SNA5000A Series

Vector Network Analyzer

DataSheet DS09050_E01C

SIGLENT TECHNOLOGIES CO.,LTD

Contents

1. General Description

The SIGLENT SNA5000A series of Vector Network Analyzers have a frequency range of 9 kHz to 8.5 GHz, which support 2/4-ports scattering-parameter, differential-parameter, and time-domain parameter measurements. The SNA5000A series of VNAs are effective instrumentation for determining the Q-factor, bandwidth and insertion loss of a filter, They feature impedance conversion, movement of measurement plane, limit testing, ripple test, fixture simulation and adapter removal/insertion adjustments. The VNAs have five sweep types: Linear-Frequency mode, Log-Frequency mode, Power-Sweep mode, CW-Time mode and Segment-Sweep mode. The SNA5000A series VNAs also support scattering-parameter correction of SOLT, SOLR, TRL, Response and Enhanced Response for increased flexibility in R&D and manufacturing applications.

2. Features

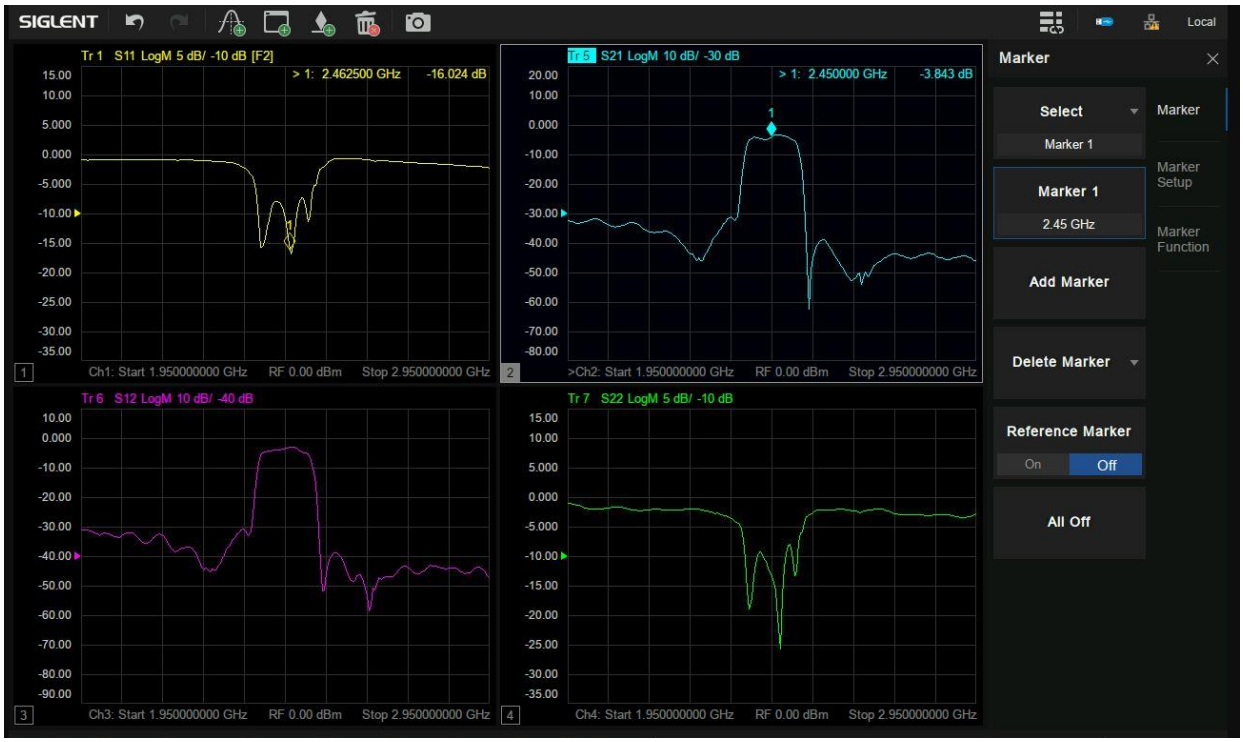
- Frequency range: 9 kHz - 8.5 GHz
- Frequency resolution: 1 Hz
- Level resolution: 0.05 dB
- Range of IFBW: 10 Hz~3 MHz
- Setting range of output level: -55 dBm ~ +10 dBm
- Dynamic range: 125 dB
- Types of calibration: Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, Full-three port calibration, Full-four port calibration, TRL calibration
- Types of measurement: Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, limit test, ripple test, impedance conversion, fixture simulation, adapter removal/insertion, spectrum analysis
- Support Bias-Tees
- Interface: LAN, USB Device, USB Host(USB-GPIB)
- Remote control: SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet/WebServer
- 12.1-inch touch screen
- Video output: HDMI

3. Models and key specifications

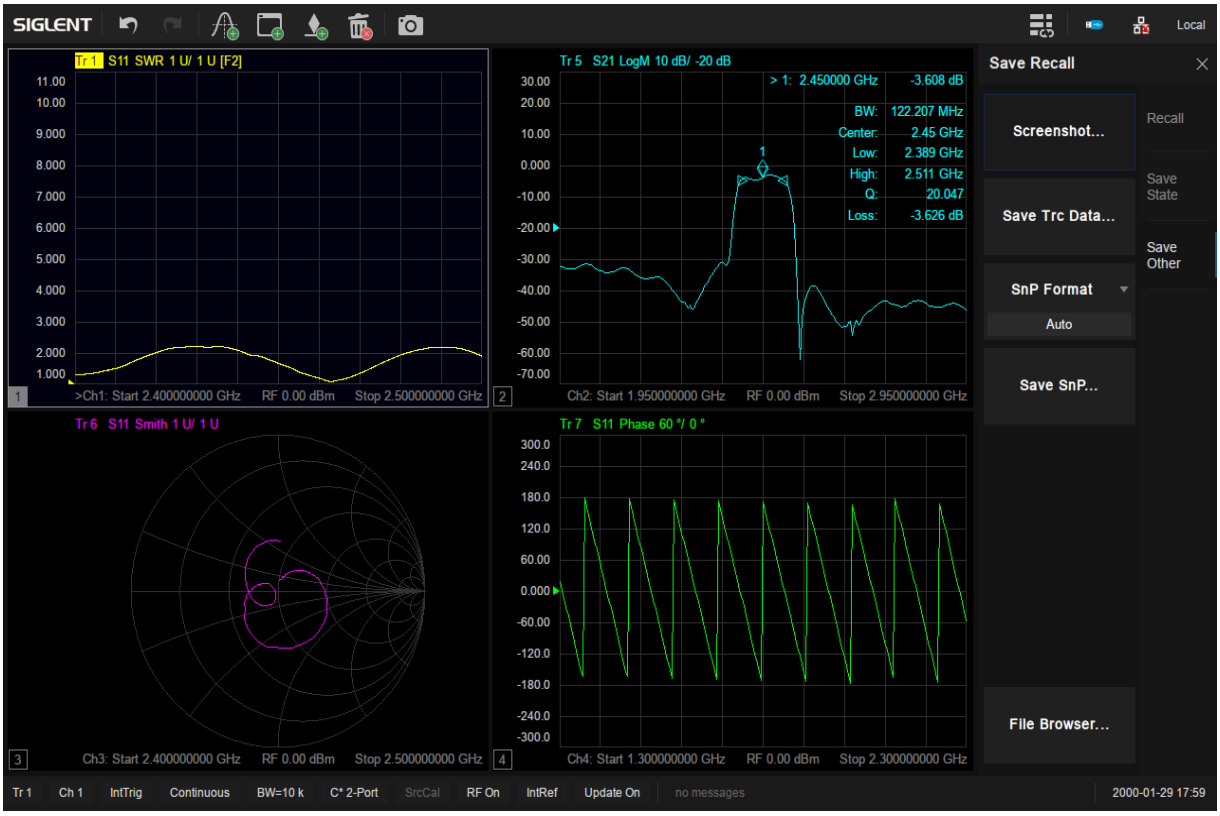
Model	SNA5002A	SNA5012A	SNA5004A	SNA5014A
Frequency range	9 kHz- 4.5 GHz	9 kHz- 8.5 GHz	9 kHz- 4.5 GHz	9 kHz- 8.5 GHz
Ports	2	2	4	4
Frequency resolution	1 Hz			
Level resolution	0.05 dB			
Range of IFBW	10 Hz~3 MHz			
Setting range of output level	-55 dBm ~ +10 dBm			
Dynamic range	125 dB			
Types of calibration	Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, Full-three port calibration, Full-four port calibration, TRL calibration			
Types of measurement	Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, limit test, ripple test, impedance conversion, fixture simulation, adapter removal/insertion,enhanced time-domain parameter analysis(TDR),spectrum analysis.			
Bias-Tees	Support			
Interface	LAN，USB Device，USB Host(USB-GPIB)			
Remote control	SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet/WebServer			
Display	12.1-inch touch screen			
Video output	HDMI			

4. Design Features

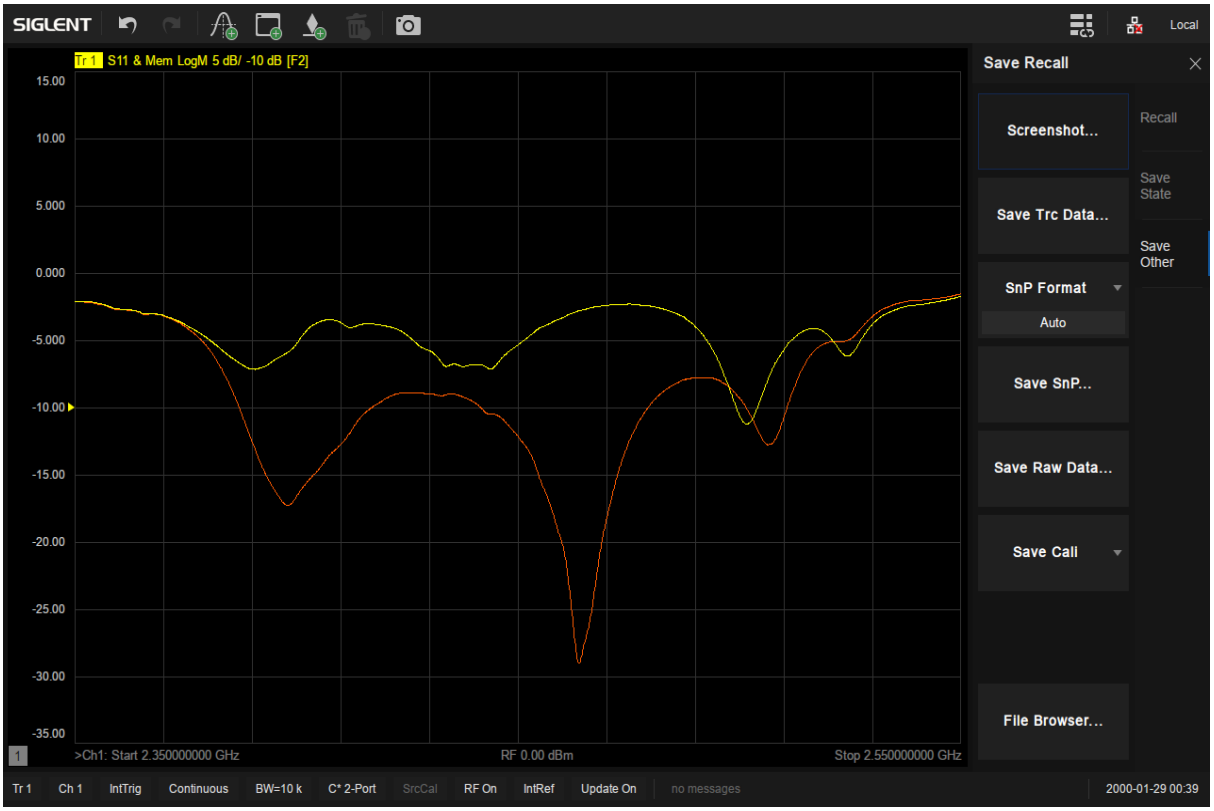
Multi-window display:



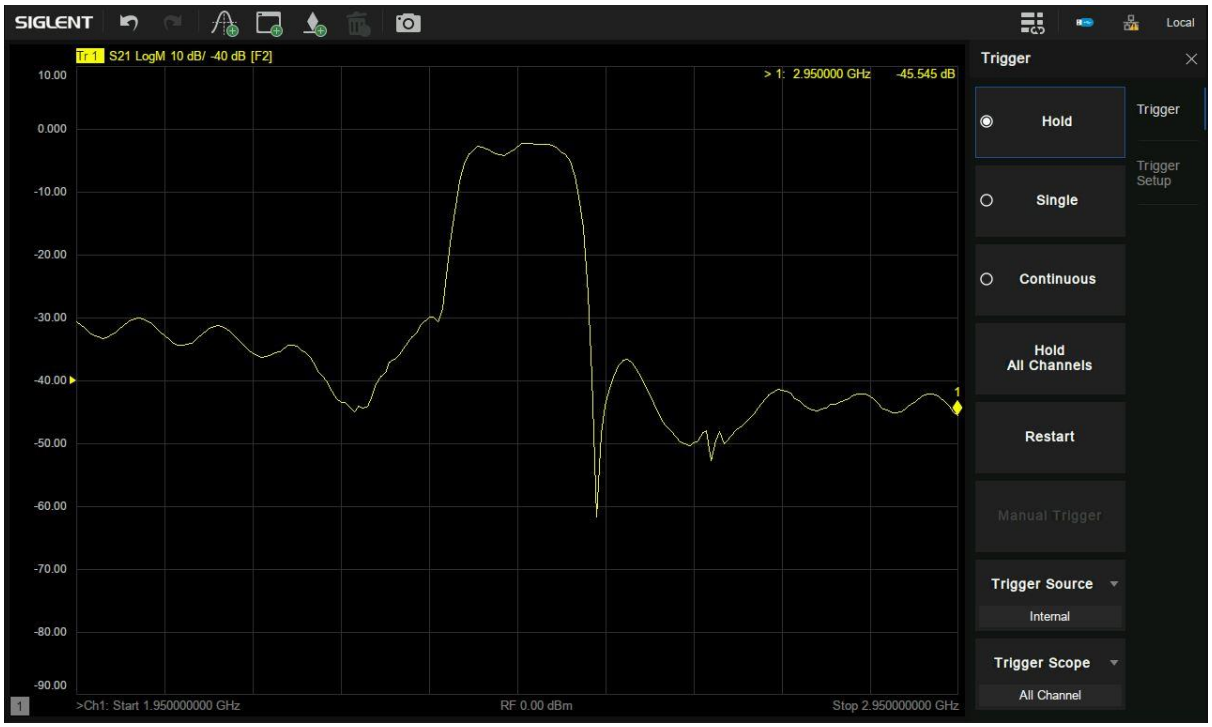
Multi-format display:



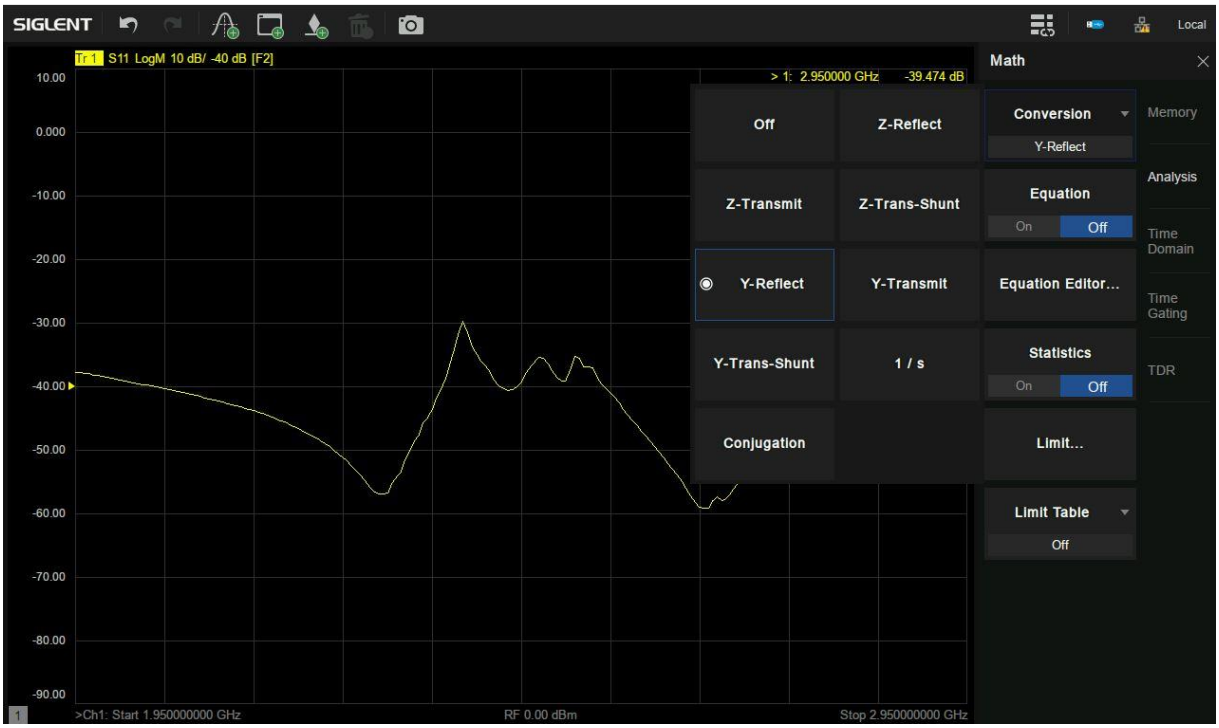
Display and compare memory and current data:



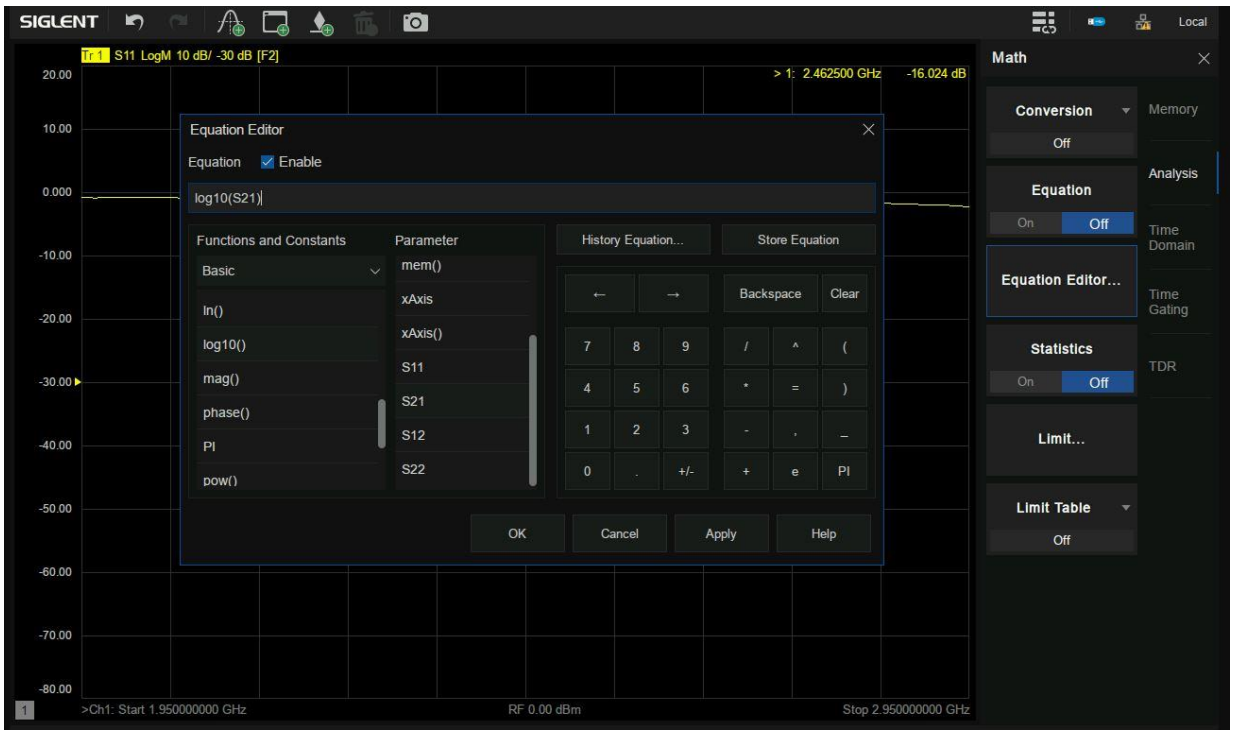
Display data hold:



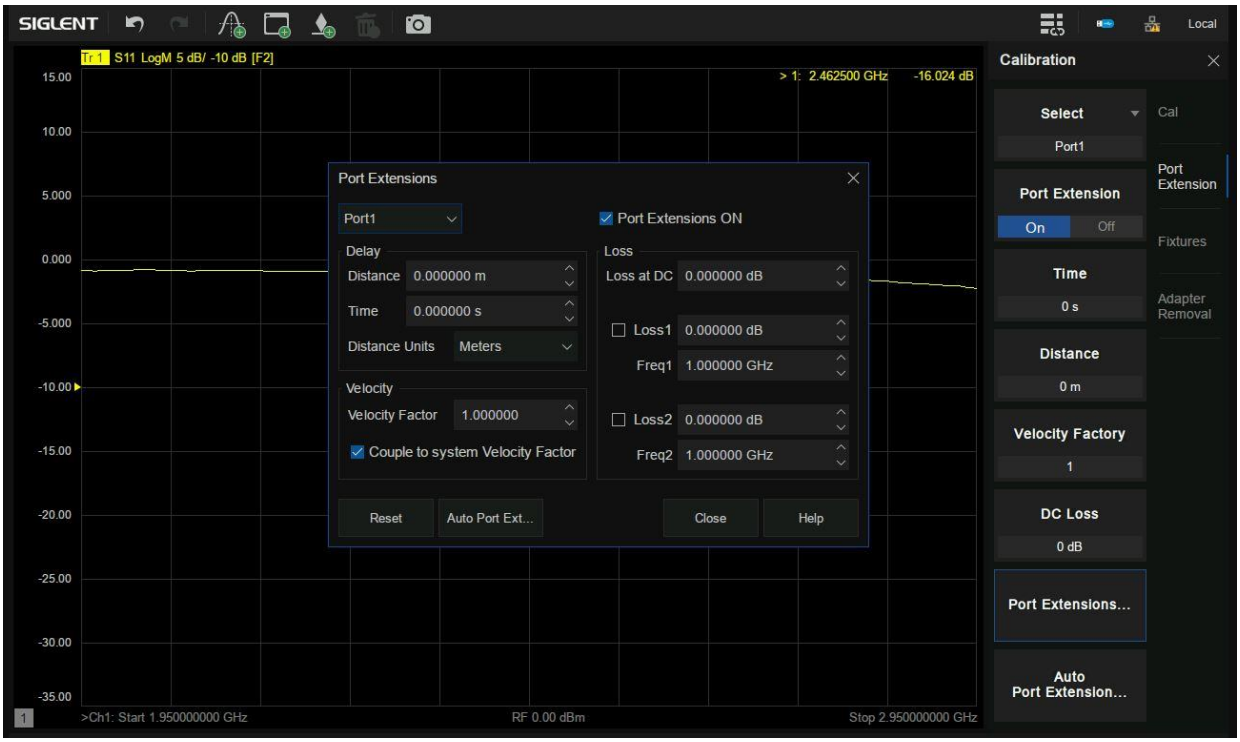
Impedance conversion:



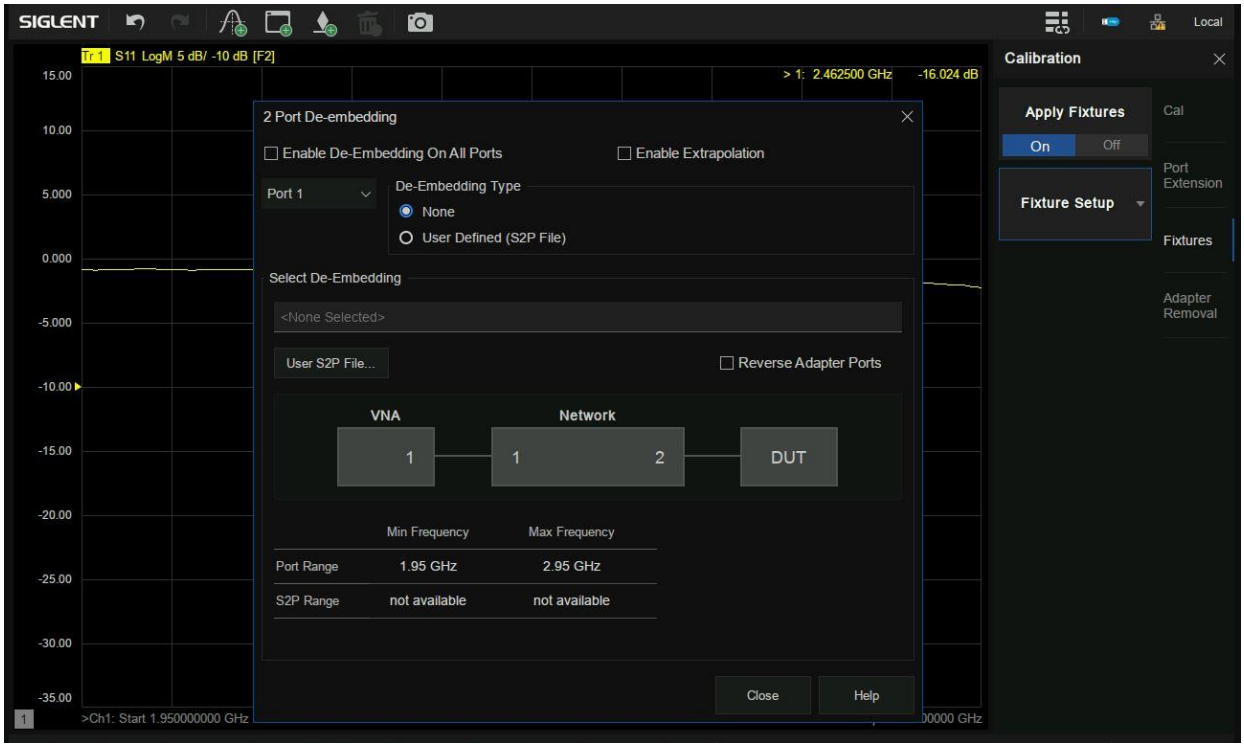
Equation Editor:



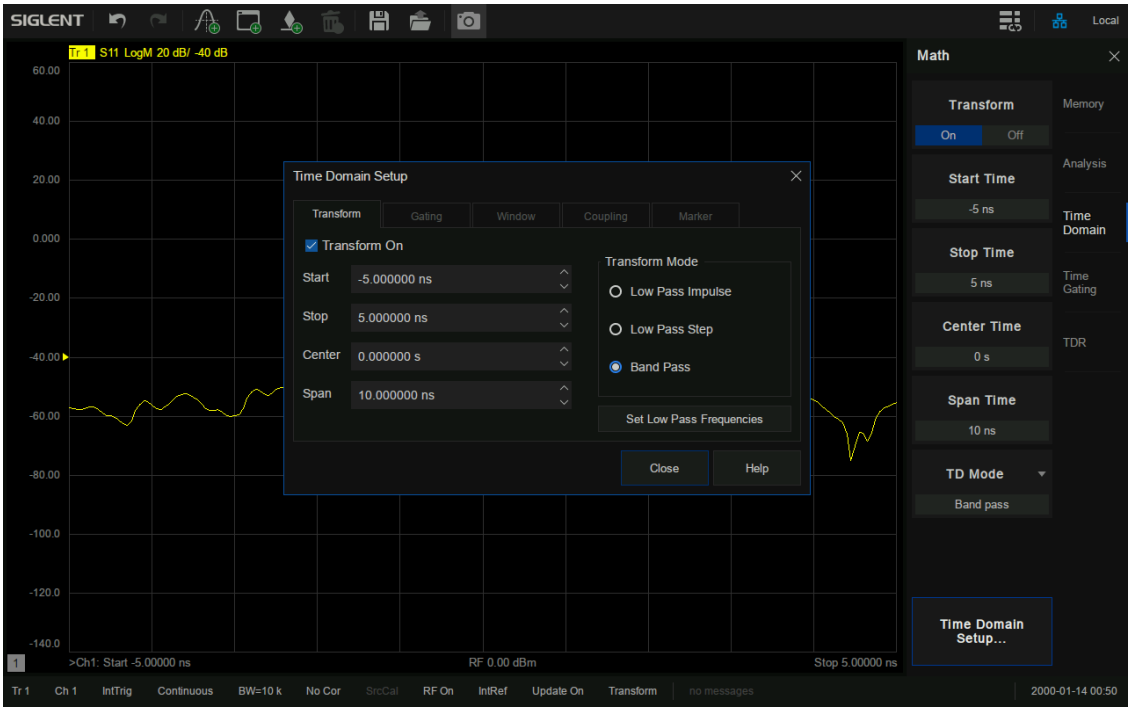
Port Extensions:



Embedding and De-Embedding:

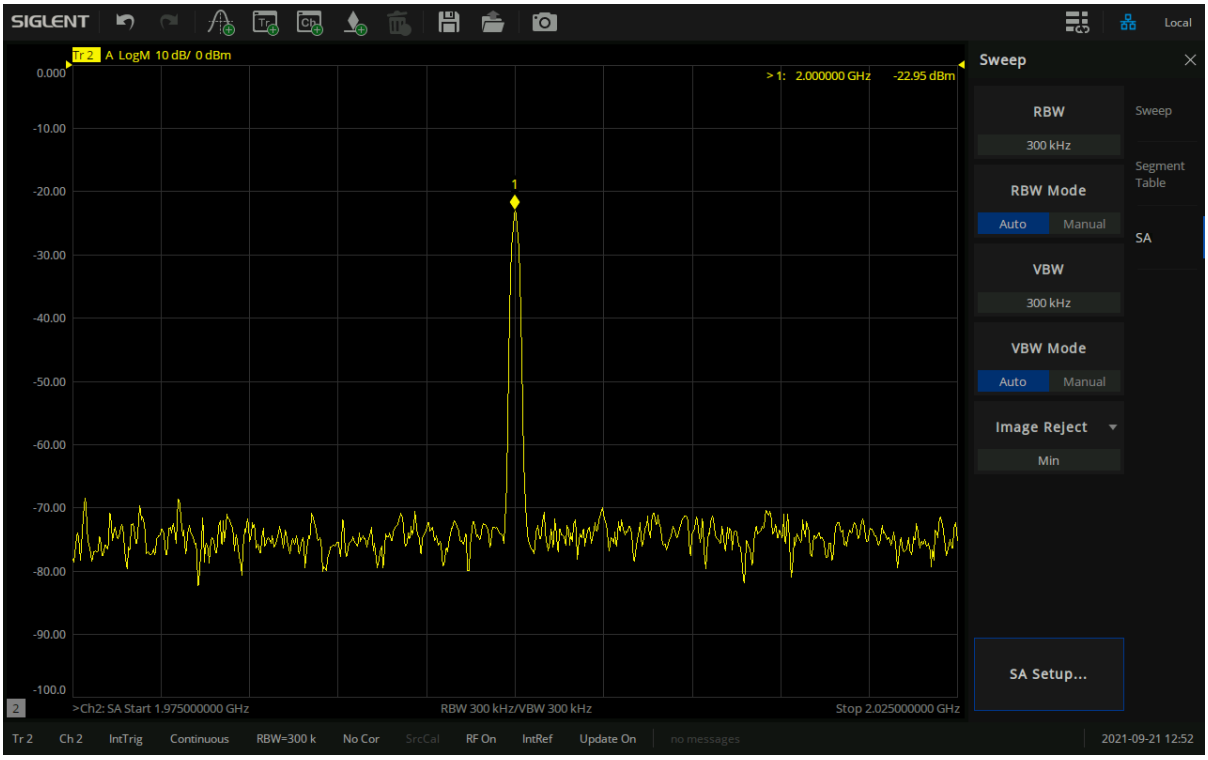


Time-Domain analysis:



Enhanced Time-Domain analysis(TDR)

Spectrum analysis



5. Definitions

Specifications are valid under the following conditions: The instrument is within the calibration period, has been stored between 0 and 40℃ for at least 2 hours before use, and has been powered on and warmed up for at least 90 minutes. The specifications include the measurement uncertainty unless otherwise noted.

Specifications: All products are guaranteed to meet published specifications at room temperature (approximately 25℃), unless otherwise noted.

Typical: Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 25℃). Typical performance is not warranted and does not include measurement uncertainty.

Nominal: This value indicates the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ohm connector.

6. Specifications

6.1. Dynamic range

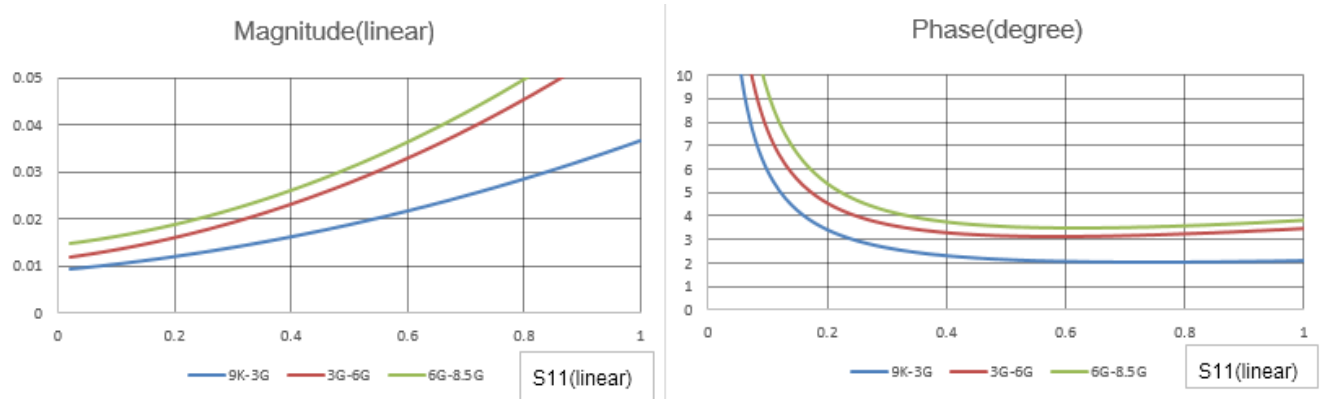
Frequency range	IFBW	Specification(dB)	SPD（dB）
9 kHz-18 kHz	10Hz	89	102
18 kHz-30 kHz		92	105
30 kHz-100 kHz		95	107
100 kHz-300 kHz		105	117
300 kHz-500 kHz		120	130
500 kHz-1 MHz		125	136
1 MHz -5 GHz		125	140
5 GHz -6.8 GHz		123	133
6.8 GHz-7.7 GHz		120	130
7.7 GHz-8 GHz		119	129
8 GHz -8.5 GHz		117	127

6.2. Corrected system performance with calibration kit

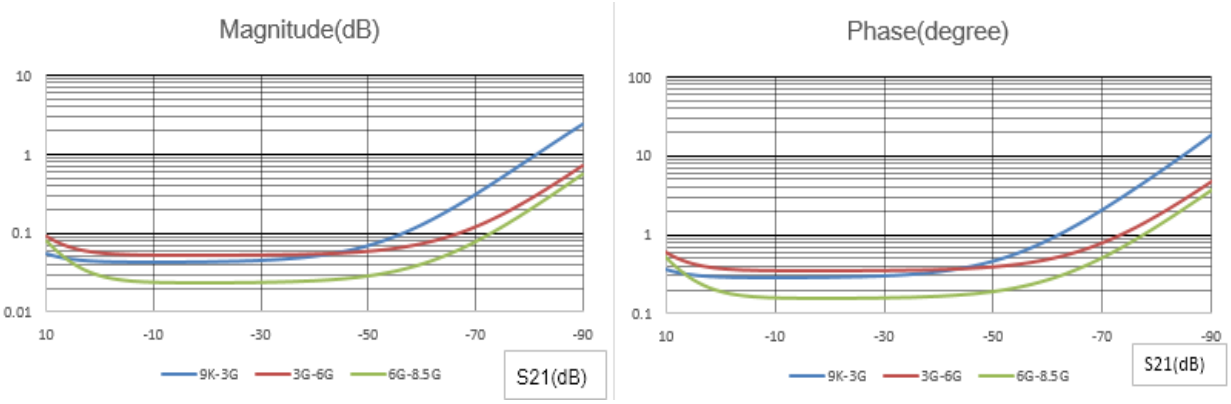
User correction: On, system correction: On; Corrected system performance with Keysight 85052D 3.5mm calibration kit, isolation calibration performed.IFBW is 10 Hz , no averaging applied to data, environmental temperature is 25℃ (± 5℃), with < 1℃ deviation from calibration temperature.

Specification (dB)	9 kHz-3 GHz	3 GHz-6 GHz	6 GHz-8.5 GHz
Directivity	41	39	37
Source match	36	30	29
Load match	41	37	35
Reflect tracking	±0.004	±0.003	±0.004
Transmission tracking	±0.06	±0.09	±0.11

Reflection uncertainty (Specification, Power: -10 dBm, IFBW:10 Hz):



Transmission uncertainty (Specification, Power: -10 dBm, IFBW:10 Hz):



6.3. Uncorrected system performance

User correction: Off, system correction: On; IFBW is 10 Hz, no averaging applied to data.

Specification (dB)	9 kHz-3 GHz	3 GHz-6 GHz	6 GHz-8.5 GHz
Directivity	22	20	16
Source match	22	20	16
Load match	13	11	10
Reflect tracking	±1.4	±1	±1
Transmission tracking	±1.4	±1	±1

6.4. Test port output (Source)

6.4.1. Test port output frequency

Description	Specification
Frequency range	
SNA5002A, SNA5004A	9 kHz to 4.5 GHz
SNA5012A, SNA5014A	9 kHz to 8.5 GHz
Frequency resolution	1 Hz
CW accuracy	
Standard	± 1.0 ppm (23 ± 3℃)
Option: SNA5000-HPR	± 0.1 ppm (23 ± 3℃)
Source stability	
Standard	± 1.0 ppm (0 to 40℃) ± 0.5 ppm/year , ± 3.0 ppm/20 year
Option: SNA5000-HPR	± 1 ppb (0 to 40℃) ± 50 ppb/year

6.4.2. Test port output power

Description	Specification
Preset power	0 dBm
Level accuracy	±1.5 dB@0 dBm
Level linearity	
9 kHz- 18 kHz	±0.5 dB(-20 dBm to -3 dBm)
18 kHz- 30 kHz	±0.5 dB(-20 dBm to 0 dBm)
30 kHz- 70 kHz	±0.5 dB(-20 dBm to 2 dBm)
70 kHz- 100 kHz	±0.5 dB(-20 dBm to 5 dBm)
100 kHz- 300 kHz	±0.5 dB(-20 dBm to 7 dBm)
300 kHz- 5 GHz	±0.5 dB(-20 dBm to 10 dBm)
5 GHz- 6.8 GHz	±0.5 dB(-20 dBm to 8 dBm)
6.8 GHz- 7.7 GHz	±0.5 dB(-20 dBm to 5 dBm)
7.7 GHz- 8 GHz	±0.5 dB(-20 dBm to 4 dBm)
8 GHz- 8.5 GHz	±0.5 dB(-20 dBm to 2 dBm)
Range	
9 kHz- 18 kHz	-55 dBm to -3dBm
18 kHz- 30 kHz	-55 dBm to 0 dBm
30 kHz- 70 kHz	-55 dBm to 2dBm
70 kHz- 100 kHz	-55 dBm to 5dBm
100 kHz- 300 kHz	-55 dBm to 7dBm
300 kHz- 5 GHz	-55 dBm to 10 dBm
5 GHz- 6.8 GHz	-55 dBm to 8 dBm
6.8 GHz- 7.7 GHz	-55 dBm to 5 dBm
7.7 GHz- 8 GHz	-55 dBm to 4 dBm
8 GHz- 8.5 GHz	-55 dBm to 2 dBm
Sweep range	
9 kHz- 18 kHz	-55 dBm to -3dBm
18 kHz- 30 kHz	-55 dBm to 0 dBm
30 kHz- 70 kHz	-55 dBm to 2dBm
70 kHz- 100 kHz	-55 dBm to 5dBm
100 kHz- 300 kHz	-55 dBm to 7dBm
300 kHz- 5 GHz	-55 dBm to 10 dBm
5 GHz- 6.8 GHz	-55 dBm to 8 dBm
6.8 GHz- 7.7 GHz	-55 dBm to 5 dBm
7.7 GHz- 8 GHz	-55 dBm to 4 dBm
8 GHz- 8.5 GHz	-55 dBm to 2 dBm
Max leveled power	
9 kHz- 18 kHz	-3 dBm
18 kHz-30 kHz	0 dBm
30 kHz- 70 kHz	2 dBm
70 kHz-100 kHz	5 dBm

100 kHz-300 kHz	7 dBm
300 kHz- 5 GHz	10 dBm
5 GHz- 6.8 GHz	8 dBm
6.8 GHz-7.7 GHz	5 dBm
7.7 GHz- 8 GHz	4 dBm
8 GHz- 8.5 GHz	2 dBm
Level resolution	0.05 dB

6.4.3. Test port output signal purity

Description	Specification
2nd or 3rd harmonics (0 dBm)	
9 kHz to 100 kHz	<–15 dBc
100 kHz to 8.5 GHz	<–30 dBc
Non-harmonic spurious (0 dBm)	<-30 dBc

6.5. Test port input

6.5.1. Test port input levels

Description	Specification	Typical
Max input level		
9 kHz-8.5 GHz	+10 dBm	
Damage input level		
9 kHz-8.5 GHz	+27 dBm (RF) or 35 V (DC)	
Crosstalk		
9 kHz- 18 kHz	-85 dB	-96 dB
18 kHz-50 kHz	-95 dB	-106 dB
50 kHz-100 kHz	-100 dB	-110 dB
100 kHz-500 kHz	-110 dB	-120 dB
500 kHz- 1 MHz	-120 dB	-130 dB
1 MHz- 5.8 GHz	-125 dB	-140 dB
5.8 GHz-8.5 GHz	-120 dB	-130 dB
Noise floor		
9 kHz- 100 kHz	-102 dBm/Hz	-115 dBm/Hz
100 kHz-300 kHz	-110 dBm/Hz	-125 dBm/Hz
300 kHz-500 kHz	-120 dBm/Hz	-130 dBm/Hz
500 kHz- 1 MHz	-125 dBm/Hz	-136 dBm/Hz
1 MHz- 7 GHz	-125 dBm/Hz	-140 dBm/Hz
7 GHz-8.5 GHz	-125 dBm/Hz	-135 dBm/Hz
Compression level(10 dBm)		
Magnitude		
9 kHz- 8.5 GHz		0.09 dB
Phase		
9 kHz- 8.5 GHz		0.36 deg

6.5.2. Trace noise

Description	Specification	
Note:Setting max output power		
Transmission trace noise magnitude		
9 kHz- 50 kHz (IFBW=1 kHz)	0.003 dB rms	0.0015 dB rms
50 kHz- 1 MHz (IFBW=1 kHz)	0.003 dB rms	0.0015 dB rms
1 MHz- 8 GHz (IFBW=10 kHz)	0.003 dB rms	0.0015 dB rms
8 GHz-8.5 GHz(IFBW=10 kHz)	0.005 dB rms	0.0025 dB rms
Reflection trace noise magnitude		
9 kHz- 50 kHz (IFBW=1 kHz)	0.003 dB rms	0.0005 dB rms
50 kHz- 1 MHz (IFBW=1 kHz)	0.003 dB rms	0.0007 dB rms
1 MHz- 8 GHz (IFBW=10 kHz)	0.003 dB rms	0.0015 dB rms
8 GHz-8.5 GHz(IFBW=10 kHz)	0.004 dB rms	0.002 dB rms
Transmission trace noise phase		

9 kHz- 50 kHz (IFBW=1 kHz)	0.04 deg rms	0.02 deg rms
50 kHz- 1 MHz (IFBW=1 kHz)	0.03 deg rms	0.015 deg rms
1 MHz- 8.5 GHz (IFBW=10 kHz)	0.05 deg rms	0.02 deg rms
Reflection trace noise phase		
9 kHz- 50 kHz (IFBW=1 kHz)	0.03 deg rms	0.015 deg rms
50 kHz- 1 MHz (IFBW=1 kHz)	0.03 deg rms	0.015 deg rms
1 MHz- 8.5 GHz (IFBW=10 kHz)	0.05 deg rms	0.002 deg rms

6.5.3. Stability

Description	Specification	Typical
Magnitude		
9 kHz- 3 GHz		± 0.005 dB/°C
3 GHz- 8.5 GHz		± 0.014 dB/°C
Phase		
9 kHz- 3 GHz		± 0.1 deg/°C
3 GHz- 8.5 GHz		± 0.3 deg/°C

6.5.4. Dynamic accuracy

Description	Specification
Relative to -10 dBm input power	
Magnitude	
10 dBm	± 0.1 dB
-30 dBm	± 0.05 dB
-100 dBm	± 2 dB
Phase	
10 dBm	± 2 deg
-30 dBm	± 0.2 deg
-100 dBm	± 10.38 deg

7. Sweep time

Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 500 kHz.				
Points	201	401	1601	6401
Uncorrected	15 ms	17 ms	35 ms	141 ms
2-port cal	30 ms	34 ms	70 ms	282 ms
4-port cal	60 ms	68 ms	140 ms	564 ms
Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 100 kHz.				
Points	201	401	1601	6401
Uncorrected	17 ms	20 ms	46 ms	185 ms
2-port cal	34 ms	40 ms	92 ms	370 ms
4-port cal	68 ms	80 ms	184 ms	740 ms
Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 10 kHz.				
Points	201	401	1601	6401
Uncorrected	33 ms	52 ms	175 ms	698 ms
2-port cal	66 ms	104 ms	350 ms	1396 ms
4-port cal	132 ms	208 ms	700 ms	2792 ms
Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 1 kHz.				
Points	201	401	1601	6401
Uncorrected	193 ms	372 ms	1452 ms	5806 ms
2-port cal	386 ms	744 ms	2904 ms	11612 ms
4-port cal	772 ms	1488 ms	5808 ms	23224 ms

8. General information

Description	Characteristics
Operating environment	
Temperature	0 to 40 ℃
Humidity	85%: 40 ℃,24 hours
Altitude	0 to 3000 m
Non-operating storage environment	
Temperature	-20 ℃ to 60 ℃
Humidity	85%: 65 ℃,24 hours
Altitude	0 to 15000 m
Size	W×H×D=378×284×126 mm
Weight	2-port: 5.5 kg, 4-port 7.4 kg
EMC	
Conducted disturbance: CISPR 11/EN 55011	CLASS A group 1, 150 kHz - 30 MHz
Radiated disturbance: CISPR 11/EN 55011	CLASS A group 1, 30 MHz -1 GHz
Electrostatic discharge(ESD): IEC61000-4-2/ EN61000-4-2	4.0 kV (contact), 8.0 kV (air)
Radio-frequency electromagnetic field Immunity: IEC 61000-4-3/EN 61000-4-3	10 V/m (80 MHz to 1 GHz) 3 V/m (1.4 GHz to 2 GHz) 1 V/m (2.0 GHz to 2.7 GHz)
Electrical fast transients (EFT):IEC 61000-4-4/ EN 61000-4-4	2 kV (AC power ports)
Surges: IEC 61000-4-5/EN 61000-4-5	1 kV (Line to line) 2 kV (Line to ground)
Radio-frequency continuous conducted Immunity: IEC 61000-4-6/EN 61000-4-6	3 V, 0.15-80 MHz
Voltage dips and interruptions: IEC 61000-4-11/ EN 61000-4-11	Voltage dips: 0% UT during 1 cycle; 40% UT during 10/12 cycles; 70% UT during 25/30 cycles Voltage interruptions: 0% UT during 250 cycles
Safety	
UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11. UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018.	

9. Front panel information

Description	Characteristics
RF connectors	Type-N, female, 50Ω
Damage level	+27 dBm or ±35 VDC
Display	12.1 inch TFT color LCD with touch screen
Resolution	WXGA (1280 x 800)
USB interface	USB-A 2.0

10. Rear panel information

Description	Characteristics
Ext trigger input connector	
Type	BNC, female
Input level	5V TTL
Ext trigger output connector	
Type	BNC, female
Max output current	20 mA
Output level	3.3V TTL
Ext ref-signal input connector	
Type	BNC, female
Input frequency	10 MHz ±10 ppm
Input level	-3 dBm to +10 dBm
Input impedance	50Ω
Int ref-signal output connector	
Type	BNC, female
Output frequency	10 MHz ± 5 ppm
Signal type	Sinewave
Output level	0 dBm ± 3 dB into 50 Ω
Output impedance	50 Ω
Bias tee input connector	
Type	BNC, female
Max voltage	± 35 VDC
Max current	± 300 mA
(no degradation RF specification)	
Max current (damage level)	500 mA
Video output	HDMI
USB(USBTMC) interface	USB-B 2.0
LAN	10/100 BaseT Ethernet
Power	100~240 Vrms 50/60 Hz
	100~120 Vrms 400 Hz
Power consumption	2-port: 50 W (typical), 4-port: 70 W (typical)

11. Ordering Information

Items	Description	Order number
Products	2 ports，4.5G Vector Network Analyzer	SNA5002A
	2 ports，8.5G Vector Network Analyzer	SNA5012A
	4 ports，4.5G Vector Network Analyzer	SNA5004A
	4 ports，8.5G Vector Network Analyzer	SNA5014A
Standard Accessories	One Quick-start, one Power-cable, one USB-cable, One calibration-certificate	
Optional Accessories	High-performance reference source	SNA5000-HPR
	Time-Domain analysis	SNA5000-TDA
	Enhanced Time-Domain analysis	SNA5000-TDR
	Spectrum analysis	SNA5000-SA
	N-type, Male, 50Ω Calibration Kit, 0-4.5GHz	F503ME
	N-type, Female, 50Ω Calibration Kit, 0-4.5GHz	F503FE
	3.5 mm, Male, 50Ω Calibration Kit, 0-4.5GHz	F603ME
	3.5 mm, Female, 50Ω Calibration Kit, 0-4.5GHz	F603FE
	N-type, Male, 50Ω Calibration Kit, 0-9GHz	F504MS
	N-type, Female, 50Ω Calibration Kit, 0-9GHz	F504FS
	N-type, Male and Female, 50Ω Calibration Kit, 0-9GHz	F504TS
	3.5 mm, Male, 50Ω Calibration Kit, 0-9GH	F604MS
	3.5 mm, Female, 50Ω Calibration Kit, 0-9GHz	F604FS
	3.5 mm, Male and Female, 50Ω Calibration Kit, 0-9GHz	F604TS

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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