

Increase Confidence in  
Measurements Using  
**Maury Microwave 2.4mm  
Calibration, Validation and  
Interconnect Solutions**

SOLUTIONS BROCHURE / 1E-001



**Maury Microwave**

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# Confidence in Measurements

In today's competitive market, many companies are losing customer trust because the product they promise, or the product they ship, does not match customer expectations, or customer's own validation. Equally, many companies are losing market share because they are taking too long to release products due to multiple design cycles or prolonged qualification due to measurement variations or inconsistencies. Finally, many companies face production yield challenges due to built-in buffers to ensure passed parts pass, or due to inconsistent pass/fail data resulting in higher rejection rate. The root cause is often caused by inconsistencies: inconsistencies between measured data and simulations or expectations, inconsistencies related to measurement variability over time, or inconsistencies related to measurements across multiple test benches at one or more sites. These inconsistencies often lead to a lack of trust, or confidence, in measurements.

Our mission is to give our customers confidence in their RF through THz measurements and models. We have developed and offer all aspects of measurement and modeling systems with the primary objective of ensuring our customers have confidence in their measurements and models. We complete your lab with:

## Calibration, validation and measurement solutions including

- > Coaxial and waveguide VNA calibration kits which empower the highest calibration accuracy
- > Calibration verification kits to validate VNA calibrations with an unambiguous go/no-go decision
- > Software to drive the VNA calibration, validation and S-parameter measurement process with an emphasis on characterized measurement uncertainties

## Interconnect solutions including

- > VNA test port, phase-stable and general-purpose cable assemblies designed to reduce measurement uncertainties
- > Calibration-grade (metrology), color-coded precision and general purpose in-series and between-series adapters, and color-coded precision attenuators, emphasizing improved VSWR and MIL-spec pin depth and concentricity for improved connection repeatability
- > Torque wrenches and gage kits to ensure accurate and repeatable connections each time

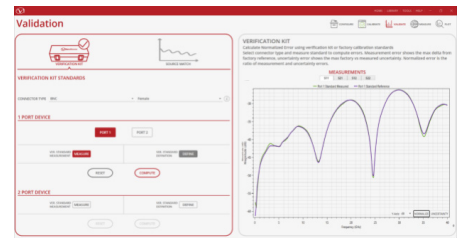
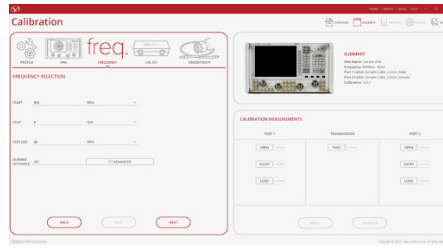
## Device characterization solutions

- > For more information on Maury's device characterization solutions, please visit [www.maurymw.com](http://www.maurymw.com)



## Calibration, Validation and Measurement Solutions

Insight is the industry's first software suite designed to empower VNA users and help them make better decisions. Insight represents a paradigm shift in the way users approach VNA calibration, validation, measurement, visualization and analysis. A single software platform standardizes the interface for all generations of VNA models and adds an intuitive GUI and wizard which walks users through every step. Advanced VNA calibration identifies and quantifies the individual sources of measurement uncertainty and can be used to improve measurement accuracy. Calibration validation uses uncertainty boundaries to definitively identify good and bad calibrations. Real-time measurements with uncertainty boundaries allow users to better understand their devices. Advanced visualization and analysis helps users make better decisions which results in bringing the best products to market faster.



Maury's new characterized device (CD) VNA calibration kits and verification kits are designed to improve confidence in your S-parameters measurements.

With individually characterized standards, CD cal kits result in calibrations with TRL-like accuracy and SOL ease-of-use, thereby improving your measurements while reducing the opportunity for potential user errors. Cal kits come with factory-characterized uncertainty data and can be used with Maury's Insight software to quantify its contribution on the overall DUT measurement uncertainty.

Maury's new verification kits include multiple standards with similar characteristics to different types of DUTs, thereby increasing the meaningfulness of the validation. Like the cal kits, verification kits come with factory-characterized uncertainty and can be used with Insight to conclusively determine the validity of a VNA calibration.

### 2.4mm VNA calibration kits

7950CK40 – fixed load SOLT kit (polynomial definitions)



7950CK41 – fixed load SOLT kit (polynomial definitions) with adapters



7950CK50 – characterized device (CD) fixed load SOLT kit



7950CK51 – characterized device (CD) fixed load SOLT kit with adapters



### 2.4mm calibration verification kits

7950CK60 – characterized verification kit



# Interconnect Solutions

Measurement uncertainty can be seen as the potential variability between measurements caused by all aspects of a measurement system. Objectively, the two largest contributors to measurement uncertainty are cables and connectors as they impact the repeatability of a measurement.

The signal passing through a cable assembly will change in magnitude and phase as the cable is moved. Measuring a device with the cable in a certain position may yield different results from the same measurement with the cable in a second, third and fourth position. The more the measurement changes with flexure, the higher the cable's measurement uncertainty contribution.

Similarly, signal changes caused by connector mating repeatability will directly impact measurement uncertainty. A connector's ability to offer repeatable connections stems from pin depth and concentricity, and mating force. Recessed or non-concentric center pins lead to reduced measurement accuracy and repeatability and hence an increased uncertainty. Protruding center pins will damage your mating connector. Hand-threading an RF connector often leads to inconsistent mating between connectors and an increased measurement uncertainty.

Maury Microwave's Interconnect Solutions offering consists of cable assemblies, adapters and attenuators developed specifically to reduce measurement uncertainty, and gages and torque wrenches to ensure accurate and repeatable measurements.



DATA SHEET  
2Z-002

Maury Microwave's StabilityVNA™ Microwave/RF Cable Assemblies provide the industry's best phase stability with flexure resulting in improved measurement accuracy and ensuring the most repeatable and reliable measurements. StabilityVNA™ cables are extremely durable with excellent crush resistance while remaining very flexible leading to enhanced longevity and to years of uninterrupted use. StabilityVNA™ is the ideal cable for critical VNA measurements in R&D and lab environments.



DATA SHEET  
2Z-009

Maury Microwave's StabilityPlus™ series sets the standard for high performance ruggedized cable assemblies. Designed specifically for phase-stable and amplitude-stable applications, StabilityPlus™ offers excellent measurement repeatability even after cable flexure. StabilityPlus™ light weight, superior flexibility and small form factor make it ideal for daily use with VNA's, test instruments, bench-top testing and ATE systems.



DATA SHEET  
2Z-010

Maury Microwave's StabilityPlus™ Low Profile Microwave/RF Cable Assemblies feature the same excellent electrical performance as our ruggedized StabilityPlus™ cables, but with a more compact and flexible design. StabilityPlus™ Low Profile cables provide excellent phase and amplitude stability with flexure resulting in highly reliable, repeatable measurements. They are ideal for applications that require lighter weight or tighter spacing such as wafer probing, ATE systems and switch matrices.

StabilityVNA, StabilityPlus™ and StabilityPlus™ Low-Profile are available in standard and custom configurations, including custom lengths, input/output connector pairs, phase matched sets, right angle connectors and high-temperature boots.

**Standard configurations include:**

Series	Frequency Range	Configuration	Length	Model Number	Image
StabilityVNA™	50 GHz	NMD2.4mm female to NMD2.4mm male	25"	SV-24-FM-25	
			38"	SV-24-FM-38	
			48"	SV-24-FM-48	
		NMD2.4mm female to 2.4mm female	25"	SV-24-FF-25	
			38"	SV-24-FF-38	
			48"	SV-24-FF-48	
	40 GHz	NMD2.4mm female to NMD2.92mm male	25"	SV-24292-FM-25	
			38"	SV-24292-FM-38	
			48"	SV-24292-FM-48	
		NMD2.4mm female to 2.92mm female	25"	SV-24292-FF-25	
			38"	SV-24292-FF-38	
			48"	SV-24292-FF-48	

Series	Frequency Range	Configuration	Length	Model Number	Image			
StabilityPlus™	50 GHz	2.4mm male to 2.4mm male	12"	SP-24-MM-12				
			18"	SP-24-MM-18				
			24"	SP-24-MM-24				
			36"	SP-24-MM-36				
			48"	SP-24-MM-48				
			60"	SP-24-MM-60				
		78"	SP-24-MM-78					
		2.4mm male to 2.4mm female	24"	SP-24-MF-24				
			36"	SP-24-MF-36				
			48"	SP-24-MF-48				
			40 GHz	2.4mm male to 2.92mm male		24"	SP-24292-MM-24	
						36"	SP-24292-MM-36	
	48"				SP-24292-MM-48			
	2.4mm female to 2.92mm male	24"		SP-24292-FM-24				
		36"		SP-24292-FM-36				
		48"		SP-24292-FM-48				

Series	Frequency Range	Configuration	Length	Model Number	Image			
StabilityPlus™ Low Profile	50 GHz	2.4mm male to 2.4mm male	12"	SP-24-MM-12-LP				
			24"	SP-24-MM-24-LP				
			36"	SP-24-MM-36-LP				
			48"	SP-24-MM-48-LP				
			60"	SP-24-MM-60-LP				
			24"	SP-24-MF-24-LP				
		2.4mm male to 2.4mm female	36"	SP-24-MF-36-LP				
			48"	SP-24-MF-48-LP				
			40 GHz	2.4mm male to 2.92mm male		24"	SP-24292-MM24LP	
						36"	SP-24292-MM36LP	
						48"	SP-24292-MM48LP	
				2.4mm female to 2.92mm male		24"	SP-24292-FM24LP	
	36"	SP-24292-FM36LP						
	48"	SP-24292-FM48LP						

## Coaxial In-Series and Between-Series Adapters

Maury Microwave's comprehensive line of calibration-grade (metrology) adapters have been designed as an integral part of its renowned Vector Network Analyzer (VNA) Calibration Kits and are also available separately where calibration-grade precision is demanded.



ColorConnect™ Precision Adapters have been designed for lab and field use where quality, performance, ease-of-identification and ease-of-use are critical. New manufacturing techniques have given ColorConnect™ Precision Adapters improved VSWR specifications bridging the gap between calibration-grade metrology adapters and daily-use lab adapters. Following the proposed IEEE high-frequency connector/adaptor color convention, ColorConnect™ Precision Adapters are the first commercially available products to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible adapters.



Test Essentials™ Lab Adapters have been designed for daily use in microwave/RF labs and production facilities and offer one of the industry's best price/performance values. Test Essentials™ Lab Adapters feature excellent electrical performance, rugged construction for durability, repeatable mating and high reliability.



DATA SHEET  
2B-075


Configuration	Frequency Range	Adapter Series					
		Calibration-Grade / Metrology		ColorConnect™		TestEssentials™	
1.85mm female to 2.4mm female	50 GHz	7824A1		N/A			
1.85mm female to 2.4mm male		7824B1					
1.85mm male to 2.4mm female		7824C1					
1.85mm male to 2.4mm male		7824D1					
NMD2.4mm female to 2.4mm female		7909A3					
NMD2.4mm female to 2.4mm male		7909A4					
NMD2.4mm female to NMD2.4mm male		7909K1					
2.4mm female to 2.4mm female		7921A1		CC-A-24-FF		TE-A-24-FF	
2.4mm male to 2.4mm female		7921C1		CC-A-24-MF		TE-A-24-MF	
2.4mm male to 2.4mm male		7921B1		CC-A-24-MM		TE-A-24-MM	

NMD2.4mm female to 2.92mm female	40 GHz	7909F3		N/A			
NMD2.4mm female to 2.92mm male		7909F4					
NMD2.4mm female to NMD2.92mm male		7909J1					
2.4mm female to 2.92mm female		7926A1		CC-A-24292-FF		TE-A-24292-FF	
2.4mm female to 2.92mm male		7926B1		CC-A-24292-FM		TE-A-24292-FM	
2.4mm male to 2.92mm female		7926C1		CC-A-24292-MF		TE-A-24292-MF	
2.4mm male to 2.92mm male		7926D1		CC-A-24292-MM		TE-A-24292-MM	
NMD2.4mm female to 3.5mm female	34 GHz	7909B3		N/A			
NMD2.4mm female to 3.5mm male		7909B4					
NMD2.4mm female to NMD3.5mm male		7909H1					
2.4mm female to 3.5mm female	26.5 GHz	7927A1		CC-A-2435-FF		TE-A-2435-FF	
2.4mm female to 3.5mm male		7927B1		CC-A-2435-FM		TE-A-2435-FM	
2.4mm male to 3.5mm female		7927C1		CC-A-2435-MF		TE-A-2435-MF	
2.4mm male to 3.5mm male		7927D1		CC-A-2435-MM		TE-A-2435-MM	
NMD2.4mm female to Type N female	18 GHz	7909D3		N/A			
NMD2.4mm female to Type N male		7909D4					
2.4mm female to Type N female		7923A					
2.4mm female to Type N male		7923B					
2.4mm male to Type N female		7923C					
2.4mm male to Type N male		7923D					

## Color-Coded Precision Attenuators

Maury Microwave's AT-series of fixed coaxial attenuators are used to reduce the power of a RF, MW or mmW signal without distorting its signal quality/waveform. Attenuators are often used to lower the amplitude of a signal to a measurable level or to protect a measurement instrument from damage. Attenuators are also used to improve matching between components by improving the return loss (twice insertion loss) and effectively reducing the VSWR seen by adjacent components. Key attenuator parameters include attenuation, frequency bandwidth, power handling, VSWR and quality/repeatability of connector.

Maury AT-series attenuators are part of the ColorConnect™ family. Following the proposed IEEE high-frequency connector/adaptor color convention, AT-series attenuators are the first commercially available attenuators to offer clear indications of compatibility and intermatability. ColorConnect™ makes it a simple matter to avoid and eliminate damaged equipment, degraded equipment reliability, degraded performance and lengthy maintenance times due to improper mating (and attempted mating) of incompatible interconnects.

Configuration	Frequency Range	Power Handling	Attenuation	Model Number	Image
2.4mm male to 2.4mm female	50 GHz	1W	1dB	AT-24-01-01	
			3dB	AT-24-01-03	
			6dB	AT-24-01-06	
			10dB	AT-24-01-10	
			20dB	AT-24-01-20	





## Connector Gages

Connector gages are an essential tool to ensure connectors pins are flush and concentric. Maury's connector gage kits provide an easy to use, direct reading, self-checking, and accurate way to measure the critical linear interface dimensions of most coaxial connectors. These kits consist of gages with specially adapted dial indicators, plus the correct bushings and pins needed to mate with specified connectors. A master setting gage is used to adjust the dial indicator to zero, before a push-on or thread-on gage is mated with a connector to measure the distance from a given interface (female or male contact location) to the outer conductor mating plane.

### 2.4mm gages



*A048A – 1.85mm/2.4mm digital connector gage kit*



*A035E – 1.85mm/2.4mm analog connector gage kit*



DATA SHEET  
2Y-051

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## Torque Wrenches

Torque wrenches are a simple and inexpensive tool to ensure repeatable force is applied to the connection each time, thereby ensuring a proper and secure connection and reducing measurement uncertainty. Maury torque wrenches employ a "break" design so it is impossible to over-torque a coupled junction, and torque can be applied in either direction. Each Maury torque wrench is factory preset to the proper in/lbs for tightening its coaxial connector type, and the color-coded handles make it easy to select the correct wrench from your toolbox at a glance.

### 2.4mm torque wrench



*TW-8 – 0.312 hex torque wrench with 8 in/lb torque*



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2Y-050A



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