This specification is based on two -10 dBm tones spaced 700 kHz apart. This specification is valid when both tones are within the PXIe-5693 preselector bandwidth with a reference level of -5 dBm and the IF filter bandwidth is set to 5 MHz.

[34] This specification is based on two -30 dBm tones spaced 700 kHz apart. This specification is valid when both tones are within the PXIe-5693 preselector bandwidth with a reference level of -25 dBm and the IF filter bandwidth is set to 5 MHz.

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Table 15. Third-Order Intermodulation Distortion Preselector Path Out-of-Band (Typical)

Center Frequency	Third-Order Intercept Point (dBm)			
	23 °C ± 5 °C		0 °C to 55 °C	
	Preamp Disabled[35]	Preamp Enabled[36]	Preamp Disabled[35]	Preamp Enabled[36]
>20 MHz to 1 GHz	+35	+15	+34	+15
>1 GHz to 3 GHz	+34	+10	+34	+9
>3 GHz to 3.6 GHz	+40	+26	+40	+25
>3.6 GHz to 7 GHz	+34	+19	+33	+19

Second Harmonic Intercept Points

Table 16. Second Harmonic Intercept Points Preselector Path (Typical)

Source Frequency	Second Harmonic Intercept Point (dBm)			
	23 °C ± 5 °C		0 °C to 55 °C	
	Preamp Disabled[37]	Preamp Enabled[38]	Preamp Disabled[37]	Preamp Enabled[38]
>20 MHz to 250 MHz	+75	+68	+75	+68
>250 MHz to 1.8 GHz	+80	+58	+80	+58
>1.8 GHz to 3.5 GHz[17]	+70	+64	+70	+64

[35] This specification is based on two -10 dBm tones placed outside the PXIe-5693 preselector bandwidth such that the intermodulation distortion product occurs in band. This specification has a reference level of -5 dBm and is valid when the IF filter bandwidth is set to 5 MHz.

[36] This specification is based on two -30 dBm tones placed outside the PXIe-5693 preselector bandwidth such that the intermodulation distortion product occurs in band. This specification has a reference level of -25 dBm and is valid when the IF filter bandwidth is set to 5 MHz.

[37] This specification is based on a -5 dBm tone at the RF IN connector with a reference level of -5 dBm. This specification is valid when the IF filter bandwidth is set to 5 MHz and the receiver tune frequency is set to twice the source frequency.

[38] This specification is based on a -35 dBm tone at the RF IN connector with a reference level of -25 dBm. This specification is valid when the IF filter bandwidth is set to 5 MHz and the receiver tune frequency is set to twice the source frequency.

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Gain Compression

Table 17. PXIe-5693 Gain Compression Preselector Path (Nominal)

Center Frequency	Input Power at <1 dB Gain Compression (dBm)			
	23 °C ± 5 °C		0 °C to 55 °C	
	Preamp Disabled[39]	Preamp Enabled[40]	Preamp Disabled[39]	Preamp Enable[40]
>20 MHz to 2.5 GHz	+8	-17	+7	-18
>2.5 GHz to 3.6 GHz	+6	-17	+6	-18
>3.6 GHz to 7 GHz[17]	+6	-16	+5	-17

39 This measurement uses the two-tone desensitization method[41] with input referred at the power level, a reference level of 0 dBm, and the IF filter bandwidth set to 110 kHz. The tone frequency spacing is >1.5 times the instantaneous bandwidth.

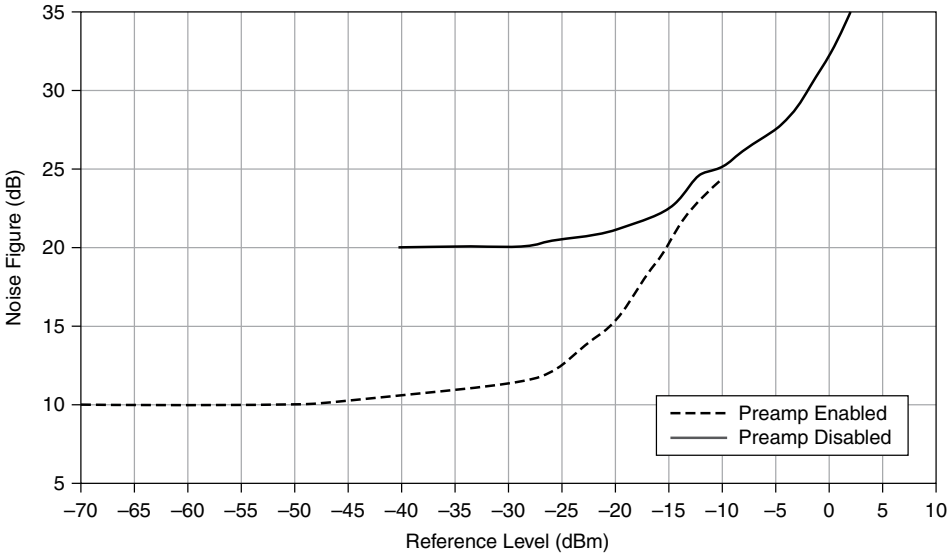
40 This measurement uses the two-tone desensitization method[41] with input referred at the power level, a reference level of -30 dBm, and the IF filter bandwidth set to 110 kHz. The tone frequency spacing is >1.5 times the instantaneous bandwidth.

41 The two-tone desensitization method places two tones within the PXIe-5693 preselector filter bandwidth with a tone spacing of 5 MHz.The lower amplitude tone power is set to -30 dBm. The amplitude variation of the lower amplitude cannot be >1 dB, because higher amplitude tone power is increased from low power to the input power at 1 dB of the *Gain Compression* specification.

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Dynamic Range

Figure 4. Noise Figure versus Reference Level (Nominal)[42]



[42] The center frequency is set to 1 GHz.

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Figure 5. In-Band Third-Order Intercept (TOI) versus Reference Level (Nominal)[42]

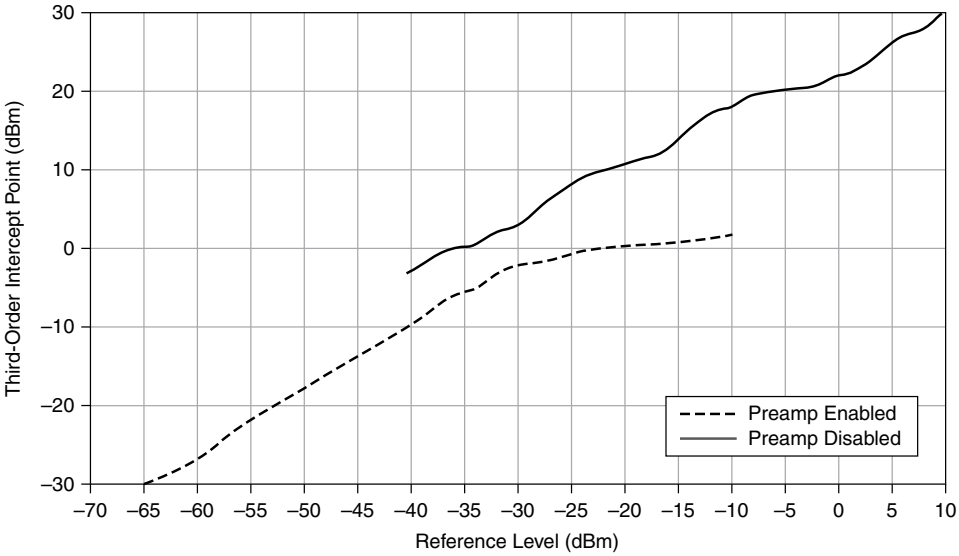
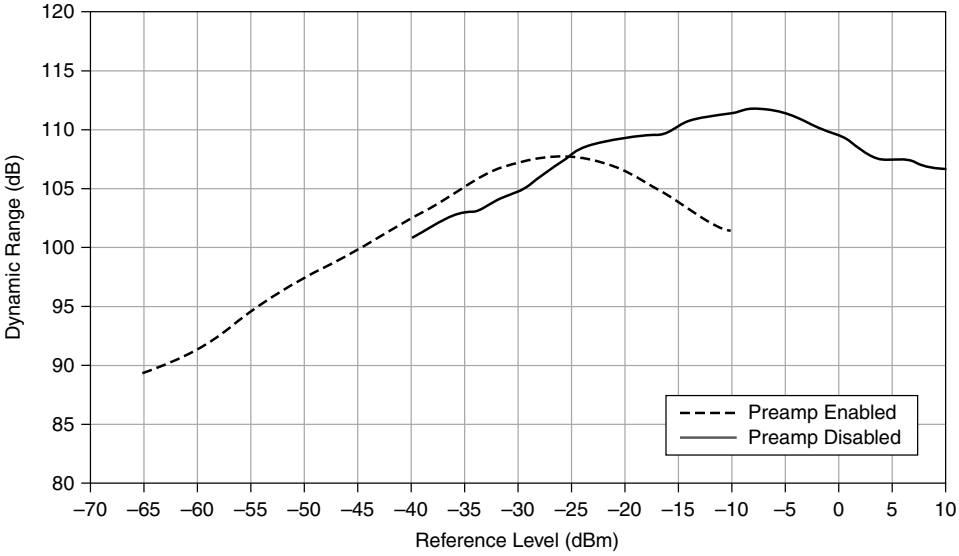


Figure 6. Dynamic Range versus Reference Level (Nominal)[43]



[43] The center frequency is set to 1 GHz. Dynamic range is defined by the following equation: *Dynamic Range* = 2/3 × (*TOI* + 174 - *Noise Figure)*.

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Measurement Speed

Table 18. Scan Rate of NI-RFSA Read Power Spectrum Mode (Nominal)[44]

Frequency Range	Instantaneous Bandwidth (MHz)	RBW (kHz)	Average Scan Rate (GHz/sec)
>20 MHz to 3.6 GHz	50	20	13
>20 MHz to 3.6 GHz	50	100	17
>20 MHz to 3.6 GHz	50	500	17
>20 MHz to 7 GHz[45]	50	20	12
>20 MHz to 7 GHz[45]	50	100	14
>20 MHz to 7 GHz[45]	50	500	16

Table 19. Scan Rate of NI-RFSA RF List Mode (Nominal)[46]

Frequency Range	Instantaneous Bandwidth (MHz)	RBW (kHz)	Average Scan Rate (GHz/sec)
>20 MHz to 3.6 GHz	50	20	30
>20 MHz to 3.6 GHz	50	100	32
>20 MHz to 3.6 GHz	50	500	32
>20 MHz to 7 GHz[45]	50	20	25
>20 MHz to 7 GHz[45]	50	100	30
>20 MHz to 7 GHz[45]	50	500	30

[44] This specification is based on using a PXIe-8133 Controller and PXIe-1075 Chassis. This specification is valid when the LO YIG main coil drive is set to fast and the FFT window type is set to 4-term blackman-harris.

[45] This specification is valid when disabling the PXIe-5605 RF Signal Downconverter preselector.

[46] This specification is based on acquiring I/Q data and converting it to power spectrum using the Spectral Measurements Toolkit and using a PXIe-8133 Controller and PXIe-1075 Chassis. This specification is valid when the frequency settling is set to 1.2 msec, the LO YIG main coil drive is set to fast, and the FFT window type is set to 4-term blackman-harris.

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Table 20. RF Configuration List Mode Tuning Time (Nominal)

Step Size	Tuning Time (ms)[47]	
	Fast Configuration	Normal Configuration
50 MHz	1.2	7.1
3.5 GHz	17.1	20.1

Input and Output Characteristics

PXIe-5693 RF IN

Connector	SMA female
Reference impedance	50 Ω
Maximum safe input power	
Preselector path	+30 dBm
Low-frequency bypass path, PXIe-5605, 0 dB RF attenuation	+10 dBm
Low-frequency bypass path, PXIe-5605, ≥10 dB RF attenuation	+25 dBm
Safe DC input voltage	
Preselector path	
Minimum	-25 V
Maximum	25 V
AC-coupled low-frequency bypass path	
Minimum	-25 V
Maximum	25 V
DC-coupled low-frequency bypass path	
Minimum	0 V
Maximum	0 V
VSWR	
Low-frequency bypass	<1.5 : 1, nominal

[47] *Tuning time* refers to tuning within a single band (i.e. 20 MHz to 3.6 GHz).

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Preselector path	
20 MHz to 950 MHz	<2.0 : 1, nominal
>950 MHz to 2 GHz	<2.6 : 1, nominal
>2 GHz to 3 GHz	<1.9 : 1, nominal

PXIe-5693 EXT FILTER IN/OUT

Connector	SMA female
Reference impedance	50 Ω
Safe DC input voltage	
Minimum	-25 V
Maximum	25 V
VSWR	<2.0 : 1, nominal

PXIe-5605 LO IN and LO OUT

Connector	SMA female
Reference impedance	50 Ω
Coupling	AC
LO IN maximum safe power level	+15 dBm
LO IN safe DC input voltage	
Minimum	-25 V
Maximum	25 V
LO OUT maximum safe power level	+15 dBm
LO OUT safe DC input voltage	
Minimum	0 V
Maximum	0 V
LO frequency	
LO1	4.6 GHz to 8.3 GHz
LO2	4.0 GHz
LO3	800 MHz
LO output level	
LO1	+5 dBm to +12 dBm, nominal (varies with frequency)
LO2	+9 dBm, nominal
LO3	+9 dBm, nominal

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PXIe-5694 REF/LO IN

Connector	SMA female
Reference impedance	50 Ω
Frequency	
REF	10 MHz, ±5 ppm
LO	215 MHz, nominal
Safe DC input voltage	
Minimum	-12 V
Maximum	12 V
VSWR (10 MHz, 215 MHz)	<2:1, nominal
Operating power	
REF	10 dBm ± 1 dBm
LO	10 dBm ± 1 dBm

PXIe-5694 REF OUT

Connector	SMA female
Reference impedance	50 Ω
Frequency	10 MHz
Safe DC input voltage	
Minimum	-12 V
Maximum	12 V
VSWR	<2:1, nominal
Output power	10 dBm ± 1 dBm

PXIe-5694 LO OUT

Connector	SMA female
Reference impedance	50 Ω
Frequency	215 MHz
Safe DC input voltage	
Minimum	-12 V
Maximum	12 V
VSWR	<2:1, nominal
Output power	10 dBm ± 1 dBm

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Physical Characteristics

Power Requirements

Table 21. PXIe-5667 Power Requirements (Nominal)

Module	Power Requirements (Voltages ± 5%)	
	From +3.3 VDC	From +12 VDC
PXIe-5693	1.30 A (4.29 W)	0.85 A (10.2 W)
PXIe-5653	1.10 A (3.63 W)	4.00 A (48.0 W)
PXIe-5605	1.20 A (3.96 W)	3.40 A (40.8 W)
PXIe-5694	1.31 A (4.32 W)	1.40 A (16.8 W)
PXIe-5622	1.75 A (5.78 W)	2.25 A (27.0 W)

Dimensions and Weight

PXIe-5693	
Dimensions	3U, one slot, PXI Express module 21.6 cm × 2.0 cm × 13.0 cm (8.5 in. × 0.8 in. × 5.1 in.)
Weight	465 g (16.4 oz)
PXIe-5653	
Dimensions	3U, two slot, PXI Express module 21.6 cm × 4.0 cm × 13.0 cm (8.5 in. × 1.6 in. × 5.1 in.)
Weight	1,076 g (37.8 oz)
PXIe-5605	
Dimensions	3U, four slot, PXI Express module 21.6 cm × 8.0 cm × 13.0 cm (8.5 in. × 3.2 in. × 5.1 in.)
Weight	1,882 g (66.4 oz)

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PXIe-5694	
Dimensions	3U, one slot, PXI Express module 21.6 cm × 2.0 cm × 13.0 cm (8.5 in. × 0.8 in. × 5.1 in.)
Weight	465 g (16.4 oz)
PXIe-5622	
Dimensions	3U, one slot, PXI Express module 21.6 cm × 2.0 cm × 13.0 cm (8.5 in. × 0.8 in. × 5.1 in.)
Weight	376 g (13.3 oz)

Environment

Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

Operating Environment

Ambient temperature range	0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)

Storage Environment

Ambient temperature range	-40 °C to 71 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range	5% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56.)

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Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)
Random vibration	
Operating	5 Hz to 500 Hz, 0.3 g_{rms} (Tested in accordance with IEC 60068-2-64.)
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC 60068-2-64. Test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Compliance and Certifications

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

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Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations, certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit *ni.com/certification*, search by model number or product line, and click the appropriate link in the Certification column.

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