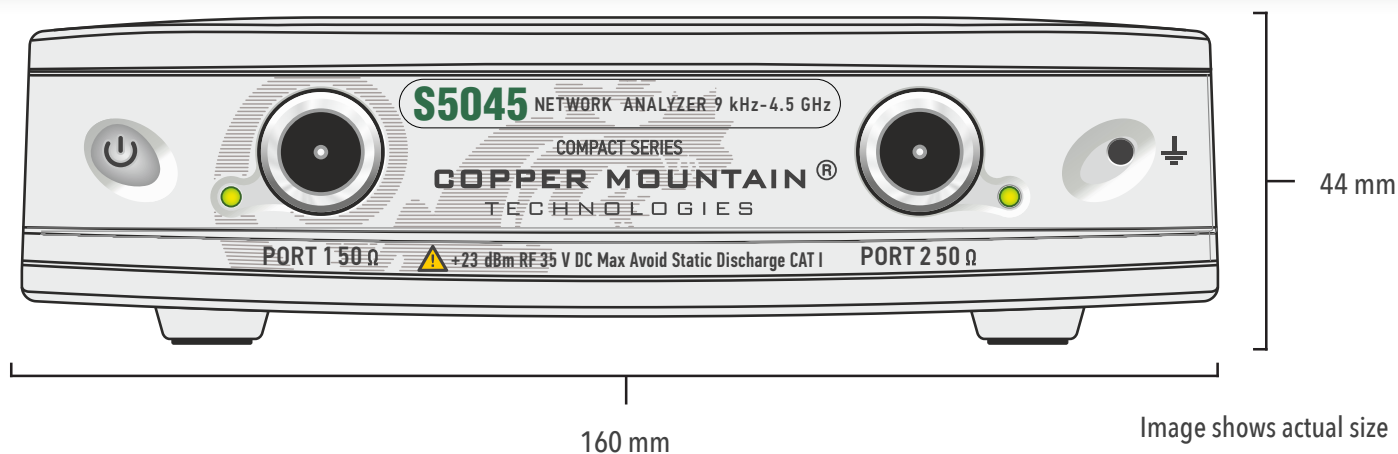


S5045 Extended Data Sheet



- **Frequency range:** 9 kHz - 4.5 GHz
- **Wide output power range:** -55 dBm to +5 dBm
- **Dynamic range:** 135 dB (10 Hz IF bandwidth) typ.*
- **Measurement time per point:** 70 μ s per point, min typ.*
- **16 logical channels with 16 traces** each max.
- **Automation programming** in Python, LabVIEW, MATLAB, .NET, etc.
- **Time domain and gating** conversion included
- **Frequency offset mode**, including vector mixer calibration measurements
- **Up to 200,001 measurement points**
- Multiple **precision calibration** methods and automatic calibration

S5045 Specifications¹



Primary Specifications³

Impedance	50 Ohm
Test port connector	type N, female
Number of test ports	2
Frequency range	9 kHz to 4.5 GHz
Full frequency accuracy	$\pm 5 \cdot 10^{-6}$
Frequency resolution	1 Hz
Number of measurement points	2 to 200,001
Measurement bandwidths (with 1/1.5/2/3/5/7 steps)	1 Hz to 100 kHz
Dynamic range ²	
9 kHz to 300 kHz	85 dB (100 dB typ.)
300 kHz to 4.5 GHz	125 dB (130 dB typ.)

Measurement Accuracy

Accuracy of transmission measurements ⁴	Magnitude / Phase
9 kHz to 300 kHz	
-25 dB to +10 dB	± 0.2 dB / $\pm 2^\circ$
-45 dB to -25 dB	± 1.0 dB / $\pm 6^\circ$
300 kHz to 4.5 GHz	
0 dB to +10 dB	± 0.2 dB / $\pm 2^\circ$
-45 dB to 0 dB	± 0.1 dB / $\pm 1^\circ$
-65 dB to -45 dB	± 0.2 dB / $\pm 2^\circ$
-85 dB to -65 dB	± 1.0 dB / $\pm 6^\circ$
Accuracy of reflection measurements ⁵	Magnitude / Phase
-15 dB to 0 dB	± 0.4 dB / $\pm 3^\circ$
-25 dB to -15 dB	± 1.0 dB / $\pm 6^\circ$
-35 dB to -25 dB	± 3.0 dB / $\pm 20^\circ$
Trace noise magnitude (IF bandwidth 3 kHz)	
9 kHz to 300 kHz	0.050 dB rms
300 kHz to 4.5 GHz	0.002 dB rms
Temperature dependence	0.02 dB/°C

Effective System Data

9 kHz to 300 kHz		
Directivity		46 dB
Source match		40 dB
Load match		46 dB
Reflection tracking		± 0.10 dB
Transmission tracking		± 0.14 dB
300 kHz to 4.5 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

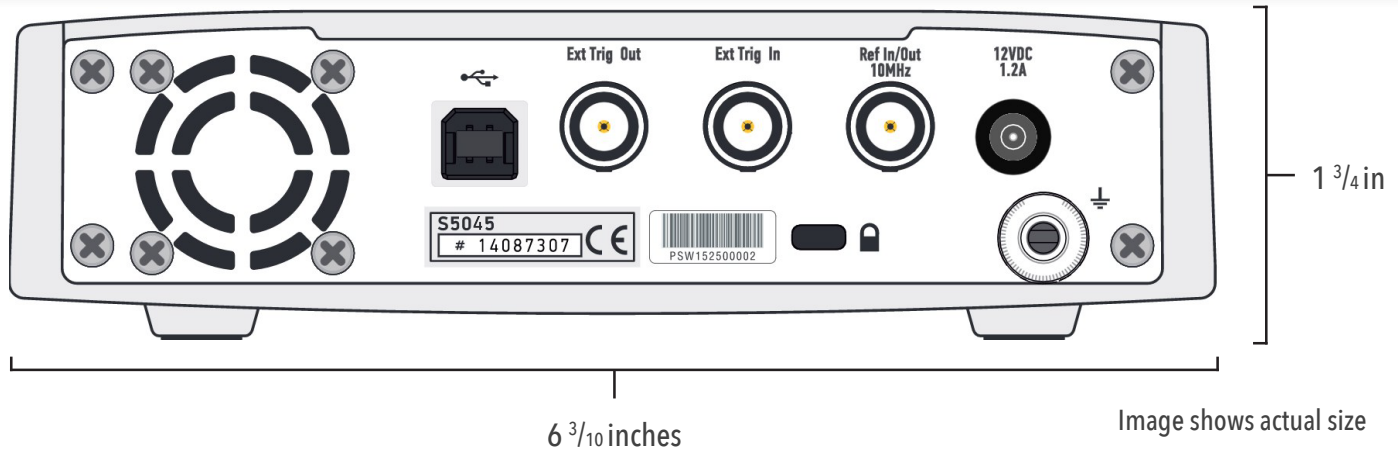
9 kHz to 300 kHz		
Directivity		8 dB
Source match		10 dB
Load match		10 dB
300 kHz to 4.5 GHz		
Directivity		15 dB
Source match		15 dB
Load match		15 dB

Test Port Output

Power range	-55 dBm to +5 dBm
Power accuracy	± 1.5 dB
Power resolution	0.05 dB
Harmonic distortion ⁶	-20 dBc
Non-harmonic spurious ⁶	-20 dBc

[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 $(73 \pm 9)^\circ\text{F}$ or $(23 \pm 5)^\circ\text{C}$ after 40 minutes of warming-up, with less than 1°C deviation from the full two-port calibration temperature, at output power of -5 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 frequency range from 300 kHz to upper frequency limit, at output power of 0 dBm. © Copper Mountain Technologies - www.coppermountaintech.com - Rev. 2022Q1

S5045 Specifications¹



Test Port Input

Noise floor	
9 kHz to 300 kHz	-90 dBm/Hz
300 kHz to 4.5 GHz	-130 dBm/Hz
Damage level	+23 dBm
Damage DC voltage	35 V

Measurement Speed

Time per point	70 μ s typ.
Port switchover time	1 ms

Frequency Reference Input

Port	10 MHz Ref In/Out
External reference frequency	10 MHz
Input level	-1 dBm to 5 dBm
Input impedance	50 Ohm
Connector type	BNC, female

Frequency Reference Output

Port	10 MHz Ref In/Out
Internal reference frequency	10 MHz
Output reference signal level at 50 Ohm impedance	1 dBm to 5 dBm
Connector type	BNC, female

Trigger Input

Port	Ext Trig In
Input level	
Low threshold voltage	0.5 V
High threshold voltage	2.7 V
Input level range	0 V to + 5 V
Pulse width	$\geq 2 \mu$ s
Polarity	positive or negative
Input impedance	≥ 10 kOhm
Connector type	BNC, female

Trigger Output

Port	Ext Trig Out
Maximum output current	20 mA
Output level	
Low level voltage	0.0 V
High level voltage	3.5 V
Polarity	positive or negative
Connector type	BNC, female

System & Power

Operating system	Windows 7 and above
CPU frequency	1.5 GHz
RAM	1 GB
Interface	USB 2.0
Connector type	USB B
Input power (VNA)	9 V DC to 15 V DC
Input power consumption (VNA)	12 W
Power supply (Main Outlet)	110-240 V, 50/60 Hz
Power consumption (Main Outlet)	14 W

Factory Adjustment

Recommended factory adjustment interval	3 years
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Dimensions

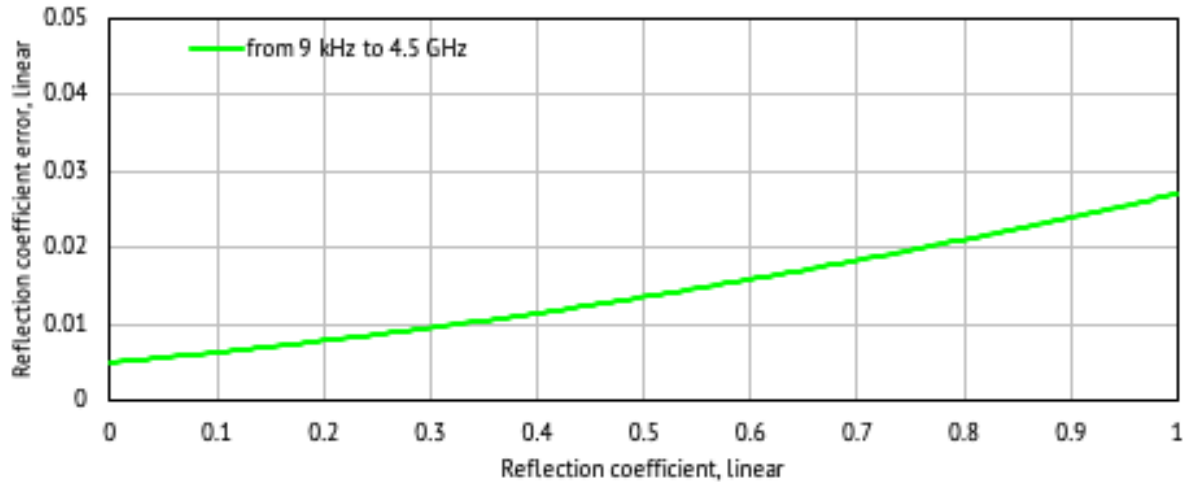
Length	297 mm
Width	160 mm
Height	44 mm
Weight	1.7 kg (60 oz)

Environmental Specifications

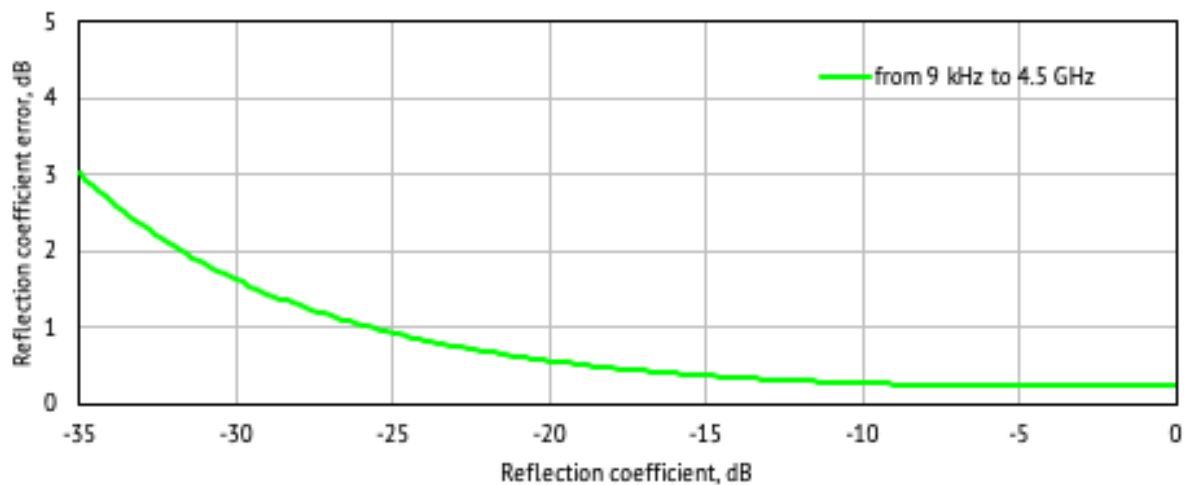
Operating temperature	+5 °C to +40 °C (41 °F to 104 °F)
Storage temperature	-50 °C to +70 °C (-58 °F to 158 °F)
Humidity	90 % at 25 °C (77 °F)
Atmospheric pressure	70.0 kPa to 106.7 kPa

Reflection Accuracy Plots

Reflection Magnitude Errors



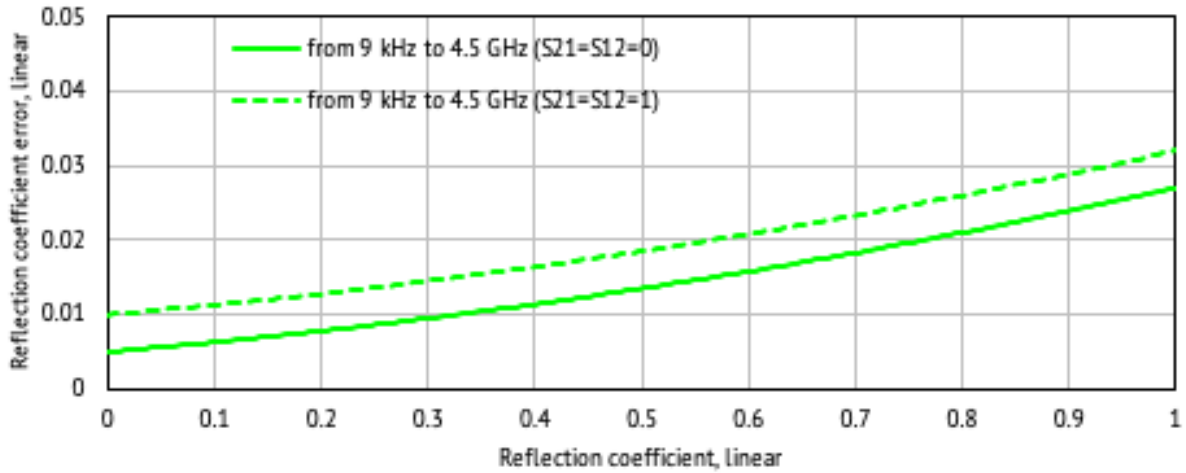
Specifications are based on isolating DUT ($S_{21} = S_{12} = 0$)



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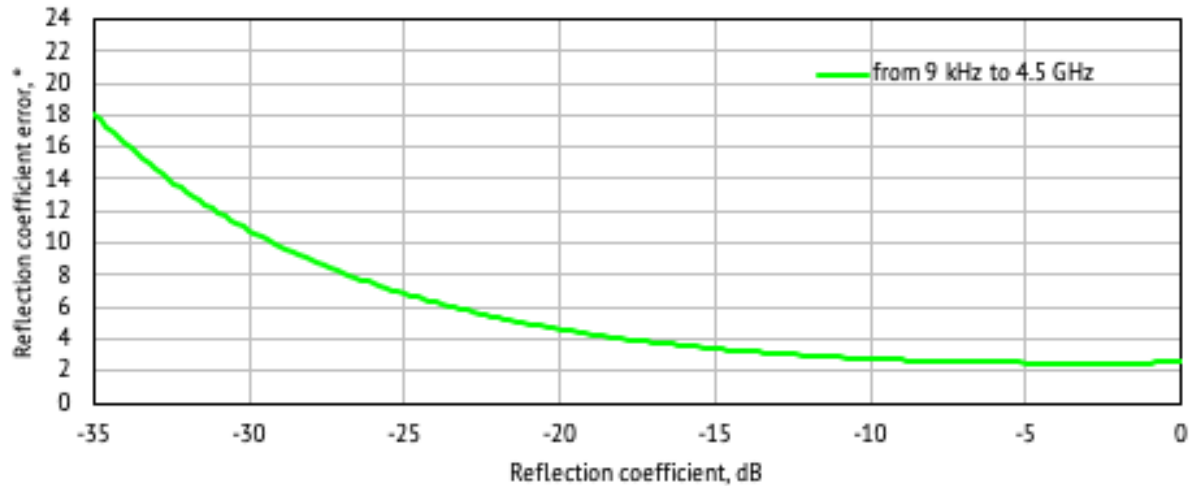
Reflection Accuracy Plots

Reflection Magnitude Errors

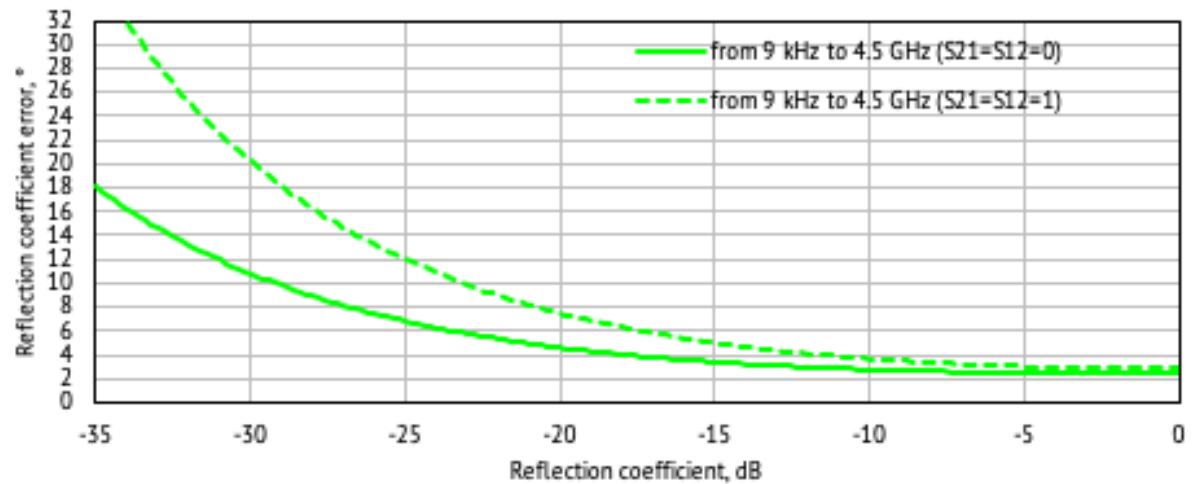


Reflection Accuracy Plots

Reflection Phase Errors

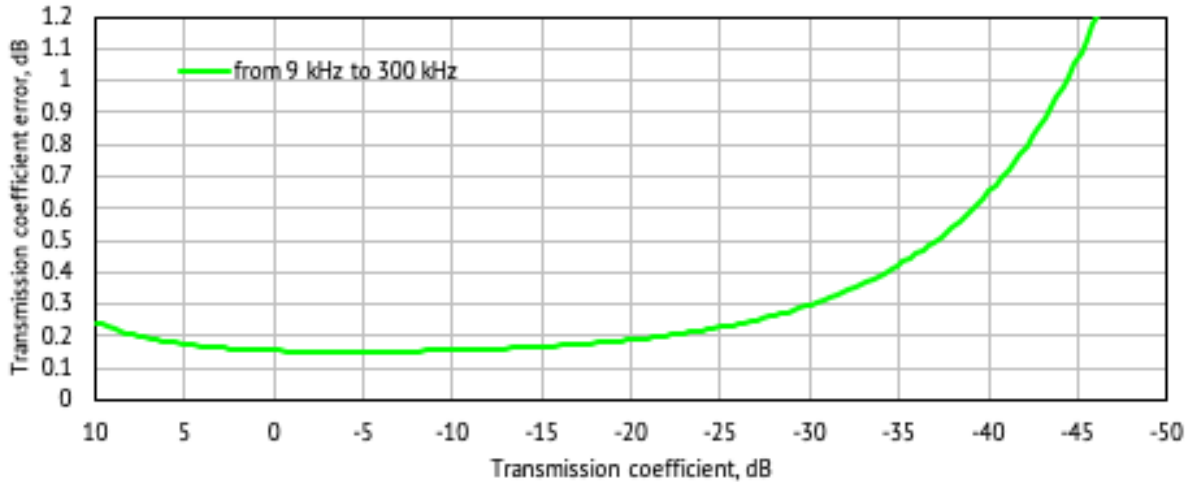


Specifications are based on isolating DUT ($S_{21} = S_{12} = 0$)

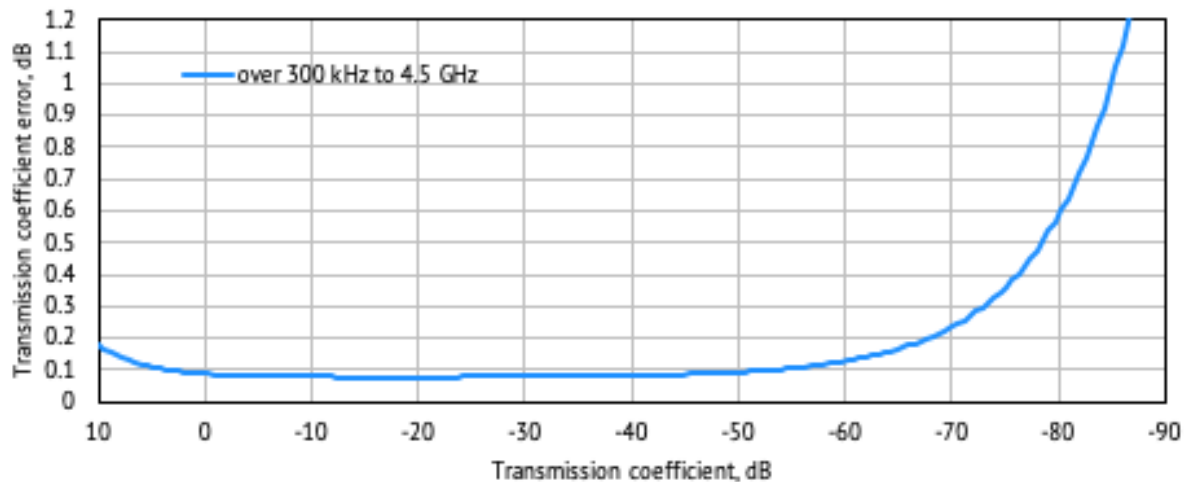


Transmission Accuracy Plots

Transmission Magnitude Errors



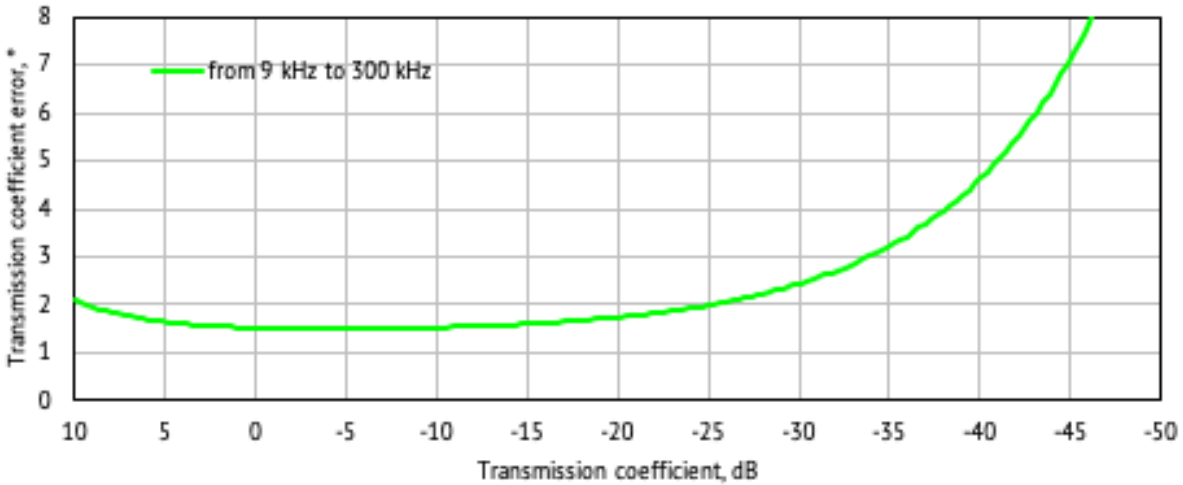
Specifications are based on matched DUT, and IF bandwidth of 10 Hz



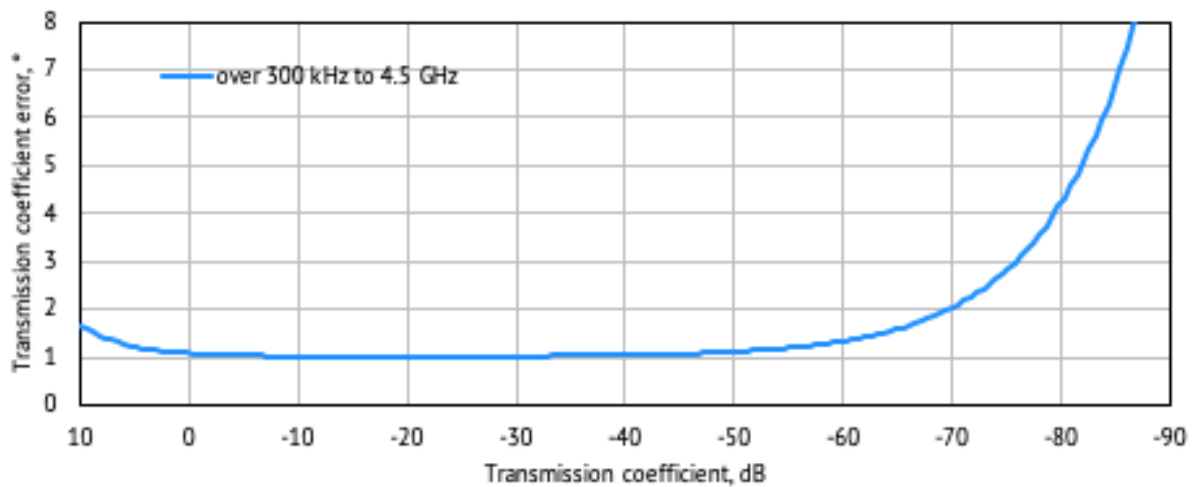
Specifications are based on matched DUT, and IF bandwidth of 10 Hz

Transmission Accuracy Plots

Transmission Phase Errors



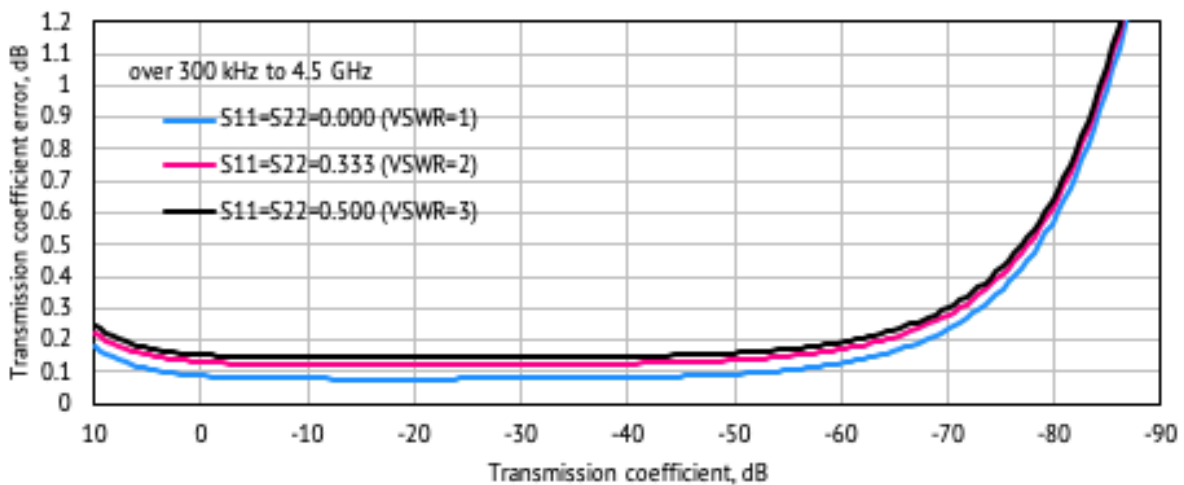
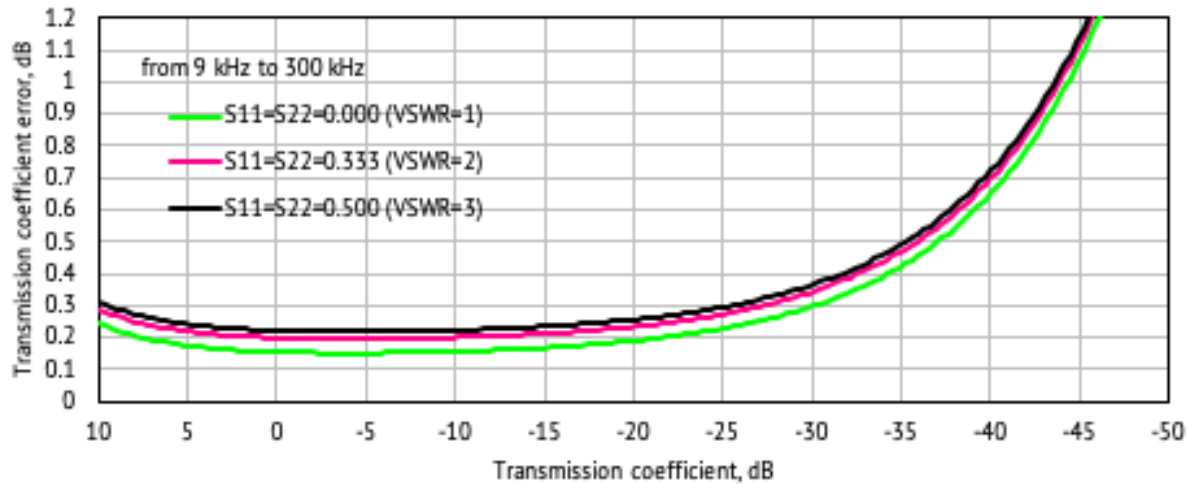
Specifications are based on matched DUT, and IF bandwidth of 10 Hz



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

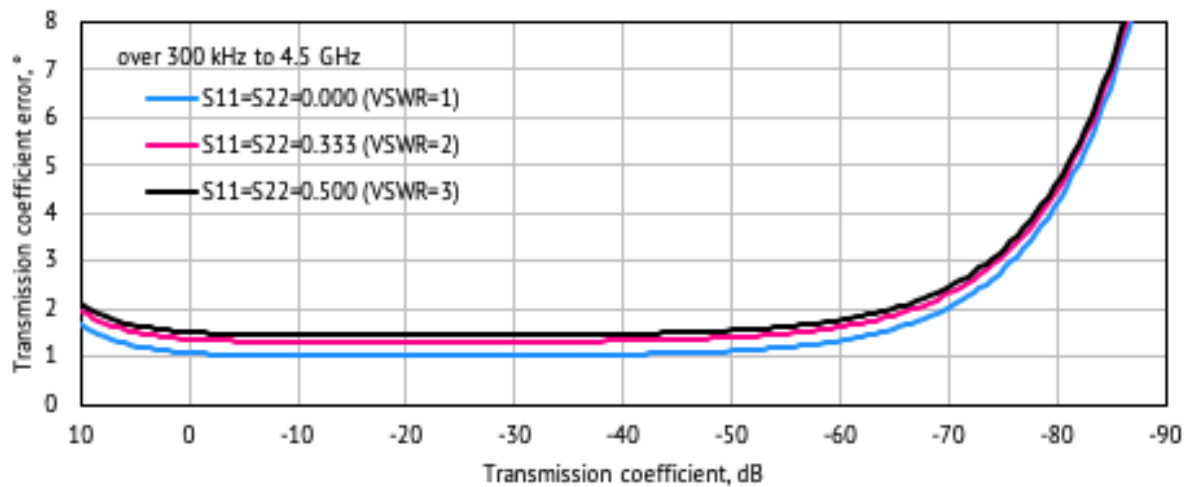
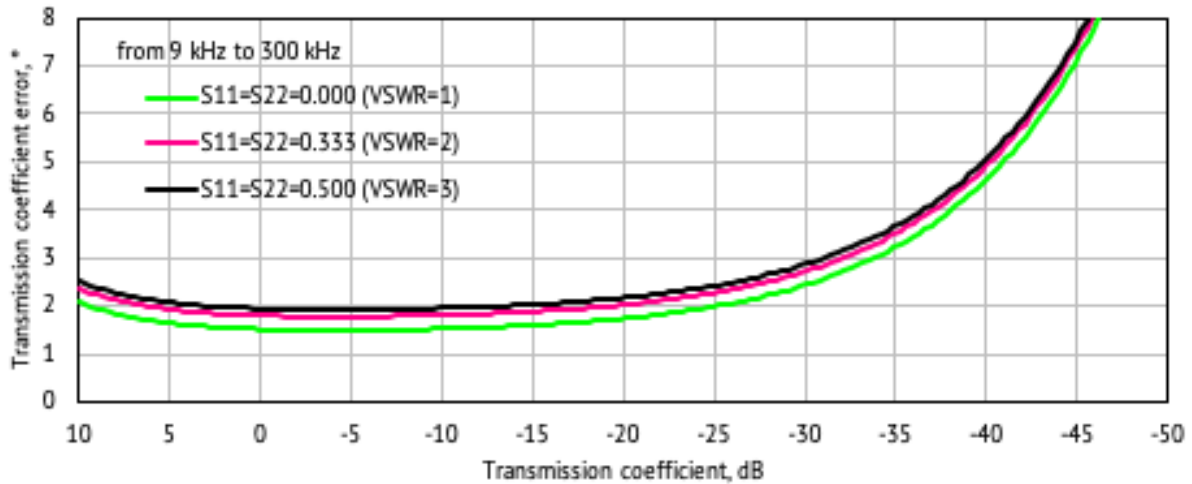
Transmission Accuracy Plots

Transmission magnitude errors for unmatched devices



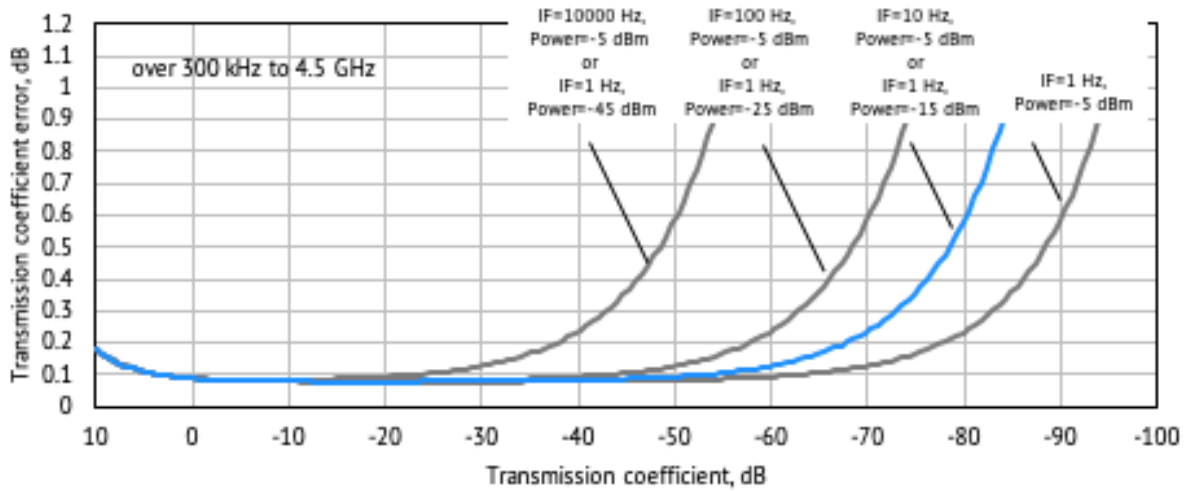
Transmission Accuracy Plots

Transmission phase errors for unmatched devices



Transmission Accuracy Plots

Transmission errors for matched devices vs Output power and IF Bandwidth





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.***



Compact Series S Models Overview

	S5045	S5065	S5085	S5180B	S5243	S7530
Frequency Range	9 kHz to 4.5 GHz	9 kHz to 6.5 GHz	9 kHz to 8.5 GHz	100 kHz to 18 GHz	10 MHz to 44 GHz	20 kHz to 3 GHz
Dynamic Range	130 dB, typ.	130 dB, typ.	130 dB, typ.	>130 dB, typ.	135 dB, typ.	123 dB, typ.
Port Impedance	50 Ohm	50 Ohm	50 Ohm	50 Ohm	50 Ohm	75 Ohm

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