Cobalt Series 9 GHz

Extended Specifications

COPPER MOUNTAIN TECHNOLOGIES

- **Frequency range:** 100 kHz - 9 GHz
- **Wide output power range:** -60 dBm to +15 dBm
- **Dynamic range:** 162 dB (1 Hz IF bandwidth) typ.
- **Measurement time per point:** 10 µs per point, min typ.
- **16 logical channels with 16 traces** each max
- **Automation programming** in LabView, Python, MATLAB, .NET, etc.
- 2- and 4-port models with **Direct Receiver Access** and **Frequency Extension** as available options
- **Time domain and gating** conversion included
- **Fixture simulation**
- **Frequency offset mode**, including vector mixer calibration measurements
- Up to **500,001 measurement points**
- Multiple **precision calibration** methods and automatic calibration

EXTEND YOUR REACH

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Specifications[1]

Measurement Range

Impedance	50 Ohm
Test port connector	type N, female
Number of test ports	
C1209, C2209, C4209	2 ports
C1409, C2409, C4409	4 ports
Direct Access (Source, Ref, and Meas)	C2209, C2409
Frequency extender compatible	C4209, C4409
Frequency range	100 kHz to 9.0 GHz
Full frequency accuracy	$\pm 2 \cdot 10^{-6}$
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 2 MHz
Dynamic range[2]	
100 kHz to 1 MHz	105 dB
1 MHz to 8 GHz	148 dB (152 dB typ.)
8 GHz to 9 GHz	138 dB (142 dB typ.)

Measurement Accuracy[3]

Accuracy of transmission measurements[4]	Magnitude / Phase
100 kHz to 1 MHz	
5 dB to 15 dB	±0.2 dB / ±2°
-30 dB to 5 dB	±0.1 dB / ±1°
-50 dB to -30 dB	±0.2 dB / ±2°
-70 dB to -50 dB	±1.0 dB / ±6°
1 MHz to 8 GHz	
5 dB to 15 dB	±0.2 dB / ±2°
-70 dB to 5 dB	±0.1 dB / ±1°
-90 dB to -70 dB	±0.2 dB / ±2°
-110 dB to -90 dB	±1.0 dB / ±6°
8 GHz to 9 GHz	
5 dB to 15 dB	±0.2 dB / ±2°
-60 dB to 5 dB	±0.1 dB / ±1°
-80 dB to -60 dB	±0.2 dB / ±2°
-100 dB to -80 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)	
100 kHz to 1 MHz	0.005 dB rms
1 MHz to 9 GHz	0.001 dB rms
Temperature dependence	0.02 dB/°C (0.01 dB/°C typ.)

[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 1 Hz. [5] Reflection specifications are based on an isolating DUT. *- www.coppermountaintech.com - Rev. 2019Q4*

Specifications[1]

Effective System Data

100 kHz to 1 MHz	
Directivity	46 dB
Source match	40 dB
Load match	46 dB
Reflection tracking	±0.05 dB
Transmission tracking	±0.10 dB
1 MHz to 9 GHz	
Directivity	46 dB
Source match	40 dB
Load match	46 dB
Reflection tracking	±0.05 dB
Transmission tracking	±0.05 dB

Uncorrected System Performance

C1209, C4209, C1409, C4409	
100 kHz to 1 MHz	
Directivity	12 dB
Source match	12 dB
Load match	12 dB
1 MHz to 9 GHz	
Directivity	18 dB
Source match	20 dB
Load match	20 dB
C2209, C2409	
100 kHz to 1 MHz	
Directivity	12 dB
Source match	12 dB
Load match	12 dB
1 MHz to 9 GHz	
Directivity	15 dB
Source match	15 dB
Load match	15 dB

Test Port Output

Power range	-60 dBm to +15 dBm
Power accuracy	±1.5 dB
Power resolution	0.05 dB
Harmonic distortion[6]	-25 dBc
Non-harmonic spurious[6]	-30 dBc

[1] All specifications subject to change without notice. [6] Specification applies over frequency range from 1 MHz to 9 GHz, at output power of 0 dBm.

Specifications[1]

Test Port Input

Noise floor	
100 kHz to 1 MHz	-100 dBm/Hz
1 MHz to 8 GHz	-143 dBm/Hz
8 GHz to 9 GHz	-133 dBm/Hz
Damage level	+26 dBm
Damage DC voltage	35 V
Direct receiver access ports	C2209, C2409
Maximum operating input power level	
Ref	-3 dBm
Source	15 dBm
Meas	-3 dBm
Damage level	
Ref	13 dBm
Source	26 dBm
Meas	13 dBm
Damage DC voltage	
Ref	0 V
Source	35 V
Meas	0 V

Measurement Speed

Time per point	10 µs typ.	
Port switchover time	0.2 ms typ.	
Typical cycle time vs number of measurement points		
Number of points (IF bandwidth 1 MHz)	Uncorrected	2-port calibration
51	1.0 ms	2.0 ms
201	2.6 ms	5.0 ms
401	4.6 ms	9.0 ms
1601	16.7 ms	33.3 ms

Frequency Reference Input

Port	10 MHz Ref In
External reference frequency	10 MHz
Input level	-2 dBm to 4 dBm
Input impedance	50 Ohm
Connector type	BNC, female

Frequency Reference Output

Port	10 MHz Ref Out
Internal reference frequency	10 MHz
Output reference signal level at 50 Ohm impedance	0 dBm to 2 dBm
Connector type	BNC, female

Specifications[1]

Trigger Input

Port	Ext Trig In
Input level	
Low threshold voltage	0.8 V
High threshold voltage	2.7 V
Input level range	0 to + 5 V
Pulse width	≥2 µs
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	0.4 V
High level voltage	3.0 V
Polarity	positive or negative
Connector type	BNC, female

Aux Inputs (Optional)

Port	AUX In1, AUX In2
DC voltage range	±1 V, or ±10 V selectable
Measurement accuracy	
±1 V input	1 % ± 1 mV
±10 V input	1 % ± 10 mV
Input impedance	≥10 kOhm
Damage voltage	30 V
Number of ports	2
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
Power supply	110-240 V, 50/60 Hz
Power consumption	
40W	C1209, C2209
75W	C4209, C1409, C2409
145W	C4409

Specifications[1]

Calibration

Recommended Factory Adjustment Interval	3 Years

Dimensions

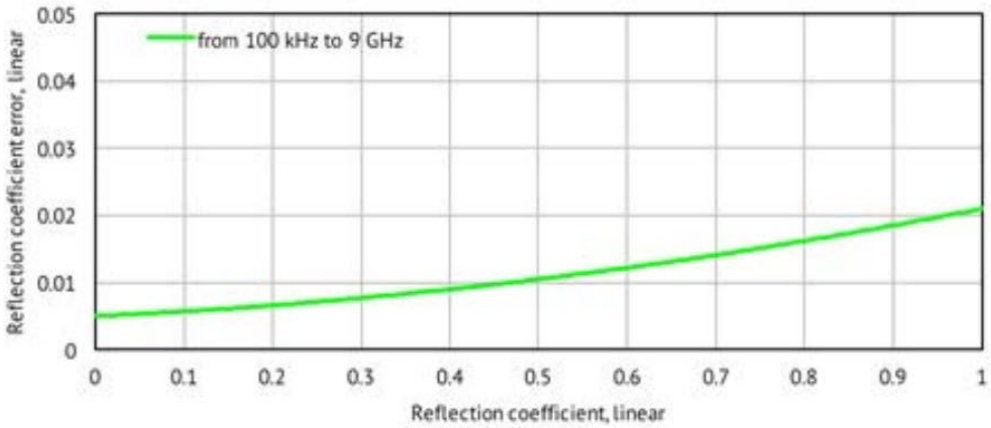
C1209	
Length	425 mm
Width	235 mm
Height	96 mm
Weight	5.5 kg (194 oz)
C2209, C4209	
Length	355 mm
Width	440 mm
Height	96 mm
Weight	7 kg (247 oz)
C1409, C2409, C4409	
Length	355 mm
Width	440 mm
Height	96 mm
Weight	10 kg (353 oz)

Environmental Specifications

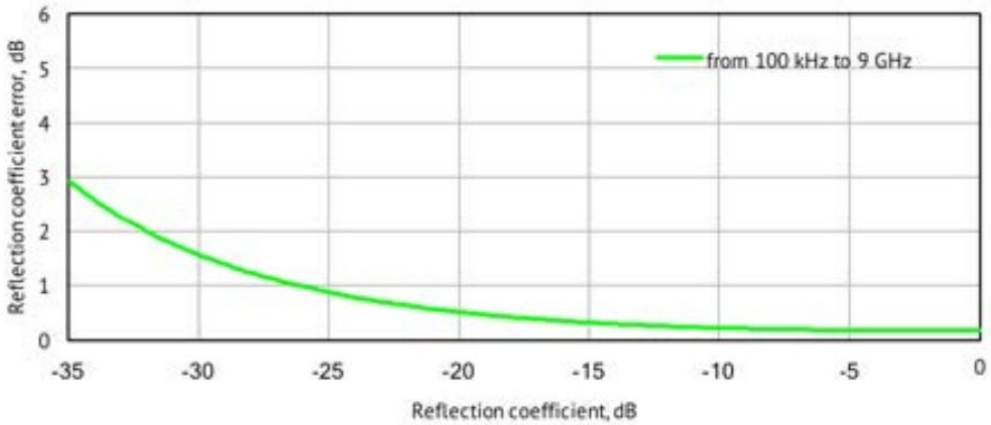
Operating temperature	+5 °C to +40 °C (41 °F to 104 °F)
Storage temperature	-50 °C to +70 °C (-58 °F to 158 °F)
Humidity	90 % at 25 °C (77 °F)
Atmospheric pressure	70.0 kPa to 106.7 kPa

Reflection Accuracy Plots

Reflection Magnitude Errors



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



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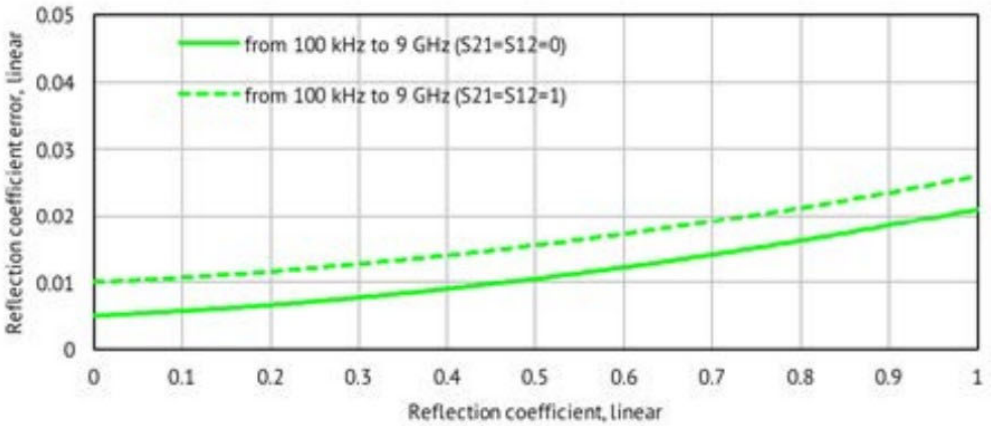
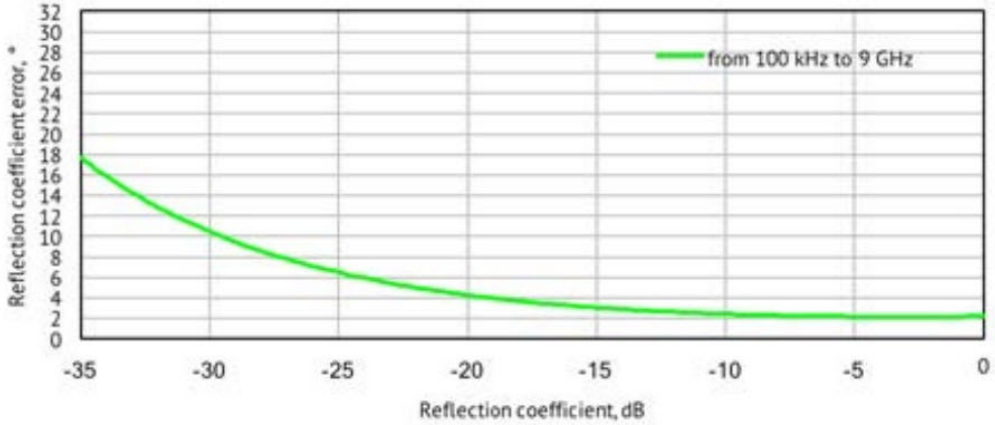


Reflection Accuracy Plots

Reflection Phase Errors



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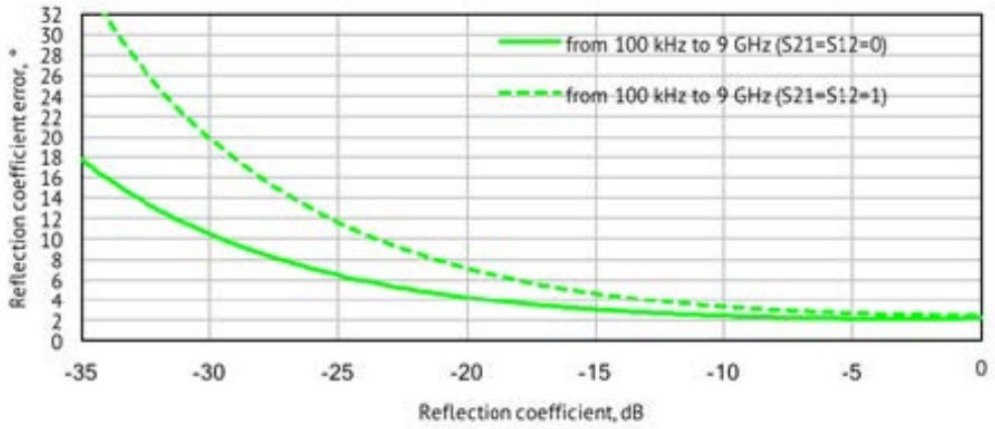
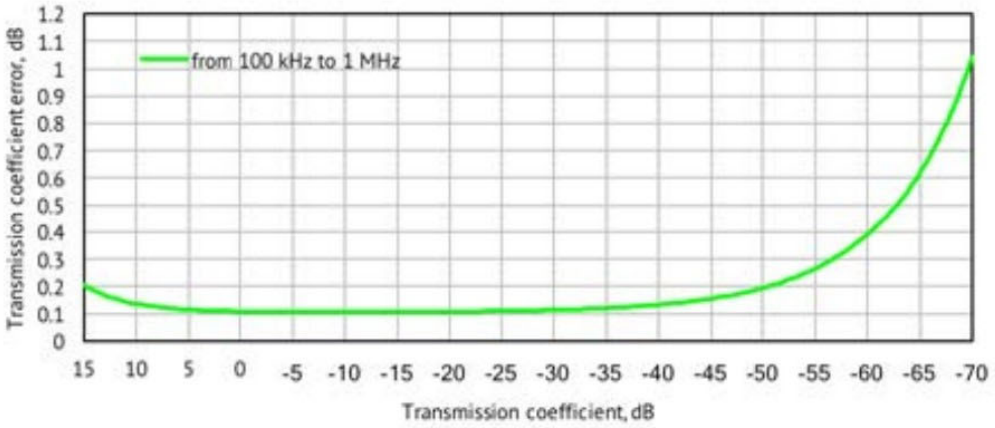
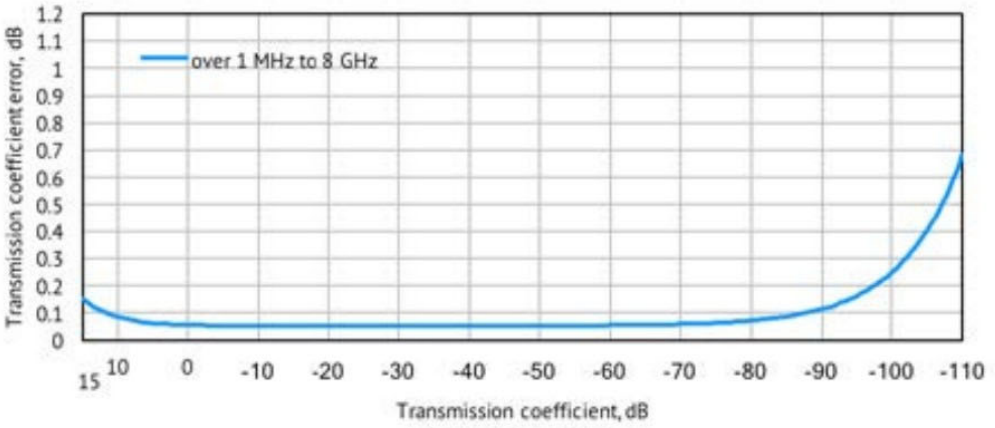


Transmission Accuracy Plots

Transmission Magnitude Errors



Specifications are based on matched DUT, and IF bandwidth of 1 Hz



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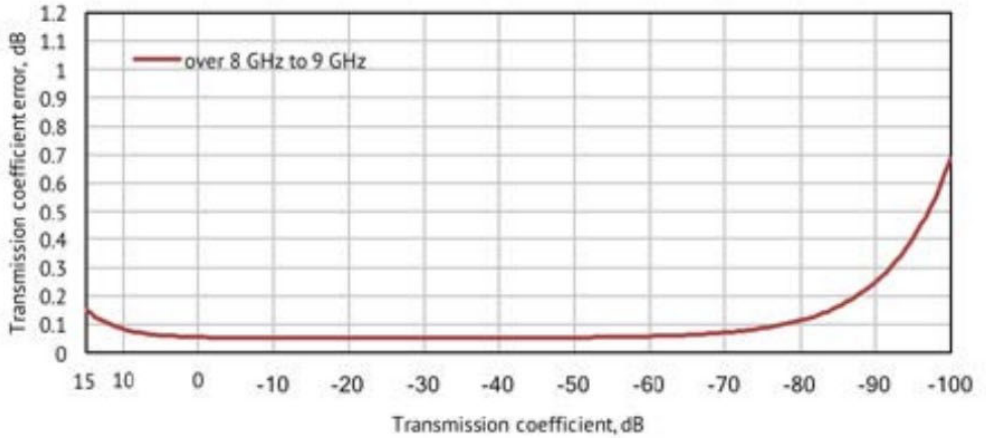
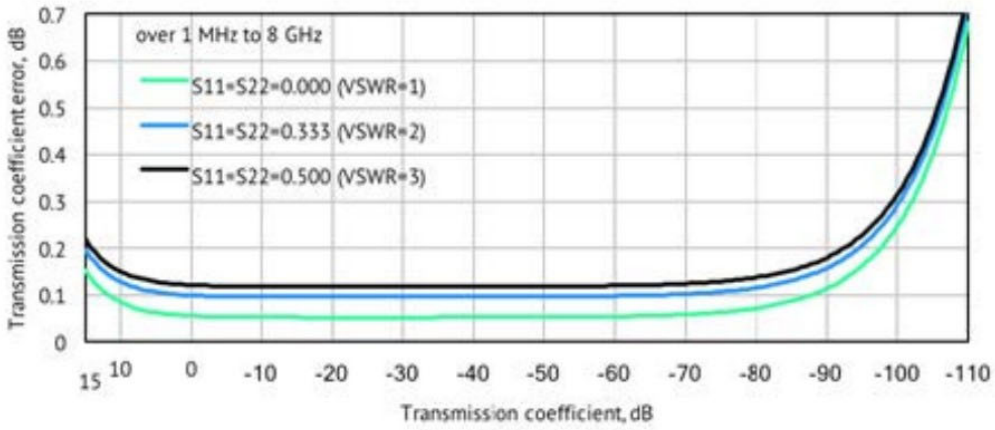


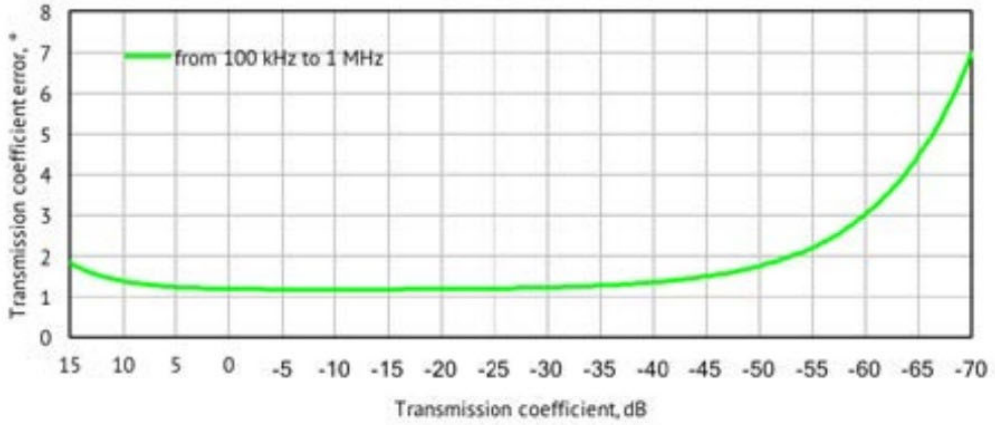
Specifications are based on matched DUT, and IF bandwidth of 1 Hz

Transmission Accuracy Plots

Transmission Magnitude Errors



Transmission Phase Errors



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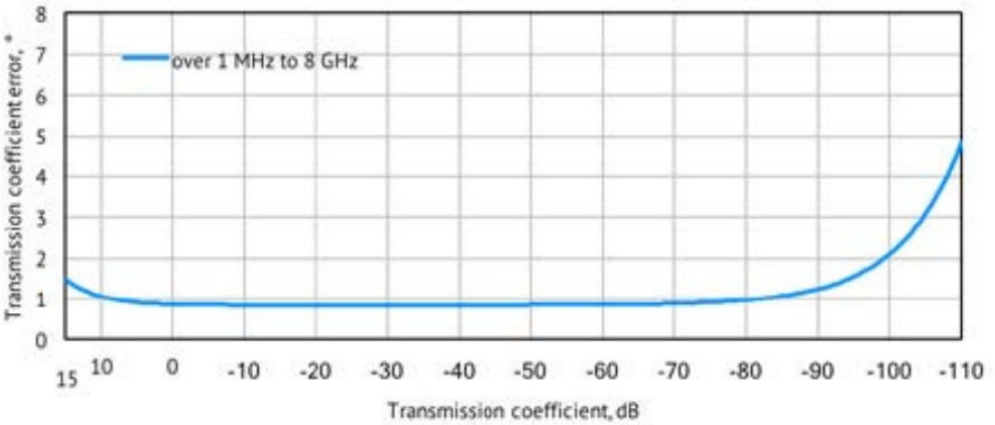

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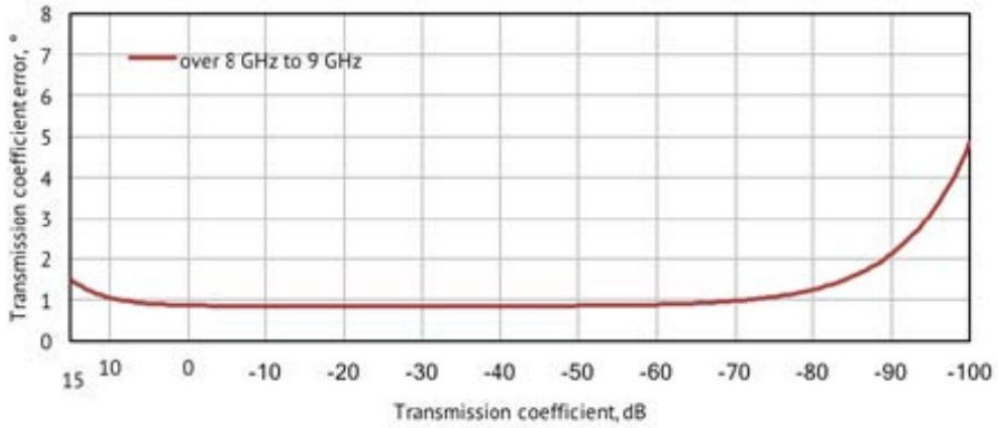
Transmission Accuracy Plots

Transmission Phase Errors



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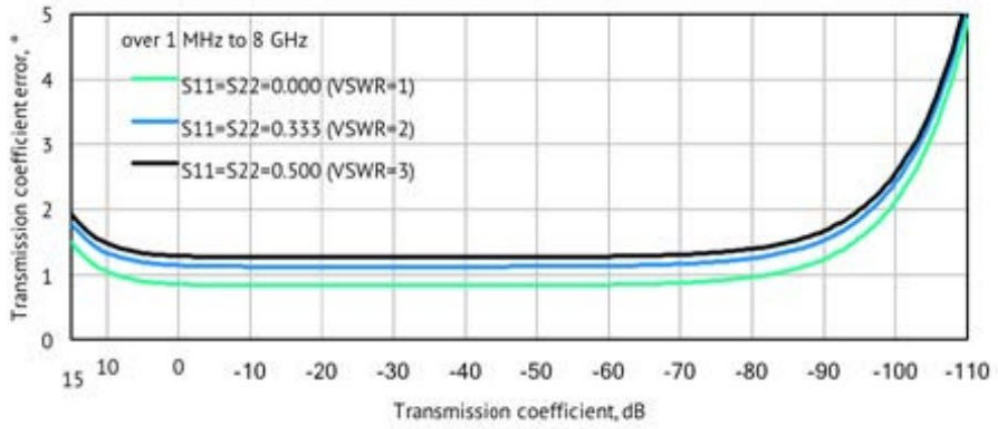
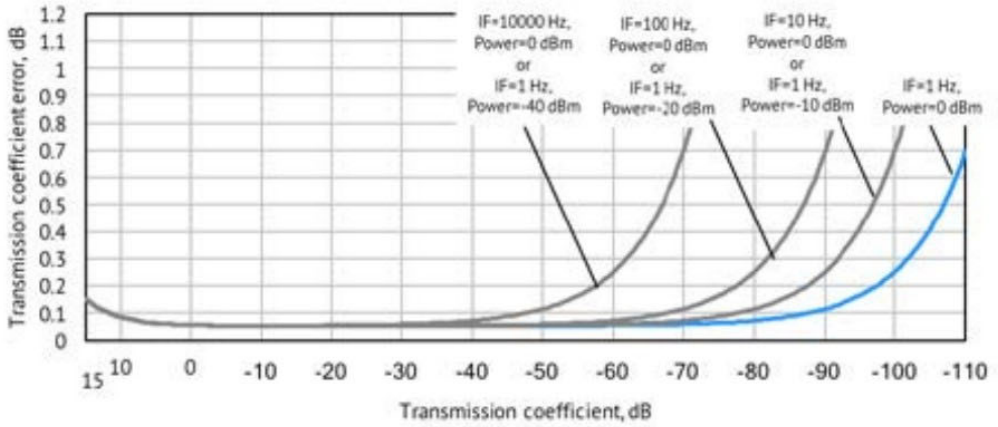


Transmission errors for matched devices vs. output power and IF Bandwidth



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 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.

	C1209	C2209	C4209	C1409	C2409	C4409
Frequency Range	100 kHz to 9 GHz	100 kHz to 9 GHz	100 kHz to 9 GHz	100 kHz to 9 GHz	100 kHz to 9 GHz	100 kHz to 9 GHz
Number of Ports	2	2	2	4	4	4
Additional Features		Direct Receiver Access	Frequency Extension		Direct Receiver Access	Frequency Extension

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