# PXIe VNA
## PXIe-S5090

COPPER MOUNTAIN
TECHNOLOGIES

**PXIe-S5090**
300 kHz to 9 GHz VNA

ACCESS    ACTIVE

PORT1 50Ω

REF IN
10 MHz

REF OUT
10 MHz

EXT
TRIG IN

EXT
TRIG OUT

PORT2 50Ω

⚠ +26 dBm RF
35 V DC Max
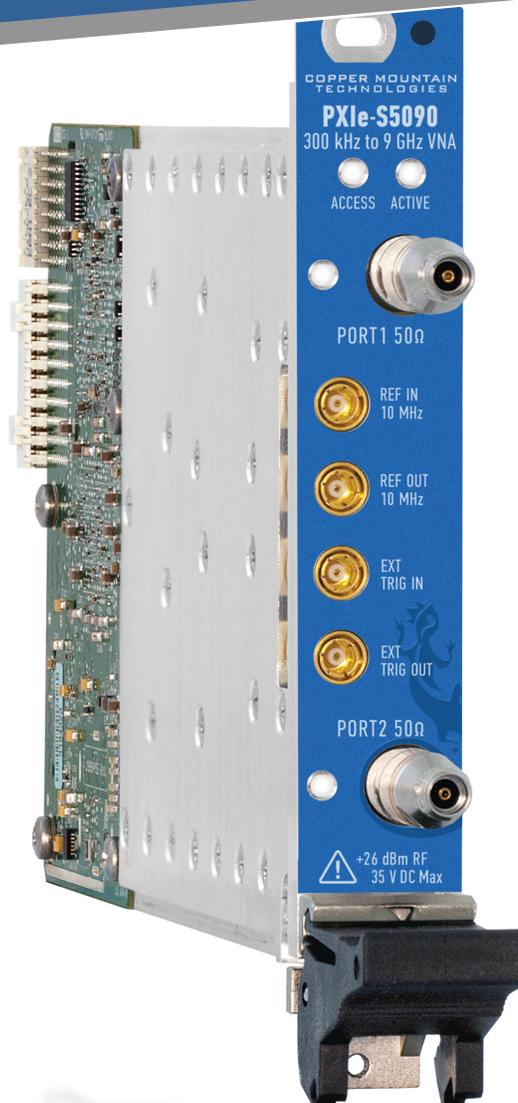
- **Frequency range:** 300 kHz - 9 GHz
- **Wide output power adjustment range:** -45 dBm to +13 dBm
- **Dynamic range:** 138 dB (10 Hz IF bandwidth) typ.
- **Measurement time per point:** 16 µs per point, min typ.
- Up to **16 logical channels with 16 traces** each max
- **Automation programming** in 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[1]

## 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[2] | |
| 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[3]

| Accuracy of transmission measurements[4] | Magnitude / Phase |
|---|---|
| 300 kHz to 1 MHz | |
| 0 dB to +13 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 +13 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 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 |

## 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 |

## Test Port Output

| Power range | |
|---|---|
| 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 |
| Power accuracy | ±2 dB |
| Power resolution | 0.05 dB |
| Harmonic distortion[6] | -8 dBc |
| Non-harmonic spurious[6] | -15 dBc (-22 dBc typ.) |

## 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 |

# PXIe-S5090 Specifications[1]

## Measurement Speed

| Time per point | | 16 µs typ. | |
|---|---|---|---|
| Port switchover time | | 200 µs | |
| Typical cycle time vs number of measurement points[7] | | | |
| 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 | ≥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 | 1.0 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 |
|---|---|

## 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) |

# PXIe-S5090 Specifications[1]

## Extended Effective System Data

| 300 kHz to 1 MHz | |
|---|---|
| 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 | $0.65 \cdot 10^{-3}$ |
| **1 MHz to 5 MHz** | |
| 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 | $0.65 \cdot 10^{-3}$ |
| **5 MHz to 6.5 GHz** | |
| 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 | $0.65 \cdot 10^{-3}$ |
| **6.5 GHz to 8.0 GHz** | |
| 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 | $1.15 \cdot 10^{-3}$ |
| **8 GHz to 9 GHz** | |
| 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**
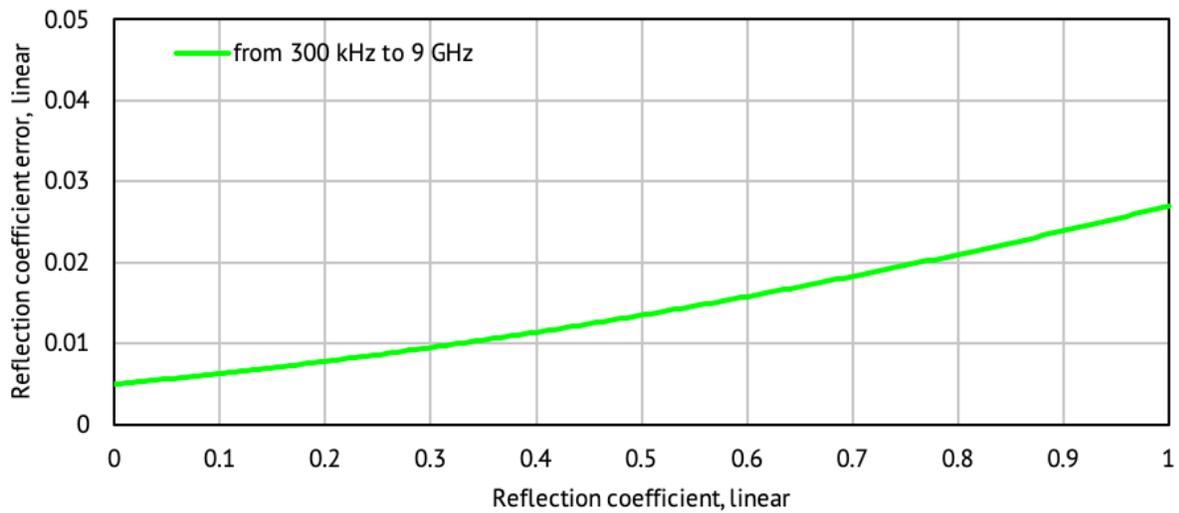


Specifications are based on isolating DUT $(S_{21} = S_{12} = 0)$
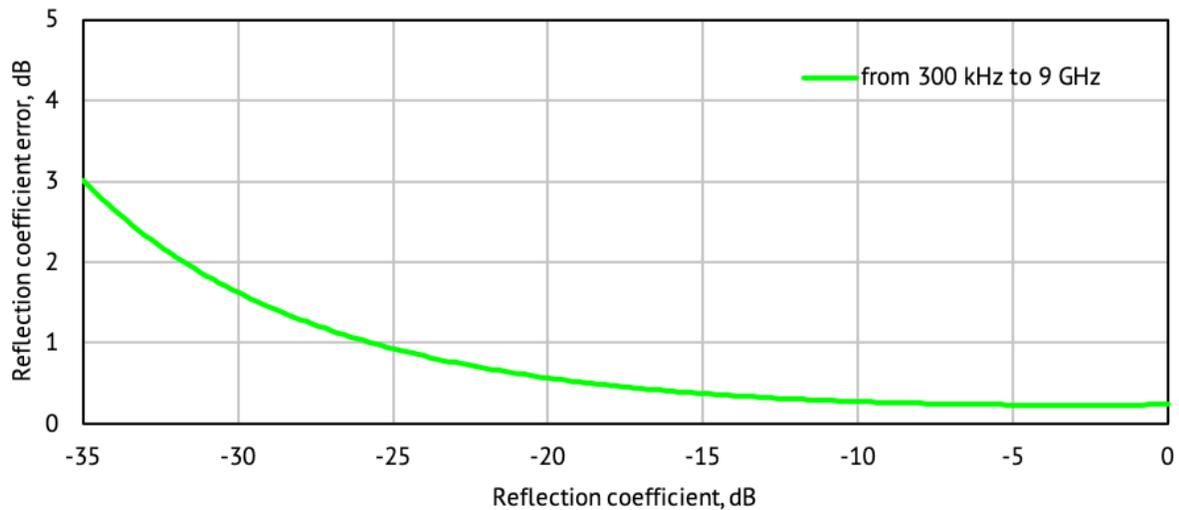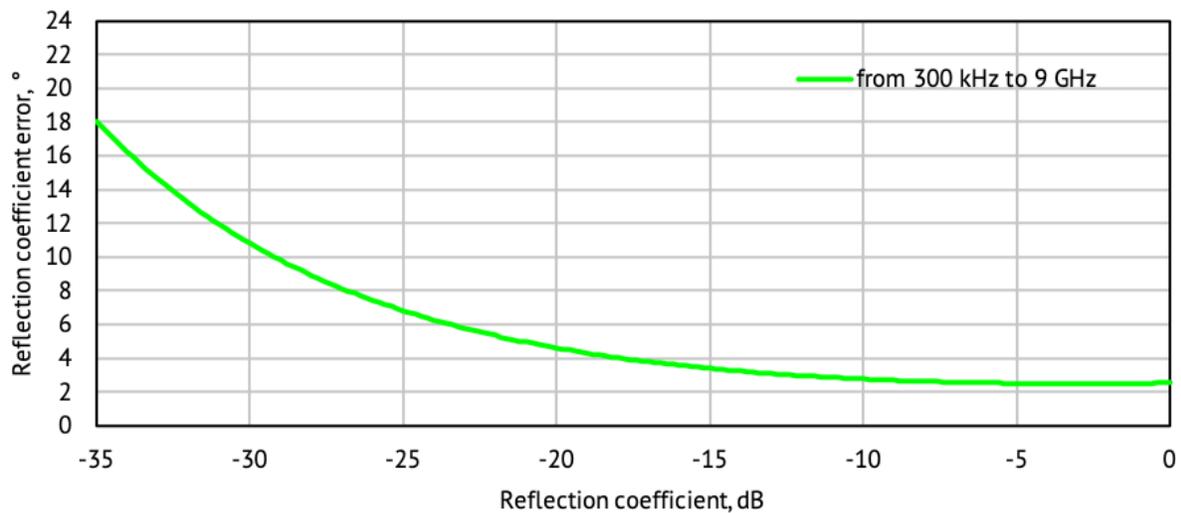


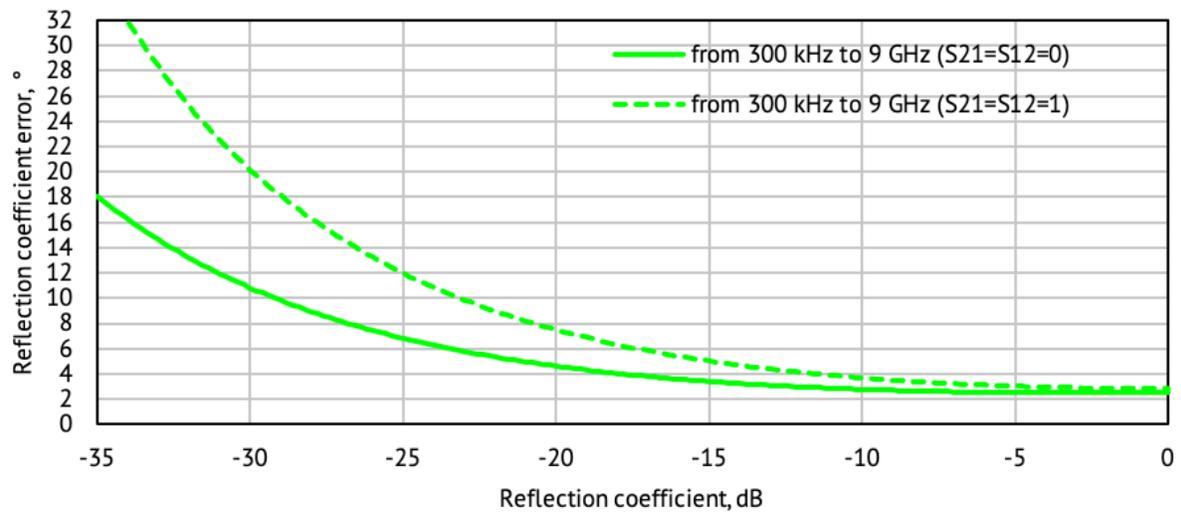Specifications are based on isolating DUT $(S_{21} = S_{12} = 0)$
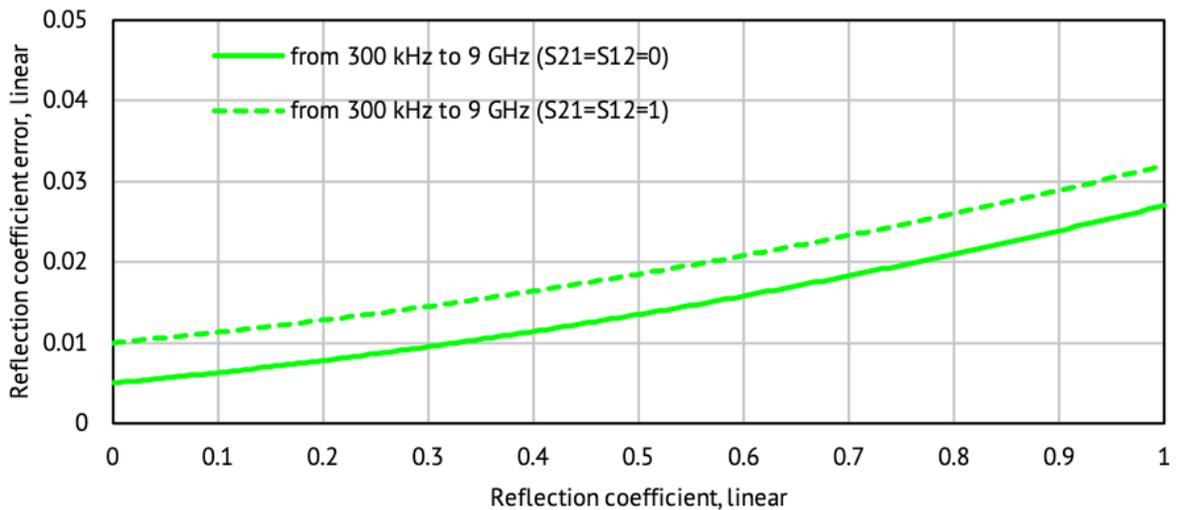
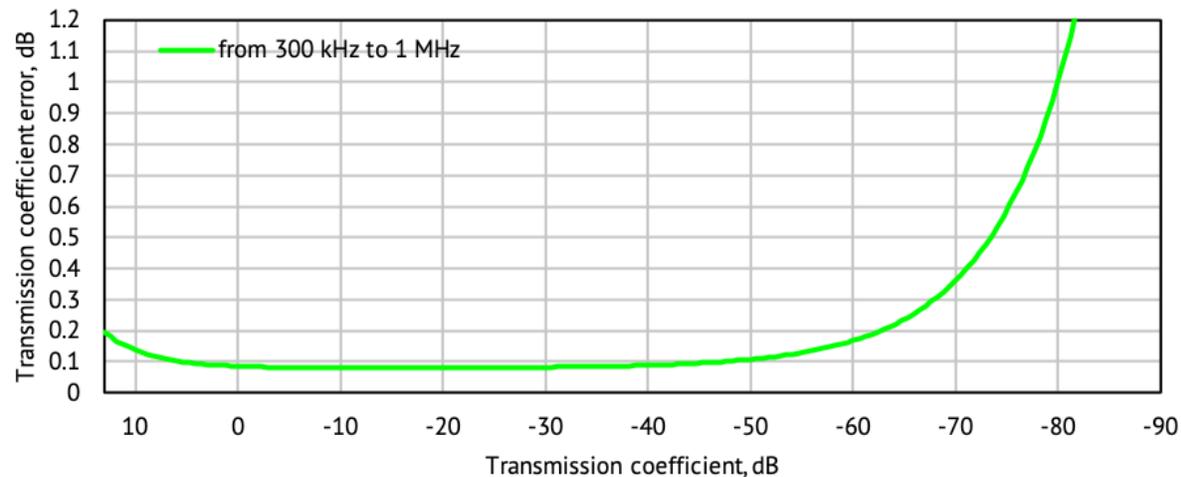# Reflection/Transmission Accuracy Plots

**Reflection Phase Errors**



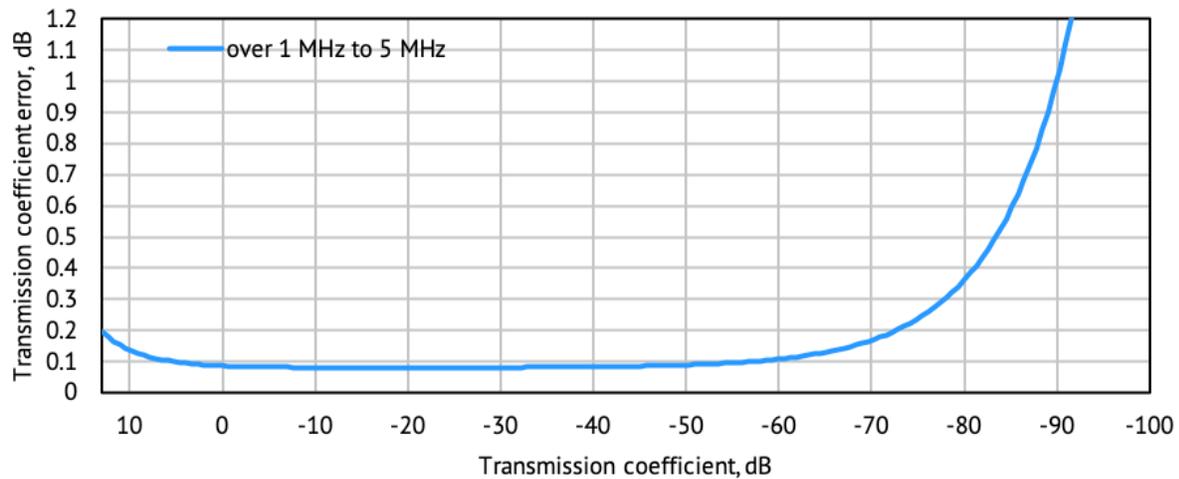Specifications are based on isolating DUT ($S_{21} = S_{12} = 0$)
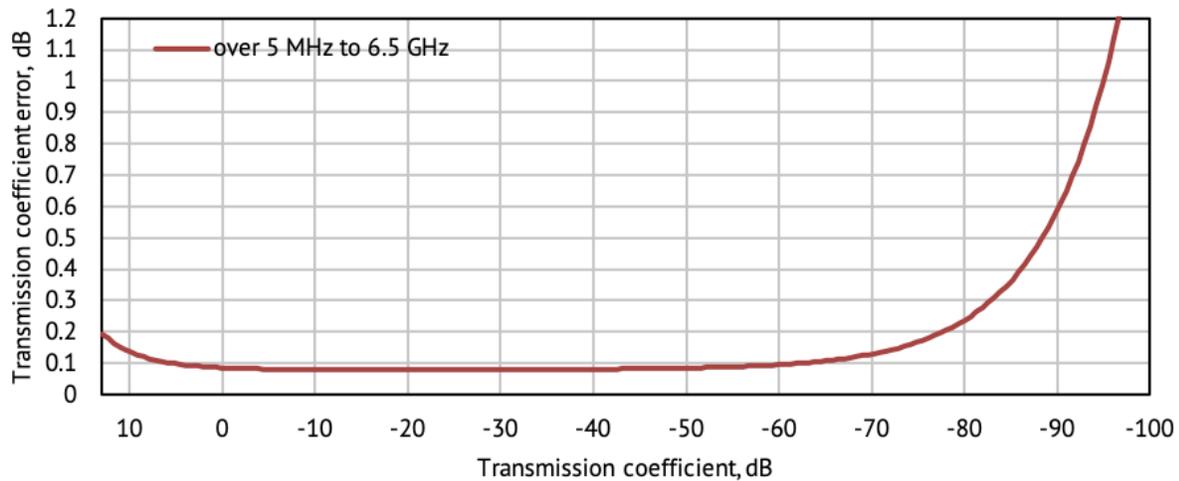


**Transmission Magnitude Errors**



Specifications are based on matched DUT, and IF bandwidth of 10 Hz
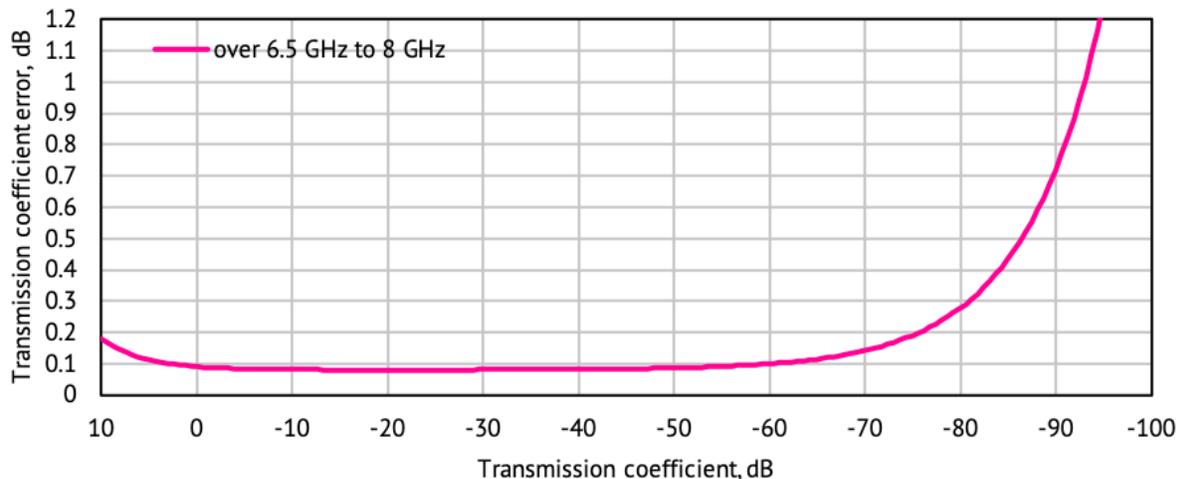
# Transmission Accuracy Plots

**Transmission Magnitude Errors**



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



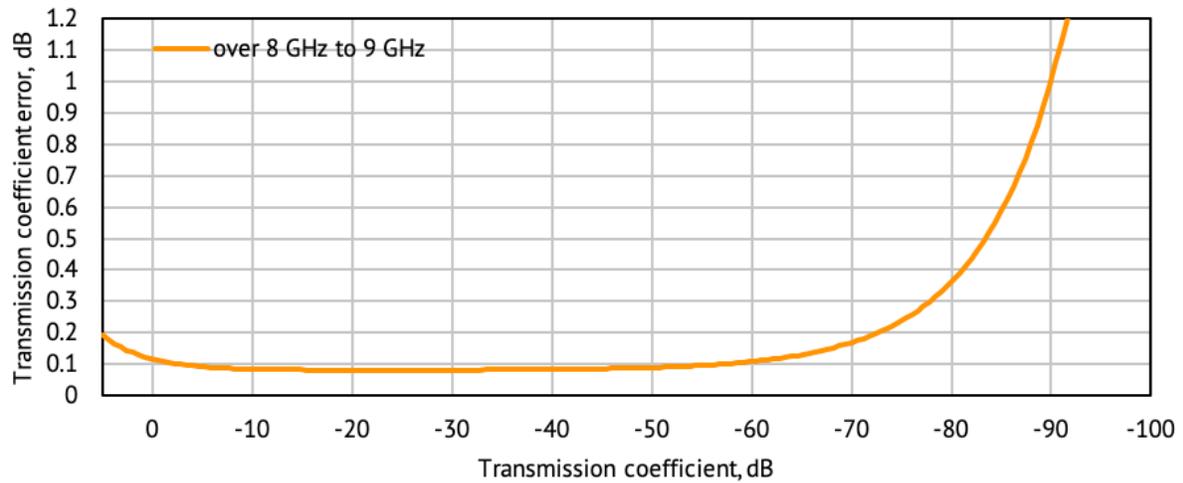Specifications are based on matched DUT, and IF bandwidth of 10 Hz
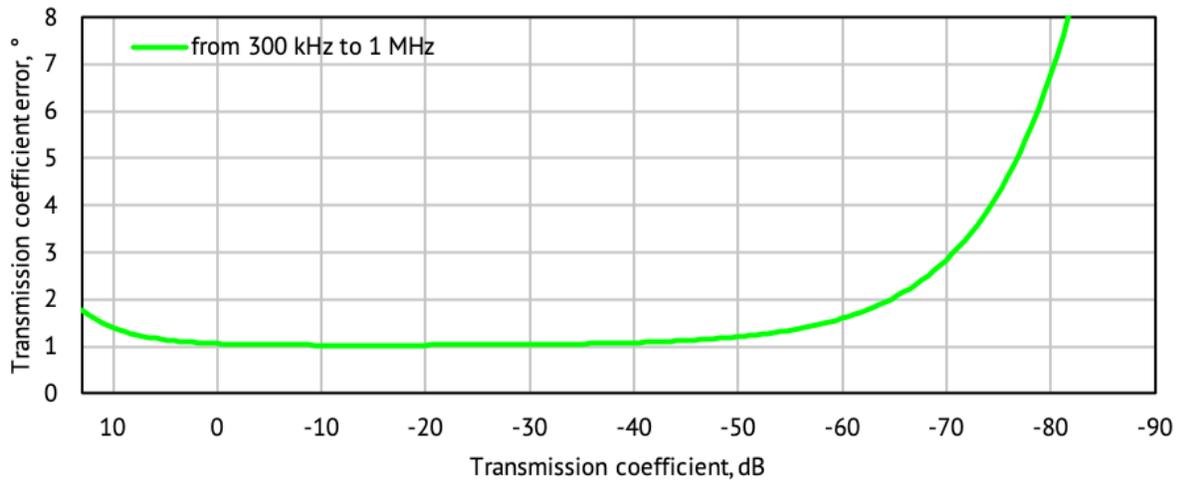
**Transmission Phase Errors**



Specifications are based on matched DUT, and IF bandwidth of 10 Hz
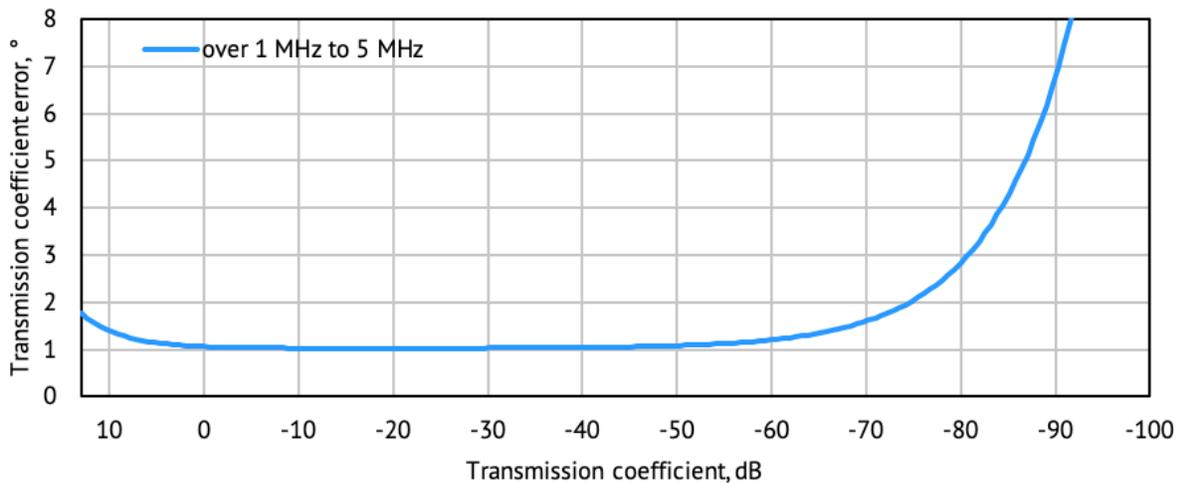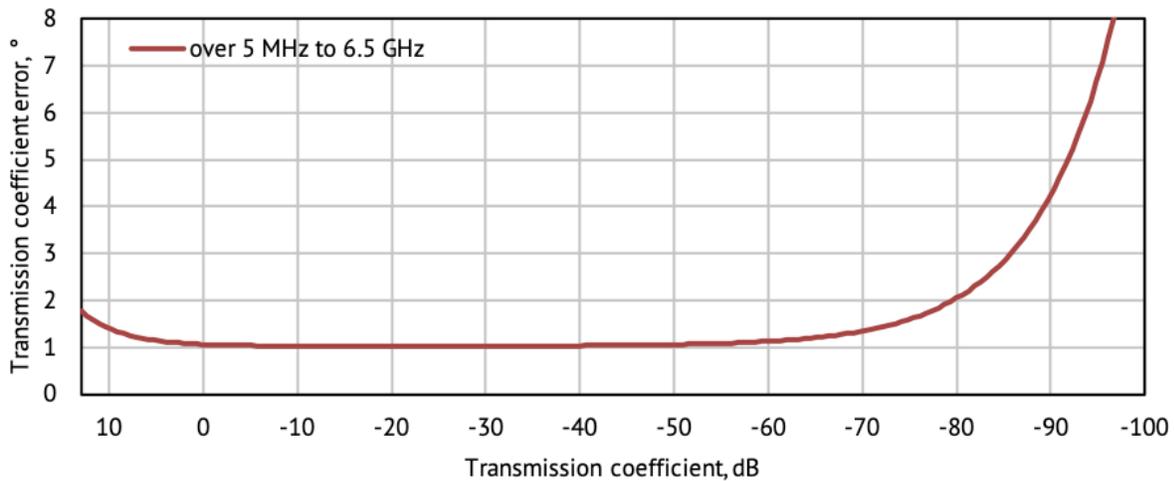
# Transmission Accuracy Plots

**Transmission Phase Errors**



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



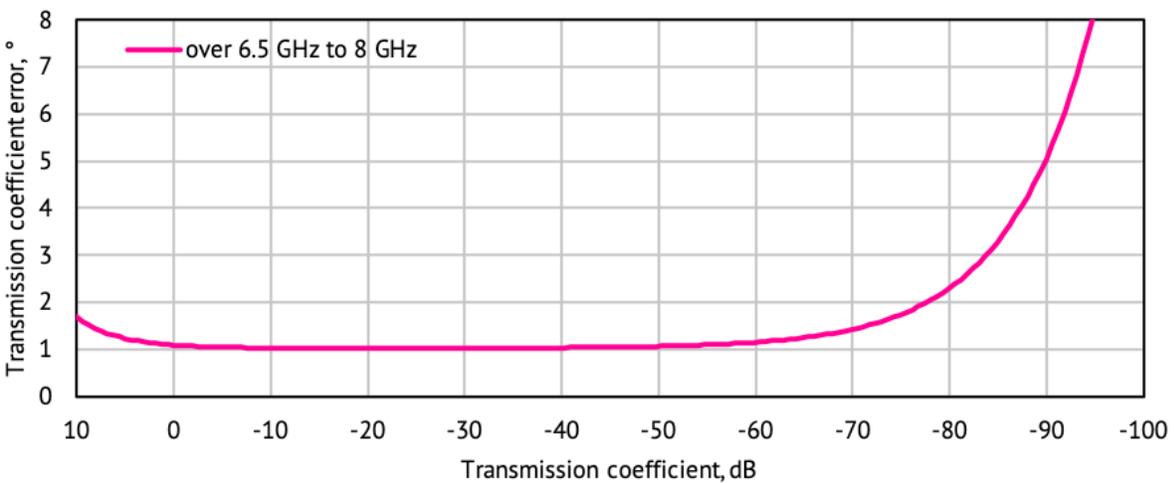Specifications are based on matched DUT, and IF bandwidth of 10 Hz



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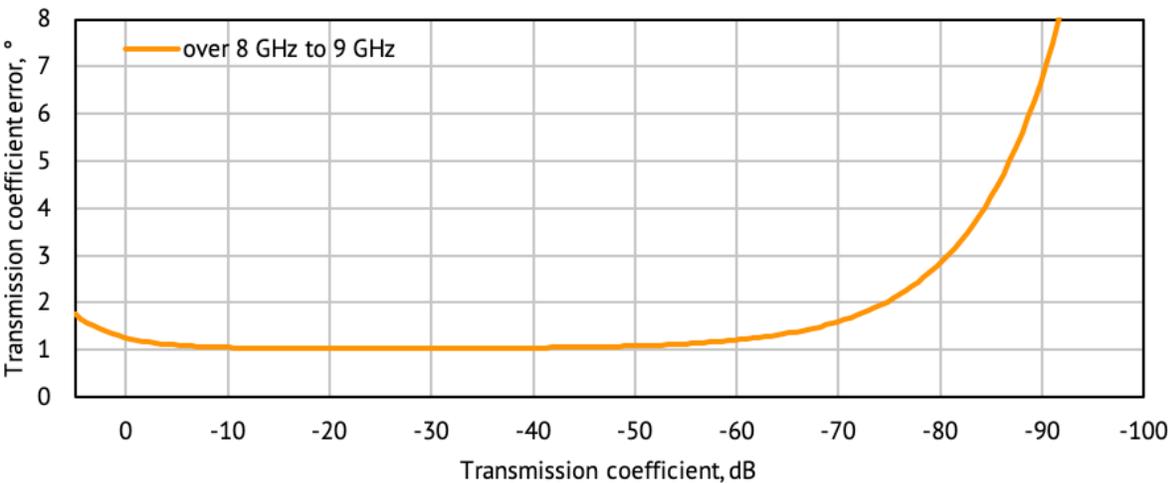
# Transmission Accuracy Plots

**Transmission Phase Errors**



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



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