

# NI USB-5680 RF Power Meter Specifications

This document lists specifications for the NI USB-5680 RF power meter. Minimum or maximum specifications are warranted under the following conditions:

- 1 hour warm-up time at ambient temperature
- Calibration cycle maintained
- Temperature 0 to 55 °C unless otherwise noted

Typical values are used to define a non-warranty specification that at least 68 percent of units exhibit at ambient temperatures of 15 to 35 °C.

Specifications that do not list tolerance values are typical values unless otherwise specified. Tolerance values represent the maximum variation.

Specifications subject to change without notice. For the most recent NI 5680 specifications, visit [ni.com/manuals](http://ni.com/manuals).

## General

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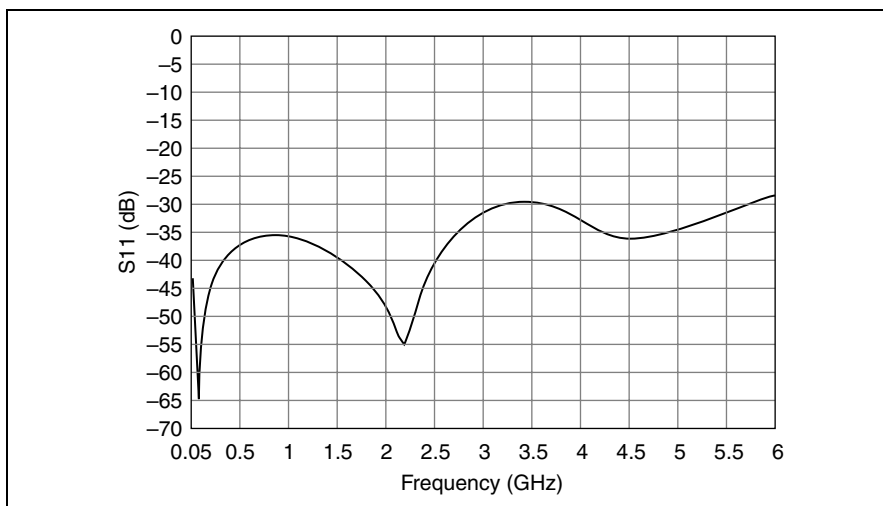
Frequency range ..... 50 MHz to 6 GHz

Dynamic range ..... -40 to +23 dBm

Input return loss

50 MHz to <2 GHz ..... <-26 dB

2 to 6 GHz ..... <-20 dB



**Figure 1.** Power Meter Return Loss, Typical

Measurement range

Measurement range 1 .....-40 to <-5 dBm

Measurement range 2 .....-5 to +23 dBm

**Table 1.** Averaging, Low-Aperture Time Mode

Input Power (dBm)	Input Power (mW)	Number of Reads to Average for <±0.10 dB Noise	Number of Reads to Average for <±0.01 dB Noise
>10	>10.0	1	1
5	3.2	1	2
0	1.0	1	16
-5	0.32	1	78
-10	0.10	1	1
-15	0.032	1	1
-20	0.010	1	7
-25	0.0032	1	61
-30	0.0010	7	—
-35	0.00032	62	—
-40	0.00010	—	—

**Table 2.** Averaging, High-Aperture Time Mode

<b>Input Power (dBm)</b>	<b>Input Power (mW)</b>	<b>Number of Reads to Average for &lt;±0.10 dB Noise</b>	<b>Number of Reads to Average for &lt;±0.01 dB Noise</b>
>0	>1.00	1	1
–5	0.32	1	5
–10	0.10	1	1
–15	0.032	1	1
–20	0.010	1	1
–25	0.0032	1	4
–30	0.0010	1	38
–35	0.00032	4	—
–40	0.00010	39	—

Signal-channel bandwidth..... 100 Hz

## Uncertainty

### Linearity

Power level <18 dBm ..... ±0.13 dB

Power level ≥18 dBm ..... ±0.18 dB

Calibration factor<sup>1</sup> ..... ±0.06 dB

### Noise<sup>2</sup>

<b>Input Power Measurement Range</b>	<b>Low-Aperture Time Mode</b>	<b>High-Aperture Time Mode</b>
–40 to <–5 dBm	<2.5 nW	<1.3 nW
–5 to +23 dBm	<0.6 μW	<1.7 μW

<sup>1</sup> Expanded uncertainty with coverage factor K=2 for absolute power measurements on continuous wave (CW) signal at 0 dBm calibration level over a 50 MHz to 6 GHz frequency range.

<sup>2</sup> Expanded uncertainty with coverage factor K=2 after zero operation for a five-minute measurement incorporating 128 averaged values. Includes effect of noise and zero offset.

#### Zero set<sup>1</sup>

–40 to <–5 dBm .....	<10 nW
–5 to +23 dBm .....	<1.7 $\mu$ W

#### Zero drift<sup>1</sup>

–40 to <–5 dBm .....	<3.0 nW
–5 to +23 dBm .....	<0.5 $\mu$ W

#### Temperature compensation<sup>2,3</sup>

0 to 50 °C .....	$\pm$ 0.06 dB
20 to 30 °C .....	0 dB

#### Effect of digital modulation

Power level <18 dBm .....	$\pm$ 0.02 dB
Power level $\geq$ 18 dBm .....	$\pm$ 0.10 dB

## System

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Measurement ..... True root mean square/  
Average power

Measurement resolution ..... 0.01 dB

Offset range .....  $\pm$ 100 dB

Averaging range<sup>4</sup> ..... 1 to 256

#### Measurement speed

Low-aperture time mode ..... 15 measurements per second

High-aperture time mode ..... 1 measurement per second

Interface ..... USB 2.0 and 1.1 compliant

## Maximum Damage Levels

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Maximum DC voltage at RF port ..... 25 V

Absolute power ..... 33 dBm

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<sup>1</sup> After zero operation. 128 values averaged over one hour with temperature within  $\pm 1$  °C.

<sup>2</sup> Measurement error with reference to a CW signal of equal power and frequency at 25 °C.

<sup>3</sup> Negligible error at 20 to 30 °C.

<sup>4</sup> Averaging range limit set by software. You can override this value; however, a value greater than 256 results in a higher measurement time.

# DC Power Requirements (5V) through Host USB

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Typical current .....	100 mA
Maximum current.....	150 mA

## Calibration

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Interval .....	1 year
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## Physical Dimensions

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NI USB-5680 module .....	8.5 × 3.0 × 5.6 cm (3.35 × 1.18 × 2.2 in.)
Weight.....	180 g (6.4 oz)

## Environment<sup>1</sup>

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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 to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range <sup>2</sup> (noncondensing)	
At 55 °C .....	45%
At 40 °C .....	75%
At 30 °C .....	95%

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<sup>1</sup> Tests were performed per MIL-PRF-28800F (Class 2).

<sup>2</sup> Tested in accordance with IEC 60068-2-56.

## Storage Environment

Ambient temperature range .....	–51 to +71 °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 .....	10–500 Hz, Power spectral density 0.03 g <sup>2</sup> /Hz (Tested in accordance with IEC 60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

## Compliance and Certifications

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### 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, CSA 61010-1



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

# Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



**Note** For EMC compliance, operate this device according to product documentation.

## 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)



**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](http://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## Environmental Management

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## Waste Electrical and Electronic Equipment (WEEE)



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