

# SVA1000X

## Series

### Spectrum & Vector Network Analyzer



# SVA1015X

## General Description

The SIGLENT SVA1000X series spectrum & vector network analyzers are powerful and flexible tools for broadcast and RF device testing. With a wide frequency range from 9 kHz to 1.5 GHz, the analyzer delivers reliable automatic measurements and plenty of features including a tracking generator and multiple modes of operation: the base model is a swept super-heterodyne spectrum analyzer and optional functions include a vector network analyzer, a Frequency Domain Reflectometer based distance-to-fault locator, and a modulation analyzer. Applications include broadcast monitoring/evaluation, site surveying, EMI pre-compliance, research and development, education, production and maintenance.

## Features and Benefits

- 📡 All-Digital IF Technology
- 📡 Frequency Range from 9 kHz to 1.5 GHz
- 📡 -156 dBm/Hz Displayed Average Noise Level (Typ.)
- 📡 -99 dBc/Hz @10 kHz Offset Phase Noise (1 GHz, Typ.)
- 📡 Level Measurement Uncertainty < 1.2 dB (Typ.)
- 📡 1 Hz Minimum Resolution Bandwidth (RBW)
- 📡 Preamplifier Standard
- 📡 Tracking Generator Standard
- 📡 Vector Network Analysis (Opt.)
- 📡 Distance To Fault (Opt.)
- 📡 Modulation Analysis (Opt.)
- 📡 EMI Pre-compliance Test Kit (Opt.)
- 📡 Advanced Measurement Kit (Opt.)
- 📡 10.1 Inch (1024x600) Multi-Touch Screen, Mouse and Keyboard supported
- 📡 Web Browser Remote Control on PC and Mobile Terminals

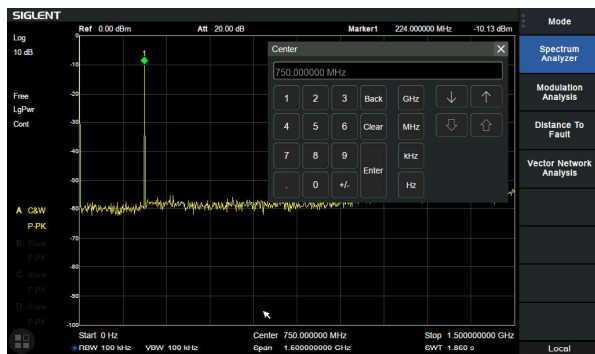


## Model and Main index

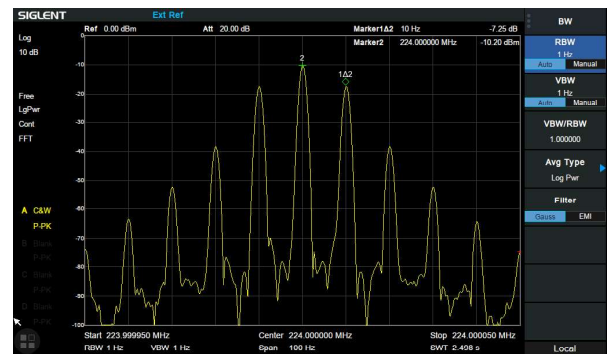
Model	SVA1015X
Frequency Range	9 kHz~1.5 GHz
Resolution Bandwidth	1 Hz~1 MHz
Displayed Average Noise Level	-156 dBm/Hz
Phase Noise	<-99 dBc/Hz@1 GHz, 10 kHz offset
Total Amplitude Precision	≤1.2 dB
Touch Screen	Standard
Tracking Generator	Standard
Vector Network Analysis	S11, S21
Distance To Fault	10 MHz-1.5 GHz
Modulation Analysis	AM, FM, ASK, FSK
Advanced Measurement Kit	CHP, ACPR, OBW, TOI, Monitor
EMI Pre-compliance Test Kit	EMI Filter and Quasi-Peak Detector, Easy Spectrum software
Communication Interface	LAN, USB Device, USB Host, USB-GPIB
Remote Control Capability	SCPI / Labview / IVI , based on USB-TMC / VXI-11 / Socket / Telnet
Remote Controller	Easy Spectrum software, Web Browser

## Design features

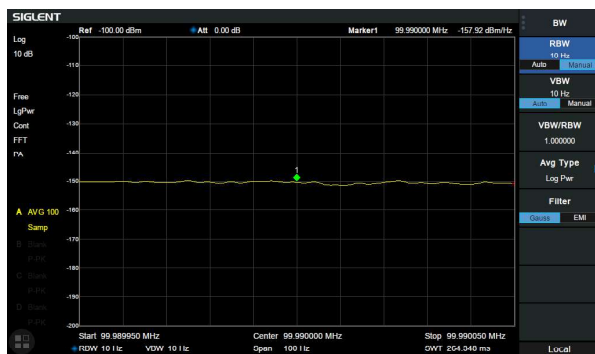
### 10.1 Inch (1024x600) Multi-Touch Screen



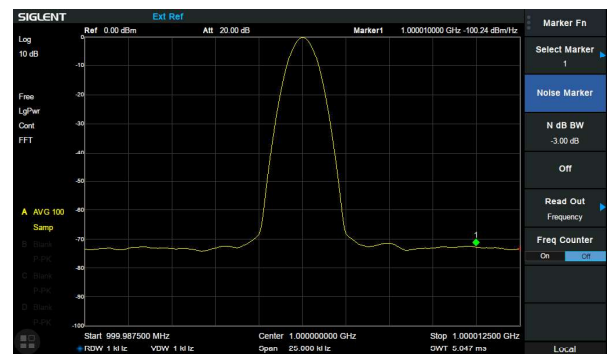
### Minimum 1 Hz Resolution Bandwidth (RBW)



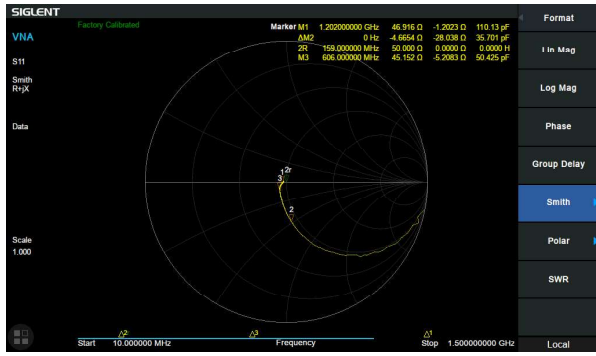
### -156 dBm/Hz Displayed Average Noise Level



### Phase noise <-99 dBc/Hz@1 GHz, offset 10 kHz



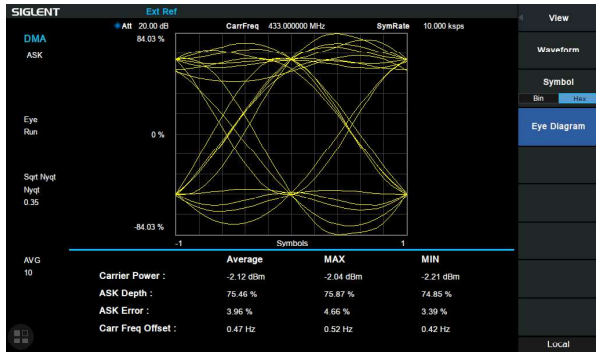
### Smith Chart in Vector Network Analysis Mode



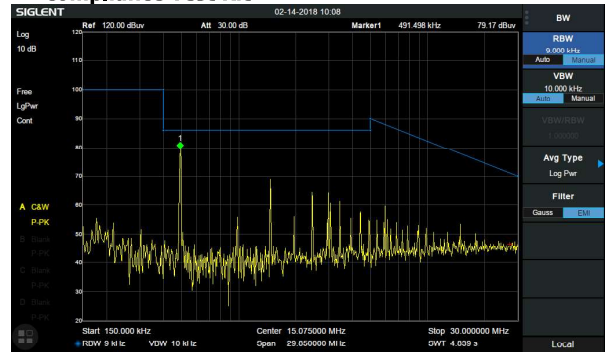
### Cable Fault Locator in Distance to Fault Mode



### ASK/FSK Eye Diagram in Modulation Analysis Mode



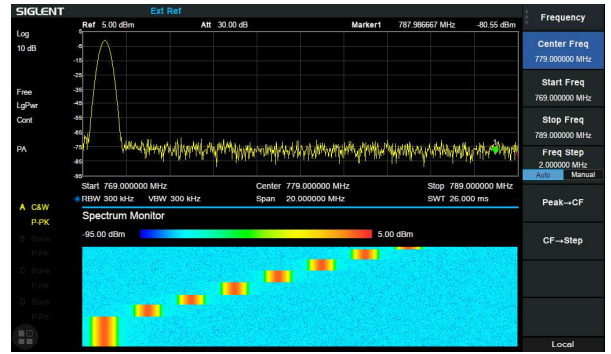
### EMI filter and Quasi-peak Detector in EMI Pre-compliance Test Kit



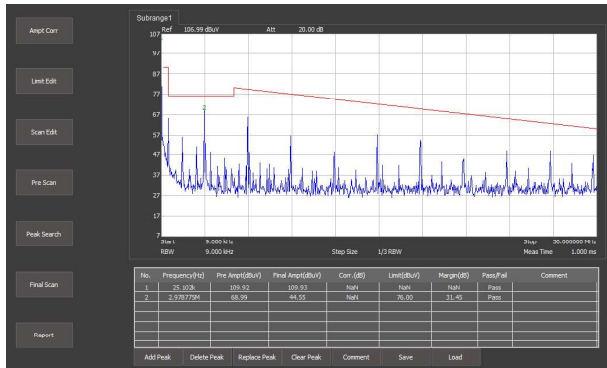
### ACPR in Advanced Measurement Kit



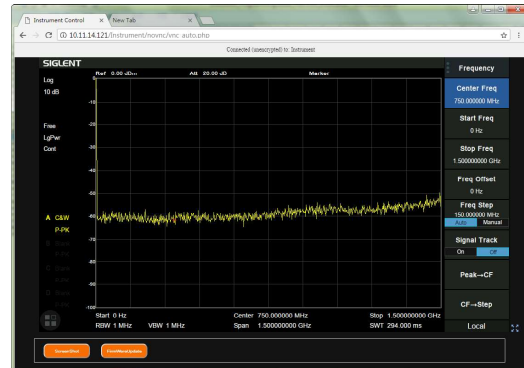
### Spectrum Monitor in Advanced Measurement Kit



### Easy Spectrum Software in EMI Pre-compliance Test Kit



### Remote Control through Web Browser





Utility Kit



Near Field Probe Set SRF5030



Near Field Probe Set SRF5030T



USB-GPIB Adaptor



Soft Carrying Bag



Mechanical Calibration Kit

## Specifications

Specifications are valid under the following conditions: The instrument is within the calibration period, has been stored between 0 and 50°C for at least 2 hours prior to use, and has been powered on and warmed up for at least 40 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

**Specifications:** All products are guaranteed to meet published specifications when operating temperatures from 5 to 45°C, 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°C). Typical performance is not warranted and does not include measurement uncertainty.

**Nominal:** The expected performance or design attribute.

Frequency Characteristic	
<b>Frequency</b>	
Frequency range	9 kHz-1.5 GHz
Frequency resolution	1 Hz
<b>Frequency Span</b>	
Range	0 Hz, 100 Hz to 1.5 GHz
Accuracy	$\pm \text{Span} / (\text{number of sweep points} - 1)$
<b>Internal Reference Source</b>	
Reference frequency	10.000000 MHz
Frequency reference accuracy	$\pm [(\text{time since last adjustment} \times \text{frequency aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$
Initial calibration accuracy	<1 ppm
Temperature stability	<1 ppm/year, 0 °C~50 °C
Frequency aging rate	<0.5 ppm/first year, 3.0 ppm/20 years
<b>Marker</b>	
Marker resolution	$\text{Span} / (\text{number of sweep points} - 1)$
Marker uncertainty	$\pm [\text{frequency indication} \times \text{frequency reference uncertainty} + 1\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \text{marker resolution}]$
Frequency counter resolution	0.01 Hz
Frequency counter uncertainty	$\pm [\text{frequency indication} \times \text{frequency reference accuracy} + \text{counter resolution}]$
<b>Bandwidths</b>	
Resolution bandwidth (-3dB)	1 Hz~1 MHz, in 1-3-10 sequence
Resolution filter shape factor	< 4.8 : 1 (60 dB:3 dB), Gaussian-like
RBW uncertainty	<5%
Video bandwidth (-3dB)	1 Hz ~3 MHz, in 1-3-10 sequence
VBW uncertainty	<5%



## Amplitude Characteristic

Amplitude and Level			
Measurement range	DANL to +10 dBm, 100 kHz~1 MHz, preamplifier off DANL to +20 dBm, 1 MHz~1.5 GHz, preamplifier off		
Reference level	-100 dBm to +30 dBm, 1 dB steps		
Preamplifier	20 dB (nom.), 9 kHz~1.5 GHz		
Input attenuation	0~30 dB, 1 dB steps		
Maximum input DC voltage	+/- 50 VDC		
Maximum average RF power	30 dBm, 3 minutes, $f_c \geq 10$ MHz, attenuation >20 dBm, preamp off		
Maximum damage level	33 dBm, $f_c \geq 10$ MHz, attenuation >20 dBm, preamp off		
Displayed Average Noise Level (DANL)			
20 °C~30 °C,attenuation = 0 dB, sample detector, trace average >50			
Preamp off		RBW = 10 Hz	Normalized to 1 Hz
	100 kHz~1 MHz	-91 dBm, -97 dBm (typ.)	-101 dBm, -107 dBm (typ.)
	1 MHz~10 MHz	-114 dBm, -120 dBm (typ.)	-124 dBm, -130 dBm (typ.)
	10 MHz~1 GHz	-118 dBm, -124 dBm (typ.)	-128 dBm, -134 dBm (typ.)
Preamp on	1 GHz~1.5 GHz	-111 dBm, -117 dBm (typ.)	-121 dBm, -127 dBm (typ.)
	100 kHz~1 MHz	-110 dBm, -118 dBm (typ.)	-120 dBm, -128 dBm (typ.)
	1 MHz~10 MHz	-137 dBm, -142 dBm (typ.)	-147 dBm, -152 dBm (typ.)
	10 MHz~1 GHz	-140 dBm, -146 dBm (typ.)	-150 dBm, -156 dBm (typ.)
1 GHz~1.5 GHz	-132 dBm, -138 dBm (typ.)	-142 dBm, -148 dBm (typ.)	
Phase Noise			
20 °C~30 °C, $f_c = 1$ GHz			
Phase noise	<-95 dBc/Hz@10 kHz offset, <-99 dBc/Hz (typ.)		
	<-96 dBc/Hz@100 kHz offset, <-98 dBc/Hz (typ.)		
	<-115 dBc/Hz@1 MHz offset, <-120 dBc/Hz (typ.)		
Level Display			
Logarithmic level axis	10 dB to 200 dB		
Linear level axis	0 to reference level		
Units of level axis	dBm, dBmV, dBuV, dBuA, Volt, Watt		
Number of display points	751		
Number of traces	4		
Trace detectors	Positive-peak, Negative-peak, Sample, Normal, Average(Voltage/RMS/Video), Quasi-peak		
Trace functions	Clear write, Max Hold, Min Hold, View, Blank, Average, Math		
Frequency Response			
20 °C to 30 °C, 30% to 70% relative humidity, attenuation = 20 dB, reference frequency 50 MHz			
Preamp off	$\pm 0.8$ dB, $\pm 0.4$ dB (typ.)		
Preamp on	$\pm 0.9$ dB, $\pm 0.4$ dB (typ.)		
Error and Accuracy			
Resolution bandwidth switching uncertainty	Logarithmic resolution $\pm 0.2$ dB, liner resolution $\pm 0.01$ , nominal, 10 kHz RBW		
Input attenuation switching uncertainty	20 °C to 30 °C, $f_c = 50$ MHz, preamp off, 1 to 30 dB relative to 20 dB $\pm 0.5$ dB		
Absolute amplitude accuracy	20 °C to 30 °C, $f_c = 50$ MHz, RBW = 1 kHz, VBW = 1 kHz, peak detector, attenuation = 20 dB, 95th percentile reliability		
	Preamp off	$\pm 0.4$ dB, $f_c = 50$ MHz, input signal -20 dBm	
	Preamp on	$\pm 0.5$ dB, $f_c = 50$ MHz, input signal -40 dBm	
Total amplitude accuracy	20 °C to 30 °C, $f_c > 100$ kHz, input signal -50 dBm~0 dBm, RBW = 1 kHz, VBW = 1 kHz, peak detector, attenuation = 20 dB, preamp off, 95th percentile reliability $\pm 1.2$ dB		
RF input VSWR	input attenuation 10 dB, 1 MHz~1.5 GHz <1.5 (nom.)		

## Amplitude Characteristic

### Distortion and Spurious Responses

Second harmonic distortion	-65 dBc (nom.) fc≥50 MHz, mixer level -30dBm, attenuation = 0dB, preamp off, 20 °C to 30 °C
Third-order intercept	+8 dBm (typ.) fc≥50 MHz, two -20 dBm tones at input mixer spaced by 100 kHz, attenuation = 0 dB, preamp off, 20 °C to 30 °C
1dB Gain Compression	>-5 dBm (nom.) fc≥50 MHz, attenuation = 0 dB, preamp off, 20 °C to 30 °C
Residual response	<-90 dBm input terminated = 50 Ω, attenuation = 0 dB, 20 °C to 30 °C
Input related spurious	<-65 dBc Mixer level = -30 dBm, 20 °C to 30 °C

## Sweep and Trigger

Sweep time	1 ms to 1500 s	
Sweep accuracy	Accuracy, Speed	
Sweep mode	Sweep	FFT
	RBW=30 Hz~1 MHz	RBW=1 Hz~10 kHz
Sweep rule	Single, Continuous	
Trigger source	Free, Video, External	
External trigger	5 V TTL level, rising edge/falling edge	

## Options

### Tracking Generator

Frequency range	5 MHz~1.5 GHz
RBW	30 Hz~1 MHz, only sweep mode
Output level	-20 dBm~0 dBm
Output level resolution	1 dB
Output flatness	+/-3 dB
Output maximum reverse level	Mean power:30 dBm,DC: ±50 V <sub>oc</sub>

### EMI Pre-compliance Test Kit

Resolution bandwidth (6 dB)	200 Hz,9 kHz,120 kHz
Detector	Quasi-peak (following CISPR 16-1-1)
Dwell time	0 us~10 s
PC Application Software	EasySpectrum EMI pre-compliance test Software

### Vector Network Analysis

Measurement	S11, S21
Frequency Range	10 MHz~1.5 GHz
Dynamic Range	75 dB, 10 kHz RBW
Trace Noise	0.1 dB rms, 10 kHz RBW
Output Power	0 dBm (Nom.)
Format	Lin Mag, Log Mag, Phase, Group Delay, Smith Chart, Polar Chart, SWR
Sweep Point	751

### Distance to Fault

Frequency Range	10 MHz~1.5 GHz
Distance Resolution	0.1 m x Velocity Factor
Windows	Rectangular, Hamming

**Digital Modulation Analysis Mode**

Frequency range	5 MHz to 1.5 GHz
Carrier Power Accuracy	±2 dB, nominal
Carrier Power Range	-30 dBm to +20 dBm, nominal

**ASK**

Symbol rate range	1 kHz to 100 kHz
Modulation depth/index range	5% to 95%
Accuracy	±4%, nom.

**FSK**

Symbol rate range ( $\beta$ = deviation/Symbol rate)	1 kHz to 20 kHz	$1 \leq \beta \leq 20$
	25 kHz to 50 kHz	$1 \leq \beta \leq 8$
	50 kHz to 100 kHz	$1 \leq \beta \leq 4$
FSK deviation	1 kHz to 400 kHz	
Accuracy	±4%, nom.	

**AM**

Modulation rate range	20 Hz to 100 kHz	
Accuracy	1 Hz, nom.	Modulation rate < 1 kHz
	< 0.1% modulation rate, nom.	Modulation rate ≥ 1 kHz
Modulation depth range	5% to 95%	
Accuracy	±4%, nom.	

**FM**

Modulation rate range	20 Hz to 200 kHz	
Accuracy	1 Hz, nom.	Modulation rate < 1 kHz
	< 0.1% modulation rate, nom.	Modulation rate ≥ 1 kHz
Frequency deviation	1 kHz to 400 kHz	
Accuracy	±4%, nom.	

**Advanced Measurement Kit**

Power Measurement	Channel Power, ACPR, OBW, T-Power
Non-Linear Measurement	TOI
Spectrum Monitor	Waterfall



## External input and external output

### Front panel Interface

Front panel RF input	50 $\Omega$ , N-female
Front panel tracking generator output	50 $\Omega$ , N-female
10 MHz reference output	10 MHz, >0 dBm, 50 $\Omega$ , BNC-female
10 MHz reference input	10 MHz, -5dBm~+10dBm, 50 $\Omega$ , BNC-female
External trigger input	1 k $\Omega$ , 5V TTL , BNC-female

### Rear Panel Interface

USB device	USB- 2.0
LAN	LAN (VXI-11) , 10/100 Base, RJ-45
10 MHz reference output	10 MHz, >0 dBm, 50 $\Omega$ , BNC-female
10 MHz reference input	10 MHz, -5 dBm~+10 dBm, 50 $\Omega$ , BNC-female
External trigger input	1 k $\Omega$ , 5V TTL , BNC-female

### Remote Controller

Easy Spectrum	V1.0.5.0 and higher
Web Browser	HTML 5 Supported

## General Specification

Display	TFT LCD, 1024×600 (waveform area 751×501), 10.1 inch multi-touch screen
Storage	Internal(Flash) 256 MByte, external(USB storage device)32 GByte
Source	Input voltage range(AC) 100 V~240 V, AC frequency supply 45 Hz~440 Hz, Power consumption 3.5W
Temperature	Working temperature 0°C to 50°C, Storage temperature -20°C to 70°C
Humidity	0°C to 30°C, ≤95% Relative humidity; 30°C to 50°C, ≤75% Relative humidity
Dimensions	393 mm×207 mm×116.5 mm (W×H×D)
Weight	4.40 kg (9.7 lb)

## Electromagnetic Compatibility and Safety

EMC	EN 61326-1:2006
Electrical safety	EN 61010-1:2010

## Ordering Information

Product Description	SVA1000X	Order Number
Product Code	Spectrum Analyzer, 9 kHz~1.5 GHz	SVA1015X
Standard configurations	Quick Start, USB Cable, Power Cord	
Utility Options	Advanced Measurement Kit	SVA1000X-AMK
	Utility Kit: N(M)-SMA(M) cable N(M)-N(M) cable N(M)-BNC(F) adaptor(2 pcs) N(M)-SMA(F) adaptor(2 pcs) 10 dB attenuator	UKitSSA3X
	N(M)-SMA(M) cable, 70cm, 6 GHz	N-SMA-6L
	N(M)-N(M) cable, 70cm, 6 GHz	N-N-6L
	N(M)-BNC(M) cable, 70cm, 2 GHz	N-BNC-2L
	USB-GPIB Adaptor	USB-GPIB
	Soft carrying bag	BAG-SCC
EMI Options	EMI Measurement Kit: EMI Filter and Quasi Peak Detector, EMI test option in EasySpectrum Software	SVA1000X-EMI
	Near Field Probe Kit SRF5030: 4 H-probes (25 mm, 10 mm, 5 mm, 2mm), 30 MHz~3 GHz	SRF5030
	Near Field Probe Kit SRF5030T: 3 H- probes (20 mm, 10 mm, 5 mm), 1 E-probes (5 mm), 300 kHz~3 GHz	SRF5030T
Vector Network Analysis Options	Vector Network Analysis	SVA1000X-VNA
	Distance To Fault	SVA1000X-DTF
	Mechanical Calibration Kit: Open(M), Short(M), Match(M,50), Through(F-F), 50 Ω, 4 GHz	F503ME
Modulation Analysis Options	ASK, FSK	SVA1000X-DMA
	AM, FM	SVA1000X-AMA

