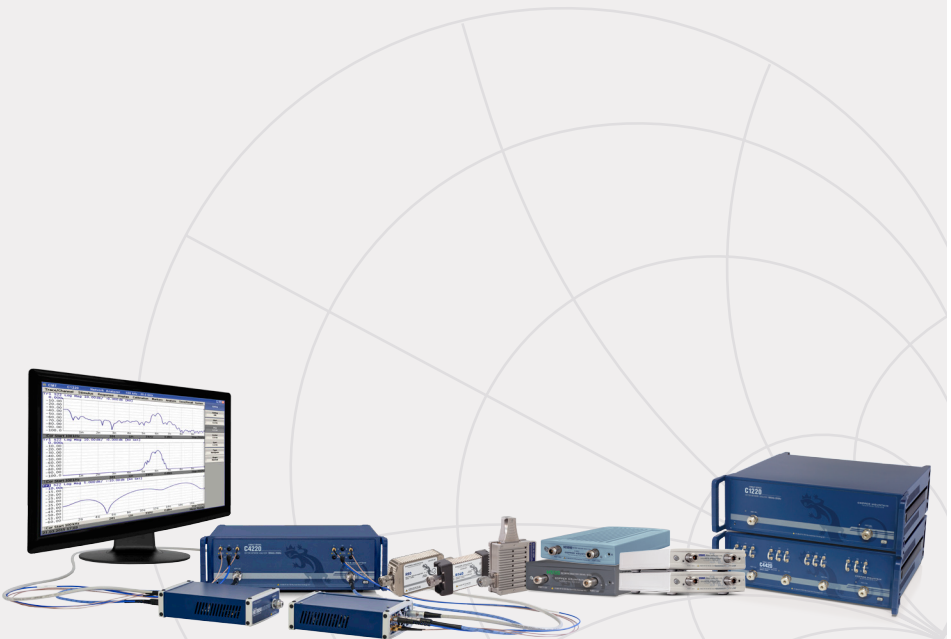


# Copper Mountain Technologies Product Catalog



# Copper Mountain Technologies' VNAs



- S-parameter measurement solutions from 9 kHz to 110 GHz
- VNAs compatible with third-party extenders up to 330 GHz
- Measured parameters from  $S_{11}$  to  $S_{1616}$
- Dynamic range as high as 152 dB typ. (10 Hz IF bandwidth)
- Measurement speeds as fast as 10  $\mu$ s per point
- Windows® and Linux® OS

*Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.*

## Copper Mountain Technologies' VNA Product Line

		Maximum Frequency Limit											
CMT VNAs		1.3 GHz	3.2 GHz	4.5 GHz	6 GHz	6.5 GHz	8 GHz	8.5 GHz	9 GHz	14 GHz	18 GHz	20 GHz	44 GHz
1-Port	Standard				●					●	●		
	DRA	●	●	●		●	●	●			●		●
2-Ports	Fx								●			●	
	Standard						●		●			●	
4-Ports	DRA								●			●	
	Fx								●			●	
6+ Ports									●				

**Legend:** DRA — Direct Receiver Access; Fx — Frequency Extension Compatible

# Software Features of CMT VNAs

Our software can be downloaded free from our website, used on an unlimited number of PCs using either Linux or Windows operating systems, and enables easy VNA integration with other software applications and automation.

Included software features:

- Time domain and gating conversion
- Frequency offset mode
- Vector mixer calibration measurements
- Embedding and de-embedding
- Limit testing
- Power scanning
- Compression point recognition

*\*M Series VNAs do not include time domain, mixer measurements, or advanced calibration*



***Learn more about the demo software version you can get on any computer for free at any time from the Copper Mountain Technologies' website***

## Software Plug-ins

The VNA software is extended by many plug-ins that increase the functionality. There are a number of plug-ins that you can download for free on the CMT website, like the Amplifier Stability plug-in to plot amplifier stability K factor,  $\mu_1$  and  $\mu_2$  versus frequency by measuring 2-port S-parameters, or Third Order Intercept, to help characterize the linearity of the device under test.

Also available are plug-ins that can be purchased to simplify measurement workflows.

**Automatic Fixture Removal (AFR)** VNA software plug-in enables the measurement of a wide range of components through comprehensive methods tailored to specific fixture properties. It can simplify measurements made on fixtures by de-embedding the fixture effects.

The **Manufacturing Plug-in** provides consistency for test settings and consistency in measurement processes. Automatically archive tests into a network folder for reporting and analysis. The plug-in template can be used, or it is easily and readily customizable.

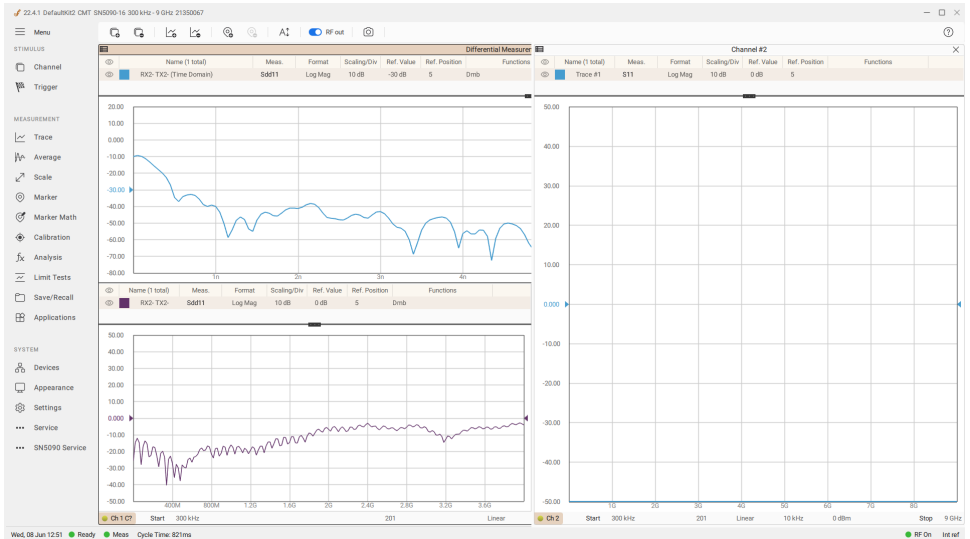


***Learn more about the software plug-ins on page 6 of the catalog or see more information about all of them on our website***

# NEW! 9 GHz Multiport VNAs



SN5090-16 16-port VNA



- First true multiport USB VNA
- Organic extension of Compact family without bulky RF switch
- Better calibration, easier automation, and faster measurement speed
- Robust, durable port connectors with ergonomic positioning, simplifying measurement cable connections
- Multiport VNA will be the first CMT VNA using next generation software
- Fits into the standard 19" test bay
- Improvements from CMT's original VNA software, making measurements even more customizable and intuitive
- Channels can be undocked from main software menu to be moved independently
- Compatible with Linux and Windows OS
- Software was compiled in native Linux for reduced latency

# NEW! 9 GHz Multiport VNAs

## SN5090-6

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **6**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**

## SN5090-8

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **8**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**

## SN5090-10

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **10**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**

## SN5090-12

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **12**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**

## SN5090-14

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **14**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**

## SN5090-16

Frequency range: **300 kHz to 9 GHz**  
Number of Ports: **16**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24  $\mu$ s min. typ**



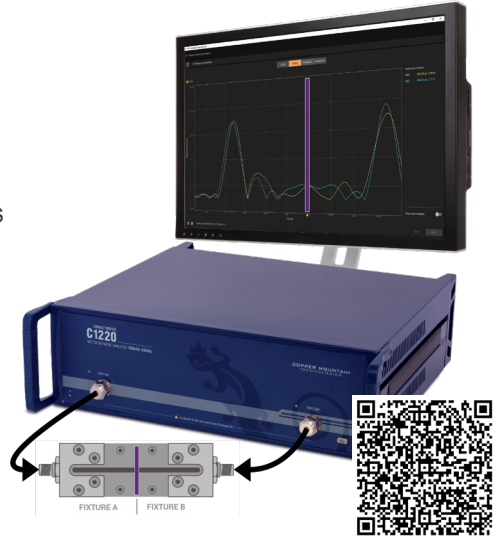
# VNA Software Plug-Ins

## Automatic Fixture Removal Plug-in

Automatic Fixture Removal (AFR) is an intuitive software plug-in that is used to accurately measure hard to access devices, such as SMD sized components mounted on a fixture by de-embedding the fixture effects.

The AFR VNA software plug-in enables the measurement of a wide range of components through comprehensive methods tailored to specific fixture properties.

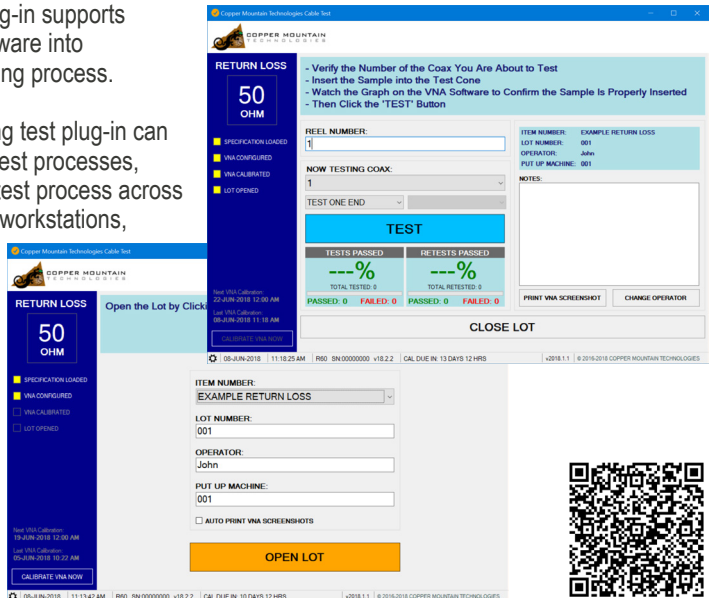
The wizard-like interface is easy to use and is compatible with all CMT 2- and 4-port Cobalt series VNAs up to 20 GHz and Compact series two-port, two-path VNAs up to 44 GHz.



## Manufacturing Test Plug-in

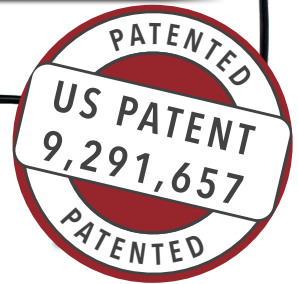
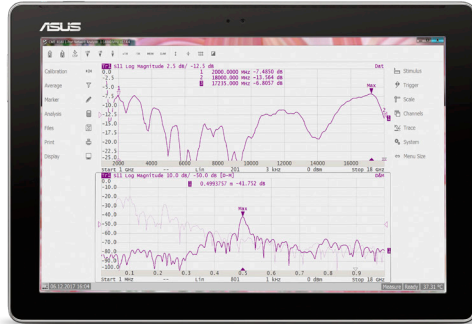
Manufacturing Test Plug-in supports incorporating VNA software into automated manufacturing process.

Using the manufacturing test plug-in can streamline production test processes, ensure consistency of test process across multiple operators and workstations, easily create and manage pass/fail limits across multiple workstations, organize test results for subsequent retrieval and analysis, and adapt to any specific production test process and QMS requirements.



# 1-Port VNA Series

Lab-grade performance  
in a handheld cable and  
antenna analyzer



## R60



Frequency range: **1 MHz to 6 GHz**  
Measurement Points: **2-100,001**  
Time domain with gating standard

## R140



Frequency range: **85 MHz to 14 GHz**  
Measurement Points: **2-100,001**  
Time domain with gating standard

## R180



Frequency range: **1 MHz to 18 GHz**  
Measurement Points: **2-100,001**  
Time domain with gating standard  
Optional: IP54 Rating



# Compact VNA Comparison

## TR Series

The TR Series Compact VNAs deliver lab grade performance in a compact package and perform 2-port 1-path measurements. The software includes all the features engineers have come to expect: time domain and gating conversion, segmented frequency sweeps, linear/logarithmic sweeps, power sweeps, multiple trace formats, 16 channels max. with up to 16 traces each, marker math, and limit tests.

## M Series

The M Series Compact VNAs deliver metrology-grade performance in a more economical package that excludes a number of advanced features: Vector Mixer Calibration, TRL Calibration, Frequency Offset mode, and Time Domain.

## S Series

The S Series Compact VNAs deliver lab grade performance in a compact package and perform 2-port 2-path measurements. The software includes all the features engineers have come to expect: time domain and gating conversion, segmented frequency sweeps, linear/logarithmic sweeps, power sweeps, multiple trace formats, 16 channels max. with up to 16 traces each, marker math, and limit tests.

## SC Series

The SC Series Compact VNAs deliver lab grade performance with higher speed, more dynamic range, and higher output power in a compact package. These instruments perform 2-port 2-path measurements. The software includes all the features engineers have come to expect: time domain and gating conversion, segmented frequency sweeps, linear/logarithmic sweeps, power sweeps, multiple trace formats, 16 channels max. with up to 16 traces each, marker math, and limit tests.



# Compact VNA – TR Series

Full feature performance in a compact package for 2-port 1-path measurements

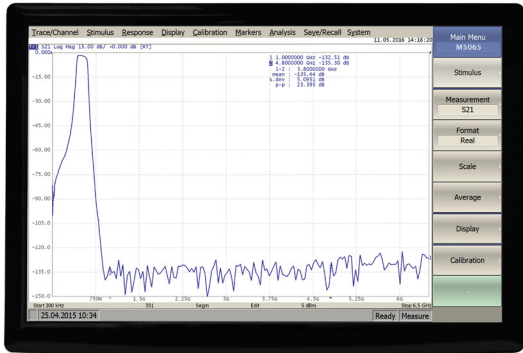
## TR1300/1



Frequency range: **300 kHz to 1.3 GHz**  
Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
Measured parameters: **S11, S21**



# Compact VNA – M Series



Economy VNAs  
for 2-port 2-path  
measurements



*\*M Series VNAs do not include time domain, mixer measurements, or advanced calibration*

## M5045



Frequency range: **300 kHz to 4.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70  $\mu$ s min. typ**

## M5065



Frequency range: **300 kHz to 6.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70  $\mu$ s min. typ**

## M5090



Frequency range: **300 kHz to 8.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70  $\mu$ s min. typ**

## M5180



Frequency range: **300 kHz to 18 GHz**  
Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **30  $\mu$ s min. typ**

# Compact VNA – S Series

Full feature performance in a compact package for 2-port 2-path measurements

## S5045



Frequency range: **9 kHz to 4.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70 µs min. typ**

## S5065



Frequency range: **9 kHz to 6.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70 µs min. typ**

## S5085



Frequency range: **9 kHz to 8.5 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **70 µs min. typ**

## S5180B



Frequency range: **100 kHz to 18 GHz**  
Dynamic Range: **133 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **24 µs min. typ**

## S5243



Frequency range: **10 MHz to 44 GHz**  
Dynamic Range: **130 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **15 µs min. typ**

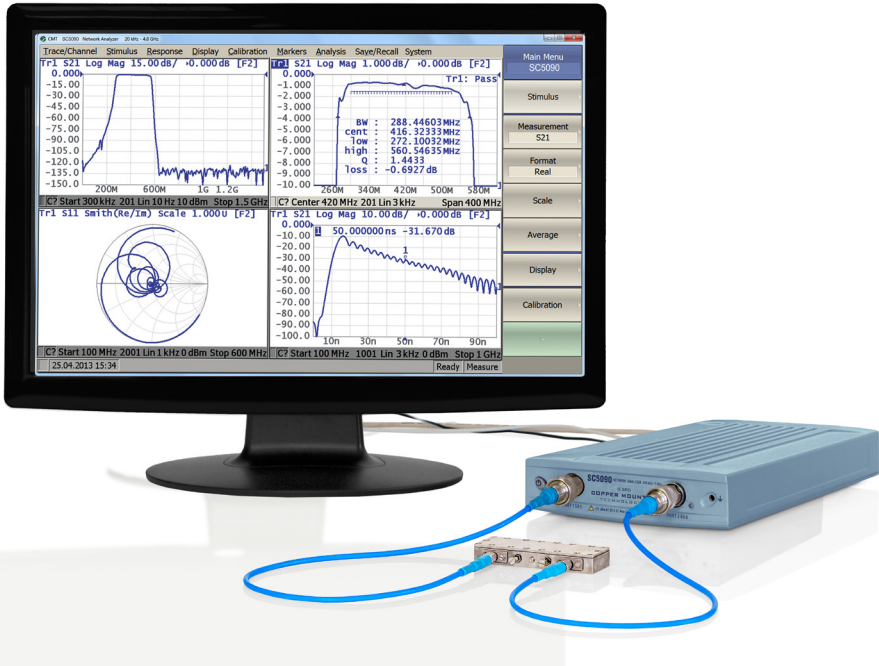
## S7530



75 Ohm Impedance  
Frequency range: **20 kHz to 3.0 GHz**  
Dynamic Range: **123 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **250 µs min. typ**

# Compact VNA – SC Series

Compact lab grade VNA with higher performance



## SC5065



Frequency range: **300 kHz to 6.5 GHz**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **16  $\mu$ s min. typ**

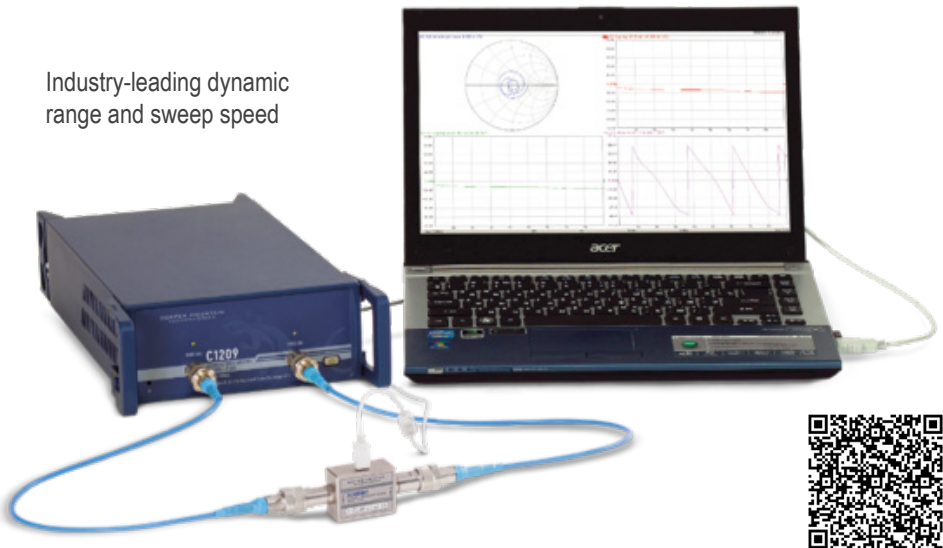
## SC5090



Frequency range: **300 kHz to 9 GHz**  
Dynamic Range: **140 dB typ.** (10 Hz IFBW)  
Measurement Time per Point: **16  $\mu$ s min. typ**

# Cobalt Series: 9 GHz

Industry-leading dynamic range and sweep speed



## C1209 Base Model



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11, S21, S12, S22**  
Measurement Time per Point: **10  $\mu$ s min. typ**

## C2209 Direct Receiver Access



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11, S21, S12, S22**  
Measurement Time per Point: **10  $\mu$ s min. typ**

## C1409 Base Model



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11,...S44**  
Measurement Time per Point: **10  $\mu$ s min. typ**

## C2409 Direct Receiver Access



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11,...S44**  
Measurement Time per Point: **10  $\mu$ s min. typ**

# Cobalt Series: 20 GHz

CMT's 2- and 4-port Cobalt VNAs fit into three categories depending on the functionality you require. Base models for standard capabilities, Direct Receiver Access (DRA) models, and Frequency Extension compatible models designed to anchor your CobaltFx system.



## C1220 Base Model



Frequency Range: **100 kHz to 20 GHz**  
 Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
 Measured Parameters: **S11, S21, S12, S22**  
 Measurement Time per Point: **12 μs min. typ**

## C2220 Direct Receiver Access



Frequency Range: **100 kHz to 20 GHz**  
 Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
 Measured Parameters: **S11, S21, S12, S22**  
 Measurement Time per Point: **12 μs min. typ**

## C1420 Base Model



Frequency Range: **100 kHz to 20 GHz**  
 Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
 Measured Parameters: **S11,...S44**  
 Measurement Time per Point: **12 μs min. typ**

## C2420 Direct Receiver Access



Frequency Range: **100 kHz to 20 GHz**  
 Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
 Measured Parameters: **S11,...S44**  
 Measurement Time per Point: **12 μs min. typ**

# Cobalt Series: Frequency Extension Models

Base VNAs for a cost-effective, scalable frequency extension solution

## C4209



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11, S21, S12, S22**  
Measurement Time per Point: **10  $\mu$ s min. typ**

## C4220



Frequency Range: **100 kHz to 20 GHz**  
Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11, S21, S12, S22**  
Measurement Time per Point: **12  $\mu$ s min. typ**

## C4409



Frequency Range: **100 kHz to 9 GHz**  
Dynamic Range: **152 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11,...S44**  
Measurement Time per Point: **10  $\mu$ s min. typ**

## C4420



Frequency Range: **100 kHz to 20 GHz**  
Dynamic Range: **135 dB typ.** (10 Hz IFBW)  
Measured Parameters: **S11,...S44**  
Measurement Time per Point: **12  $\mu$ s min. typ**

**Frequency Extension compatible 20 GHz Cobalt instruments can be used with many different frequency extension modules, including VDI and Eravant brands.**

Copper Mountain Technologies offers a Booster Set in cases when frequency extenders are located at a distance from the VNA or require amplification of the RF, LO and IF signals, for example with third party frequency extenders. It increases the upper limit of RF and LO signals' output power to 13 dBm. Booster Set includes module, external amplifiers, and adapters. Connecting cables depend on required length and are not a part of the set.

# CobaltFx Frequency Extenders

Cost-effective millimeter wave frequency extension system



## FET1854



Frequency range: **18 GHz to 54 GHz**  
Measured parameters: **S11, S21, S12, S22**  
System Dynamic Range: **130 dB typ.** (10 Hz IFBW)

## FEV-15



Frequency range: **50 GHz to 75 GHz**  
Measured parameters: **S11, S21, S12, S22**  
System Dynamic Range: **120 dB typ.** (10 Hz IFBW)

## FEV-12



Frequency range: **60 GHz to 90 GHz**  
Measured parameters: **S11, S21, S12, S22**  
System Dynamic Range: **110 dB typ.** (10 Hz IFBW)

## FEV-10



Frequency range: **75 GHz to 110 GHz**  
Measured parameters: **S11, S21, S12, S22**  
System Dynamic Range: **110 dB typ.** (10 Hz IFBW)

# Application Solutions

Extend Your Reach™ Beyond the Box



## University Kit

- Complete S-parameters measurement solution that backs RF theory with a robust hands-on VNA experience and sample labs for classes
- Exclusively offered to educational institutions teaching RF
- Practical approach to a variety of measurements that will prepare students for a wide range of industry engineering jobs
- CMT can assist with creating labs designed by applications engineers to walk students through common VNA measurements
- Software is free to download on an unlimited number of PCs
- Students can perform measurement preparations and post-process results on their own computers without the measurement module

Copper Mountain Technologies' University Kit is a complete solution designed to teach engineering students RF skills. It features three VNA options and includes the calibration equipment, device under test (DUT), and accessories necessary for an array of common VNA measurements. CMT's University Kit is an affordable way to outfit your lab with RF measurement equipment, providing a practical introduction to vector network analysis, which includes sample labs for RF Engineering classes.

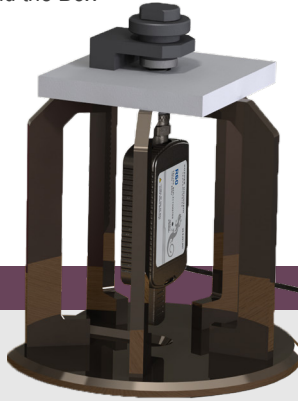
You can also work with CMT to create s-parameter measurement curriculum designed by RF engineers and materials to promote class interest. The University Kit is backed by comprehensive support from Copper Mountain Technologies' expert engineers. The hardware included in the University Kit will enable users to cover all major VNA measurements such as impedance, VSWR, return loss, and insertion loss.





# Application Solutions

Extend Your Reach™ Beyond the Box



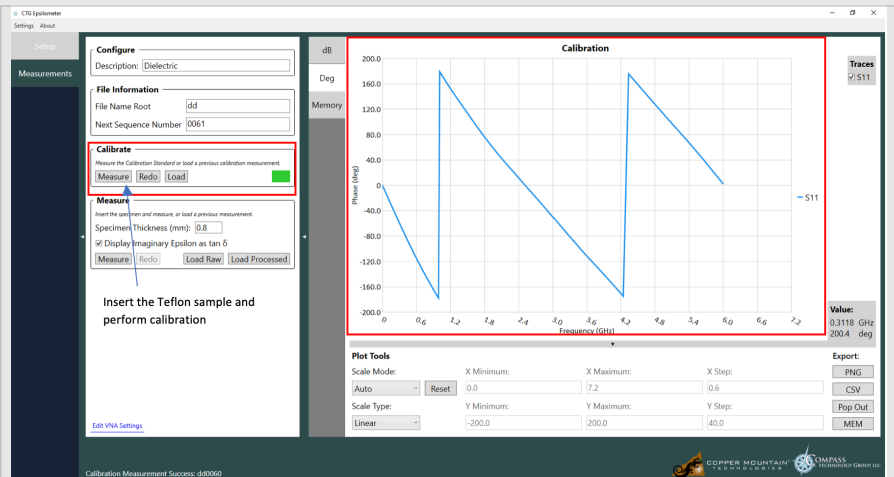
## EpsilonMeter

This solution was developed in collaboration with the leading provider of materials measurement solutions and systems, Compass Technology Group. It represents a new measurement method based on the parallel plate capacitor concept, which determines complex permittivity of dielectric sheets with thicknesses up to about 3 mm. Unlike the conventional capacitive measurement devices, this new method uses a greatly simplified calibration procedure. It solves the parasitic impedance limitations in

conventional capacitor methods by explicitly modeling the fixture with a full-wave computational electromagnetic code.



In collaboration with



# Calibration Kits and Accessories

## Automatic Calibration Modules

### ACM2506



50 Ohm  
Frequency range:  
20 kHz to 6.5 GHz

### ACM2509



50 Ohm  
Frequency range:  
20 kHz to 9 GHz

### ACM2520



50 Ohm  
Frequency range:  
100 kHz to 20 GHz

### ACM2543



50 Ohm  
Frequency range:  
10 MHz to 44 GHz

### ACM4509



50 Ohm  
Frequency range:  
100 kHz to 9 GHz

### ACM4520



50 Ohm  
Frequency range:  
100 kHz to 20 GHz

### ACM4000T



75 Ohm  
Frequency range:  
20 kHz to 4 GHz

### ACM2708



75 Ohm  
Frequency range:  
20 kHz to 8 GHz

## Mechanical Calibration Kits

CMT Mechanical Calibration Kits are available from DC to 50 GHz in SOL and SOLT models.

## Accessories

Copper Mountain Technologies also offers an extensive range of 50 Ohm and 75 Ohm accessories, including cables, matching pads, adapters, bias tees and other items to complete your test setup.



# Customizable VNAs

When your system includes network analysis and requires a custom VNA, our engineers will work with you to find the right solution:

- Ultra-compact, rack mountable or special size analyzer that would fit in your system
- Utilizes an external computer for data processing and analysis, storage and software integration with other systems
- Purpose-built software that integrates the VNA with other system components.

We have designed our analyzers for ease of customization, so we can deliver a high performing custom VNA solution at a lower cost than any other provider.



S5180B Compact VNA



*Custom Configuration of the S5180B Compact VNA for Compass Technology Group*



Copper Mountain Technologies develops innovative and robust RF test and measurement solutions for engineers all over the world. The company was created in 2011 and based in Indianapolis, IN with sales offices in Singapore, United Kingdom, and Miami. Copper Mountain Technologies' world-class metrology and engineering resources work as an extension of your team.

Copper Mountain Technologies' VNAs include an RF measurement module and a software application that runs on an external Windows or Linux PC, laptop, or tablet, connecting to the measurement hardware via USB interface. The result is a faster, more effective test process that fits into the modern workspace.

The engineers at Copper Mountain Technologies extend their reach by using the latest available technologies and components, and continuously improving product selection and service. The goal is to help engineers and developers extend their reach by equipping them with cutting-edge test instruments that are small but accurate, lightweight, and affordable.

 ***We're creative. We're problem solvers.***



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