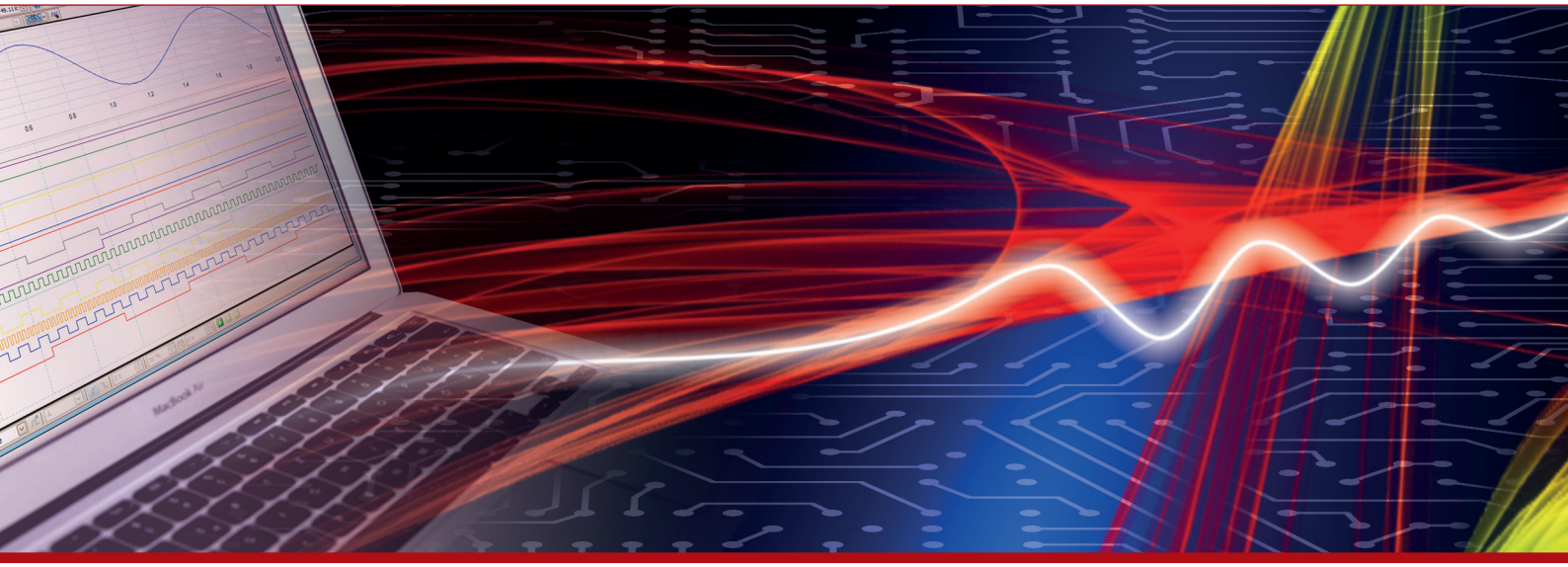
Product Datasheet - Technical Specifications



More information in our Web-Shop at ▸ **www.meilhaus.com** and in our download section.

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Compact VNA - SC5090

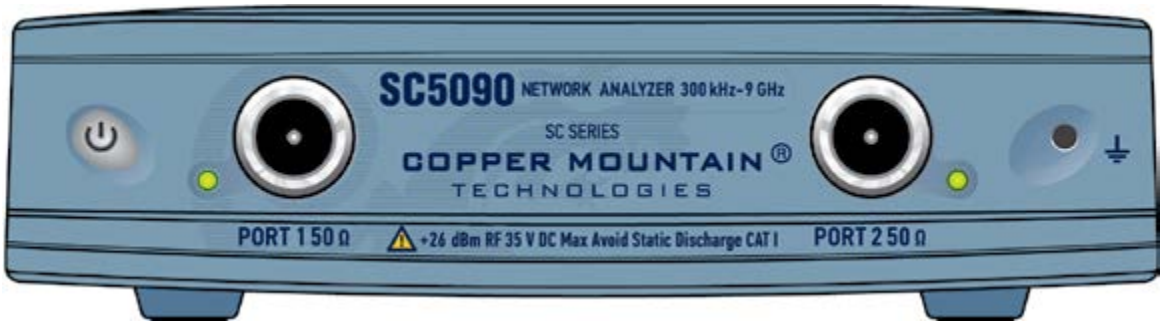
Extended Specifications

COPPER MOUNTAIN™ TECHNOLOGIES

- **Frequency range:** 300 kHz - 9 GHz
- **Wide output power adjustment range:** -45 dBm to +15 dBm
- **Dynamic range:** 140 dB (10 Hz IF bandwidth) typ.
- **Measurement time per point:** 16 µs per point, min typ.
- Up to **16 logical channels with 16 traces** each max
- **Time domain and gating** conversion included
- **Automation programming** in LabView, Python, MATLAB, .NET, etc.
- Models available in **50 Ohm**
- Up to **500,001 measurement points**
- Multiple **precision calibration** methods and automatic calibration

EXTEND YOUR REACH™

Specifications[1]



Primary Specifications

Impedance	50 Ohm
Test port connector	type N, 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[2]	
300 kHz to 1 MHz	125 dB
1 MHz to 5 MHz	135 dB (138 dB typ.)
5 MHz to 4 GHz	140 dB
4.0 GHz 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.)

Effective System Data

300 kHz to 9 GHz	
Directivity	46 dB
Source match	40 dB
Load match	46 dB
Reflection tracking	±0.10 dB
Transmission tracking	±0.08 dB

Uncorrected System Performance

300 kHz to 6.5 GHz	
Directivity	15 dB
Source match	15 dB
Load match	15 dB
6.5 GHz to 9 GHz	
Directivity	10 dB
Source match	15 dB
Load match	15 dB

Measurement Accuracy

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

[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 ± 9) °F or (23 ± 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.

Specifications[1]

Test Port Output

Power range	
300 kHz to 4 GHz	-45 dBm to +15 dBm
4.0 GHz to 6.5 GHz	-45 dBm to +13 dBm
6.5 GHz to 8.0 GHz	-45 dBm to +10 dBm
8 GHz to 9 GHz	-45 dBm to +5 dBm
Power accuracy	±2 dB
Power resolution	0.05 dB
Harmonic distortion[6]	-8 dBc
Non-harmonic spurious[6]	-15 dBc

Test Port Input

Noise floor	
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
Damage level	+26 dBm
Damage DC voltage	35 V

Measurement Speed

Time per point		16 µs typ.	
Port switchover time		200 µs	
Typical cycle time vs number of measurement points			
Frequency range	**Number of points**	**Uncorrected**	**2-port calibration**
from 300 kHz to 9 GHz IF bandwidth 1 MHz	51	1.6 ms	3.2 ms
	201	4.3 ms	8.6 ms
	401	7.5 ms	15.0 ms
	1601	26.7 ms	53.7 ms
from 4 GHz to 5 GHz IF bandwidth 1 MHz	51	1.2 ms	2.6 ms
	201	3.5 ms	7.4 ms
	401	6.6 ms	13.5 ms
	1601	23.0 ms	46.6 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	≥2 µs
Polarity	positive or negative
Input impedance	≥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	1.5 GHz
RAM	1 GB
Interface	USB 2.0
Connector type	USB B
Power supply	110-240 V, 50/60 Hz
Power consumption	12 W
Input power	9 V DC to 15 V DC
Input power consumption DC	18 W

Factory Adjustment

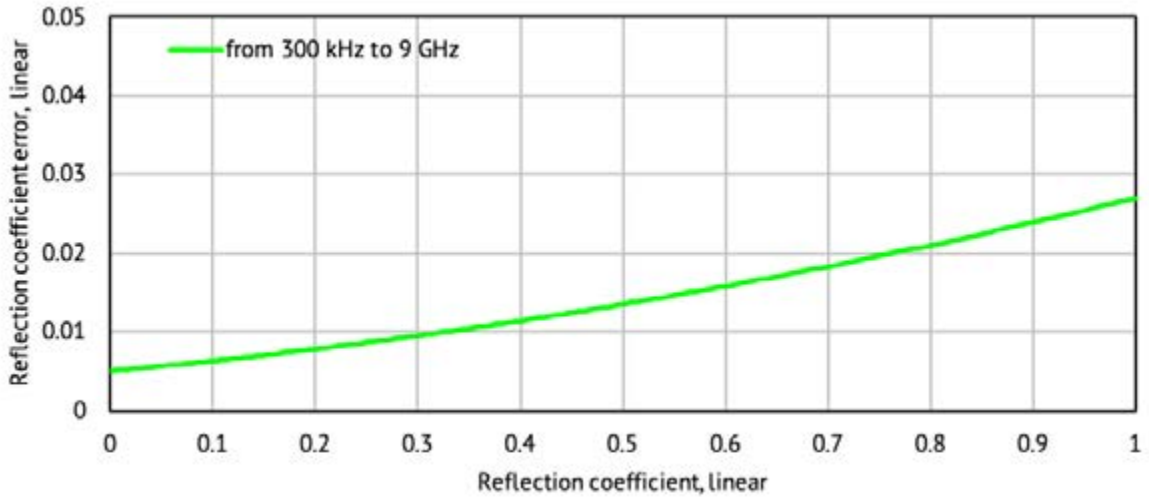
Recommended factory adjustment interval	3 years

Environmental Specifications

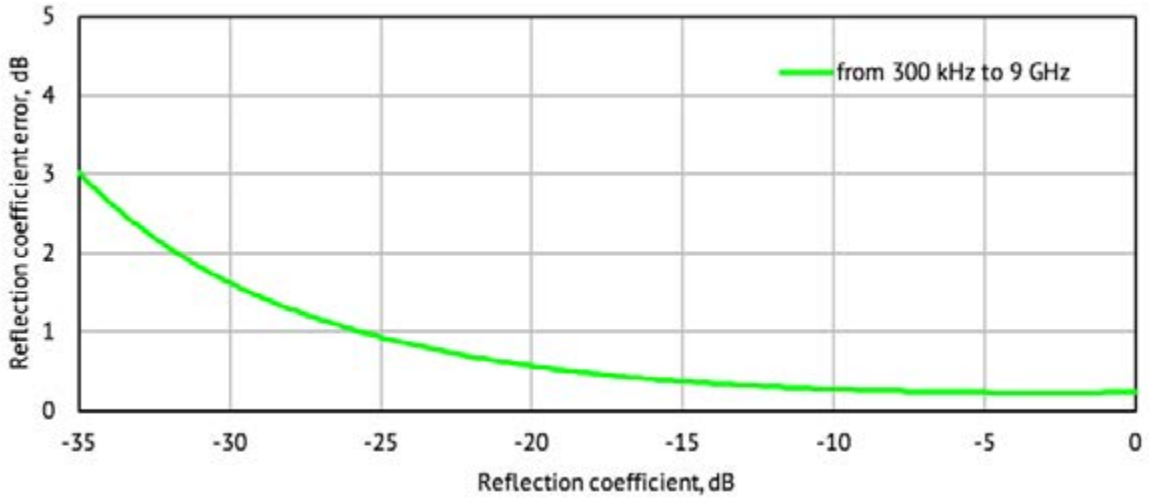
Operating temperature	+5 °C to +40 °C (41 °F to 104 °F)
Storage temperature	-50 °C to +70 °C (-58 °F to 158 °F)
Humidity	90 % at 25 °C (77 °F)
Atmospheric pressure	70.0 kPa to 106.7 kPa

Reflection Accuracy Plots

Reflection Magnitude Errors



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



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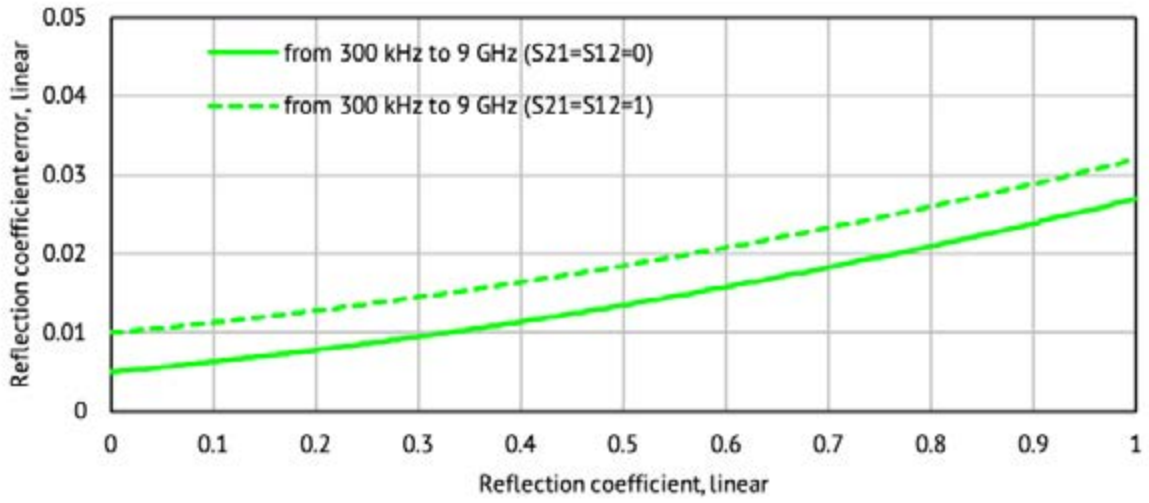
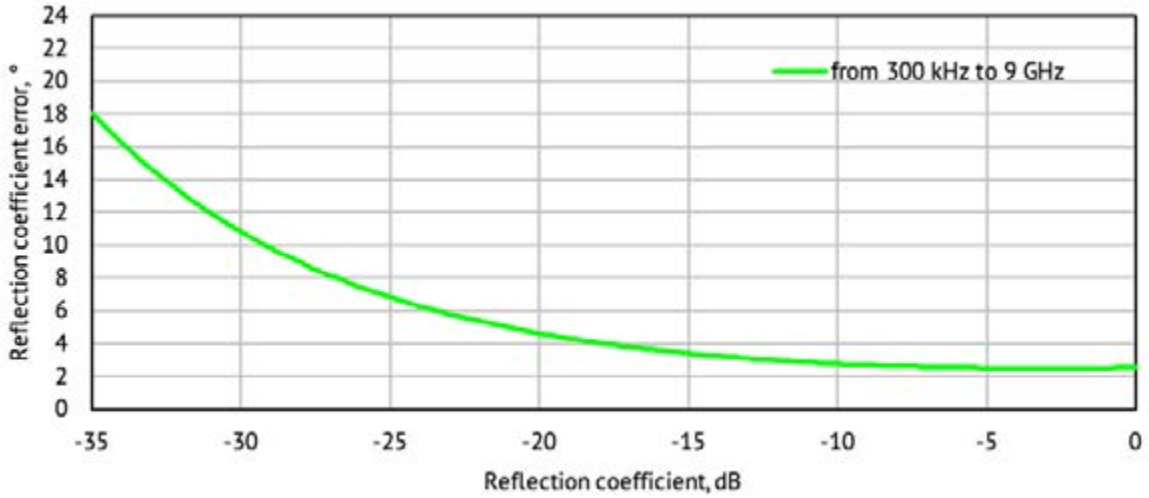
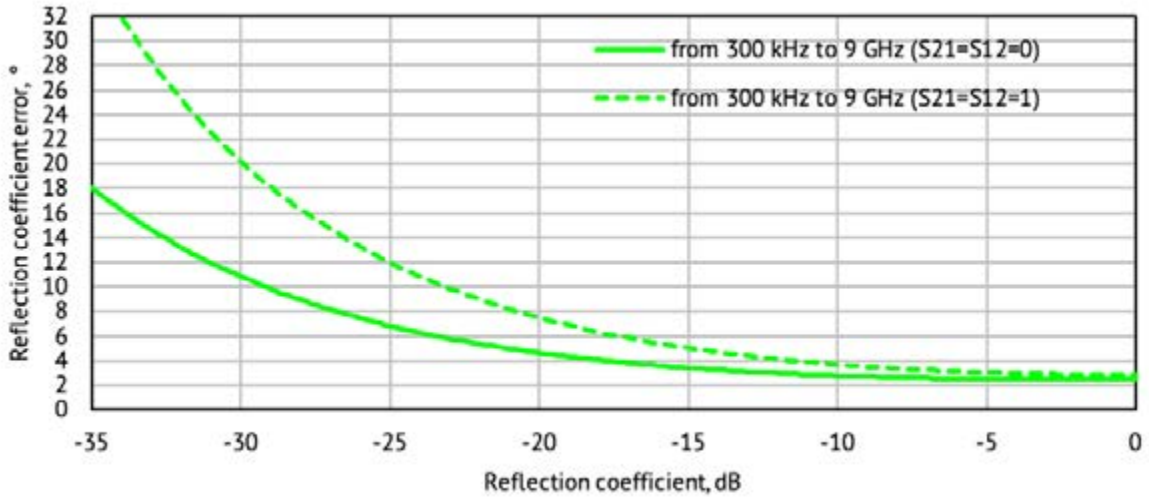


Reflection/Transmission Accuracy Plots

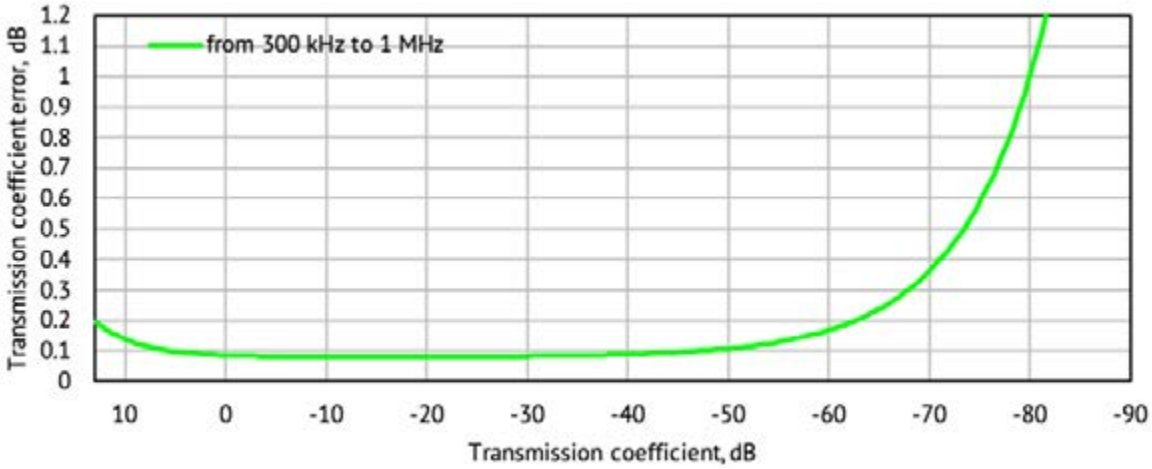
Reflection Phase Errors



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



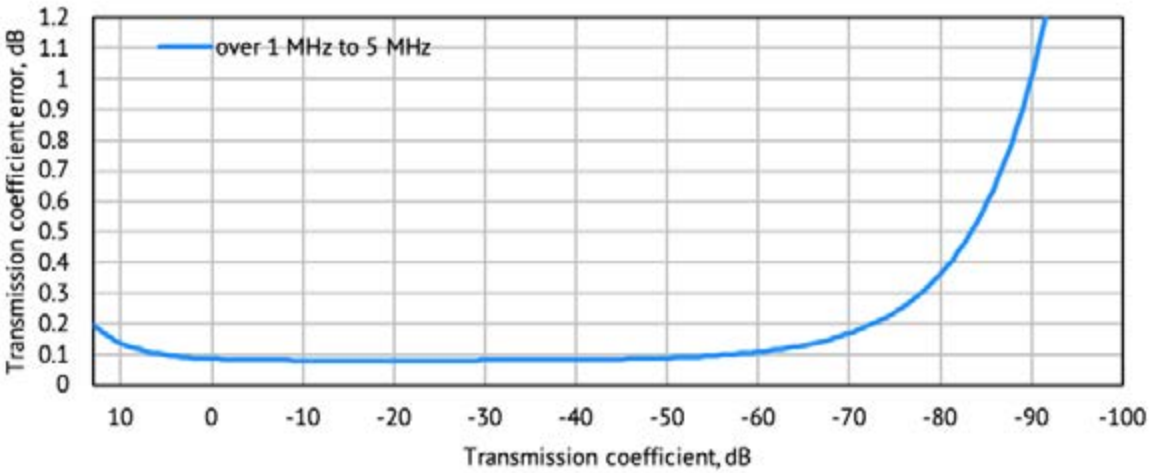
Transmission Magnitude Errors



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

Transmission Accuracy Plots

Transmission Magnitude Errors



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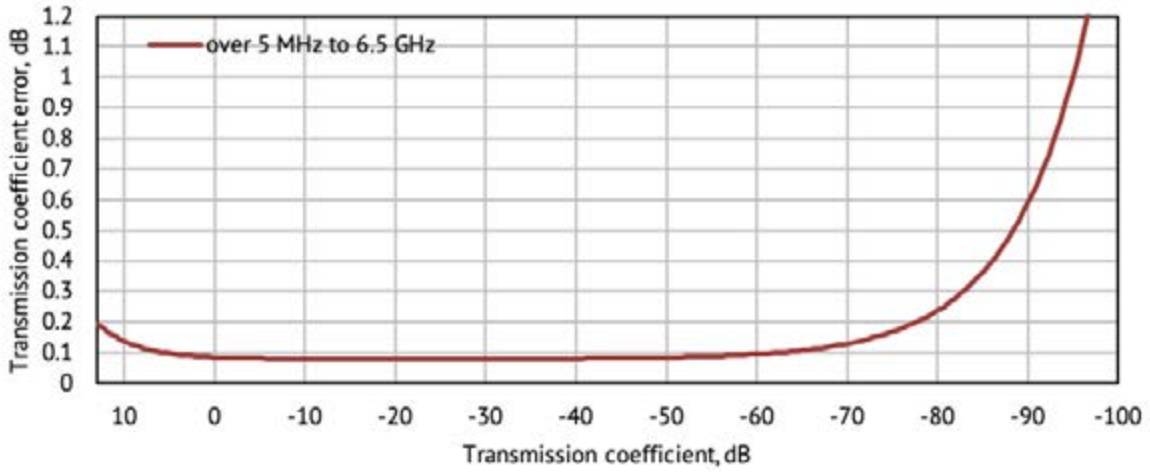

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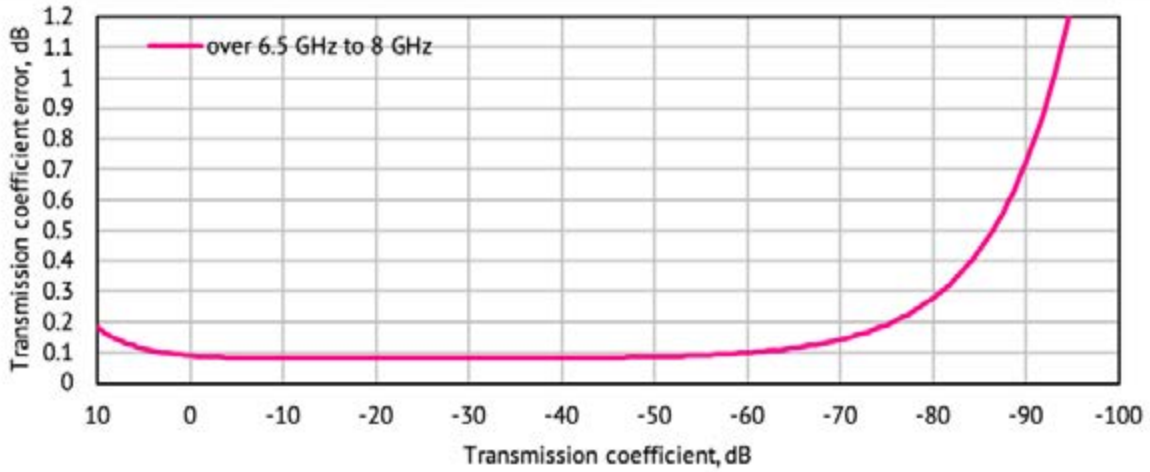
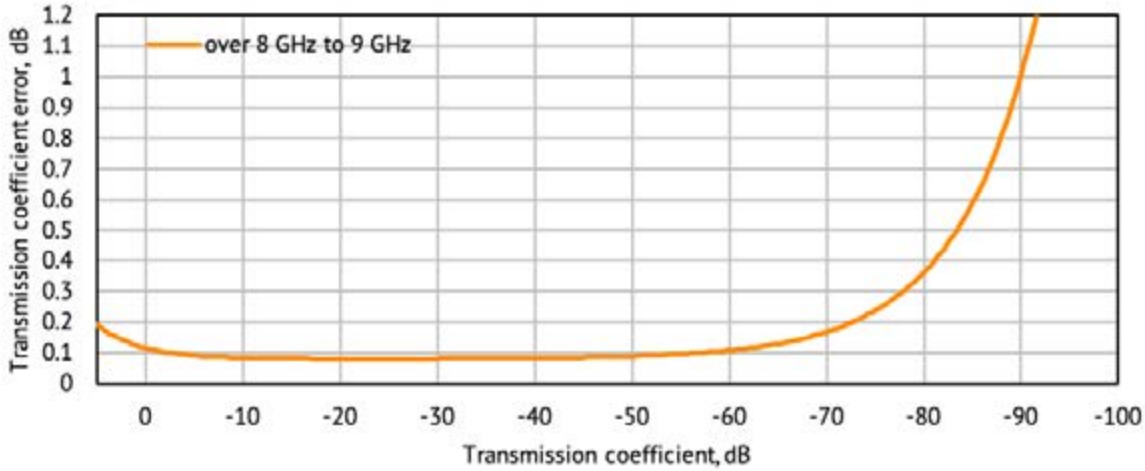


Specifications are based on matched DUT, and IF bandwidth of 10 Hz

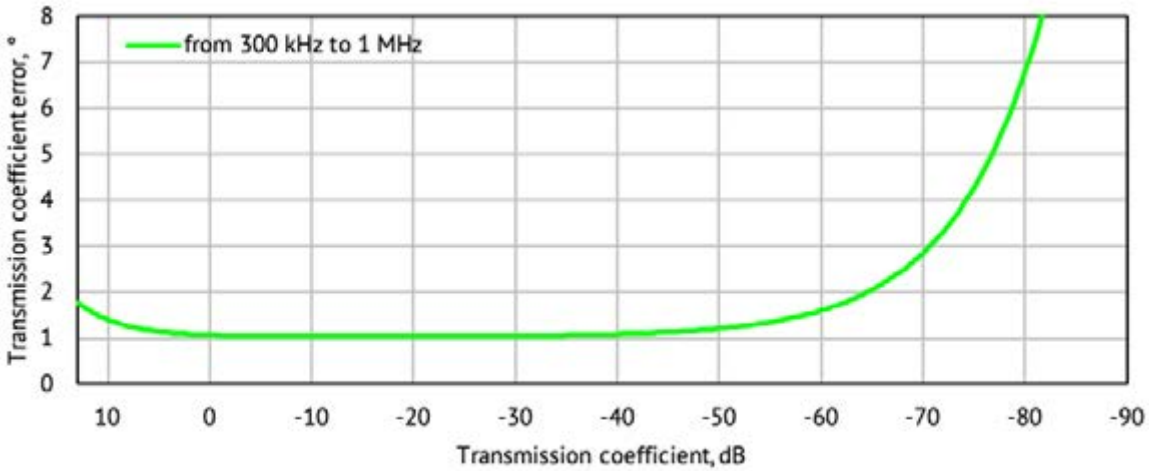
Transmission Accuracy Plots

Transmission Magnitude Errors



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

Transmission Phase Errors



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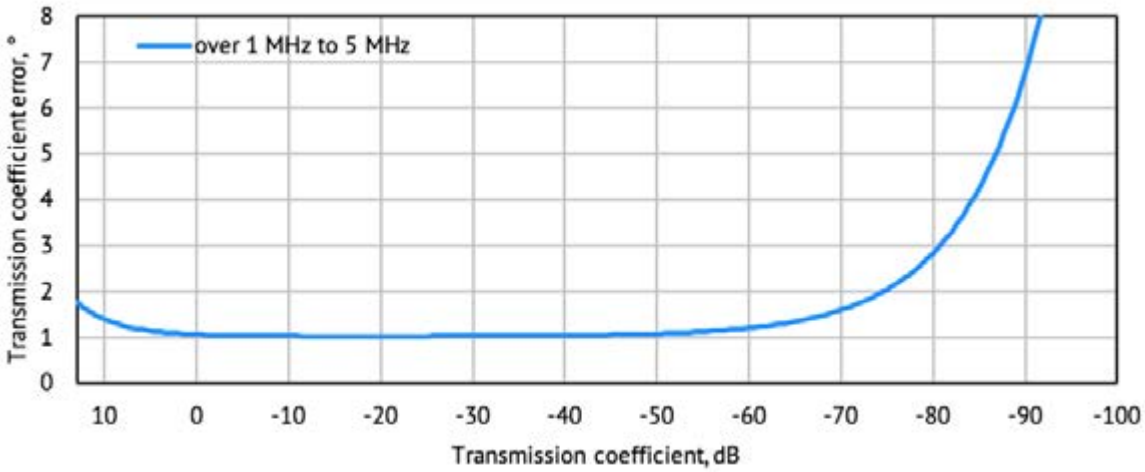

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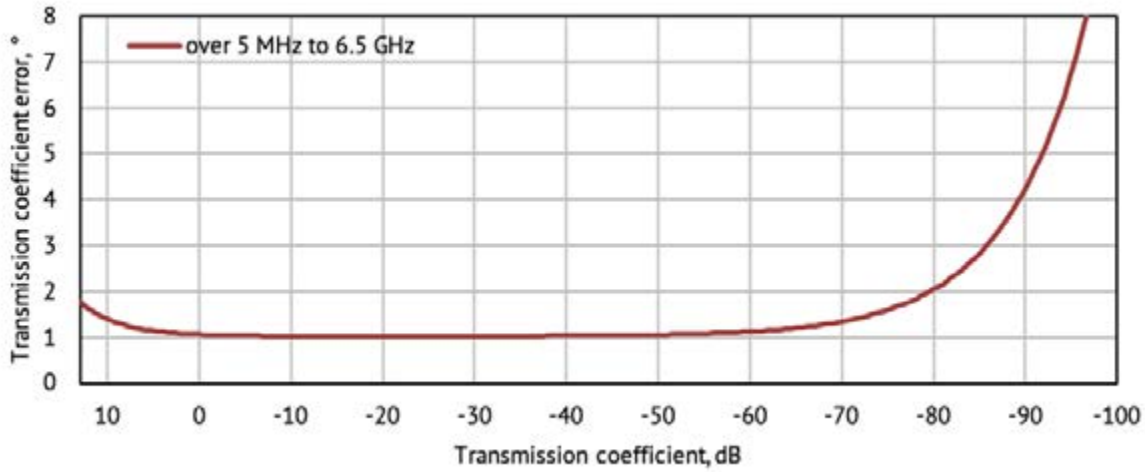
Transmission Accuracy Plots

Transmission Phase Errors



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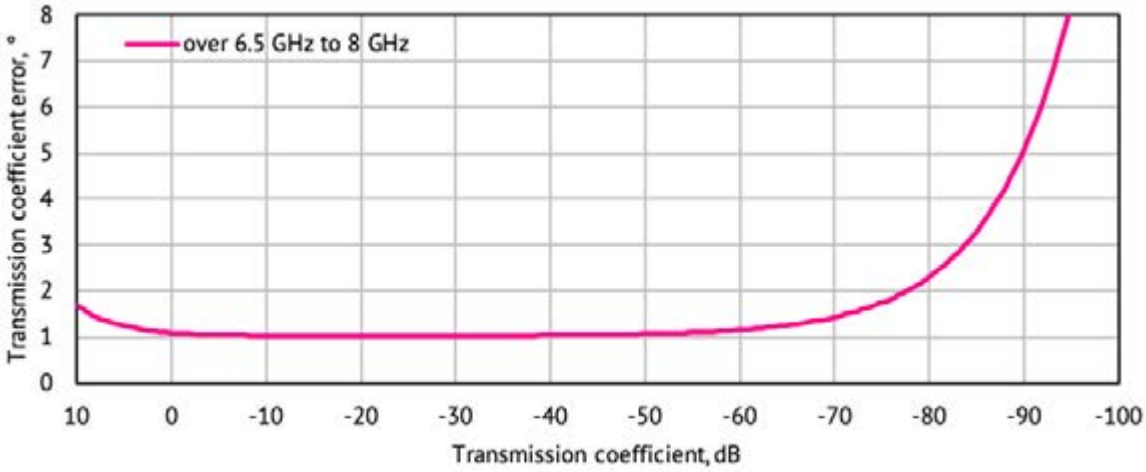

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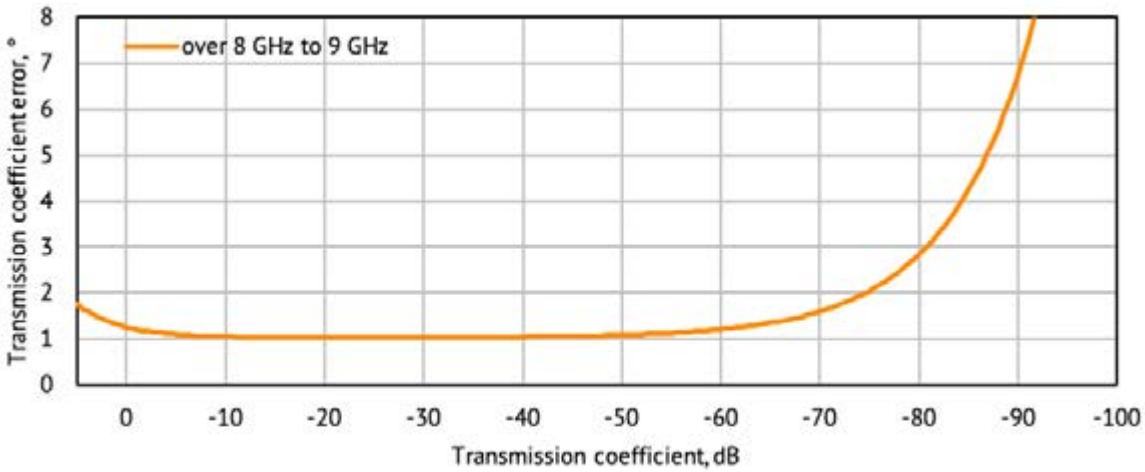

Specifications are based on matched DUT, and IF bandwidth of 10 Hz

Technology is supposed to move. It's supposed to change and update and progress. It's not meant to sit stagnant year after year simply because that's how things have always been done.

The engineers at Copper Mountain Technologies are creative problem solvers. They know the people using VNAs don't just need one giant machine in a lab. They know that VNAs are needed in the field, requiring portability and flexibility. Data needs to be quickly transferred, and a test setup needs to be easily automated and recalled for various applications. The engineers at Copper Mountain Technologies are rethinking the way VNAs are developed and used.

Copper Mountain Technologies' VNAs are designed to work with the Windows or Linux PC you already use via USB interface. After installing the test software, you have a top-quality VNA at a fraction of the cost of a traditional analyzer. The result is a faster, more effective test process that fits into the modern workspace. This is the creativity that makes Copper Mountain Technologies stand out above the crowd.

We're creative. We're problem solvers.

	SC5065	SC5090
Frequency Range	300 kHz to 6.5 GHz	300 kHz to 9 GHz
S-parameters	S_{11}, S_{21}, S_{12}, S_{22}	S_{11}, S_{21}, S_{12}, S_{22}
Dynamic Range	140 dB, typ.	140 dB, typ.