

NI PXI-565X RF Signal Generator Specifications

This document lists specifications for NI PXI-565X RF Signal Generators. Minimum or maximum specifications are warranted under the following conditions:

- 30 minutes warm-up time at ambient temperature
- Calibration cycle maintained
- Temperature 0 °C to 55 °C unless otherwise noted.

Typical values are used to define an average unit measured at ambient temperatures of 15 °C to 35 °C. Specifications that do not list a tolerance are typical values unless otherwise specified. Tolerance values represent the maximum variation that will be observed.

Frequency

Range

PXI-5650..... 500 kHz* to 1.3 GHz

PXI-5651..... 500 kHz* to 3.3 GHz

PXI-5652..... 500 kHz* to 6.6 GHz

*Tunable down to 100 kHz with amplitude uncalibrated.

Resolution

Frequency	Step Size
500 kHz to 1.3 GHz	<1 Hz
1.3 GHz to 3.3 GHz	<2 Hz
3.3 GHz to 6.6 GHz	<4 Hz

Accuracy

Refer to the *Reference Clock* section.

Settling Time

0.1 ppm of final frequency..... <5 ms

0.01 ppm of final frequency..... <20 ms

Reference Clock

Internal Clock

Initial accuracy ±3 ppm max.

Temperature (15 °C to 35 °C) ±1 ppm max.

Aging ±5 ppm/year max.

Internal Reference Output

Frequency 10 MHz

Amplitude 1 V_{pk-pk} into 50 Ω

Coupling AC

Output impedance 50 Ω

External Reference Input

Frequency 10 MHz ±10 ppm

Amplitude 0.2 V_{pk-pk} to 1.5 V_{pk-pk}
into 50 Ω

Input impedance 50 Ω

Lock time to external reference..... <1 s

Spectral Purity

SSB Phase Noise at 10 kHz Offset

Frequency	Phase Noise
100 MHz	<-125 dBc/Hz
500 MHz	<-112 dBc/Hz
1 GHz	<-105 dBc/Hz
2 GHz	<-98 dBc/Hz
3 GHz	<-95 dBc/Hz
4 GHz	<-93 dBc/Hz
5 GHz	<-90 dBc/Hz
6.6 GHz	<-90 dBc/Hz

Jitter (seconds, rms) at 0 dBm Output Power

622 MHz with 1 kHz to

5 MHz jitter BW<200 fs typical

2.488 GHz with 5 kHz to

15 MHz jitter BW<50 fs typical



Note Refer to Figures 1 through 3 for phase noise plots.

Residual FM (300 Hz to 3 kHz, CCITT, rms)

Frequency	Residual FM
1.0 GHz	<0.8 Hz rms
2.4 GHz	<1.5 Hz rms

Phase Noise Measurements at 0 dBm Output Power

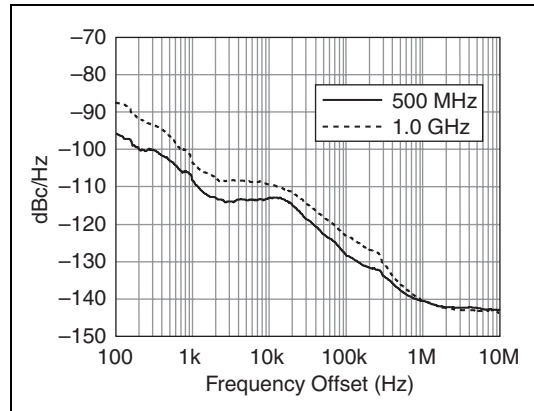


Figure 1. Phase Noise at 500 MHz and 1.0 GHz

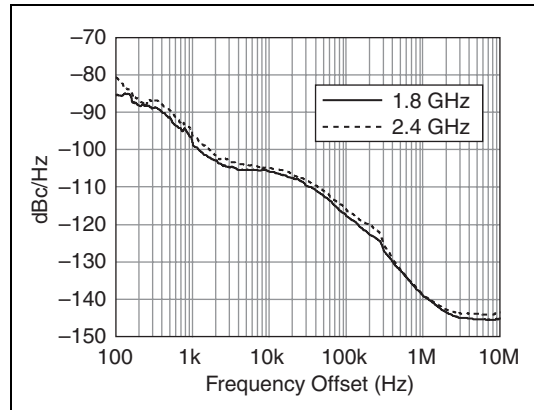


Figure 2. Phase Noise at 1.8 GHz and 2.4 GHz

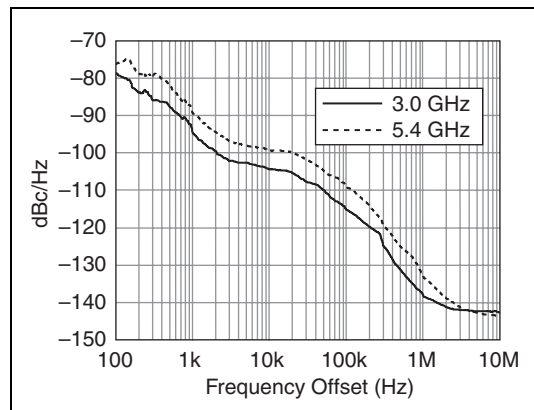


Figure 3. Phase Noise at 3.0 GHz and 5.4 GHz

Harmonics at ≤ 0 dBm Output Power

Frequency	Harmonic (typical)
500 kHz to 1.3 GHz	-15 dBc
1.3 GHz to 3.3 GHz	-25 dBc
3.3 GHz to 6.6 GHz	-20 dBc

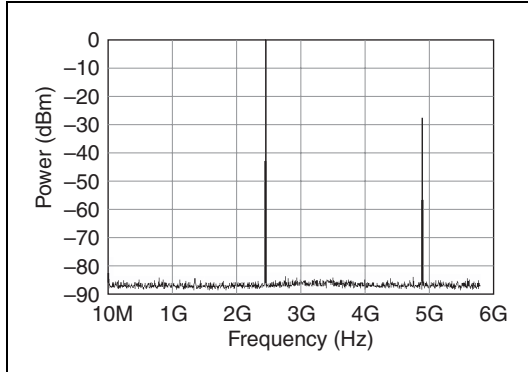


Figure 4. Spectrum at 2.45 GHz

Nonharmonics at ≤ 0 dBm Output Power

Table 1. Nonharmonic Products

Frequency	>1 kHz offset	>100 kHz offset
500 kHz to 50 MHz	<-65 dBc	<-75 dBc
50 MHz to 3.3 GHz	<-65 dBc	<-70 dBc
3.3 GHz to 6.6 GHz	<-50 dBc	<-65 dBc

Table 2. Subharmonic Products

Frequency	Subharmonic Products
500 kHz to 3.3 GHz	Not applicable*
3.3 GHz to 4 GHz	<-30 dBc
4 GHz to 6.6 GHz	<-25 dBc

*No harmonic multiplication in this band.

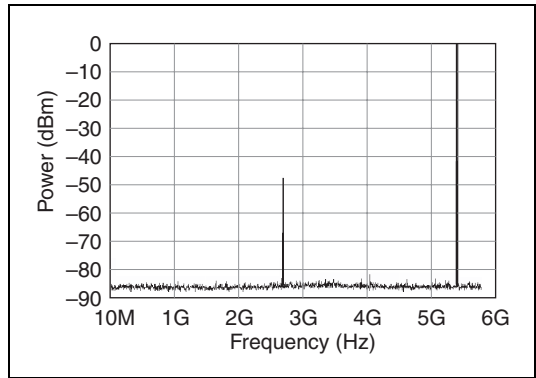


Figure 5. Spectrum at 5.4 GHz (Subharmonic at 2.7 GHz)

Amplitude

Resolution.....<0.1 dB

Range

Frequency	Amplitude
500 kHz to 10 MHz	-100 dBm to 5 dBm
10 MHz to 500 MHz	-100 dBm to 10 dBm
500 MHz to 1.3 GHz	-90 dBm to 10 dBm
1.3 GHz to 1.6 GHz	-90 dBm to 10 dBm
1.6 GHz to 2.9 GHz	-80 dBm to 10 dBm
2.9 GHz to 3.3 GHz	-70 dBm to 10 dBm
3.3 GHz to 3.7 GHz	-60 dBm to 7 dBm
3.7 GHz to 5.0 GHz	-50 dBm to 7 dBm
5.0 GHz to 6.6 GHz	-50 dBm to 0 dBm

Maximum available power.....Typically 3 dB above maximum specified amplitude

Minimum available powerTypically 10 dB below minimum specified amplitude

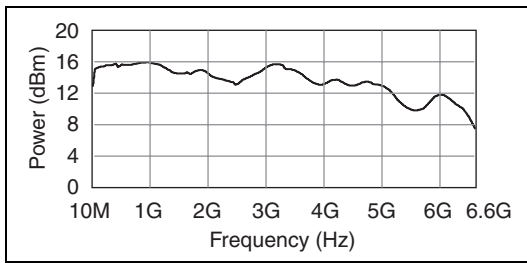


Figure 6. Typical Available Power

Power Level Accuracy (15 °C to 35 °C)

Less than 3.3 GHz

- > 40 dBm±0.75 dB
- ≤ 40 dBm±1.8 dB

Greater than 3.3GHz

- > 40 dBm±1.0 dB
- ≤ 40 dBm±2.0 dB

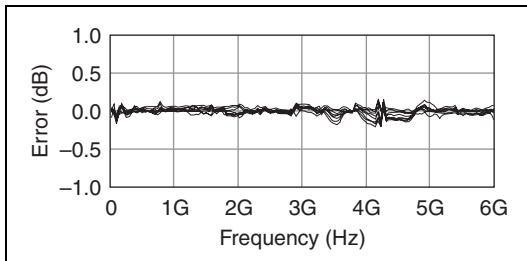


Figure 7. Typical Power Accuracy, -40 to 0 dBm, 5 dB Steps

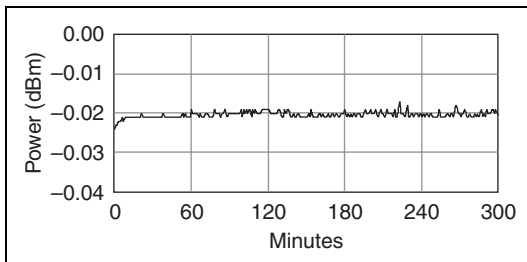


Figure 8. Typical Power (0 dBm) at 2.4 GHz Over Time¹

Amplitude Settling Time

0.25 dB of final value<10 ms typical

0.05 dB of final value<500 ms typical

Signal to Noise Ratio

≥0 dBm output power<-140 dBc/Hz typical

VSWR

500 kHz to 3.3 GHz <1.8:1 typical

3.3 GHz to 6.6 GHz <2.0:1 typical

Output impedance 50 Ω

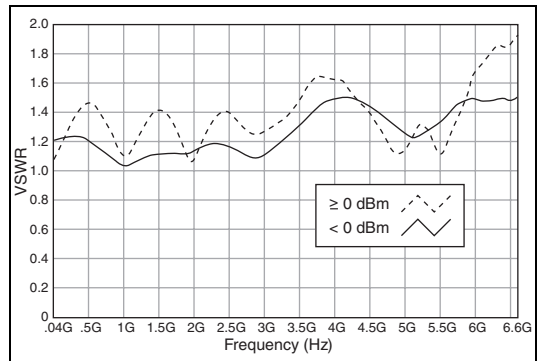


Figure 9. Typical VSWR

Reverse Power Handling

RF 2 Watts

DC 25 Volts

Modulation

Frequency Modulation (FM)

Modulation waveform types Sine, triangle, square

External modulation source Not supported

Frequency Range	Maximum Deviation (Sine Wave)
500 kHz to <50 MHz	500 kHz
≥50 MHz to <100 MHz	125 kHz
≥100 MHz to <200 MHz	250 kHz
≥200 MHz to <400 MHz	500 kHz
≥400 MHz to <800 MHz	1 MHz
≥800 MHz to <1.6 GHz	2 MHz
≥1.6 GHz to <3.3 GHz	4 MHz
≥3.3 GHz to <6.6 GHz	8 MHz

¹ Calling niRFSG Perform Thermal Correction once/minute.

Modulation waveform frequency¹ 1 Hz to 100 kHz
 Deviation accuracy² $\pm 3.5\%$
 Distortion² $< 0.1\%$
 SINAD² > 65 dB

Frequency Shift Keying (FSK)

Modulation waveform types
 PRBS 5 to 31-order
 User defined Up to 1020 bit
 Modulation format 2-FSK

Frequency Range	Maximum Deviation
500 kHz to < 50 MHz	250 kHz
≥ 50 MHz to < 100 MHz	31.25 kHz
≥ 100 MHz to < 200 MHz	62.5 kHz
≥ 200 MHz to < 400 MHz	125 kHz
≥ 400 MHz to < 800 MHz	250 kHz
≥ 800 MHz to < 1.6 GHz	500 kHz
≥ 1.6 GHz to < 3.3 GHz	1 MHz
≥ 3.3 GHz to < 6.6 GHz	2 MHz

FSK deviation accuracy (100 kHz rate, 10% of maximum deviation) $\pm 10\%$
 Symbol rate 763 Hz to 100 kHz
 Pulse shaping Not supported

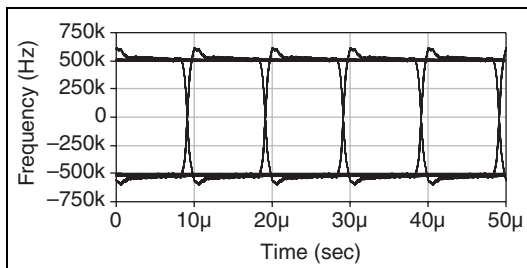


Figure 10. FSK Modulation Eye Diagram, 1.0 GHz Carrier, 100 kHz Symbol Rate, 500 kHz Deviation, 9th order PRBS

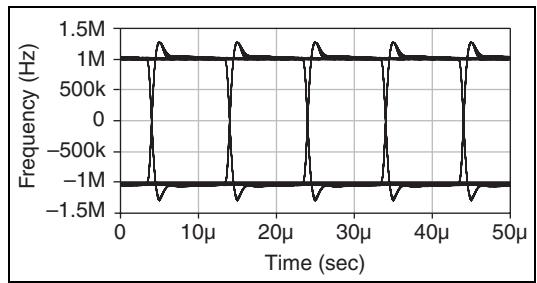


Figure 11. FSK Modulation Eye Diagram, 2.4 GHz Carrier, 100 kHz Symbol Rate, 1.0 MHz Deviation, 9th order PRBS

On Off Keying (OOK)

Modulation waveform types 5 to 31-order PRBS
 Power level
 < 10 MHz Typically 7 dBm below maximum specified amplitude
 > 10 MHz Typically 10 dBm below maximum specified amplitude
 Symbol rate 153 Hz to 100 kHz
 Pulse shaping Not supported

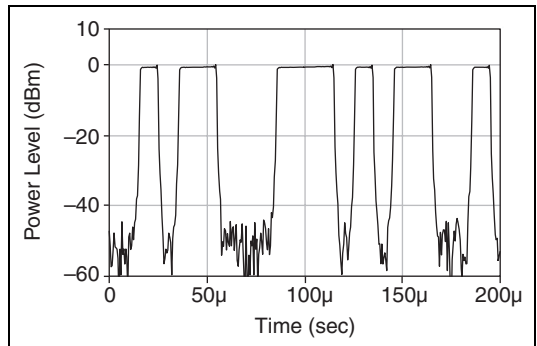


Figure 12. OOK Diagram, 1.0 GHz Carrier, 100 kHz Symbol Rate, 9th order PRBS

¹ Settable frequencies are given by $50 \text{ MHz}/k$, where k is an even integer up to 2^{26} .

² 1 kHz sine wave, 10% of maximum deviation; noise bandwidth of 10 kHz.

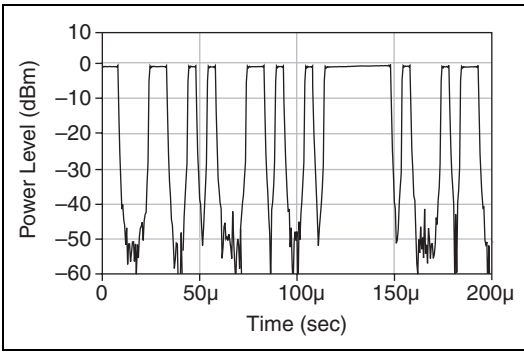


Figure 13. OOK Diagram,
1.0 GHz Carrier, 200 kHz Symbol Rate, 9th order PRBS

DC Power Requirements

Voltage (V _{DC})	Maximum Current (A)	Typical Current (A)
+3.3	0.50	0.40
+5	0.70	0.50
+12	0.55	0.52
-12	0.09	0.08

Calibration

Interval.....1 year

Physical Dimensions

NI PXI-565X module3U, One Slot, PXI/cPCI
2.0 × 13.0 × 21.6 cm
(0.8 × 5.1 × 8.5 in.)

Weight415 g (14.6 oz)

Environment

Maximum altitude2,000 m (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.)

Relative humidity range..... 10 % to 90 %,
noncondensing (Tested
in accordance with
IEC-60068-2-56.)

Storage Environment

Ambient temperature range -40 °C to 70 °C (Tested
in accordance with
IEC-60068-2-1 and
IEC-60068-2-2.)

Relative humidity range..... 5 % to 95 %,
noncondensing (Tested
in accordance with
IEC-60068-2-56.)

Shock and Vibration

Nonoperational shock 30 g peak, half-sine,
11 ms pulse (Tested in
accordance with
IEC-60068-2-27.
Test profile developed
in accordance with
MIL-PRF-28800F.)

Random vibration
nonoperating 5–500 Hz, 2.4 g_{rms}
(Tested in accordance
with IEC-60068-2-64.
Nonoperating test profile
exceeds the requirements
of MIL-PRF-28800F,
Class 3.)

Specifications subject to change without notice.

Safety

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

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



Note For UL and other safety certifications, refer to the product label, or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions EN 55011 Class A at 10 m.
FCC Part 15A above 1 GHz

Immunity EN 61326:1997+A2:2001

CE, C-Tick, and FCC part 15 (Class A) compliant



Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European directives, as amended for CE marking, as follows:

Low-voltage directive (safety) 73/23/EEC

Electromagnetic compatibility
directive (EMC) 89/336/EEC



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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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