

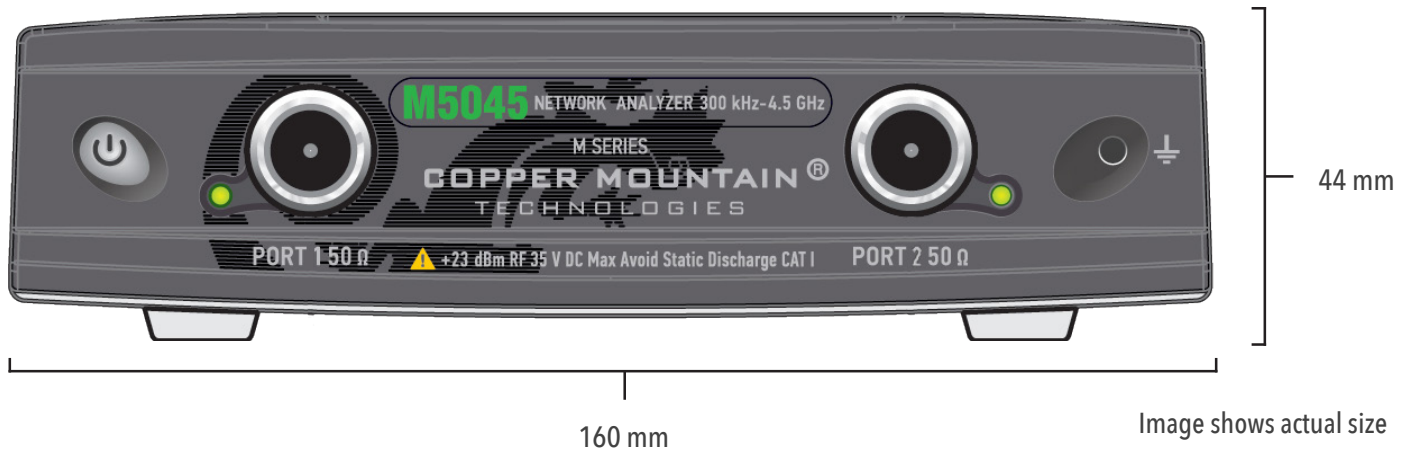
M5045 Extended Data Sheet



- **Frequency range:** 300 kHz - 4.5 GHz
- **Wide output power range:** -55 dBm to +5 dBm
- **Dynamic range:** 130 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.
- **Up to 200,001 measurement points**
- **Multiple precision calibration** methods and automatic calibration

**Depending on model*

M5045 Specifications¹



Primary Specifications³

| | |
|---|-----------------------|
| Impedance | 50 Ohm |
| Test port connector | type N, female |
| Number of test ports | 2 |
| Frequency range | 300 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 | 125 dB (130 dB typ.) |

Measurement Accuracy

| Accuracy of transmission measurements ⁴ | Magnitude / Phase |
|--|-------------------------------|
| 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) | 0.002 dB rms |
| Temperature dependence | 0.02 dB/°C |

Effective System Data

| | |
|-----------------------|---------------|
| Directivity | 46 dB |
| Source match | 40 dB |
| Load match | 46 dB |
| Reflection tracking | ± 0.10 dB |
| Transmission tracking | ± 0.08 dB |

Uncorrected System Performance

| | |
|--------------|-------|
| Directivity | 15 dB |
| Source match | 15 dB |
| Load match | 15 dB |

Test Port Output

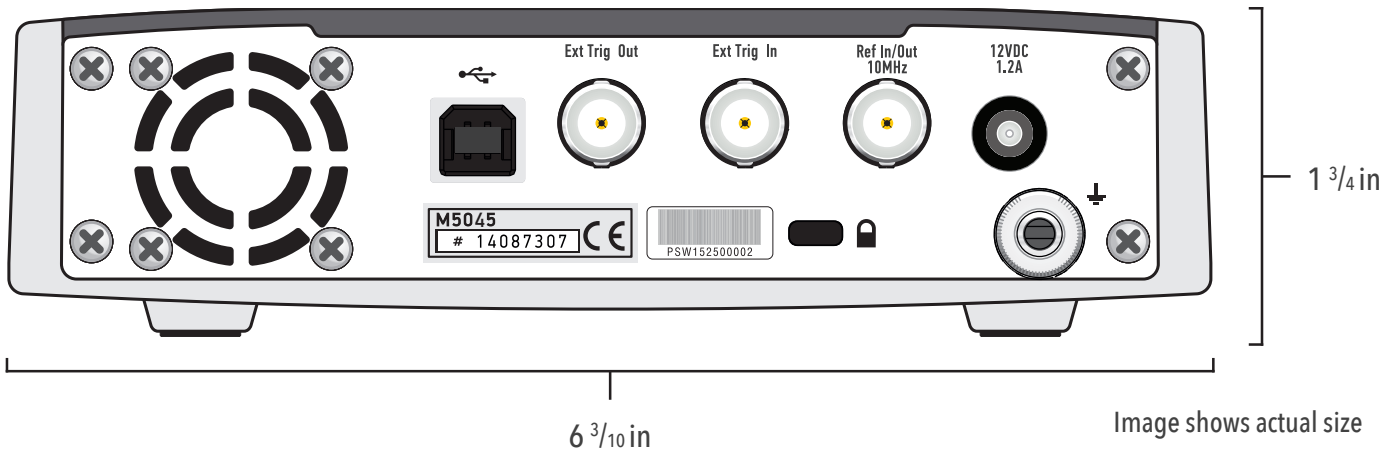
| | |
|------------------------------------|-------------------|
| Power range | -55 dBm to +5 dBm |
| Power accuracy | ± 1.5 dB |
| Power resolution | 0.05 dB |
| Harmonic distortion ⁶ | -20 dBc |
| Non-harmonic spurious ⁶ | -20 dBc |

Test Port Input

| | |
|-------------------|-------------|
| Noise floor | -130 dBm/Hz |
| Damage level | +23 dBm |
| Damage DC voltage | 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 -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 entire frequency range, at output power of 0 dBm. © Copper Mountain Technologies - www.coppermountaintech.com - Rev. 2022Q1

M5045 Specifications¹



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 |
|---|---------|

Dimensions

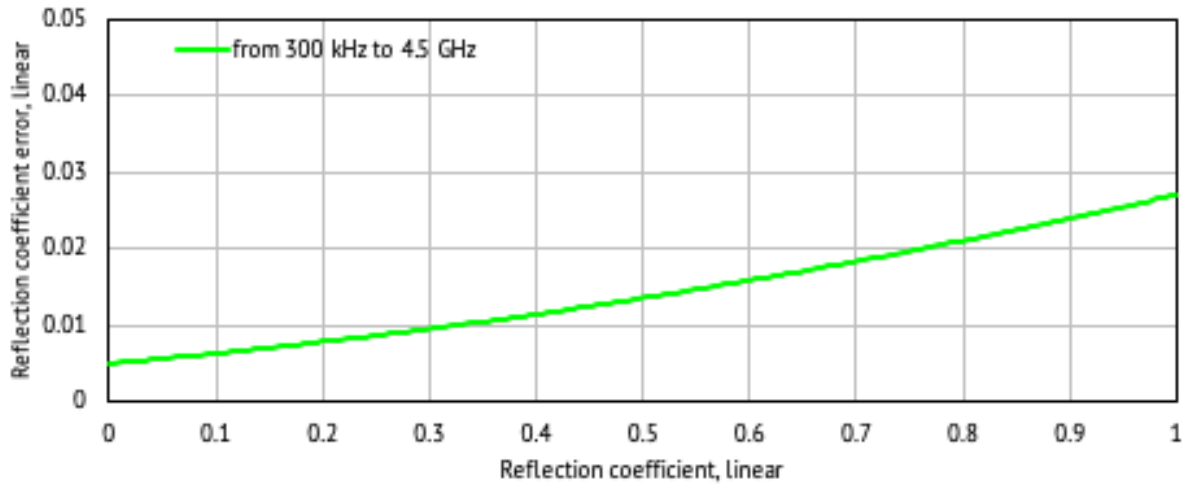
| | |
|--------|----------------|
| Length | 297 mm |
| Width | 160 mm |
| Height | 44 mm |
| Weight | 1.7 kg (60 oz) |

Environmental Specifications

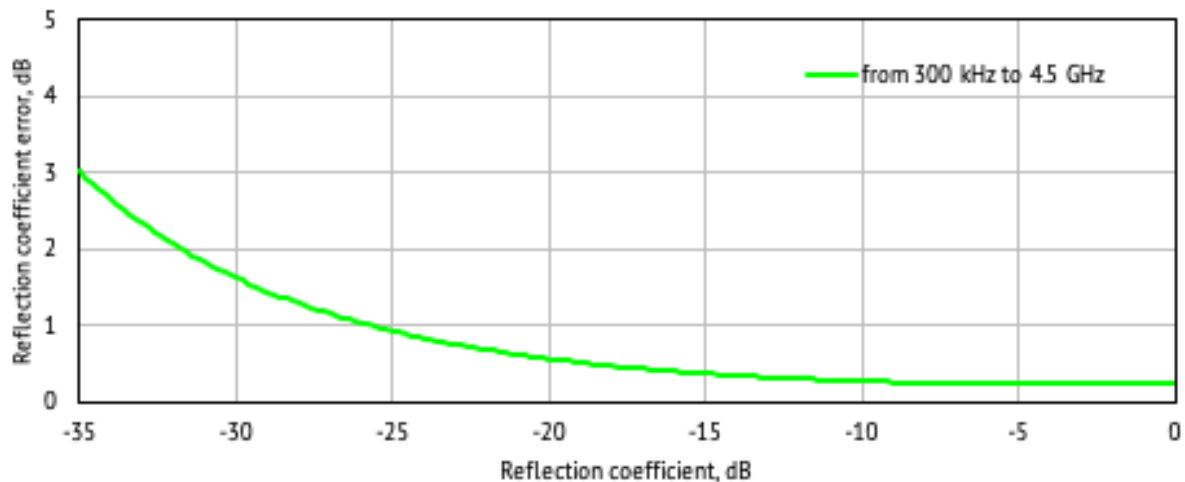
| | |
|-----------------------|-------------------------------------|
| Operating temperature | +5 °C to +40 °C (41 °F to 104 °F) |
| Storage temperature | -50 °C to +70 °C (-58 °F to 158 °F) |
| Humidity | 90 % at 25 °C (77 °F) |
| Atmospheric pressure | 70.0 kPa to 106.7 kPa |

Reflection Accuracy Plots

Reflection Magnitude Errors



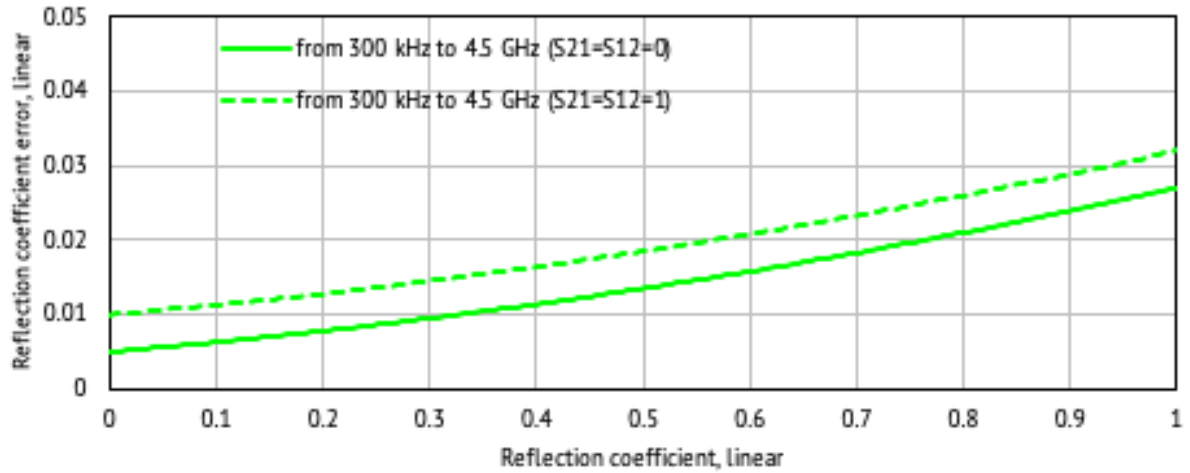
Specifications are based on isolating DUT ($S_{21} = S_{12} = 0$)



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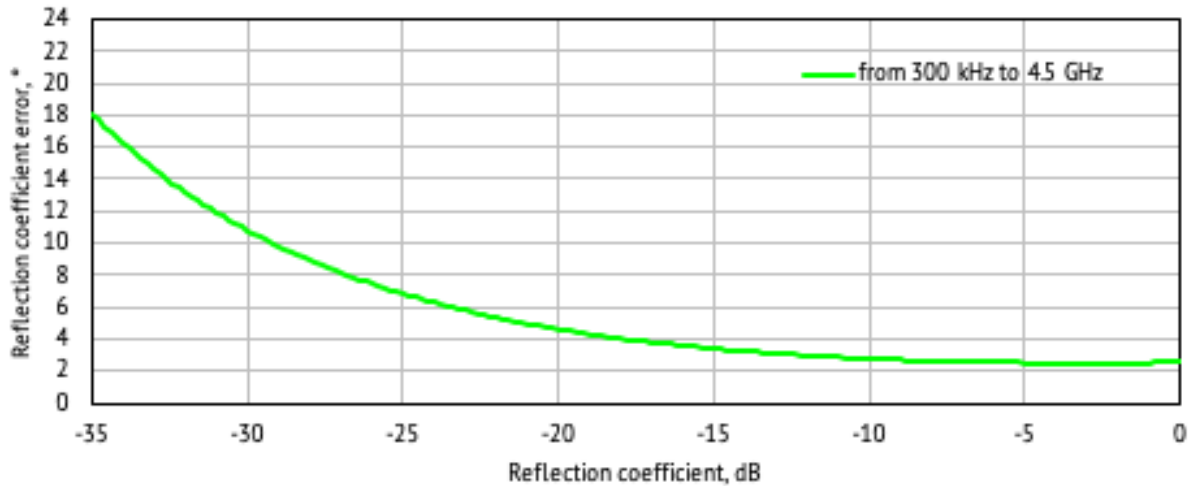
Reflection Accuracy Plots

Reflection Magnitude Errors

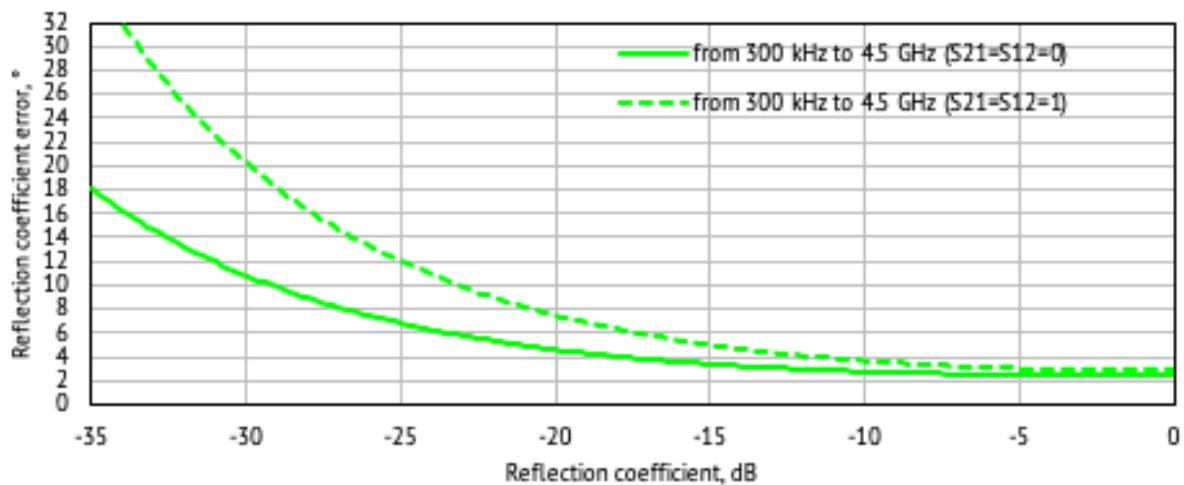


Reflection Accuracy Plots

Reflection Phase Errors

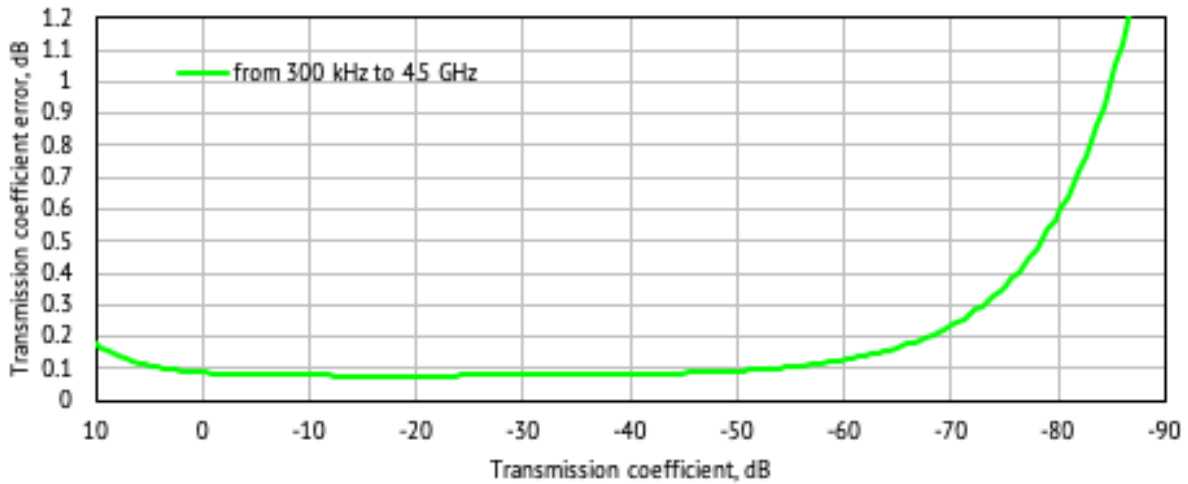


Specifications are based on isolating DUT ($S_{21} = S_{12} = 0$)



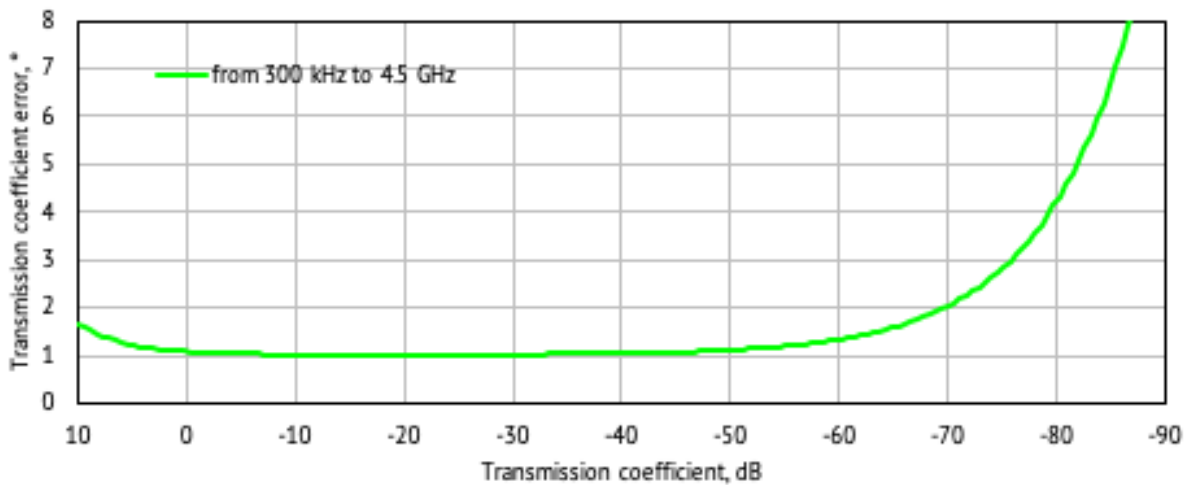
Transmission Accuracy Plots

Transmission Magnitude Errors



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

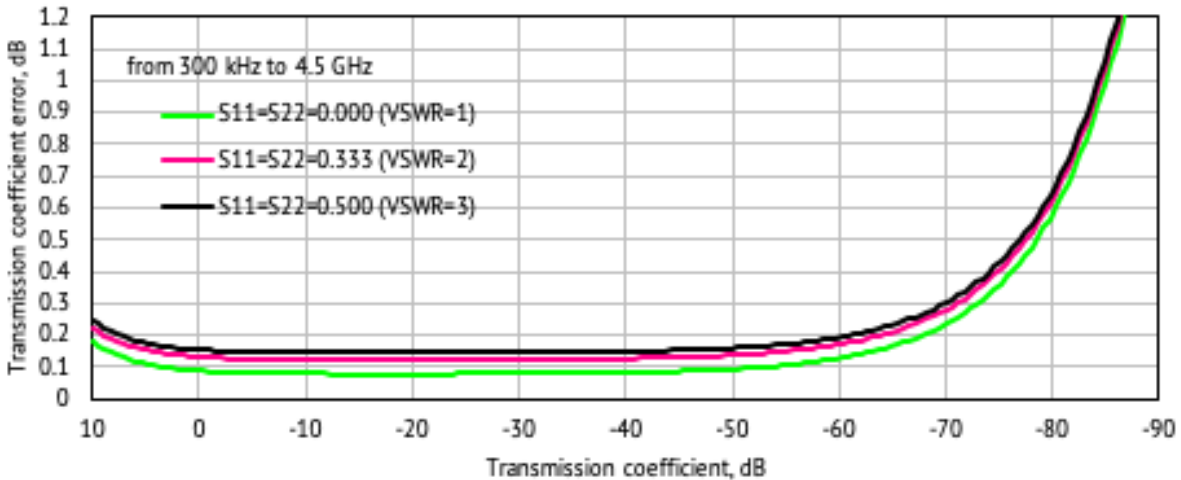
Transmission Phase Errors



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

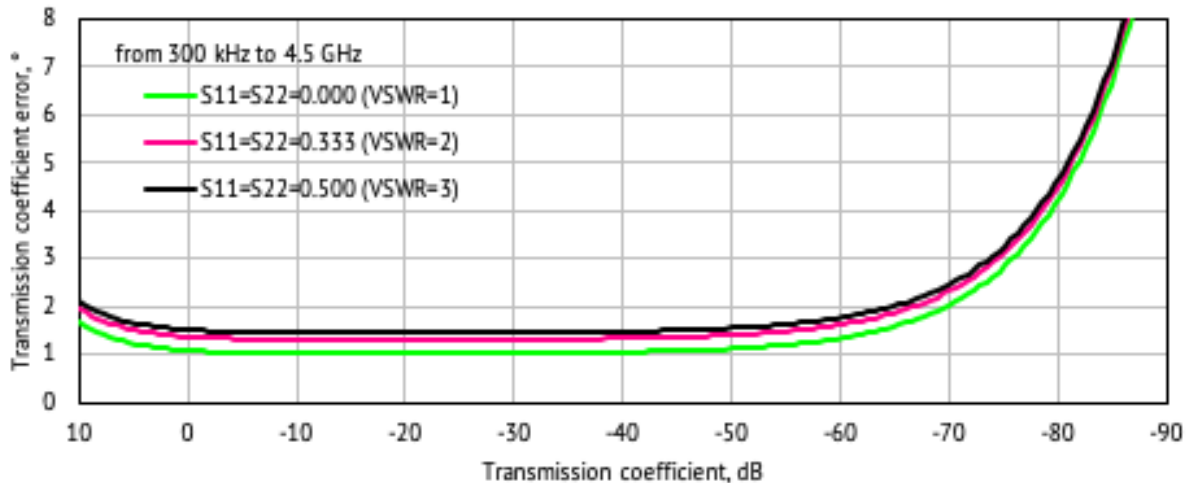
Transmission Accuracy Plots

Transmission Magnitude Errors for Unmatched Devices



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

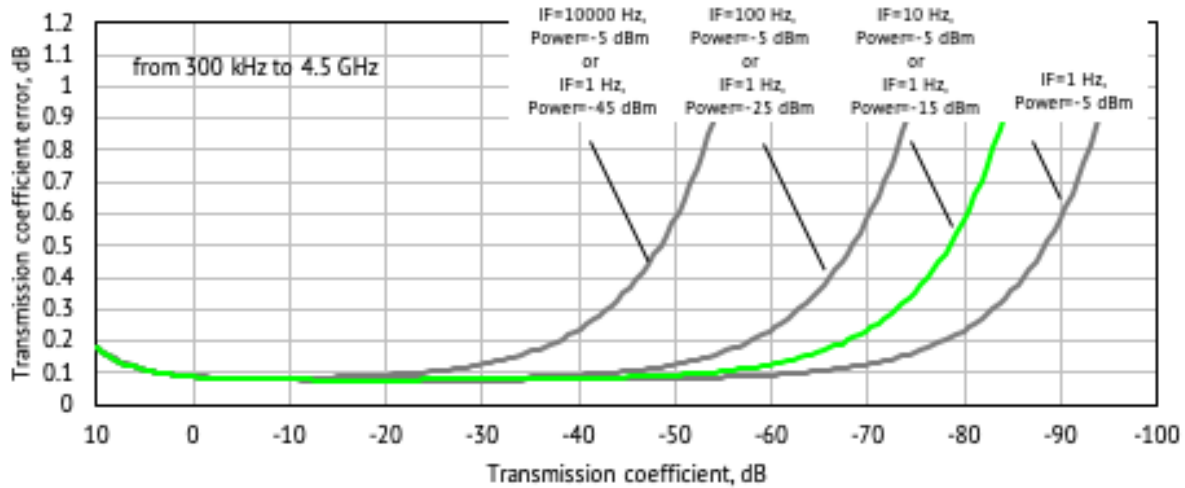
Transmission Phase Errors for Unmatched Devices



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

Transmission Accuracy Plots

Transmission Errors for Matched Devices vs. Output Power and IF Bandwidth



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.***



Compact Series M Models Overview

| | M5045 | M5065 | M5090 | M5180 |
|-----------------|--------------------|--------------------|------------------|-------------------|
| Frequency Range | 300 kHz to 4.5 GHz | 300 kHz to 6.5 GHz | 300 kHz to 9 GHz | 300 kHz to 18 GHz |
| Dynamic Range | 130 dB, typ. | 130 dB, typ. | 130 dB, typ. | 135 dB, typ. |

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