

# DEVICE SPECIFICATIONS

## Phase Matrix PXI-1470

### 26.5 GHz PXI Vector Signal Analyzer

This document lists specifications for the Phase Matrix PXI-1470 26.5 GHz vector signal analyzer (VSA).

The PXI-1470 26.5 GHz VSA comprises the following modules:

- PXI-1410 preselector
- PXI-1420 microwave (MW) downconverter
- PXI-1430C RF downconverter
- PXI-1450B local oscillator
- NI PXIe-5622 high-speed digitizer



**Note** There is no physical device named PXI-1470.

Phase Matrix warrants the PXI-1470 to meet its published specifications if the individual modules are calibrated and operating within specifications.

Specifications are warranted under the following conditions, unless otherwise noted:

- 20 minutes warm-up time.
- Calibration cycle is maintained.
- Chassis fan speed is set to High. In addition, Phase Matrix recommends using slot blockers and EMC filler panels in empty module slots to minimize temperature drift.
- NI-RFSA 2.9 instrument driver is used.
- Operating systems: Windows 8.1/8/7/Vista with all available critical updates and service packs
- Processor speed: Intel i5 or equivalent
- Modules are connected with NI cables as shown in the *Phase Matrix PXI-1470 Getting Started Guide*.

*Specifications* describe the warranted, traceable product performance over ambient temperature ranges of 0 °C to 55 °C, unless otherwise noted.

*Typical* values describe useful product performance beyond specifications that are not covered by warranty and do not include guardbands for measurement uncertainty or drift. Typical values may not be verified on all units shipped from the factory. Unless otherwise noted, typical values cover the expected performance of units over ambient temperature ranges of 23 °C ±5 °C with a 90% confidence level, based on measurements taken during development or production.

*Nominal* values (or supplemental information) describe additional information about the product that may be useful, including expected performance that is not covered under *Specifications* or *Typical* values. Nominal values are not covered by warranty.

Specifications are subject to change without notice. For the most recent device specifications, visit [ni.com/manuals](http://ni.com/manuals).



**Caution** Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for important safety and electromagnetic compatibility information. To obtain a copy of this document online, visit [ni.com/manuals](http://ni.com/manuals) and search for the document title.



**Caution** To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

## Frequency

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Frequency range..... 50 MHz to 26.5 GHz

### Analysis Bandwidth<sup>1</sup>

Maximum analysis bandwidth (3 dB, typical)

50 MHz to <250 MHz..... 10 MHz

250 MHz to 26.5 GHz..... 50 MHz

>2.85 GHz with preselector yttrium-iron  
garnet tunable filter (YTF) enabled ..... 40 MHz

### Streamed Analog Bandwidth

Maximum streamed analog bandwidth (3 dB, typical)

50 MHz to <250 MHz..... 10 MHz

250 MHz to 26.5 GHz..... 50 MHz

>2.85 GHz with preselector  
YTF enabled ..... 40 MHz

### Resolution Bandwidth

Minimum ..... 100 Hz

Maximum..... 50 MHz (refer to *Analysis Bandwidth*)

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<sup>1</sup> Instantaneous, single-shot capture bandwidth where no LO tuning and/or tiling is required.

# Frequency Reference

## Internal Frequency Reference

REF OUT frequency.....	10 MHz, nominal
Amplitude.....	0 dBm $\pm$ 3 dB, nominal
Aging.....	$\pm$ 1.0 ppm/year after 30 days of operation
Temperature stability.....	$\pm$ 0.5 ppm
Impedance.....	50 $\Omega$ , nominal
REF OUT connector.....	SMB (f)

## External Frequency Reference Input

REF IN lock frequency range.....	10 MHz $\pm$ 2 ppm
REF IN level range.....	0 dBm $\pm$ 4 dBm, nominal
Impedance.....	50 $\Omega$ , nominal
REF IN connector.....	SMB (f)

## Frequency Span

Minimum frequency span.....	7.325 kHz
Maximum frequency span.....	Full span

# Amplitude

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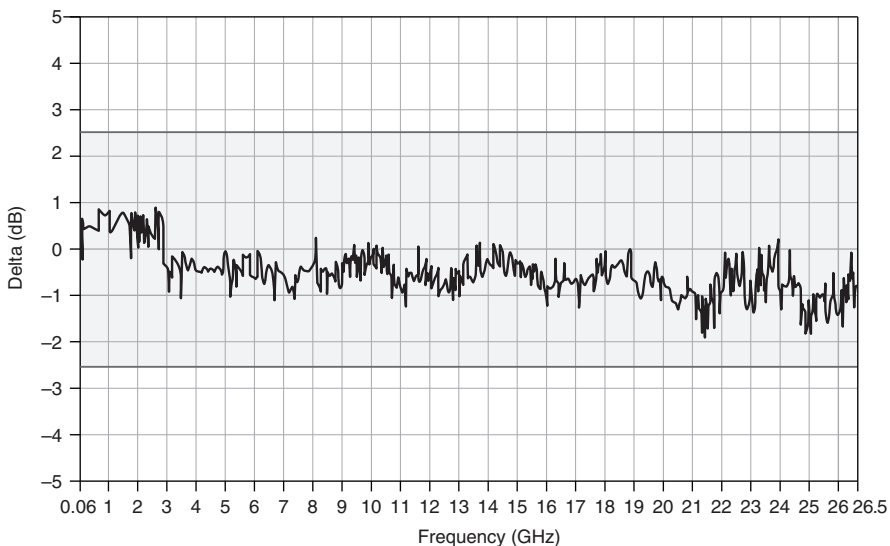
## Amplitude Range

Amplitude range.....	+30 dBm to noise floor (DANL)
Maximum safe input level (at RF IN).....	+30 dBm (1 W)
RF IN attenuator range.....	0 dB to 70 dB in 10 dB steps, mechanical type

## Absolute Amplitude Accuracy

Absolute amplitude accuracy at -20 dBm RF IN (preselector YTF disabled)	
Uncorrected (BW <10 MHz)	
50 MHz to 2.85 GHz.....	$\pm$ 2 dB
>2.85 GHz to 26.5 GHz.....	$\pm$ 2.5 dB
Absolute amplitude accuracy at -20 dBm RF IN (preselector YTF enabled, RF IN >2.85 GHz)	
Uncorrected.....	$\pm$ 3 dB, typical

**Figure 1.** Frequency Response, Uncorrected, Preselector YTF Disabled



## Displayed Average Noise Level (DANL)

Preselector YTF disabled

50 MHz to 8.8125 GHz.....-158 dBm/Hz

>8.8125 GHz to 26.5 GHz.....-147 dBm/Hz

Preselector YTF enabled

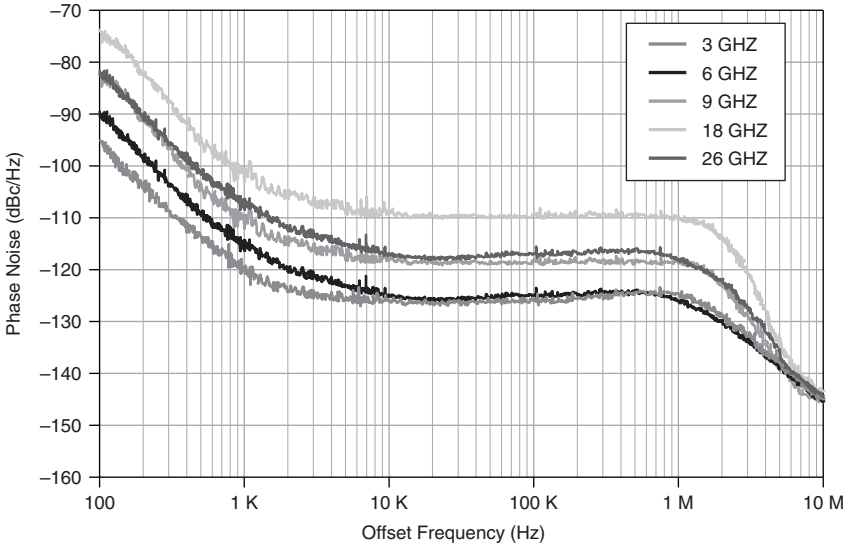
2.85 GHz to 8.8125 GHz .....-146 dBm/Hz

>8.8125 GHz to 26.5 GHz.....-142 dBm/Hz

# Phase Noise

Phase noise (at 10 GHz, 10 kHz)..... -115 dBc/Hz, nominal

**Figure 2.** Residual Local Oscillator Phase Noise, Nominal (Phase Noise Only)



# Spurious Responses

## Residuals/Images/Spurious Responses

Residuals (input terminated, 0 dB step attenuation) ..... -100 dBm maximum

Input-related spurious 50 MHz to 2.85 GHz

<100 kHz offset from carrier ..... <-70 dBc, typical

<10 MHz offset from carrier ..... <-60 dBc, typical

Input-related spurious >2.85 GHz to 26.5 GHz

<100 kHz offset from carrier ..... <-63 dBc, typical

<10 MHz offset from carrier ..... <-60 dBc, typical

Input-related image spurious

≤2.85 GHz ..... <-60 dBc, typical

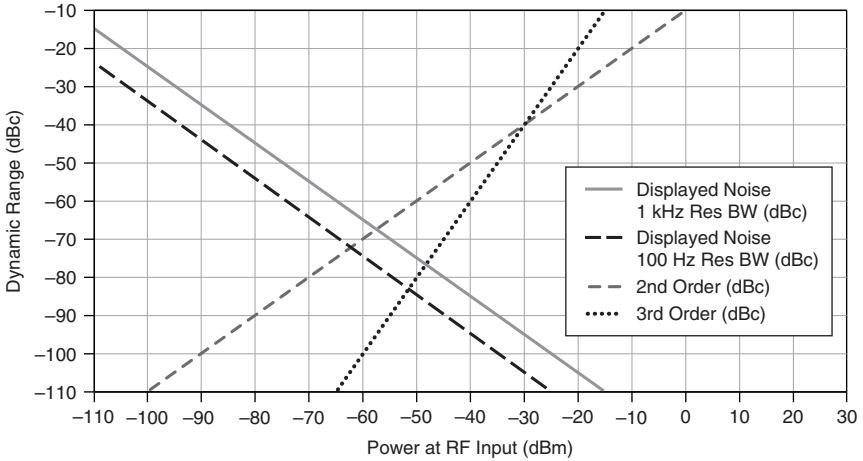
>2.85 GHz ..... <-70 dBc, typical

Local oscillator leakage to RF IN port

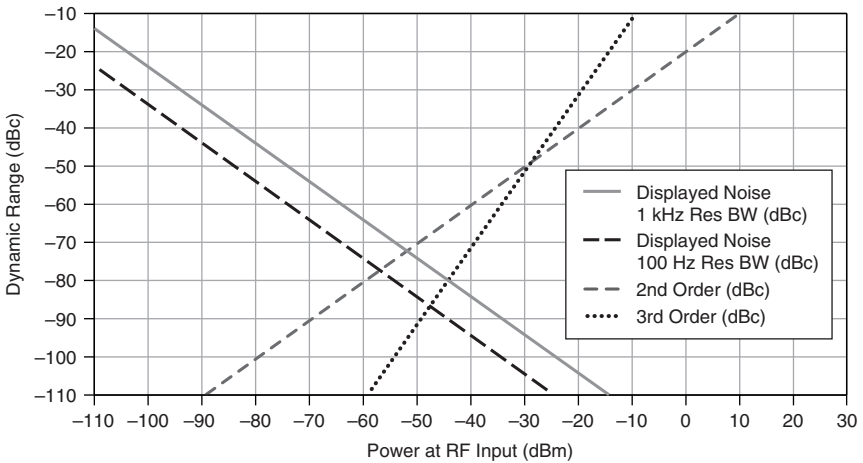
- <2.85 GHz.....<-60 dBm, typical
- >2.85 GHz preselector YTF disabled .....<-60 dBm, typical
- >2.85 GHz preselector YTF enabled .....<-80 dBm, typical

IIP3<sup>1</sup> .....-10 dBm, minimum

**Figure 3.** Dynamic Range 50 MHz to 2.85 GHz (PXI-1430C Related)



**Figure 4.** Dynamic Range 2.85 to 26.5 GHz (PXI-1420B Related)



<sup>1</sup> Two -40 dBm RF input tones, spaced 10 MHz apart, referenced to RF IN on the PXI-1410A preselector module.

# Modulation

## Measurement Accuracy

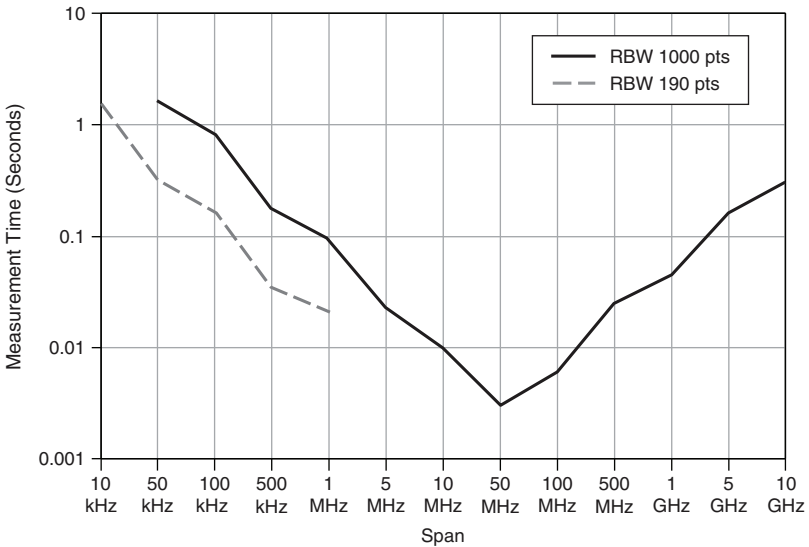
Supported standards with NI-RFSA and

WLAN Analysis software ..... WLAN 802.11a/b/g/j/p, WCDMA, 3 GPP/LTE, GSM/EDGE

Residual EVM ..... <-40 dB (1%) at 50 MHz bandwidth, maximum; -20 dBm to +5 dBm RF IN; 2.4 GHz/5.8 GHz, 64 QAM (WLAN 802.11g), nominal

## Measurement Speed

**Figure 5. PXI-1470 Measurement Time vs. Span<sup>1</sup>**



Center frequency tune and transfer..... 8 ms, nominal

<sup>1</sup> Analysis time versus span was measured with tuned frequencies greater than 100 MHz and 1,000 frequency points. For spans <1 MHz, both 1,000 and 190 frequency points are shown. Analysis time includes acquisition, FFT analysis, and data transfer time. For spans >50 MHz, analysis time includes tuning time with the preselector YTF disabled. This measurement was taken using an Intel® Core™ Duo processor-based PC at 3.06 GHz.

# Time and Triggering

Internal storage<sup>1</sup> ..... 256 MB  
Sweep trigger modes ..... Disable, software edge, digital edge, and I/Q power edge

# Input and Output Characteristics

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## RF IN Front Panel Connector

Connector ..... SMA (f), 27 GHz type  
Impedance ..... 50  $\Omega$ , nominal  
Coupling ..... A/C  $\pm$  5 VDC, maximum  
Maximum safe input level (at RF IN) ..... +30 dBm (1 W)

## Input Voltage Standing Wave Ratio (VSWR)

VSWR ( $\geq$ 10 dB input attenuation)  
50 MHz to 2.85 GHz ..... 1.4:1 -16 dB return loss max  
>2.85 GHz to 26.5 GHz ..... 2.0:1 -10 dB return loss max

# Power Requirements

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**Table 1.** Power Requirements (Voltages  $\pm$ 5%)

Module	From +3.3 VDC	From +5 VDC	From +12 VDC	From -12 VDC	Total Power
PXI-1410	0.1 A	0.6 A	1.3 A	0.5 A	25 W max
PXI-1420	0.1 A	0.1 A	0.9 A	0.1 A	11 W max
PXI-1430C	0.1 A	0.5 A	1.1 A	0.0 A	16 W max
PXI-1450B	0.5 A	0.5 A	0.8 A	0.1 A	16 W max
NI PXIe-5622	1.75 A	0.0 A	2.25 A	0.0 A	33 W max

# Calibration

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Calibration interval ..... 1 year

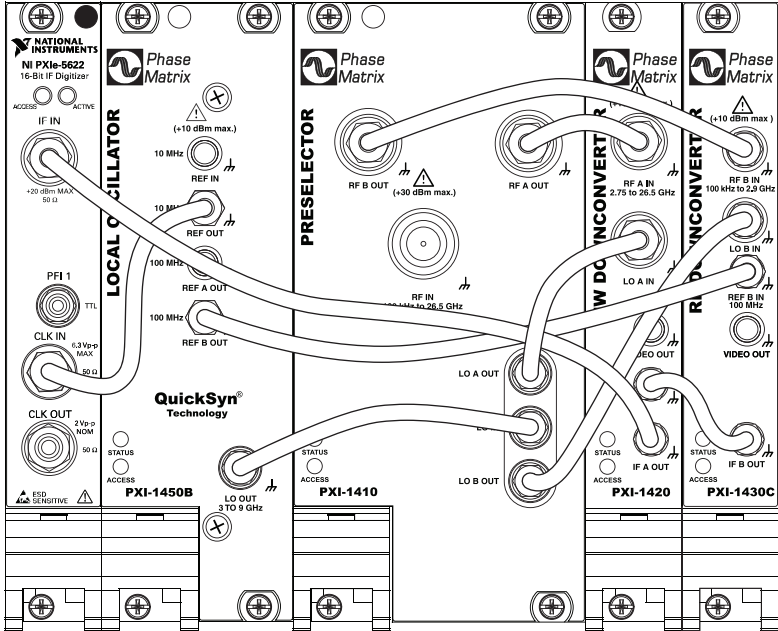
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<sup>1</sup> You can stream data at full rate to the host PC to allow for acquisitions much larger than the internal 256 MB storage limit.



# Physical Characteristics

**Figure 6. PXI-1470 26.5 GHz VSA System Front Panel**



## Physical Dimensions

### PXI-1410

Size ..... 3U, three slot, PXI/cPCI module,  
21.6 cm × 6.0 cm × 13.0 cm,  
(8.5 in. × 2.4 in. × 5.1 in.)

Weight..... 1.6 kg (3.5 lb)

### PXI-1420

Size ..... 3U, one slot, PXI/cPCI module,  
21.6 cm × 2.0 cm × 13.0 cm,  
(8.5 in. × 0.8 in. × 5.1 in.)

Weight..... 0.5 kg (1.1 lb)

### PXI-1430C

Size ..... 3U, one slot, PXI/cPCI module,  
21.6 cm × 2.0 cm × 13.0 cm,  
(8.5 in. × 0.8 in. × 5.1 in.)

Weight..... 0.5 kg (1.1 lb)

## PXI-1450B

Size.....3U, two slot, PXI/cPCI module,  
21.6 cm × 4.0 cm × 13.0 cm,  
(8.5 in. × 1.6 in. × 5.1 in.)

Weight.....0.9 kg (2 lb)

## NI PXIe-5622

Size.....3U, one slot, PXIe/cPCI module,  
21.6 × 2.0 × 13.0 cm,  
(8.5 in. × 0.8 in. × 5.1 in.)

Weight.....0.4 kg (0.9 lb)

## Combined Unit

Size.....21.6 × 16.0 × 13.0 cm, (8.5 × 6.4 × 5.1 in.)

Weight.....3.9 kg (8.6 lb)

# Environment

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Maximum Altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree .....2

Indoor use only.

## Operating Environment

Ambient temperature range .....0 °C to 55 °C

Relative humidity range.....10% to 90%, noncondensing

## Storage Environment

Ambient temperature range .....-40 °C to 70 °C

Relative humidity range.....5% to 95%, noncondensing

# Compliance and Certifications

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## 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

## 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



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

## CE Compliance

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

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

## Online Product Certification

To obtain product certifications and the DoC for this product, visit [ni.com/certification](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

# 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 *Minimize Our Environmental Impact* web page at [ni.com/environment](http://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.

## Waste Electrical and Electronic Equipment (WEEE)



**EU Customers** At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit [ni.com/environment/weee](http://ni.com/environment/weee).

## 电子信息产品污染控制管理办法（中国 RoHS）



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## Battery Replacement and Disposal



**Battery Directive** This device contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized National Instruments service representative. For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste Batteries and Accumulators, visit [ni.com/environment/batterydirective](http://ni.com/environment/batterydirective).

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