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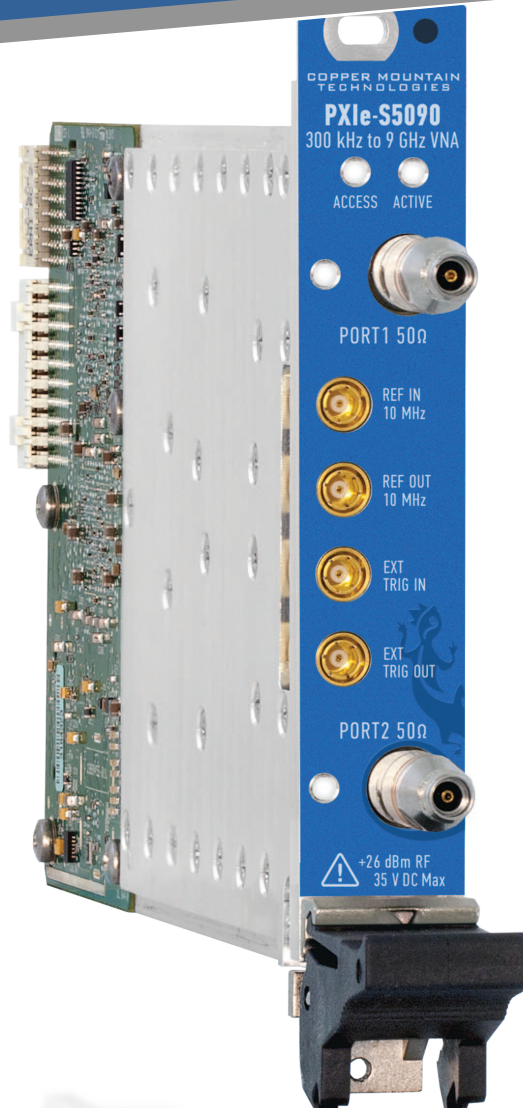
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**PXIe-8880**

# PXIe VNA

## PXIe-S5090



- **Frequency range:** 300 kHz - 9 GHz
- **Wide output power adjustment range:** -45 dBm to +13 dBm
- **Dynamic range:** 138 dB (10 Hz IF bandwidth) typ.
- **Measurement time per point:** 16  $\mu$ s per point, min typ.
- Up to **16 logical channels with 16 traces** each max
- **Automation programming** in LabVIEW, IVI drivers, IVI-C drivers, IVI.NET drivers

- **Time domain and gating** conversion included
- **Frequency offset mode**, including vector mixer calibration measurements
- Up to **500,001 measurement points**
- Multiple **precision calibration** methods and automatic calibration

## EXTEND YOUR REACH™

# PXIe-S5090 Specifications<sup>1</sup>

## Primary Specifications

Impedance	50 Ohm
Test port connector	3.5 mm, female
Number of test ports	2
Frequency range	300 kHz to 9 GHz
Full frequency accuracy	$\pm 5 \cdot 10^{-6}$
Frequency resolution	1 Hz
Number of measurement points	2 to 500,001
Measurement bandwidths (with 1/1.5/2/3/5/7 steps)	1 Hz to 1 MHz
Dynamic range <sup>2</sup>	
300 kHz to 1 MHz	123 dB (129 dB typ.)
1 MHz to 5 MHz	133 dB (138 dB typ.)
5 MHz to 6.5 GHz	138 dB (140 dB typ.)
6.5 GHz to 8.0 GHz	133 dB (136 dB typ.)
8 GHz to 9 GHz	125 dB (130 dB typ.)

## Measurement Accuracy<sup>3</sup>

Accuracy of transmission measurements <sup>4</sup>	Magnitude / Phase
<b>300 kHz to 1 MHz</b>	
0 dB to +13 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-40 dB to 0 dB	$\pm 0.1$ dB / $\pm 1^\circ$
-60 dB to -40 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-80 dB to -60 dB	$\pm 1.0$ dB / $\pm 6^\circ$
<b>1 MHz to 5 MHz</b>	
0 dB to +13 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-50 dB to 0 dB	$\pm 0.1$ dB / $\pm 1^\circ$
-70 dB to -50 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-90 dB to -70 dB	$\pm 1.0$ dB / $\pm 6^\circ$
<b>5.0 MHz to 6.5 GHz</b>	
0 dB to +13 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-55 dB to 0 dB	$\pm 0.1$ dB / $\pm 1^\circ$
-75 dB to -55 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-95 dB to -75 dB	$\pm 1.0$ dB / $\pm 6^\circ$
<b>6.5 GHz to 8.0 GHz</b>	
0 dB to +10 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-50 dB to 0 dB	$\pm 0.1$ dB / $\pm 1^\circ$
-70 dB to -50 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-90 dB to -70 dB	$\pm 1.0$ dB / $\pm 6^\circ$
<b>8 GHz to 9 GHz</b>	
0 dB to +5 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-50 dB to 0 dB	$\pm 0.1$ dB / $\pm 1^\circ$
-70 dB to -50 dB	$\pm 0.2$ dB / $\pm 2^\circ$
-90 dB to -70 dB	$\pm 1.0$ dB / $\pm 6^\circ$
Accuracy of reflection measurements <sup>5</sup>	Magnitude / Phase
-15 dB to 0 dB	$\pm 0.4$ dB / $\pm 3^\circ$
-25 dB to -15 dB	$\pm 1.0$ dB / $\pm 6^\circ$
-35 dB to -25 dB	$\pm 3.0$ dB / $\pm 20^\circ$
<b>Trace noise magnitude (IF bandwidth 3 kHz)</b>	
300 kHz to 7 GHz	0.003 dB rms
7 GHz to 9 GHz	0.006 dB rms
<b>Temperature dependence</b>	
300 kHz to 7 GHz	0.02 dB/°C
7 GHz to 9 GHz	0.04 dB/°C

## Effective System Data

<b>300 kHz to 9 GHz</b>	
Directivity	46 dB
Source match	40 dB
Load match	46 dB
Reflection tracking	$\pm 0.10$ dB
Transmission tracking	$\pm 0.08$ dB

## Uncorrected System Performance

<b>300 kHz to 6.5 GHz</b>	
Directivity	15 dB
Source match	15 dB
Load match	15 dB
<b>6.5 GHz to 9 GHz</b>	
Directivity	10 dB
Source match	15 dB
Load match	15 dB

## Test Port Output

<b>Power range</b>	
300 kHz to 6.5 GHz	-45 dBm to +13 dBm (+15 dBm typ.)
6.5 GHz to 8.0 GHz	-45 dBm to +10 dBm
8 GHz to 9 GHz	-45 dBm to +5 dBm
<b>Power accuracy</b>	$\pm 2$ dB
<b>Power resolution</b>	0.05 dB
<b>Harmonic distortion<sup>6</sup></b>	-8 dBc
<b>Non-harmonic spurious<sup>6</sup></b>	-15 dBc (-22 dBc typ.)

## Test Port Input

<b>Noise floor</b>	
300 kHz to 1 MHz	-120 dBm/Hz
1 MHz to 5 MHz	-130 dBm/Hz
5 MHz to 6.5 GHz	-135 dBm/Hz
6.5 GHz to 8.0 GHz	-133 dBm/Hz
8.0 GHz to 9 GHz	-130 dBm/Hz
<b>Damage level</b>	+26 dBm
<b>Damage DC voltage</b>	35 V

[1] All specifications subject to change without notice. [2] The dynamic range is defined as the difference between the specified maximum power level and the specified noise floor. The specification applies at 10 Hz IF bandwidth. [3] Reflection and transmission measurement accuracy applies over the temperature range of (73  $\pm$  9) °F or (23  $\pm$  5) °C after 40 minutes of warming-up, with less than 1 °C deviation from the full two-port calibration temperature, at output power of 0 dBm. Frequency points have to be identical for measurement and calibration (no interpolation allowed). [4] Transmission specifications are based on a matched DUT, and IF bandwidth of 10 Hz. [5] Reflection specifications are based on an isolating DUT. [6] Specification applies over entire frequency range at output power of 0 dBm. © Copper Mountain Technologies - www.coppermountaintech.com - Rev. 2019Q3

# PXIe-S5090 Specifications<sup>1</sup>

## Measurement Speed

Time per point		16 $\mu$ s typ.	
Port switchover time		200 $\mu$ s	
Typical cycle time vs number of measurement points <sup>7</sup>			
Frequency Range	Number of points	Uncorrected	2-port calibration
from 300 kHz to 9 GHz IF bandwidth 1 MHz	51	1.7 ms	3.2 ms
	201	4.5 ms	8.8 ms
	401	7.8 ms	15.1 ms
	1601	27.0 ms	53.7 ms
from 4 GHz to 5 GHz IF bandwidth 1 MHz	51	1.2 ms	2.7 ms
	201	3.7 ms	7.4 ms
	401	6.8 ms	13.6 ms
	1601	23.4 ms	46.5 ms
from 300 kHz to 9 GHz IF bandwidth 100 kHz	51	2.3 ms	4.3 ms
	201	6.6 ms	13.3 ms
	401	12.0 ms	23.6 ms
	1601	44.0 ms	87.7 ms
from 4 GHz to 5 GHz IF bandwidth 100 kHz	51	1.9 ms	3.9 ms
	201	5.9 ms	11.7 ms
	401	11.1 ms	22.1 ms
	1601	40.2 ms	80.4 ms
from 300 kHz to 9 GHz IF bandwidth 10 kHz	51	7.7 ms	15.1 ms
	201	28.0 ms	55.8 ms
	401	54.8 ms	109.2 ms
	1601	215.0 ms	430.0 ms
from 4 GHz to 5 GHz IF bandwidth 10 kHz	51	7.3 ms	14.7 ms
	201	27.2 ms	54.7 ms
	401	53.9 ms	107.8 ms
	1601	211.4 ms	423.0 ms

## Frequency Reference Input

Port	Ref IN 10 MHz
External reference frequency	10 MHz
Input level	-3 dBm to 3 dBm
Input impedance	50 Ohm
Connector type	SMB, male

## Frequency Reference Output

Port	Ref OUT 10 MHz
Internal reference frequency	10 MHz
Output reference signal level at 50 Ohm impedance	-1 dBm to 3 dBm
Connector type	SMB, male

## Trigger Input

Port	Ext Trig In
Input level	
Low threshold voltage	1.1 V
High threshold voltage	2.6 V
Input level range	0 V to + 5 V
Pulse width	$\geq 2 \mu$ s
Polarity	positive or negative
Input impedance	$\geq 2$ kOhm
Connector type	SMB, male

## Trigger Output

Port	Ext Trig Out
Maximum output current	20 mA
Output level	
Low level voltage	0.0 to 0.6 V
High level voltage	3.0 to 3.8 V
Polarity	positive or negative
Connector type	SMB, male

## System & Power

Operating system	Windows 7 and above
CPU frequency	1.0 GHz
RAM	512 MB
Power supply	
+3.3 V	1.5 A
+12 V	1.5 A

## Factory Adjustment

Recommended factory adjustment interval	3 Years
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## Environmental Specifications

Operating temperature	+5 °C to +40 °C (41 °F to 104 °F)
Storage temperature	-50 °C to +70 °C (-58 °F to 158 °F)
Humidity	90 % at 25 °C (77 °F)
Atmospheric pressure	70.0 kPa to 106.7 kPa

## Dimensions

Length	221 mm
Width	129 mm
Height	20 mm
Weight	0.6 kg (21.2 oz)

[1] All specifications subject to change without notice. [7] Analyzer display turned off with DISPLAY:ENABle OFF. Measured using a NI PXIe-1095 chassis, and an PXIe-8880 embedded controller with Intel® Xeon® E5-2618L v3 2.3GHz CPU and 8 GB RAM running Windows 7 (64-bit), with firmware revision 19.3.0. Data transfer includes real and imaginary pairs and includes transferring four S-parameters for 2-port calibration. Uncorrected measurements are for one sweep direction and transferring two S-parameters. © Copper Mountain Technologies - www.coppermountaintech.com - Rev. 2019Q3

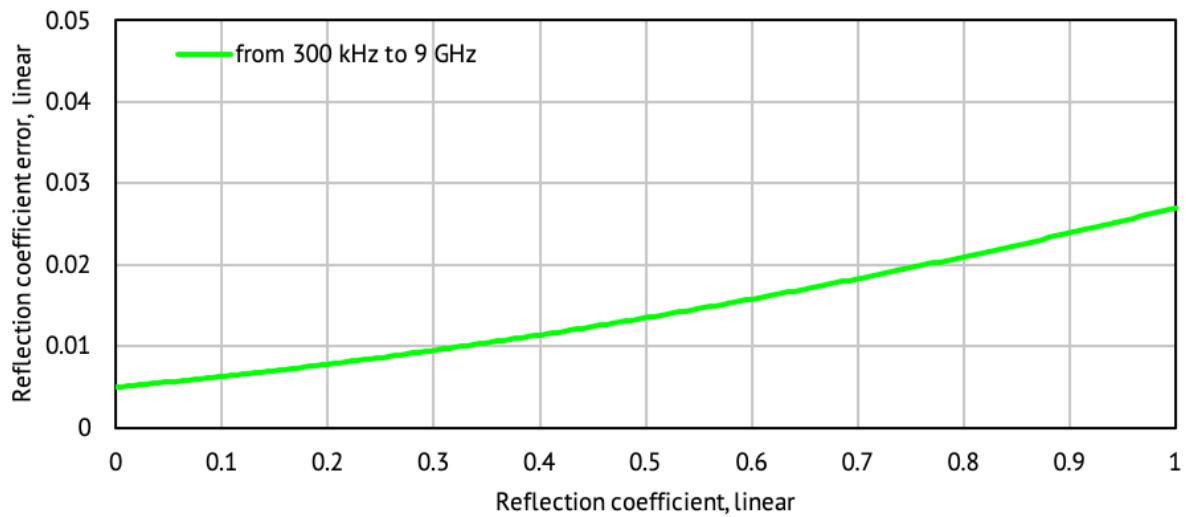
# PXle-S5090 Specifications<sup>1</sup>

## Extended Effective System Data

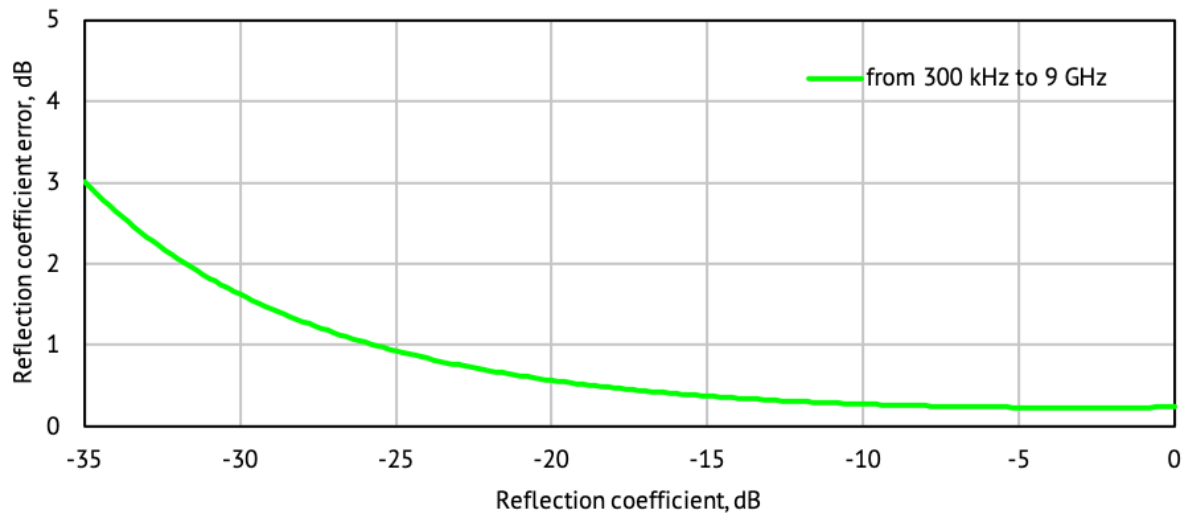
<b>300 kHz to 1 MHz</b>	
Directivity	0.005
Source match	0.010
Load match	0.005
Reflection tracking	0.012
Transmission tracking	0.009
Isolation (max noise level)	$1.0 \cdot 10^{-5}$
Compression	$0.65 \cdot 10^{-3}$
<b>1 MHz to 5 MHz</b>	
Directivity	0.005
Source match	0.010
Load match	0.005
Reflection tracking	0.012
Transmission tracking	0.009
Isolation (max noise level)	$3.2 \cdot 10^{-6}$
Compression	$0.65 \cdot 10^{-3}$
<b>5 MHz to 6.5 GHz</b>	
Directivity	0.005
Source match	0.010
Load match	0.005
Reflection tracking	0.012
Transmission tracking	0.009
Isolation (max noise level)	$1.8 \cdot 10^{-6}$
Compression	$0.65 \cdot 10^{-3}$
<b>6.5 GHz to 8.0 GHz</b>	
Directivity	0.005
Source match	0.010
Load match	0.005
Reflection tracking	0.012
Transmission tracking	0.009
Isolation (max noise level)	$2.2 \cdot 10^{-6}$
Compression	$1.15 \cdot 10^{-3}$
<b>8 GHz to 9 GHz</b>	
Directivity	0.005
Source match	0.010
Load match	0.005
Reflection tracking	0.012
Transmission tracking	0.009
Isolation (max noise level)	$3.2 \cdot 10^{-6}$
Compression	$4.0 \cdot 10^{-3}$

# Reflection Accuracy Plots

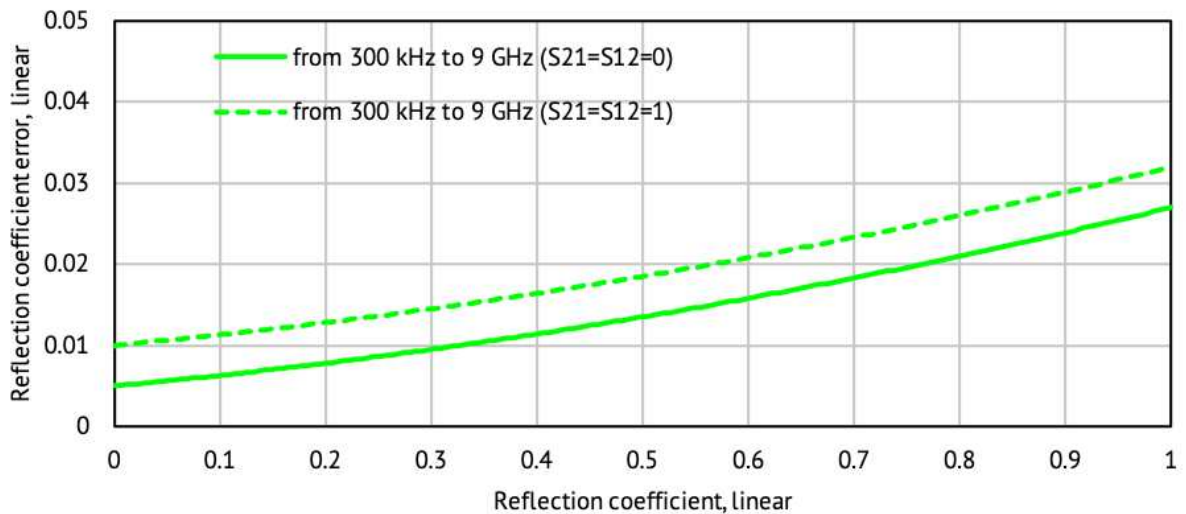
## Reflection Magnitude Errors



Specifications are based on isolating DUT ( $S_{21} = S_{12} = 0$ )

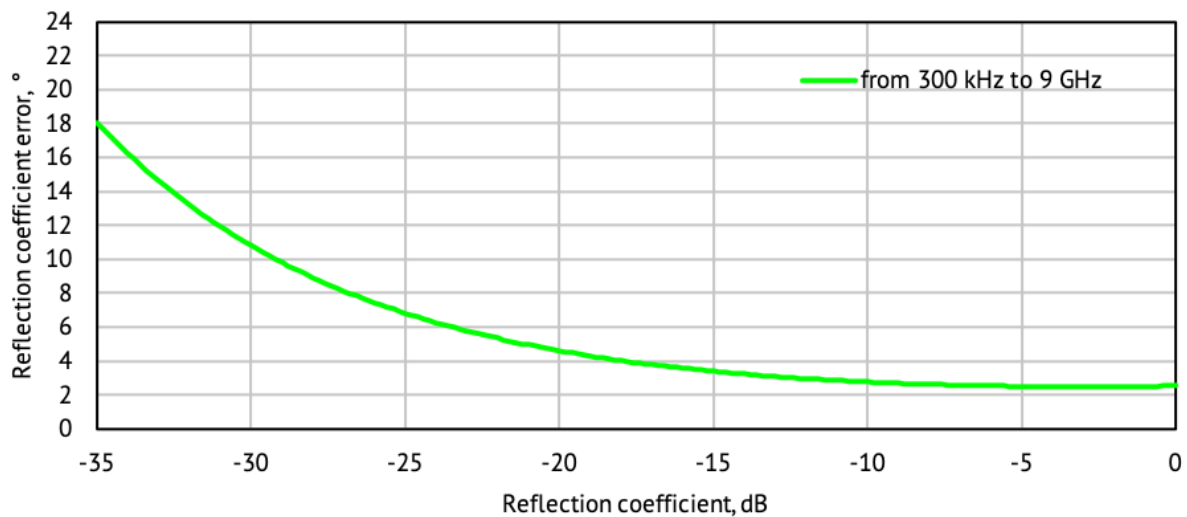


Specifications are based on isolating DUT ( $S_{21} = S_{12} = 0$ )

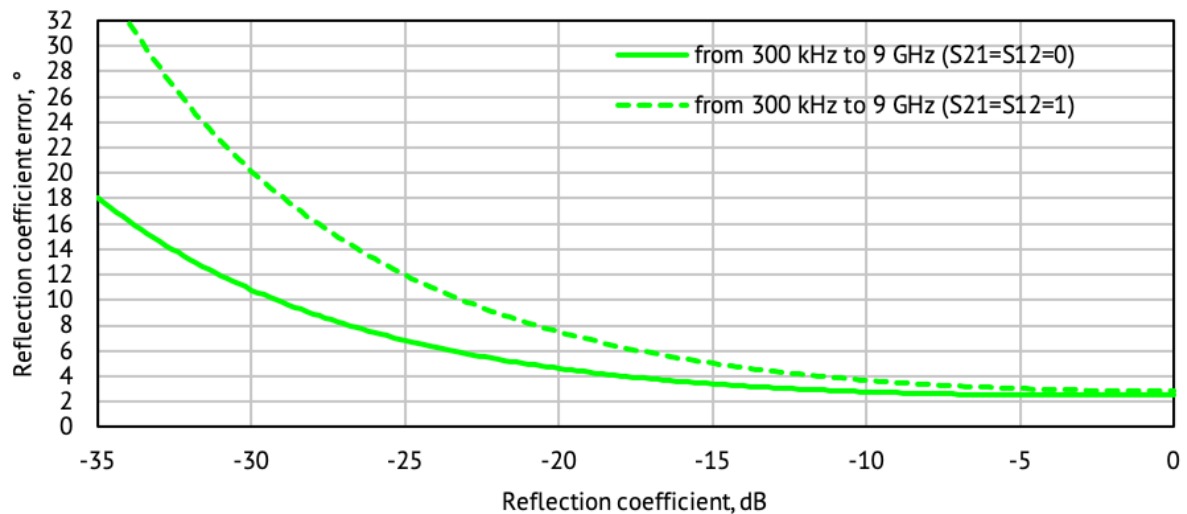


# Reflection/Transmission Accuracy Plots

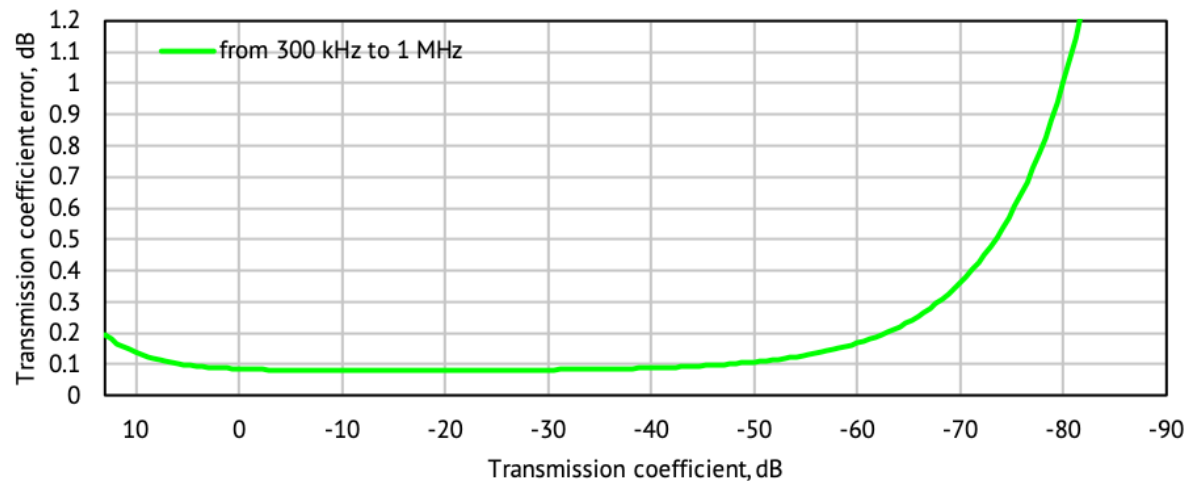
## Reflection Phase Errors



Specifications are based on isolating DUT ( $S_{21} = S_{12} = 0$ )



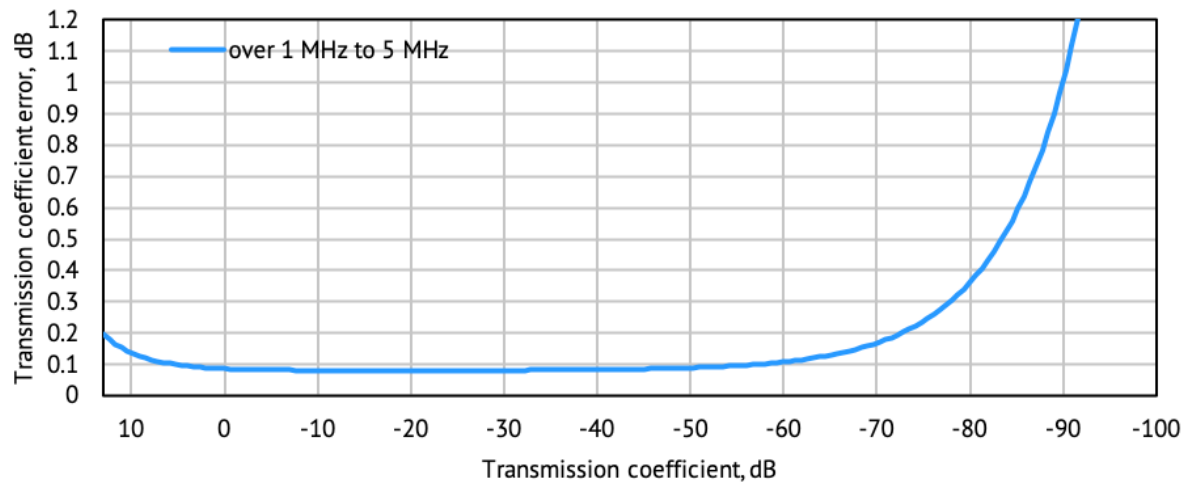
## Transmission Magnitude Errors



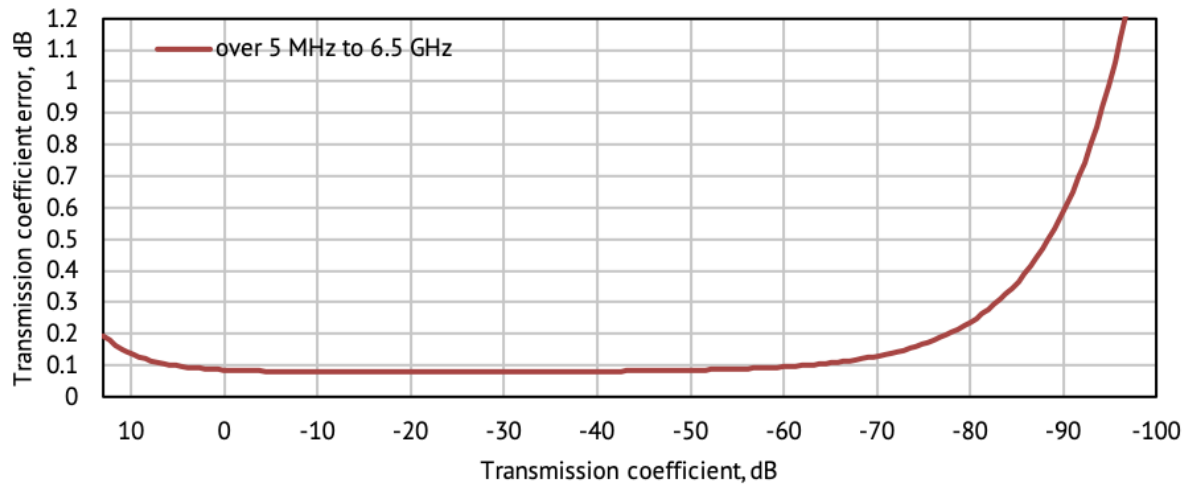
Specifications are based on matched DUT, and IF bandwidth of 10 Hz

# Transmission Accuracy Plots

## Transmission Magnitude Errors

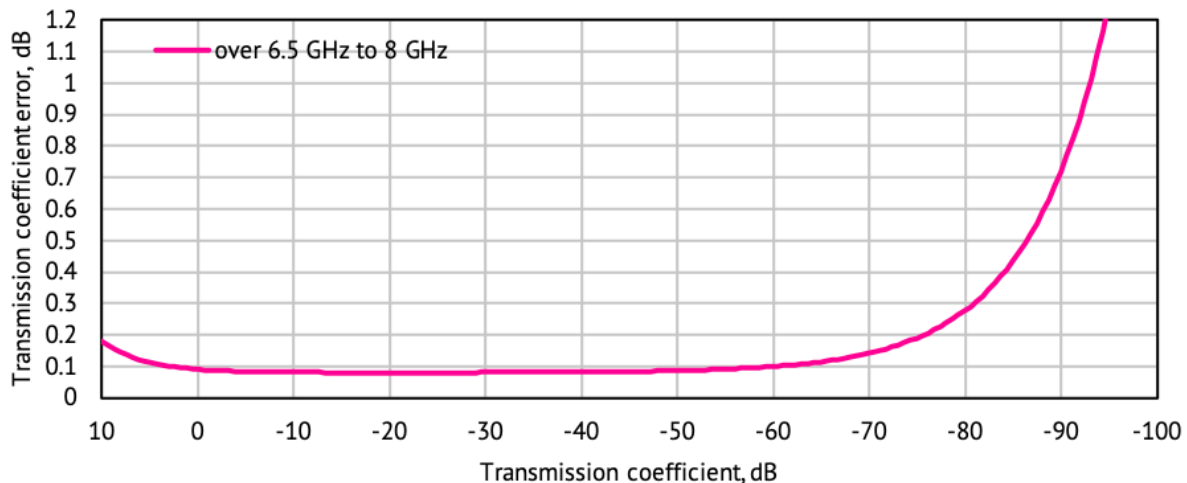


Specifications are based on matched DUT, and IF bandwidth of 10 Hz



Specifications are based on matched DUT, and IF bandwidth of 10 Hz

## Transmission Phase Errors

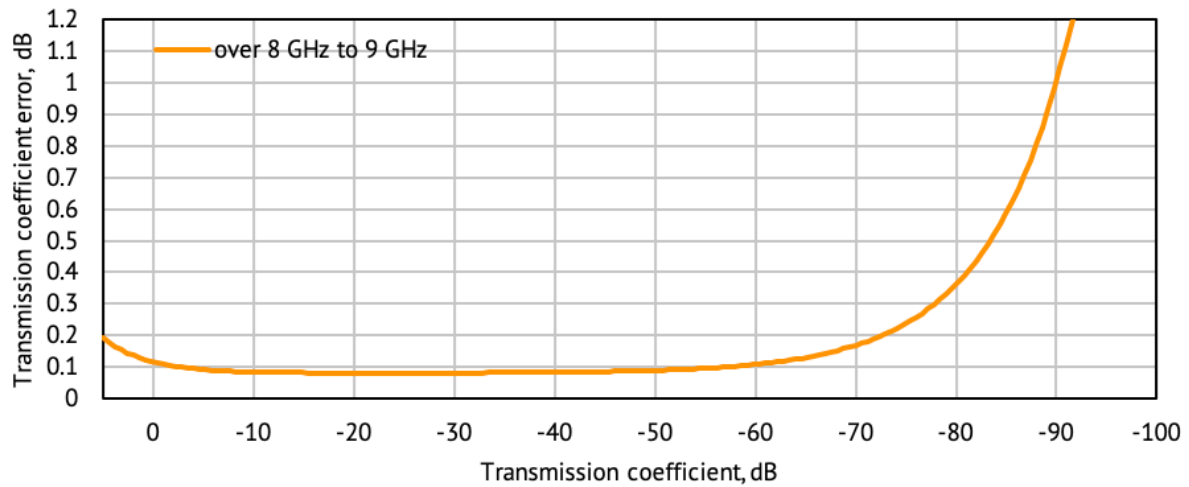


Specifications are based on matched DUT, and IF bandwidth of 10 Hz

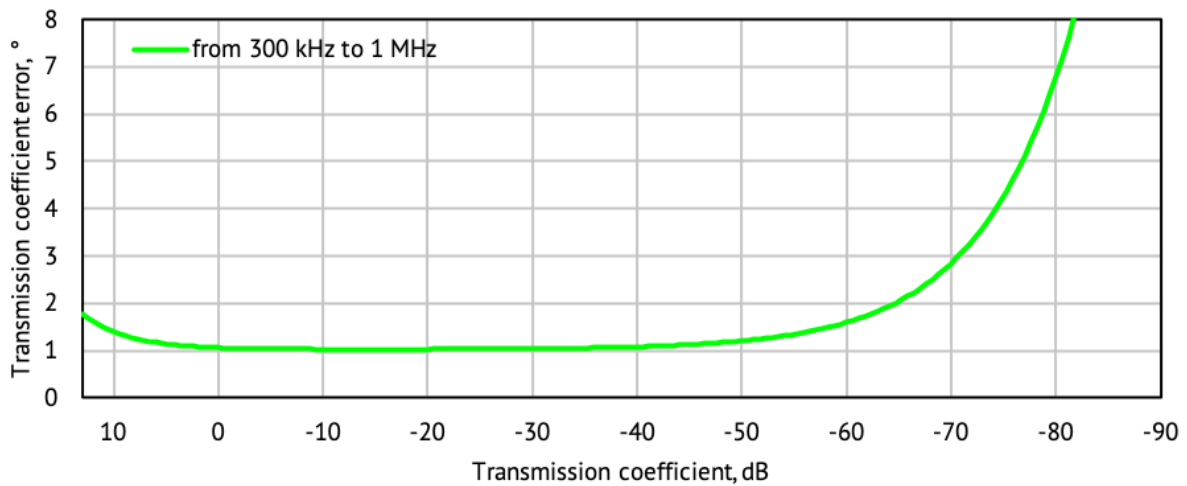


# Transmission Accuracy Plots

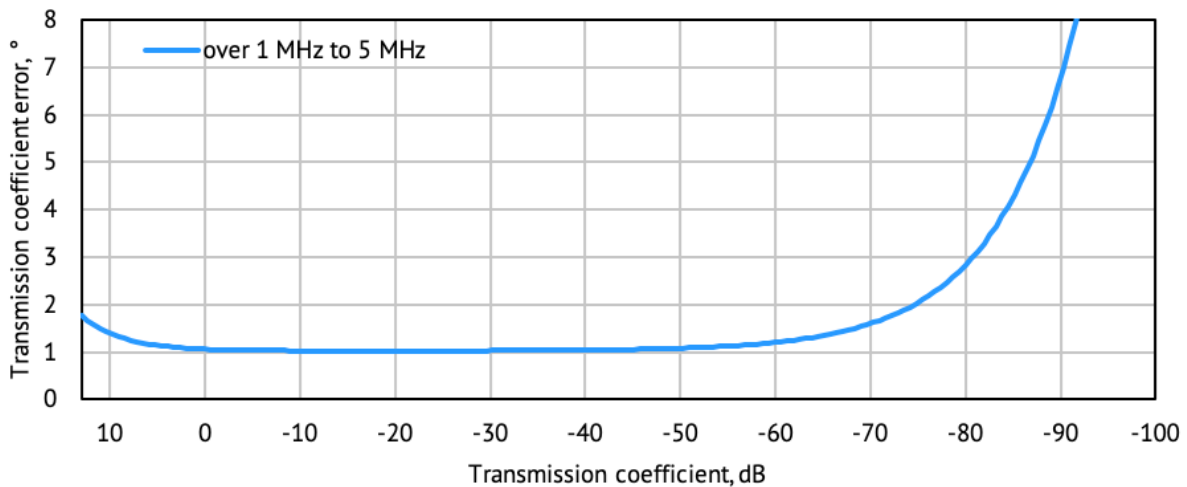
## Transmission Phase Errors



Specifications are based on matched DUT, and IF bandwidth of 10 Hz



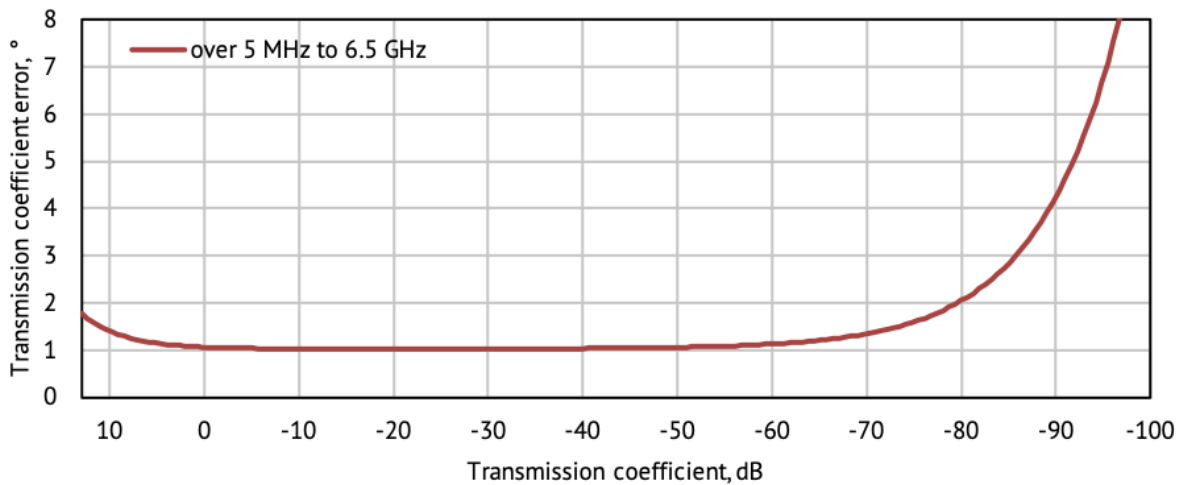
Specifications are based on matched DUT, and IF bandwidth of 10 Hz



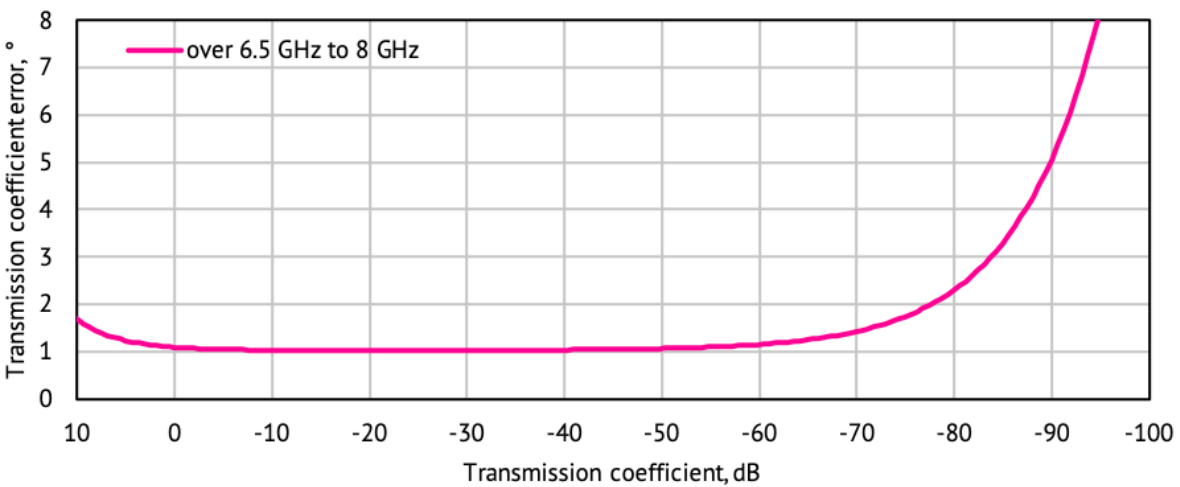
Specifications are based on matched DUT, and IF bandwidth of 10 Hz

# Transmission Accuracy Plots

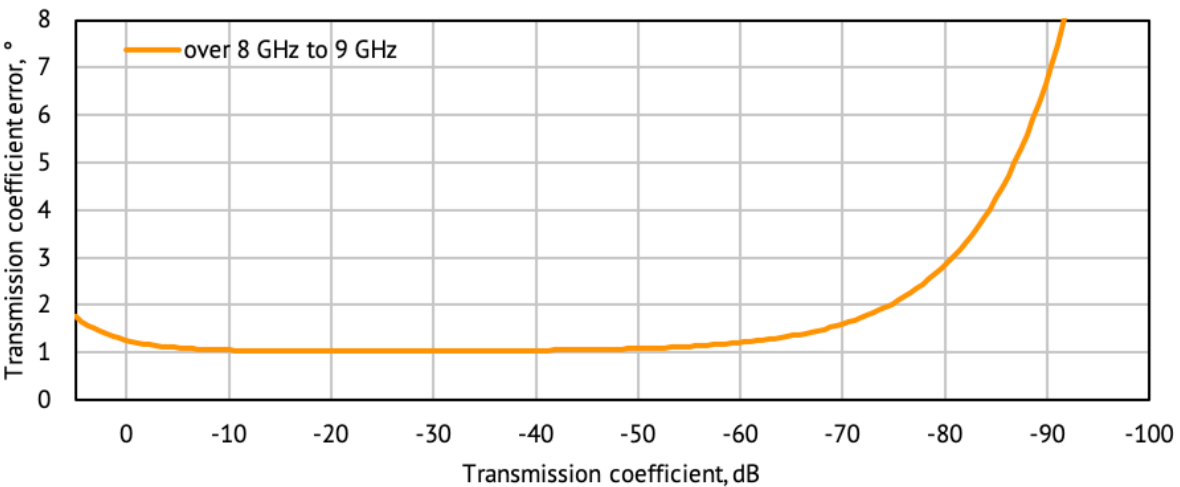
## Transmission Phase Errors



Specifications are based on matched DUT, and IF bandwidth of 10 Hz



Specifications are based on matched DUT, and IF bandwidth of 10 Hz



Specifications are based on matched DUT, and IF bandwidth of 10 Hz