RF Probing With Rohde & Schwarz ZNB VNA





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Why RF Probing?

- Necessity: Constant shrinking size of circuit components makes soldering semi-rigid RF cables to test gigahertz circuits impractical.
- Accuracy: RF probes and calibration substrates allow engineers to perform probe-tip calibration for accurate, repetitive measurements.
- Productivity: Any engineer can do RF measurements in minutes without the need of soldering semi-rigid cable



Measurements of RF Low-Pass Filter



RF probe is almost as good as SMA connector!



RF Fixture Testing





RF Module Testing





RF Antenna Testing





30/20 GHz S-Probe



PCB Probing with S-Probe





TCS70 Cal Substrate (0.7" x 0.4" x 0.025")



- **SP-GR-201504** 20 GHz, 0.4 mm **SP-GR-201505** – 20 GHz, 0.5 mm
- SP-GR-181508 18 GHz, 0.8 mm
- **SP-GR-181510** 18 GHz, 1.0 mm
- **SP-GR-161512** 16 GHz, 1.2 mm
- **SP-GR-161514** – 16 GHz, 1.4 mm ٠
 - SP-GR-161516 16 GHz, 1.6 mm

$0 \, dB$ -1.0 dB -2.0 dB 0.4 mm |S21| -3.0 dB 0.5 mm -4.0 dB -5.0 dB $0 \, dB$ -10 dB -20 dB $0.4 \,\mathrm{mm}$ -30 dB |S11| 0.5 mm -40 dB -50 dB 10 15 5 20 25 0 30 GHz SP-GR-3015025 - 30 GHz, 0.25 mm **SP-GR-301504** – 30 GHz, 0.4 mm

30 GHz S-Probe

- **SP-GR-301505** 30 GHz, 0.5 mm
- ٠ Video demo:

https://packetmicro.com/Videos/PacketMicro_Probe_Planarization.mp4



Rugged Probes vs. Microprobes



 PacketMicro rugged probes are specifically designed for probing on test pads on uneven surfaces.



Probe-Pitch Selection



S-Probe Part Number:

•	SP-GR-2015025 – 20 GHz, 0.25 mm/10 mil pitch
•	SP-GR-201504 – 20 GHz, 0.4 mm/16 mil pitch
•	SP-GR-201505 – 20 GHz, 0.5 mm/20 mil pitch
•	SP-GR-181508 – 18 GHz, 0.8 mm/32 mil pitch
•	SP-GR-181510 – 18 GHz, 1.0 mm/40 mil pitch
•	SP-GR-161512 – 16 GHz, 1.2 mm/48 mil pitch
•	SP-GR-161514 – 16 GHz, 1.4 mm/56 mil pitch
•	SP-GR-161516 – 16 GHz, 1.6 mm/64 mil pitch
•	SP-GR-3015025 – 30 GHz, 0.25 mm/10 mil pitch
•	SP-GR-301504 – 30 GHz, 0.4 mm/16 mil pitch
•	SP-GR-301505 – 30 GHz, 0.5 mm/20 mil pitch

Recommendation: B + 0.2 mm < Probe Pitch < A - 0.2 mm

Size	Probe Pitch	Α	B	С	D	Component
						Size
01005	SP-GR-2015025	0.52	0.12	0.20	0.21	0.4 x 0. 2
0201	SP-GR-201505	0.90	0.30	0.30	0.35	0.6 x 0.3
0402	0.7mm < Pitch <1.3mm	1.50	0.50	0.50	0.60	1.0 x 0.5
0603	0.8mm < Pitch <2.2mm	2.40	0.60	0.90	1.00	1.6 x 0.8
0805	1.2mm < Pitch <2.8mm	3.0	1.0	1.0	1.25	2.0 x 1.25

- The above component footprints are for reference only.
- Please use the specific component footprints in your PCB layout.



Simple DIY Probe Station



Set up your probe station in 5 minutes !



Precision Positioner – TP250



- **Precise:** XYZ stage (50 TPI, 2.5 µm resolution)
- Versatile: detachable θ stage
- Easy: lockable magnetic base



Tools - Accessories



Optical Microscope $(\sim 90 \text{ x magnification})$



USB Digital Microscope (~ 90 x magnification)







TCS70 Calibration **Substrate**

Mylar Fine-tip Sharpie pen

Using a good microscope is essential.

Tape

You might damage the probe if you cannot see its tips well.

(Make sure to use a long working range (5 cm @ 90x) microscope!)



Probe Planarization Tips

- A good microscope is important. You may damage the probe if you cannot see its tips well.
- Good contact of both probe tips with the DUT is essential to accurate calibration and measurements.
- Mylar tape provides leveling guidance on flat, even surface (bare PCB).
- Color marker helps on uneven surface (solder bump).
- Probe Planarization Video:

https://packetmicro.com/Videos/PacketMicro_Probe_Planarization.mp4







Probing Test Pads on Even Surfaces

- Use the Mylar tape on the back of the plastic cap for probe planarization by observing the indentation caused by the tips.
- Remove the plastic cap and perform probing
- Affix a Mylar tape next to test pads if there is not enough space for placing the plastic cap.







Signal tip touches down first



Step 1:

Land the probe tips on the tape and observe the probe-tip footprint. Above image shows that signal tip touches the surface first.



GND tip touches down first



Step 2:

Adjust the planarization knob on the TP150 positioner to lower the GND tip. Above image shows that GND tip touches the surface first.



Both tips touch down simultaneously



Step 3:

Adjust the planarization knob on the positioner to land both probe tips. Above image shows the two probe tips touch the surface evenly.



Use VNA to Verify Probe Contacts





- Both tips leave light probe marks
- VNA Smith Chart shows "Short"



Probing Test Pads on Uneven Surfaces

- Color solder bumps with a Sharpie
- Use the probe skid marks to confirm good tip contact
- Clean up the solder bumps with industrial alcohol after probing







Use Probe Skid Marks on Solder Bumps



Left GND tip touches down first

Right signal tip touches down first



Both Tips Touch Down Simultaneously



Both tips touch down simultaneously



Clean up solder bumps with industrial alcohol after probing



Import TCS70xx.calkit file

Press hard "Cal" button -> Cal Devices -> Cal Kits -> Import Cal Kit

Calibration Kits		* =		
Connector Type	Available Cal Kits			Cal Connector
Conn. Type 👻	Kit Name	✓ Label Agilent Mo	ode 📥 Add	Califita
1 N 50 Ω	1 📔 N 50 Ω Ideal Kit			Cat Kits
2 Ν 75 Ω	2 🔒 3653		📄 Сору	Characterize
3 3.5 mm	3 📔 ZV-Z121			Catolint
4 7 mm	4 📔 ZV-Z170		🗶 Delete	
5 2.92 mm	5 🤷 ZCAN 50 Ω		- Chanadanda	
6 2.4 mm	6 ZV-Z21 typical		Standards	
7 1.85 mm	7 🤷 85032B/E			
8 7-16	8 📔 85032F			
9 Type F (75)	9 🤷 85054B			
10 BNC 50 Ω	10 🤷 85054D			
11 BNC 75 Ω				
12 SMA				
13 4.3-10				
14 Probe	-		all period in the second	
Cal Kit	Cal Kit	X	Close 😥 Help	
			.06	J



Import SP30G0.5-TCS70V2.calkit file – cont.

- Import the correct .calkit file for your probe
- SP30G0.5-TCS70V2.calkit is for 30GHz, 0.5 mm S-Probe (SP-GR-301505)





2-Port Probe-Tip Calibration Setup



Precision TP250 Positioners with S-Probes



Thru Measurement with Probe-Tip Calibration



Probe-tip calibration (30 GHz 0.5 mm S-Probe)



2-Port Calibration with TCS70

- Reflection calibration (Short, Open, Load calibration for two ports)
- Transmission calibration (Thru calibration)



TCS	70			- March Street			
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	Open	Short	50 UHM	50 OHM	Short	Open	Provident 1
			CALCULATION OF	NUMBER OF		SHOP IN	
V2						WWW.	ACKETMICRO.COM



Start Manual Calibration

Press hard "Cal" button -> Start Cal -> Start (Manual)





Select Cal Kit

Select "Probe" connector -> "Cal Kit" -> Start

Rohde & Souverz VNA			
Calibration	Presetting		Cal X
Temp-2 Temp-2	and Cal Kits onnector type and gender for ports. If necessary, change the Cal Kit or load ropriate one.	≫	Calibration Start
Treg. Z←S11 Lin Ports 78 -62 -62 -63 50 Ω -63 -63 -63 38 ↓ -64 -64	P1 0 P3 0 P2 0 P4 0	4 .000 ps 567,421 Ω	Cal Cal Cal Devices (Manual) Owr Cal Devices Pwr Cal Settings
Ch1 Start 10 Connector Trc9 Start -300 Gender	Probe	Stop 30 GHz Stop 1.2 ns	Scalar Power Cal Use Cal
Trc2 S11 dB Ma Cal Kit	SP30G0.5-70V2	5	Power Cal
0 dB 10 20 30 45 ↓			SMARTerCal Start (Cal Unit) Start
Ch1 Start 10 M Trc3 S21 dB Ma 0 dB	- Same Connector - Same Gender - Import	Stop 30 GHz	Repeat
-12	all Ports Cal Kit		
-18 M1-15.000000 M2-30.0000000 Ch1 Start 10 M	🕞 Back 💽 Start 🔀 Cancel 😥 He	elp III, Stop 30 GHz	
File Trace Channel Display	Application System Help	Ch1: Avg None	★ ^{Ch1} □□□□□ 11/8/2021 11:46:10 AM



Set Marker to Lowest Frequency

Use 180° change in phase to detect short.

😵 Ro	hde & Schwarz V	VNA								
÷.			🗙 📆 🖓 New	New Ch + Tr	New Marker	Delete 🛃		Ma	arker	x
1	Temp-21-06	* 🗷 🍟 Temp-2	2Cal * 🗷 🗎 Tem	ıp-21-08 * 🗵	-			Mikr 1 Stin	nulus	Markers
Trc1 0-dB	S11 dB Mag 10 d	JB/ Ref 0 dB Cal Off	1	Trc2 S11 Phas	e 45°/ Ref 0° Cal Off	• M1 10.000000	2 MHz -33.72 °	MK-1 Arb	. Response	Marker Props
10 20 30 40								On	All Off	Marker Search
50 60 70									lta ode	Multiple Peak
Ch1	Start 10 MHz	Pwr 0 dBm Bw 1 kHz	Stop 30 GHz	-225 Ch1 Start 10 M	1Hz Pwr0dBmBw	1 kHz	Stop 30 GHz	Mkr 1	Mkr 2	Target Search
	<u>P1</u> ©	<u>P2</u> ©	<u>P1</u> ©,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					Mkr 3	Mkr 4	Band-
	Probe SP30G0.5-70V2	Probe \$P30G0.5-70V2	Probe SP30G0.5-70V2					Mkr 5	Mkr 6	filter
	O Open	O Open	Through					Mkr 7	Mkr 8	Marker
10	S Short	S Short	I Isolation					Mkr 9	Mkr 10	Info Field
annels	M Match	M Match						R	ef kr	
tion All Ch								Coupl Marke	ed ers	
Calibra	Restart Swe on Std. Mea	eep as.			Apply	Cancel	😥 Help		↓ ↑	J
File	Trace Channe	l Display Application	System Help				Ch1: Avg None	★ Ch1 P2		11/8/2021 1:24:12 PM



Reflection Calibration - Load





Reflection Calibration - Short

• Perform Short first to verify probe planarization





Reflection Calibration - Open





Complete Reflection OSM Cal

🗞 Rohde & Schwarz VNA		
🗈 🔄 🔚 🔚 🐼 🧟 🧒 🥂 New 🔤 New 🚺 Delete 💋	Marker	x
Image: Color of the second	Marker Mkr 1 Stimulus 0 Hz Mkr 1 Arb. Response Mkr 1 Arb. Response Delta Mkr 1 Mkr 2 Mkr 1 Mkr 2 Mkr 3 Mkr 4 Mkr 5 Mkr 6 Mkr 7 Mkr 8 Mkr 9 Mkr 10 Ref Mkr	Markers Marker Props Marker Search Multiple Peak Target Search Band- filter Set by Marker Info Field
File Trace Channel Display Application System Help	Coupled Markers	11/8/2021 12:40:43 PM



Correct Thru Calibration





Transmission Calibration - Thru

- At least one probe does not touch down.
- Need to redo the Thru measurement





Completion of SOLT Calibration

😵 Rohde & Schwarz VNA			X	
Trc9 $2 \leftarrow 511$ Lin Mag 4 Ω / Ref 50 Ω Cal	1	Trc10 Z←S22 Lin Mag 4 Ω/ Ref 50 Ω Cal 4 Remote	X	
_ ⁷⁸ M1 358.	.000 ps 50.119 Ω	M1 343.000 ps 50,114 Ω		
-66		-66 Go to Perm	ote	
-58 M1		-58	ote	
50-Ω	÷_<	So Ω Clear Error User		
38		38 Men	iu	
Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz	Stop 30 GHz	Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz Stop 30 GHz Update Display		
Trc9 Start -300 ps — Time Domain	Stop 1.2 ns	Trc10 Start -300 ps — Time Domain Stop 1.2 ns		
Trc2 S11 dB Mag 5 dB/ Ref 0 dB Cal	2	Trc1 S12 dB Mag 3 dB/ Ref 0 dB Cal 5		
0 dB		o dB Once		
5				
-15		9- 12 ● Off		
-25				
30 35 M1 15.000000 GHz -48.7984 dB	<u>M</u>	M1 15.000000 GHz -0.0413 dB		
_45 M2 30.000000 Hz -39.9867 dB	and a second	M2 30.000000 GHz -0.0839 dB Protocol		
Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz	Stop 30 GHz	Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz Stop 30 GHz VXI-11		
Trc3 S21 dB Mag 3 dB/ Ref 0 dB Cal	3	Trc4 S22 dB Mag 5 dB/ Ref 0 dB Cal		
	ļ,	0 dB		
-3-				
6				
12				
18				
M1 15.000000 GHz -0.0416 dB		M1 15.000000 GHz -49.0212 dB		
Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz	Stop 30 GHz	Ch1 Start 10 MHz Pwr 0 dBm Bw 1 kHz Stop 30 GHz		
		Ch1 11/8 P2 11/8	/2021 31 PM	



S11/S22 Measurements of a 50Ω Standard





Test Trace: 2" (5.08 mm) Microstrip

 Compare measurements between 2.92 mm connectors and probes with probe-tip SOLT calibration





Connector vs. Probes



Limitation of Probe-Tip SOLT CAL



Typical probe-tip SOLT calibration for GS probes is accurate up to ~50% of probe bandwidth because higher order coefficients cannot be defined due to probe contact.



Cal Kit Standard



Typically, only the coefficient of f⁰ is used for Open and Short standards for probes

www.packetmicro.com



Manual Entry of TCS70 Coefficients

Press hard "Cal" button -> Cal Devices -> Cal Connector Types

📴 🔚 🔄 🔊 🔐 🗨 📆 🕂 New 🔤 New 🚺 Delete	Cal	x
Trc1 S11 dB Mag 10 dB/ Ref 0 dB Cal 1 Trc2 S22 dB Mag 10 dB/ Ref 0 dB Cal 2 Cal Connector Types Image: Cal Connector Types	Cal Connector Types	Start Cal
Conn Type A Sexless Char Two Line Type Rel Permittivity or Cutoff Free	Cal Kits	Cal Devices
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	Characterize Cal Unit	Pwr Cal Settings Use Cal
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		
Add Delete Close PHelp - 0 02 - 0 03 - 0 04 - 0 04 - 0 04 - 0 04 - 0 04 - 0 05 Close PHelp - 0 03 - 0 04 - 0 04 - 0 05 Close Start 9 kHz Pwr - 10 dBm Bw 300 Hz Stop 8.5 GHz		
File Trace Channel Display System Help Ch1: Avg None	★ Ch1 P2	12/3/2014 9:25:54 PM

Need to add connector type before adding the Cal Kit!



Select Connector Type

Ŧ			C 👩 🔤 🖓 Ne	ew Rew race Ch +	- Tr	New 🔲 Dele	te	(Cal	X
Trc1	S11 dB Mag 10 dB/	Ref 0 dB Cal		Trc2 S22 o	IB I	Mag 10 dB/ Ref 0 dB Cal		2	Cal Connector Types) tart Cal
	Conn. Type	Sexless	Char. Imp.	Line Type		Rel. Permittivity er	Cu	toff Fre	Cal Kits	Cal Devices
2	2 📔 N 75 Ω		75 Ω	ТЕМ	 ‡ :	1.001			Characterize Cal Unit	Pwr Cal
3	3 🔒 3.5 mm 1 🔒 7 mm		50 Ω 50 Ω	ТЕМ	÷ :	1.001 1.001				Use
5	5 📔 2.92 mm		50 Ω	ТЕМ	\$	1.001				Cal
6	2.4 mm 2.4 mm		50 Ω 50 Ω	ТЕМ ТЕМ		1.001 1.001				
8	3 🔒 7-16		50 Ω 75 0	ТЕМ	¢ :	1.001				
1	$\begin{array}{c} \bullet \\ \bullet $		50 Ω	ТЕМ	÷ .	1.001				
1	1 🔒 BNC 75 Ω 2 User Conn 1		75 Ω 50 Ω	ТЕМ	÷ :	1.001	 			
]									
	+ Add X Delete	•				X	Close	😨 Help		
-0.02-				0.02						
				0.03						
-0.05 Ch1	Start 9 kHz Pwr -10	dBm Bw 300 H	Iz Stop 8.5 GF	Iz Ch1 Start	9 ki	Hz Pwr -10 dBm Bw 300 H	Hz S	Stop 8.5 GHz		
File	Trace Channel Displ	ay System He	lp					Ch1: Avg None		12/3/2014 9:27:38 PM

Select "Sexless and 50 $\Omega^{\prime\prime}$ for connector type and rename it to "Probe"



Probe Connector Type

😵 Rohde & Schwarz V	NA								
	()	a 🔛 🔍		New Rev Trace Charles	v 🔽 Ne + Tr 🔽 Ma	w 📗 Delete 룱	C	al	x
p-22Cal * 🗷	🇞 Cal	Connector Types	🐴 7NR40	2сн - 😿 🌾	Thick	*[tor	Start
Trc9 Z S11 Lin Mag	\$	Conn. Type 💙	Sexless	Char. Imp.	Line Type	Rel. Permittivity ɛr	Cutoff Freq. fc		Cal
78	1	巓 Ν 50 Ω		50 Ω	TEM	¢ 1.001	-		Cal
-52	2	📔 Ν 75 Ω		75 Ω	TEM	¢ 1.001	<u>120</u>	ze	Devices
50 Ω	3	📔 3.5 mm		50 Ω	TEM	¢ 1.001	-		Pwr Cal
38	4	📔 7 mm		50 Ω	TEM	¢ 1.001			Settings
Ch1 Start 10 MHz	5	실 2.92 mm		50 <u>Ω</u>	TEM	¢ 1.001			Use
Trc9 Start -300 ps	6	실 2.4 mm		50 Ω	TEM	¢ 1.001			Cal
Trc2 S11 dB Mag 5 dE	7	실 1.85 mm		50 Ω	TEM	¢ 1.001	-		
0 dB	8	<u></u> 7-16		50 Ω	TEM	¢ 1.001			
10	9	📔 Type F (75)		75 Ω	TEM	¢ 1.001	=		
20	10	📔 ΒΝϹ 50 Ω		50 Ω	TEM	¢ 1.001	-		
30M	11	📔 BNC 75 Ω		75 Ω	TEM	¢ 1.001	-		
-45 M	12	SMA 📔		50 Ω	TEM	¢ 1.001	-		
Chi Start 10 MHz	13	<u>4.3-10</u>		50 Ω	TEM	¢ 1.001	-		
Trc3 S21 dB Mag 3 dE	14	📔 Probe		50 Ω	TEM	¢ 1.001	-		
0 dB									
6									
12	_					이 바라에 가지 가지 않는다. 이 번 것은 것이 된 것 같 것 같아?			
M1 15.000000 GHz M2 30.000000 GHz	+	Add X Dele					Close 😥 Help		
Ch1 Start 10 MHz	Pwr 0	dBm Bw 1 kHz	Stop 30) GHz Ch1 Start	10 MHz Pv	vr 0 dBm Bw 1 kHz	Stop 30 GHz		,
File Trace Channel	Displa	y Application S	ystem Help				Ch1: Avg None + Ch1 P2		11/9/2021 11:41:55 AM



Add Cal Kit

Press hard "Cal" button -> Cal Devices -> Cal Kits Click on "Probe" -> Add -> Rename "New Kit 1" to "RP12G1.0-70V2

😵 Rohde & S	chwarz VNA					
1 in 1		New Rew	New The Delete		Cal	X
	🏀 Calibration Kits		*			
ip-22Cal *	Connector Type	Available Cal Kits			Cal Connector	Start Cal
Trc9 Z←S11	Conn. Type 🗡	Kit Name 👻	Label Agilent Mc 🔶	🕂 Add	Califie	
-78	1 N 50 Ω	27 RP0.5mm-70V0	N			Devices
-62	2 Ν 75 Ω	28 RP0.8mm-70V0	N	📄 Сору	Characterize	Dure Cal
5 0 Ω	3 3.5 mm	29 RP1.0mm-70V0				Settings
38	4 7 mm	30 SP30G0.5-70V2		X Delete		lse
Trc9 Start -3(5 2.92 mm	31 SP30G0.4-70V2	N	construction (Cal
	6 2.4 mm	32 SP30G0.25-70V2	N	Standards		
Trc2 S11 dB /	7 1.85 mm	33 SP18G1.0-50V2	N			
0 dB	8 7-16	34 SP20G0.4-50V2	N			
	9 Type F (75)	35 SP18G0.8-50V2				
	10 BNC 50 Ω	36 SP20G0.5-50V2				
45	11 BNC 75 Ω	37 SP20G0.25-50V2				
Ch1 Start 10	12 SMA	38 RP0.3mm-TCS70V2				
T-2 621	12 1.2 10	39 RP0.2mm-TC570V2				
	14 Probe	 New Kit 1 				
12						
- 18	Cal Kit	Export Cal Kit	X Close	😨 Help		
M1 15.0000 M2 30.0000						
Ch1 Start 10	MHz Pwr0dBmBw1kH	z Stop 30 GHz Ch1 Start 10 MH	∞ z Pwr0dBmBw1kHz	Stop 30 GHz		
File Trace	Channel Display Application	on System Help		Ch1: Avg		1/9/2021 :50:39 AM



View or Modify Cal Kit Standards

Press hard "Cal" button -> Cal Devices -> Cal Kits Click on "Probe" -> RP12G1.0-70V2 -> Standard

Calibration Kits		*	
Connector Type	Available Cal Kits		Cal Connector Types
Conn.Type 👻	🗮 Kit Name 👻	Label Agilent Mc	Add
1 Ν 50 Ω	27 RP0.5mm-70V0		
2 N 75 Ω	28 RP0.8mm-70V0		Copy Characterize
3 3.5 mm	29 RP1.0mm-70V0		Cat Offic
4 7 mm	30 SP30G0.5-70V2		Delete
5 2.92 mm	31 SP30G0.4-70V2		
6 2.4 mm	32 SP30G0.25-70V2		andards
7 1.85 mm	33 SP18G1.0-50V2		
8 7-16	34 SP20G0.4-50V2		
9 Type F (75)	35 SP18G0.8-50V2		
10 BNC 50 Ω	36 SP20G0.5-50V2		
11 BNC 75 Ω	37 SP20G0.25-50V2		
12 SMA	38 RP0.3mm-TC570V2		그렇게 가지 않는 것이 않는 것이 않는 것이 없다.
12 4.3-10	39 RP0.2mm-rC570V2		
14 Probe	40 RP12G1.0-70V2		
Cal Kit	Export Cal Kit	Close	🕐 Help
		2012-010-010-010-010-010-010-010-010-010	
a Dur O dBm Bur 1 kHz	Stop 30 GHz Ch1 Start 10 MH	T Dur OdBm Bur 1kHz S	top 30 CHr

Define or modify Cal Kit Standards



Add Cal Kit Standards

🛞 Roh⁄a	e & Schwarz	VNA	_						. —		X
1	🎨 Kit Star	ndards RP12G1.0-70		New	New New	New			*		x
	One Port	itandards			1	-	-				E
p-22Ca		Турс 🖌 🗡	Gender	Label	Min Freq	Max Freq	.s1p File	Port		🕂 Add	rt
Trc9 7	1 Ma	:ch ≎	¢		0 Hz	1000 GHz		any 🗘			
78	2 Ope	en ≑	\$		0 Hz	1000 GHz		any 😫		ј Сору	
-62	3 Sho	rt ÷	\$		0 Hz	1000 GHz		any 🗦			evices
5 <mark>0 Ω</mark>										X Delete	vr Cal
38										الiew /	
Trc9 Sta										→ Modify	
Trc2 S										File	
0 dB	Two Port	itandards									
10		lype 🎽	Gender	Label	Min Freq	Max Freq	.s2p File	Port 1	Port 2	🕂 Add	
20	1 Thr	ough 🔶	¢		0 Hz	1000 GHz		any	≑any 😫		
-45										🕤 Сору	
Ch1 Sta											
Trc3 Si										X Delete	
0 dB										· View /	
6										Modify	
12										Read .s2p	
M1 15	New York									File	
.∭2 30.											
Ch1 Sta								<i>4</i> c	OK 🔀 Canc	el 🕜 Help	6
File	ace Chann	el Display Applicati	on stem He	εφ				Ch1:	None P2	12:	9)/2021 03:04 PM

Add Open, Short, Match and Through standards



Enter Open Coefficient

۰ 🍫	Kit Standards SP30G0	۰	۵					
One Port Standards								
	Туре	Gender △ Label Min Freq Max Freq .s1p File Port			🕂 Add			
1	Open	🍫 View / Modify Cal Kit Standards 🛛 💿 💿		×				
2	Short	Open	_ ^		∃			
3	Match	Probe Open Short Matcl		R	🗶 Delete			
		SP30G0.5-70V2			T View /			
		Loss			신 Modify			
					Read .s1p			
					- rite			
Two	Port Standards	70						
	Туре	50 Ω			🕂 Add			
1	Through				🔁 Сору			
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Enter coefficient for Open standard



Enter Short Coefficient



Enter coefficient for Short standard



Enter Match (Load) Coefficient



Enter coefficient for Match (Load) standard



Enter Through Coefficient



Enter coefficient for Through standard



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