SNA5000X-E Series Vector Network Analyzer

DataSheet

EN01A

SIGLENT TECHNOLOGIES CO.,LTD

SNA5000X-E

General Description

The SIGLENT SNA5000X-E series of Vector Network Analyzers have a frequency range of 9 kHz to 6.5 GHz, which support 2-port scattering parameter, differential-parameter, and time-domain parameter measurements. The SNA5000X-E 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, 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 SNA5000X-E series VNAs also support scattering-parameter correction of SOLT, SOLR, TRL, Response, and Enhanced Response for increased flexibility in R&D and manufacturing applications.

Features

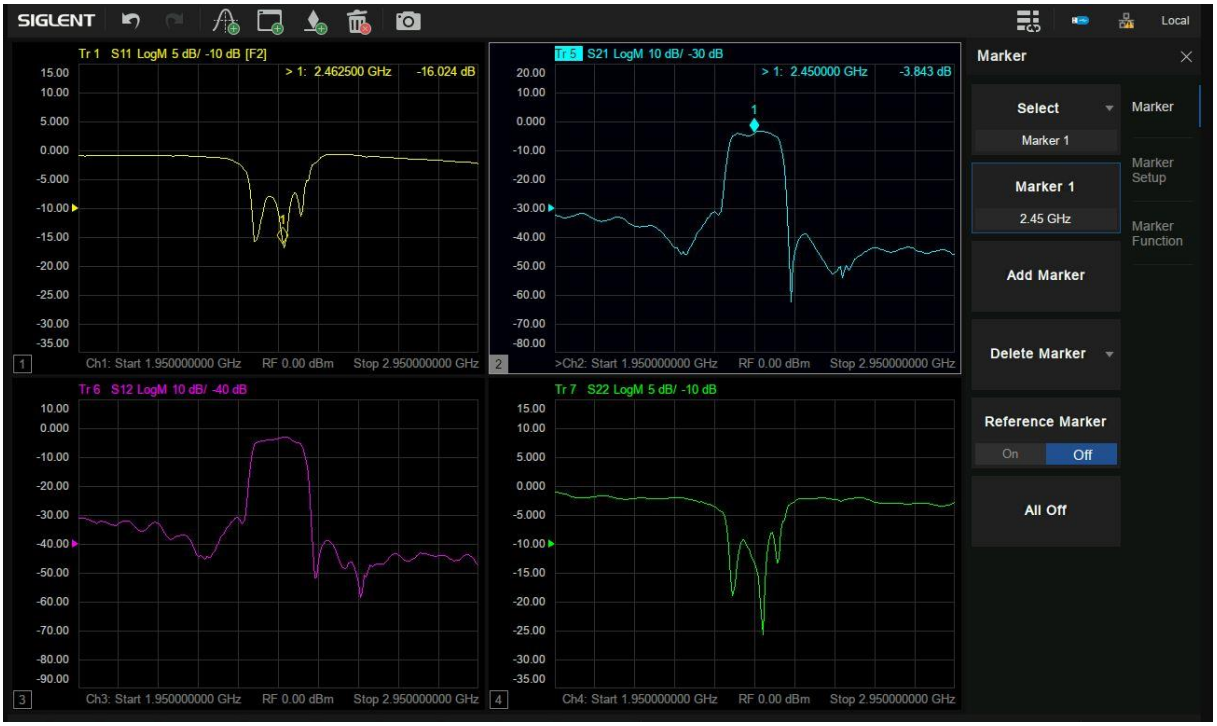
- Frequency range: 9 kHz – 6.5 GHz
- Frequency resolution: 1 Hz
- Level resolution: 0.05 dB
- Range of IFBW: 1 Hz~10 MHz
- Setting range of output level: -40 dBm ~ +10 dBm
- Dynamic range: 125 dB (typ.)
- Types of calibration: Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, TRL calibration
- Types of measurement: Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, impedance conversion, fixture simulation, adapter removal/insertion, spectrum analysis
- Internal Bias-Tee connections
- 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

Models and key specifications

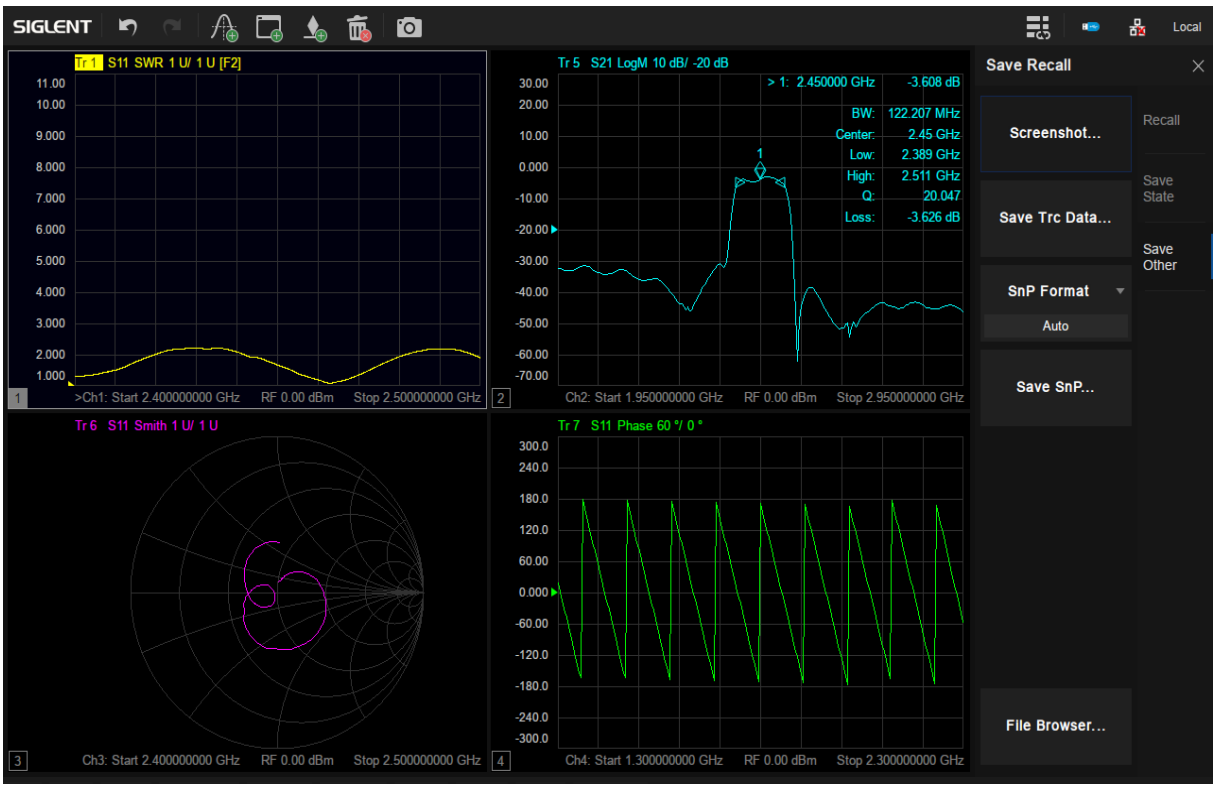
Model	SNA5003X-E	SNA5006X-E
Frequency range	9 kHz- 3 GHz	9 kHz- 6.5 GHz
Ports	2	
Frequency resolution	1 Hz	
Level resolution	0.05 dB	
Range of IFBW	1 Hz ~ 10 MHz	
Number of points	2 ~ 20001	
Setting range of output level	-40 dBm ~ +10 dBm	
Dynamic range	125 dB (typ.)	
Types of calibration	Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, TRL calibration	
Types of measurement	Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, 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	

Design Features

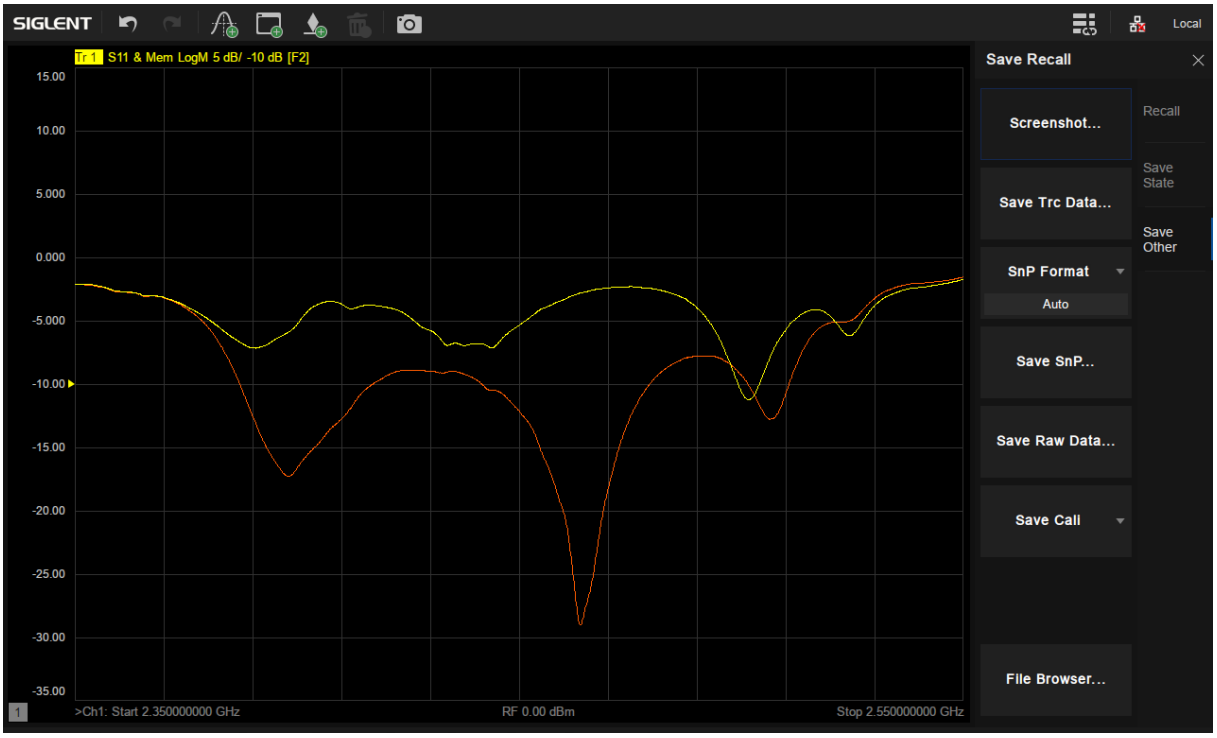
Multi-window display:



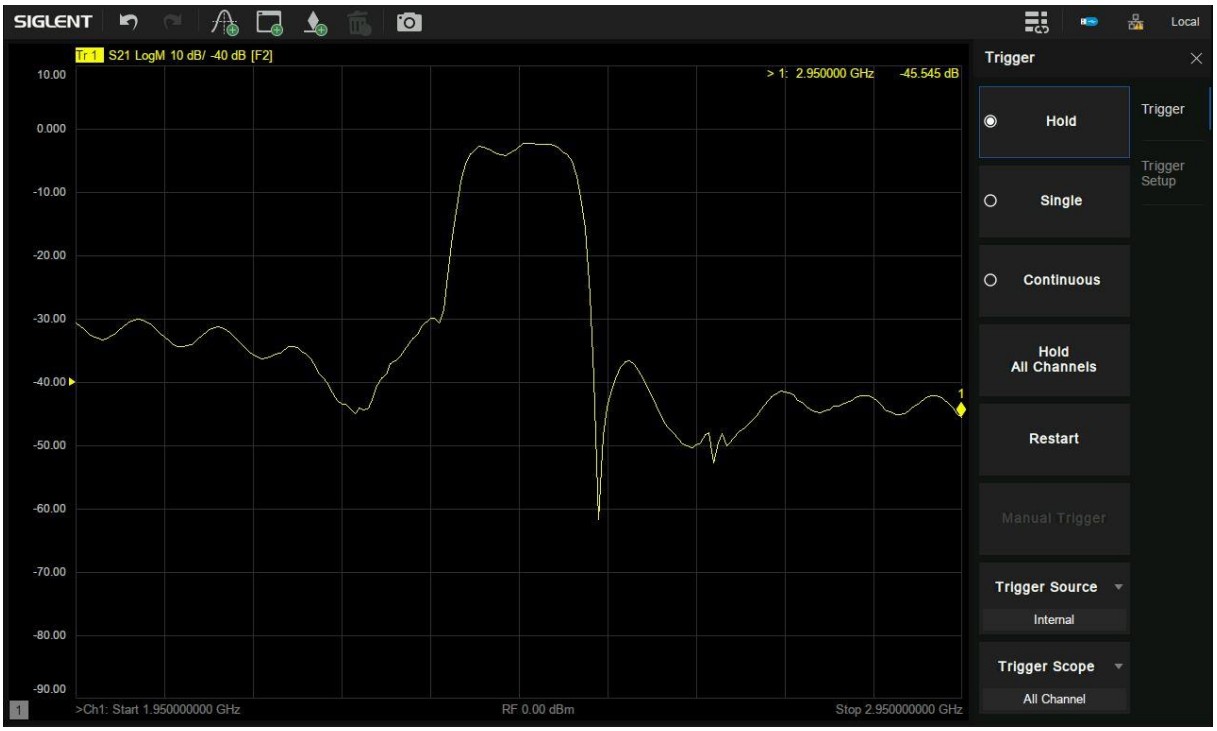
Multi-format display:



Display and compare memory and current data:

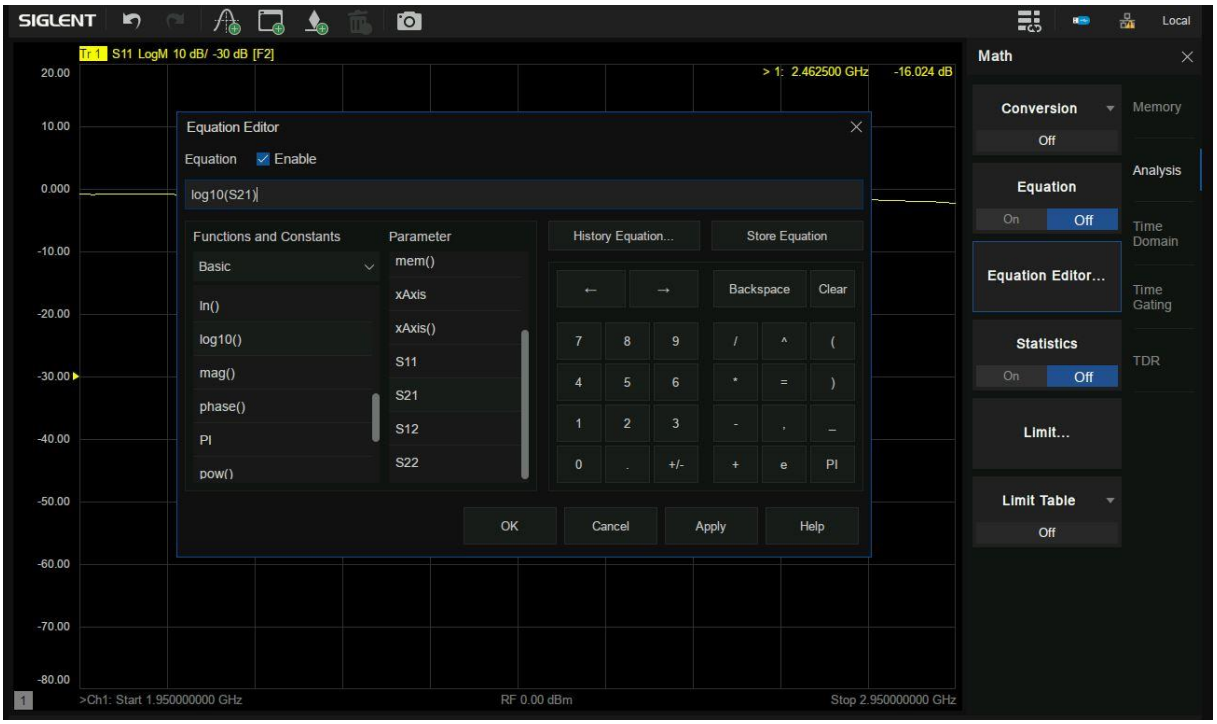


Display data hold:

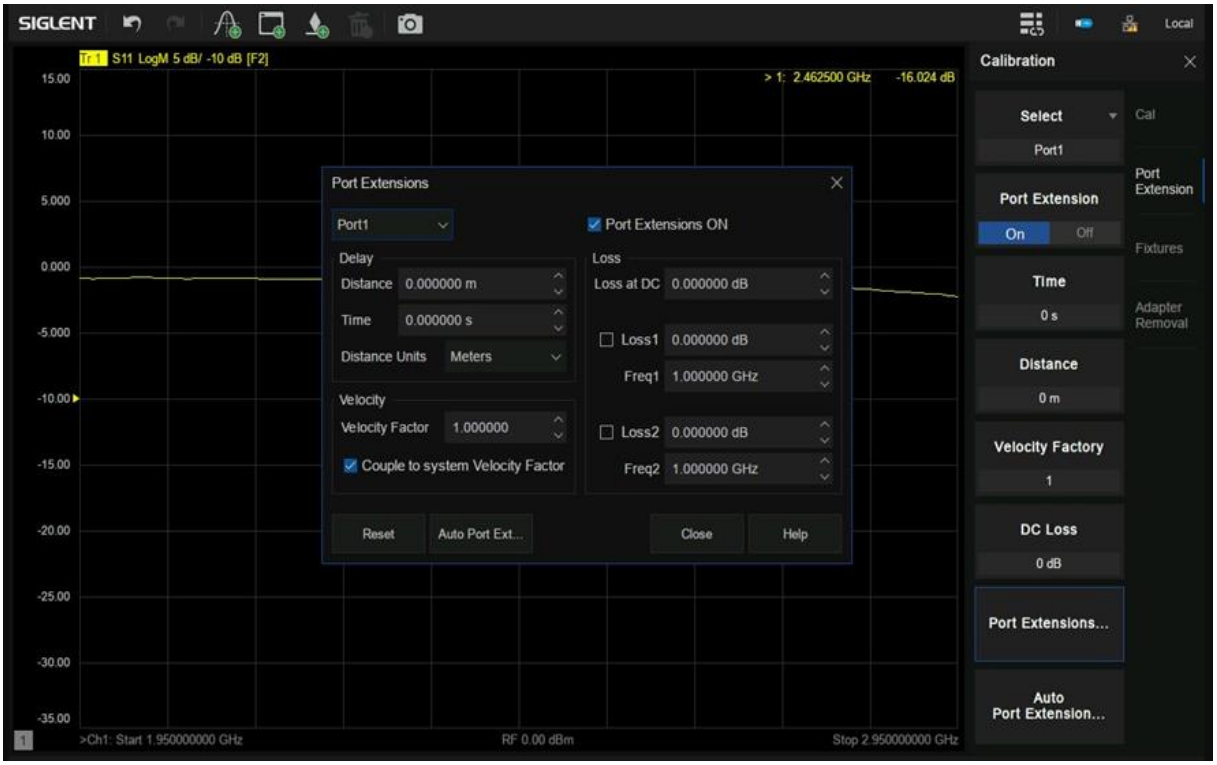


Impedance conversion:

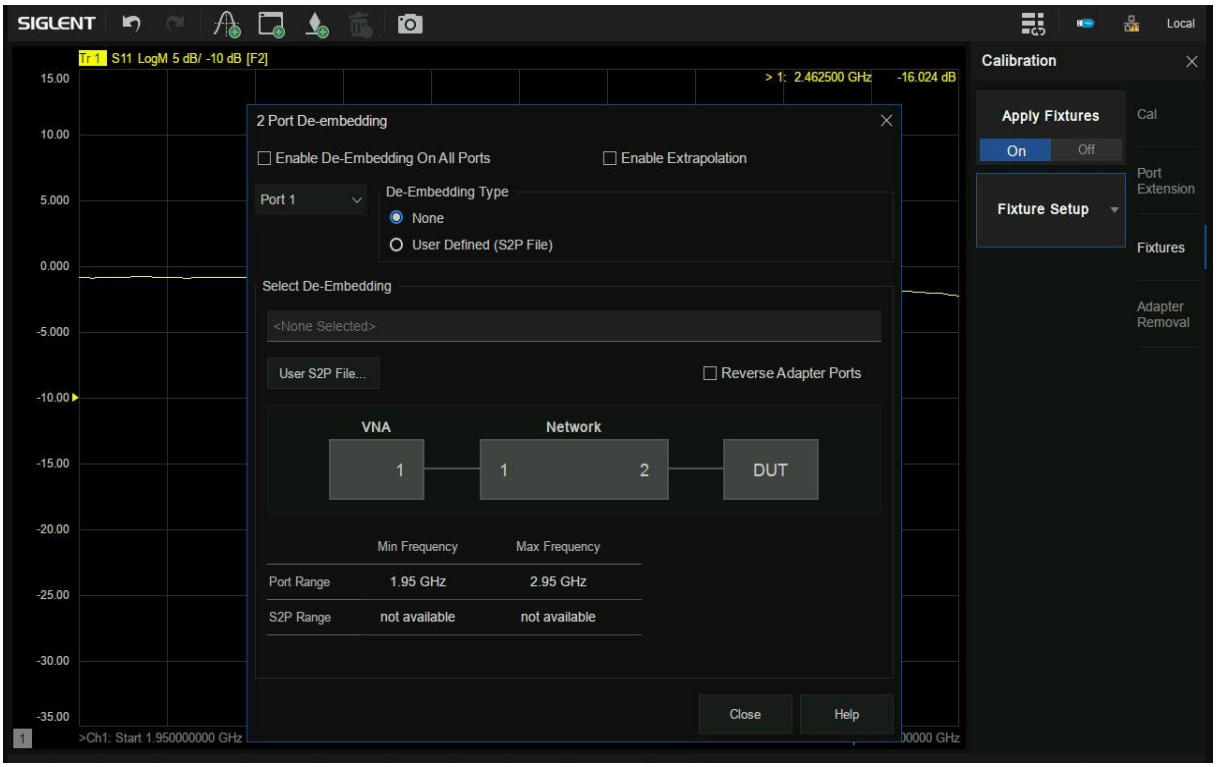
Equation Editor:



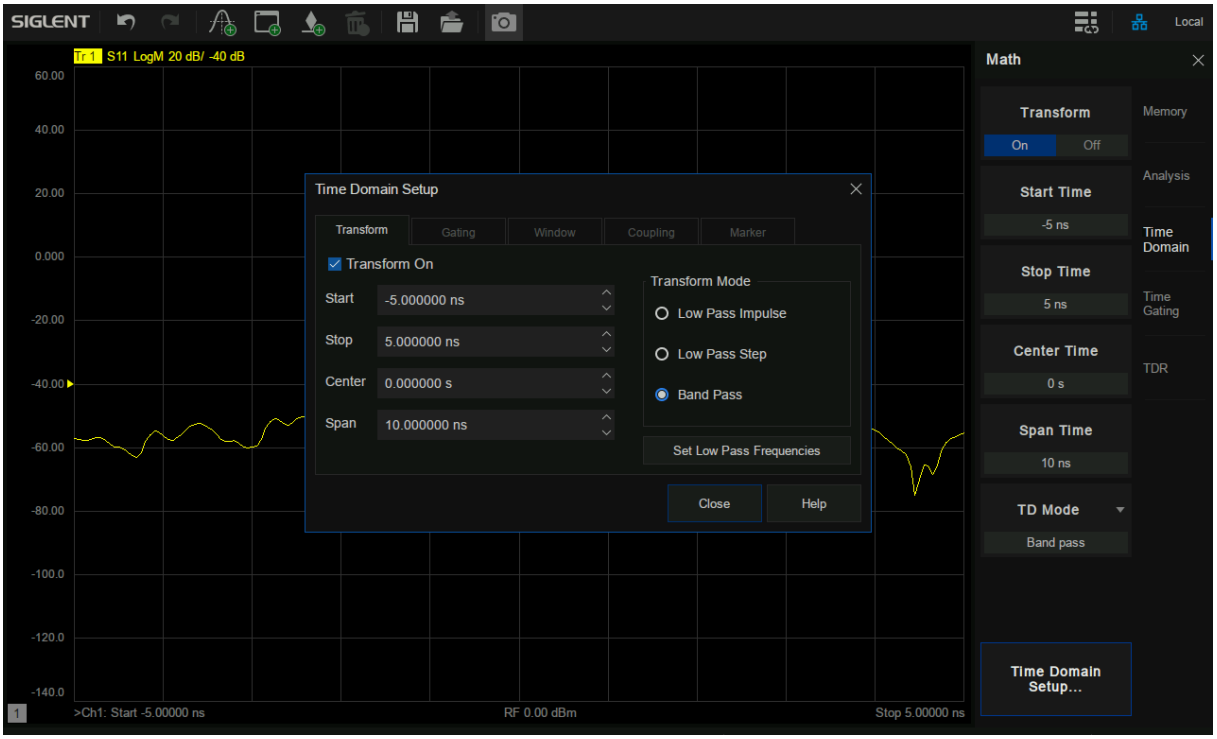
Port Extensions:



Embedding and De-Embedding:

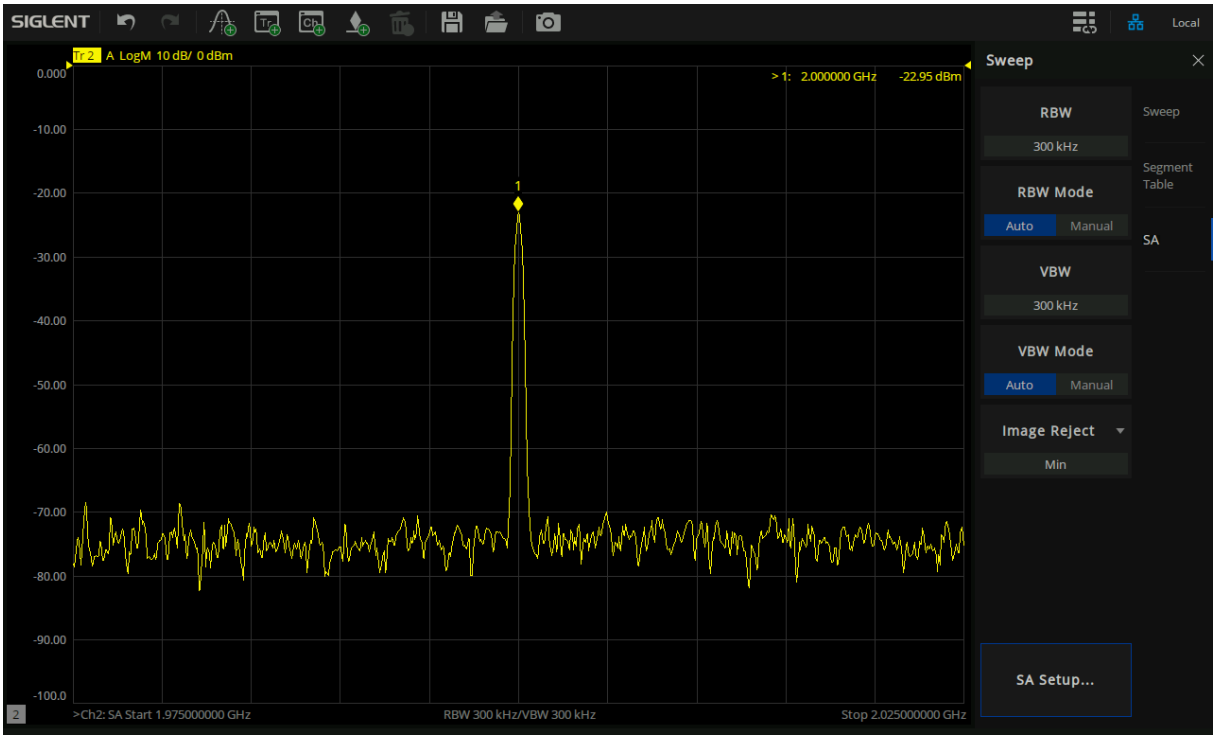


Time-Domain analysis:



Enhanced Time-Domain analysis(TDR):

Spectrum analysis:



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 23±5℃), 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 23±5℃). 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.

Specifications

Dynamic range

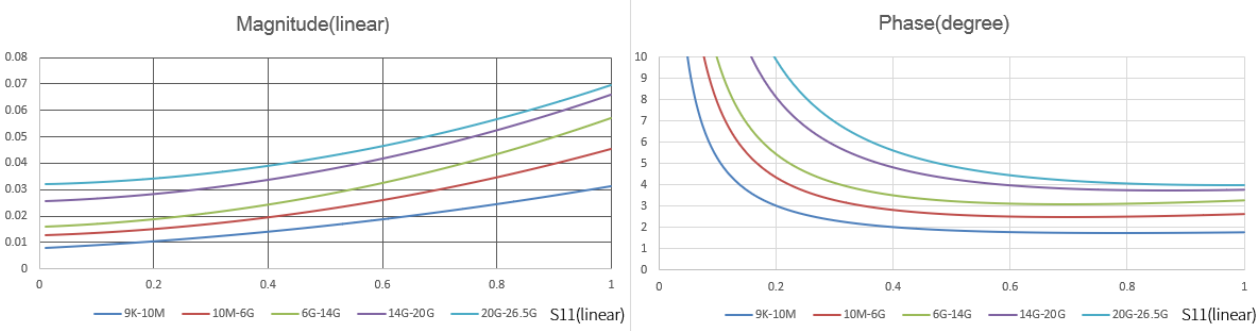
Frequency range	IFBW	Specification(dB)	Typical (dB)
9 kHz- 100 kHz	10Hz	85	100
100 kHz- 300 kHz		100	115
300 kHz- 20 MHz		110	120
20 MHz- 4.5 GHz		117	125
4.5 GHz- 6 GHz		110	120
6 GHz- 6.5 GHz		105	115

Corrected system performance with calibration kit

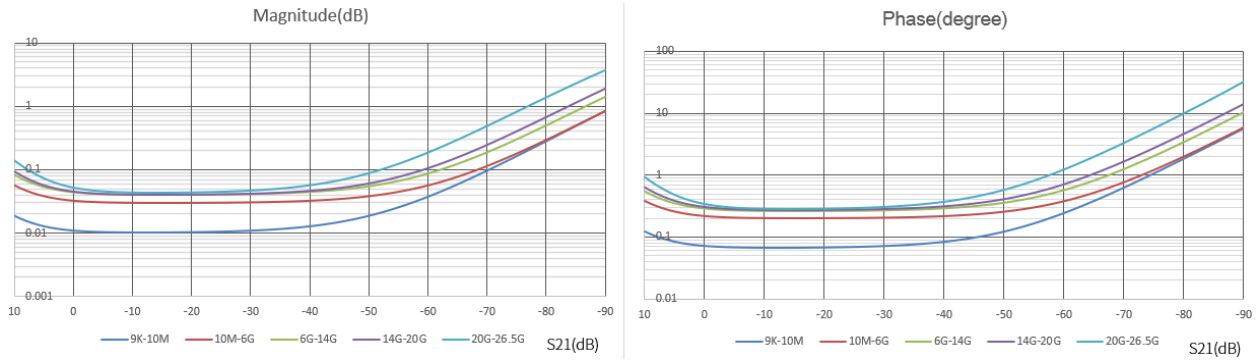
User correction: On, system correction: On; Corrected system performance with Keysight 85052D 3.5mm calibration kit, isolation calibration performed. IFBW is 10 Hz, no averaging applied to data, and environmental temperature is 23℃ (± 5℃), with < 1℃ deviation from calibration temperature.

Specification (dB)	9 kHz-10 MHz	10MHz-6GHz	6 GHz-6.5 GHz
Directivity	41	38	32
Source match	38	32	30
Load match	42	38	35
Reflect tracking	±0.02	±0.06	±0.07
Transmission tracking	±0.1	±0.15	±0.25

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



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



Uncorrected system performance

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

Specification (dB)	9 KHz- 1 MHz	1 MHz- 50 MHz	50 MHz- 200 MHz	200 MHz- 1 GHz	1 GHz- 6 GHz	6 GHz- 6.5 GHz
Directivity	15	20	25	25	25	25
Source match	20	25	25	25	25	25
Load match	6	6	7	7	12	10
Reflect tracking	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0
Transmission tracking	±1.0	±1.0	±1.0	±1.0	±1.0	±1.0

Test port output (Source)

Test port output frequency

Description	Specification
Frequency range	
SNA5003X-E	9 kHz to 3 GHz
SNA5006X-E	9 kHz to 6.5 GHz
Frequency resolution	1 Hz
CW accuracy	
Standard	± 5.0 ppm（23 ± 3 ℃）
Option: SNA5000-HPR	± 0.1 ppm（23 ± 3 ℃）
Source stability	
Standard	± 5.0 ppm（0 to 40 ℃） ± 0.5 ppm/year，± 3.0 ppm/20 year
Option: SNA5000-HPR	± 1 ppb（0 to 40 ℃），± 50 ppb/year

Test port output power

Description	Specification	Typical
Preset power	-10 dBm	
Level accuracy		
9 kHz - 100 kHz	±2.0 dB@-10 dBm	
100 kHz - 20 MHz	±2.0 dB@-10 dBm	
20 MHz - 1 GHz	±1.5 dB@-10 dBm	
1 GHz- 6 GHz	±1.5 dB@-10 dBm	
6 GHz- 6.5 GHz	±2.0 dB@-10 dBm	
Level linearity		
9 kHz- 100 kHz	±1.5 dB（-20 dBm to 0 dBm）	
100 kHz- 100 MHz	±1.2 dB（-20 dBm to 0 dBm）	
100 MHz- 1 GHz	±1.0 dB（-20 dBm to 0 dBm）	
1 GHz- 6.5 GHz	±1.0 dB（-20 dBm to 0 dBm）	
Sweep range		
9 kHz- 100 kHz	-40 dBm to -5 dBm	
100 kHz- 100 MHz	-40 dBm to 0 dBm	
100 MHz- 1 GHz	-40 dBm to 0 dBm	
1 GHz- 6.5 GHz	-40 dBm to 0 dBm	
Max leveled power		
9 kHz- 100 kHz	-5 dBm	-1 dBm

100 kHz- 100 MHz	0 dBm	5 dBm
100 MHz- 1 GHz	0 dBm	6 dBm
1 GHz- 6.5 GHz	0 dBm	4 dBm
Level resolution		0.05 dB

Test port input

Test port input levels

Description	Specification	Typical
Max input level		
9 kHz-6.5 GHz	+10 dBm	
Damage input level		
9 kHz-6.5 GHz	+27 dBm(RF) or 35 V(DC)	
Level accuracy		
9 kHz - 100 kHz	±2.0 dB@-10 dBm	
100 kHz - 10 MHz	±2.0 dB@-10 dBm	
10 MHz - 1 GHz	±2.0 dB@-10 dBm	
1 GHz - 6.5 GHz	±1.5 dB@-10 dBm	
Crosstalk		
9 kHz- 18 kHz	-75 dB	-95 dB
18 kHz- 100 kHz	-90 dB	-100 dB
100 kHz- 1 MHz	-95 dB	-105 dB
1 MHz- 30 MHz	-105 dB	-115 dB
30 MHz- 4.5 GHz	-115 dB	-120 dB
4.5 GHz- 6 GHz	-110 dB	-115 dB
6 GHz- 6.5 GHz	-100 dB	-105 dB
Noise floor		
9 kHz- 100 KHz	-100 dBm/Hz	-115 dBm/Hz
100 kHz- 300 KHz	-110 dBm/Hz	-125 dBm/Hz
300 kHz- 20 MHz	-120 dBm/Hz	-130 dBm/Hz
20 MHz- 4.5 GHz	-127 dBm/Hz	-135 dBm/Hz
4.5 GHz- 6 GHz	-120 dBm/Hz	-130 dBm/Hz
6 GHz- 6.5 GHz	-115 dBm/Hz	-125 dBm/Hz
Compression level (+10 dBm)		
Magnitude		
9 kHz- 20 MHz	0.3 dB	0.2 dB
20 MHz - 6.5 GHz	0.5 dB	0.2 dB
Phase		
9 kHz- 20 MHz	2 deg	1.5 deg
20 MHz - 6.5 GHz	5 deg	2 deg

Trace noise

Description	Specification	Typical
Note: Setting max output power		
Transmission and reflection trace noise magnitude		
9 kHz- 10 MHz (IFBW=1 kHz)	0.009 dB rms	0.002 dB rms
10 MHz- 500 MHz (IFBW=10 kHz) [1]	0.009 dB rms	0.002 dB rms
500 MHz- 4.5 GHz (IFBW=10 kHz)	0.006 dB rms	0.0015 dB rms
4.5 GHz- 6.5 GHz (IFBW=10 kHz)	0.006 dB rms	0.0015 dB rms
Transmission and reflection trace noise phase		
9 kHz- 10 MHz (IFBW=1 kHz)	0.09 deg rms	0.015 deg rms
10 MHz- 500 MHz (IFBW=10 kHz) [1]	0.09 deg rms	0.015 deg rms
500 MHz- 4.5 GHz (IFBW=10 kHz)	0.05 deg rms	0.01 deg rms
4.5 GHz- 6.5 GHz (IFBW=10 kHz)	0.05 deg rms	0.015 deg rms

[1] 21.25MHz frequency point does not meet the specification requirements

Stability

Description	Specification	Typical
Magnitude		
9 kHz- 1 MHz		± 0.02 dB/°C
1 MHz- 6 GHz		± 0.01 dB/°C
6 GHz- 6.5 GHz		± 0.025 dB/°C
Phase		
9 kHz- 1 MHz		± 0.4 deg/°C
1 MHz- 6 GHz		± 0.2 deg/°C
6 GHz- 6.5 GHz		± 0.5 deg/°C

Dynamic accuracy

Description	Specification
Relative to -10 dBm input power	
Magnitude	
10 dBm	± 1.9 dB
0 dBm	± 0.08 dB
-20 dBm	± 0.12 dB
-30 dBm	± 0.19 dB
-40 dBm	± 0.25 dB
-50 dBm	± 0.36 dB
-60 dBm	± 0.49 dB
-70 dBm	± 0.65 dB
-80 dBm	± 0.95 dB
-90 dBm	± 1.65 dB
-100 dBm	± 2.0 dB
Phase	
10 dBm	± 15.6 deg
0 dBm	± 0.46 deg
-20 dBm	± 0.62 deg
-30 dBm	± 1.19 deg
-40 dBm	± 1.25 deg
-50 dBm	± 2.36 deg
-60 dBm	± 2.49 deg
-70 dBm	± 4.65 deg
-80 dBm	± 6.95 deg
-90 dBm	± 8.35 deg
-100 dBm	± 10.38 deg

Sweep time

Start frequency: 100 kHz, Stop frequency: 6.5 GHz; IFBW: 500 kHz				
Points	201	401	1601	6401
Uncorrected	15ms	19 ms	43ms	118 ms
2-port cal	30 ms	38 ms	86 ms	236 ms
Start frequency: 100 kHz, Stop frequency: 6.5 GHz; IFBW: 100 kHz				
Points	201	401	1601	6401
Uncorrected	17 ms	22 ms	55 ms	164 ms
2-port cal	34 ms	44 ms	110 ms	328 ms
Start frequency: 100 kHz, Stop frequency: 6.5 GHz; IFBW: 10 kHz				
Points	201	401	1601	6401
Uncorrected	33 ms	54 ms	182 ms	673 ms
2-port cal	66 ms	108 ms	364 ms	1346 ms
Start frequency: 100 kHz, Stop frequency: 6.5 GHz; IFBW: 1 kHz				
Points	201	401	1601	6401
Uncorrected	193 ms	374 ms	1460 ms	5784 ms
2-port cal	386 ms	748 ms	2920 ms	11568 ms

Enhanced Time Domain Analysis with TDR (SNA5000-TDR)

Description	SNA5003X-E	SNA5006X-E
Bandwidth	3 GHz	6.5 GHz
Input Impedance	50 Ohm	
DC damage Level at test port	35 V	
Maximum test port input voltage (Hot TDR Mode)	1.5Vpp	
TDR stimulus	Step，Impulse	
TDR step amplitude	1 mV to 5 V	
TDR step rise time (min) (10% to 90%)	148.7 ps	68.6 ps
TDR step response resolution in free space (min) (εr = 1)	22.4 mm	10.4
TDR impulse width (min)	201.2 ps	92.9 ps
DUT length (max)	13.8 μs	
Eye diagram data rate (max)	2.4 Gb/s	5.2 Gb/s

General Information

Description	Characteristics
Operating environment	
Temperature	0 to 40℃
Humidity	Type tested at 20 to 80%, wet bulb temperature < 29 °C (non-condensing)
Altitude	0 to 2000 m
Non-operating storage environment	
Temperature	-10℃ to 60℃
Humidity	Type tested at 20 to 90%, wet bulb temperature < 40 °C (non-condensing)
Altitude	0 to 5000 m
Size	W×H×D=378×284×126 mm
Weight	5.4 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 2.7GHz）
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.	

Front panel information

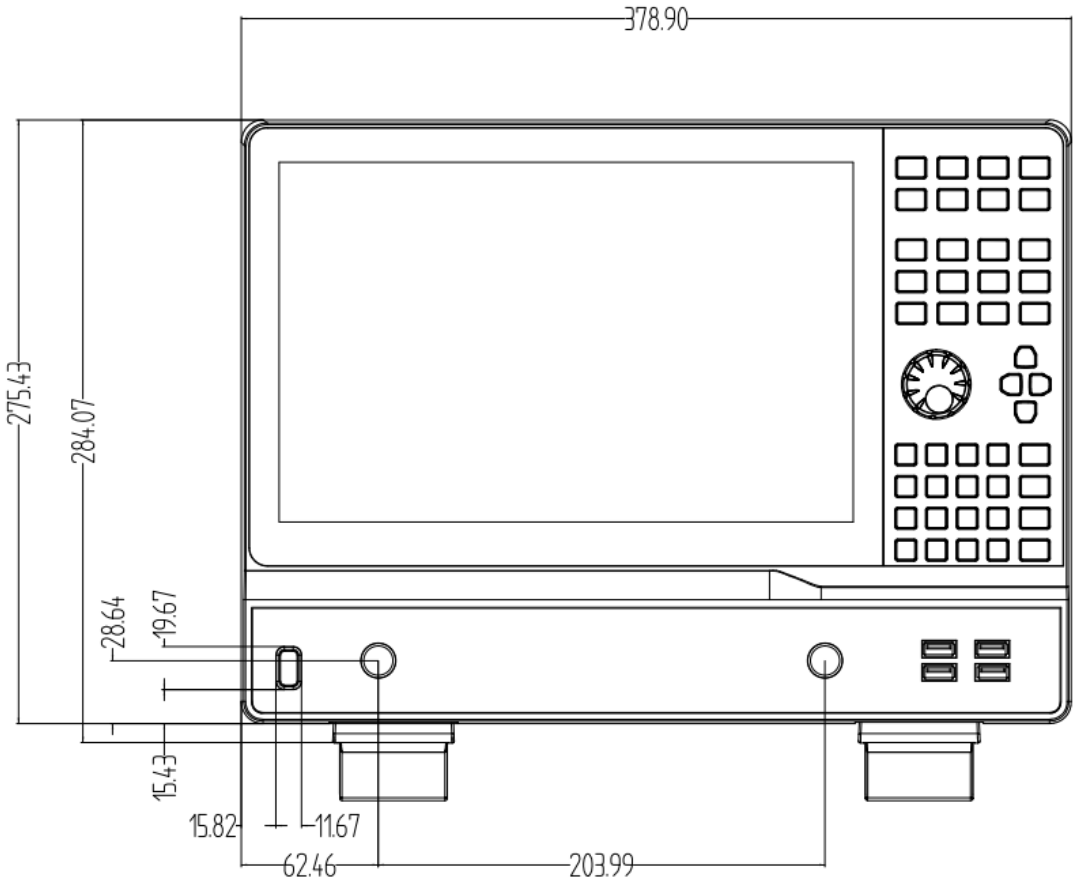
Description	Characteristics
RF connectors	Type-N, female, 50Ω
Damage level	+27 dBm or ±35 VDC
Display Resolution	12.1 inch TFT color LCD with touch screen ; WXGA (1280 x 800)
USB interface	USB-A 2.0

Rear panel information

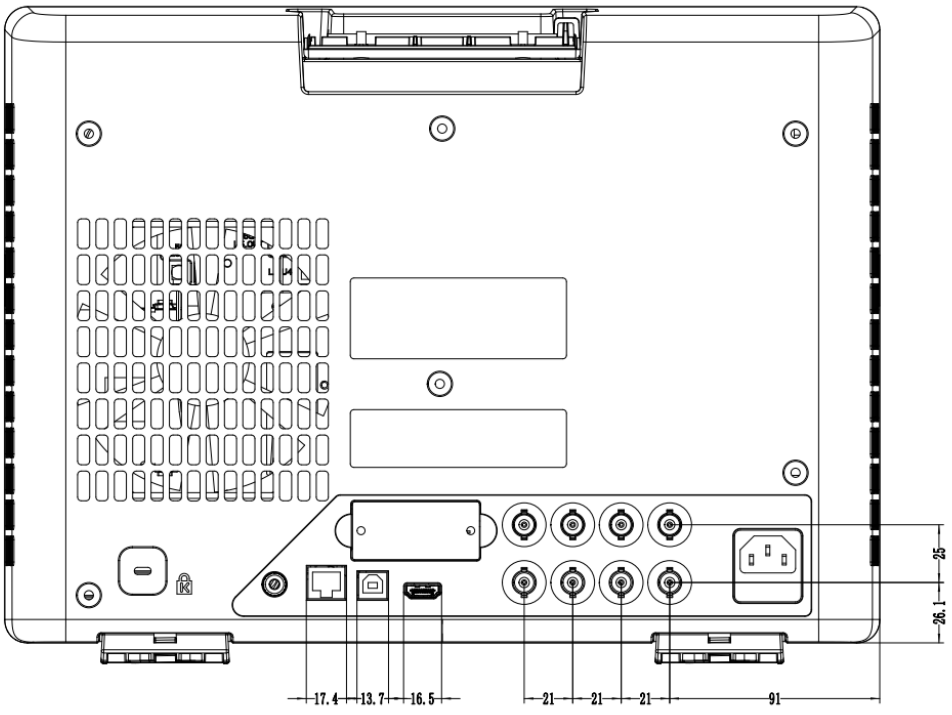
Description	Characteristics
Ext trigger input connector	
Type	BNC，female
Input level	5V TTL
Ext trigger output connector	
Type	BNC，female
Max output current	20 mA
Output level	3.3V TTL
Ext ref-signal input connector	
Type	BNC, female
Input frequency	10 MHz ±10 ppm
Input level	-3 dBm to +10 dBm
Input 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 (no degradation RF specification)	± 300 mA
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)

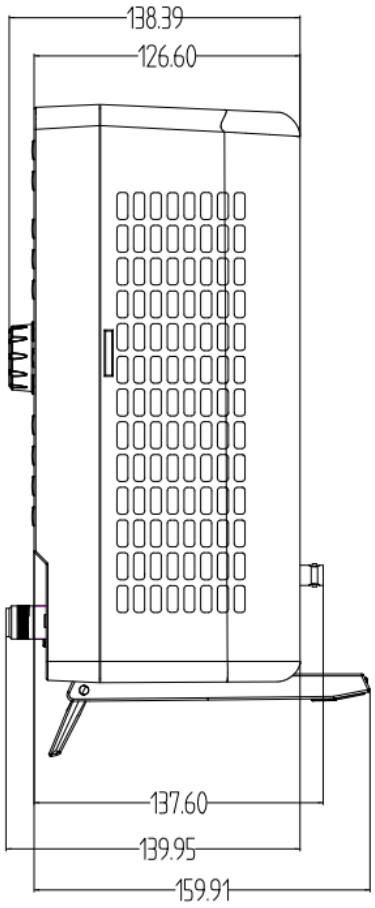
Dimensions



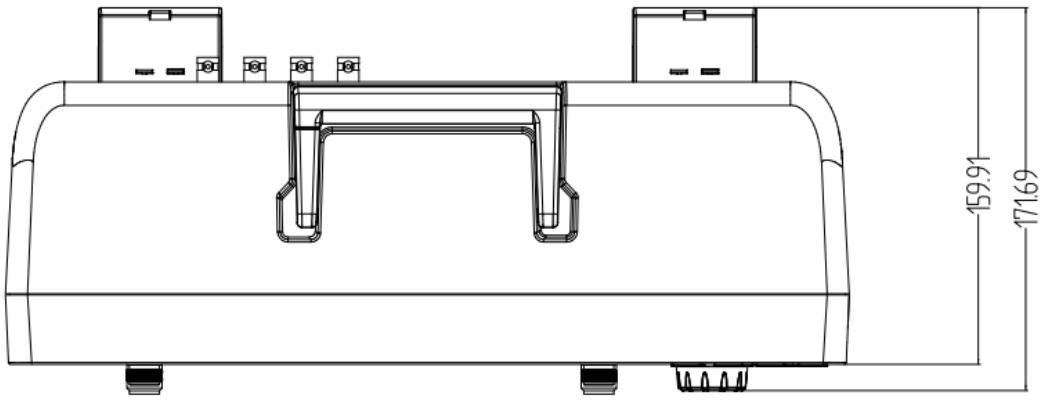
Front view



Rear panel view



Side view



Vertical view

Ordering Information

Model	Description
SNA5003X-E	2 ports, 3G Vector Network Analyzer
SNA5006X-E	2 ports, 6.5G Vector Network Analyzer

Standard Accessories	Quantity
Quick-start	1
Power-cable	1
USB-cable	1
Certificate of Calibration	1
Wireless Mouse	1
Protective Cover	1

Optional Accessories		Description	Model
Hardware option	HPR option	High-performance reference source	SNA5000-HPR
Software option	TDA option	Time-Domain analysis	SNA5000-TDA
	TDR option	Enhanced Time-Domain analysis	SNA5000-TDR
	SA option	Spectrum analysis	SNA5000-SA
Accessories		SEM5000A Series Electronic Calibration (ECal) Modules	SEM5000A
		N-type, Male, 50Ω Calibration Kit, 0-4.5GHz	F503ME
		N-type, Female, 50Ω Calibration Kit, 0-4.5GHz	F503FE
		N-type, Male, 50Ω Calibration Kit, 0-9GHz	F504MS
		N-type, Female, 50Ω Calibration Kit, 0-9GHz	F504FS
		N-type, Male, 50Ω Calibration Kit, 0-9GHz	Y504MS
		N-type, Female, 50Ω Calibration Kit, 0-9GHz	Y504FS
		N-type, Male and Female, 50Ω Calibration Kit, 0-9GHz	F504TS
		N-type, Male and Female, 50Ω Calibration Kit, 0-18GHz	F505TS
		3.5 mm, Male, 50Ω Calibration Kit, 0-4.5GHz	F603ME
		3.5 mm, Female, 50Ω Calibration Kit, 0-4.5GHz	F603FE
		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

	3.5 mm, Male, 50Ω Calibration Kit, 0-26.5GHz	Y606MS
	3.5 mm, Female, 50Ω Calibration Kit, 0-26.5GHz	Y606FS
	3.5 mm, Female, 50Ω Calibration Kit, 0-26.5GHz	F606FS
	3.5 mm, Male and Female, 50Ω Calibration Kit, 0-26.5GHz	F606TS
	50Ω Waveguide Calibration Kit, 18-26.5GHz	KWR42A
	N(M)-SMA(F) RF Cable DC~6 GHz,1000 mm	S06-NMSF-1M
	N(M)-SMA(F) RF Cable DC~18 GHz,1000 mm	S18-NMSF-1M
	2.9 mm(M)- 2.9 mm (F) RF Cable DC~40 GHz,1000 mm	S40-29M29F-1M
	N(M)-SMA(M) RF Cable DC~18 GHz,1000 mm	N-SMA-18L
	N(M)-N(M) RF Cable DC~18 GHz,1000 mm	N-N-18L
	SMA(M)-SMA(M) RF Cable DC~18 GHz,1000 mm	SMA-SMA-18L
	SMA(M)-SMA(M) RF Cable DC~26.5 GHz,1000 mm	SMA-SMA-26L
	SMA(F)-SMA(M) RF Cable DC~26.5 GHz,1000 mm	SMAF-SMA-26L
	NMD 3.5 female-NMD 3.5 Male DC-26.5 GHz，635 mm	V26-N35MN35F-25IN
	NMD 3.5 female-APC 3.5 female DC-26.5 GHz，635 mm	V26-N35FA35F-25IN
	USB-GPIB Adapter	USB-GPIB
	RF Demonstration Board	SNA-TB01
	Adjustable Differential TDR Probe DC-18 GHz	ADP-18
	Adjustable Differential TDR Probe DC-26.5 GHz	ADP-26
	Adjustable Single-end TDR Probe DC-18 GHz	ASP-18
	Adjustable Single-end TDR Probe DC-26.5 GHz	ASP-26

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, spectrum analyzers, function/arbitrary waveform generators, RF/MW signal generators, 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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