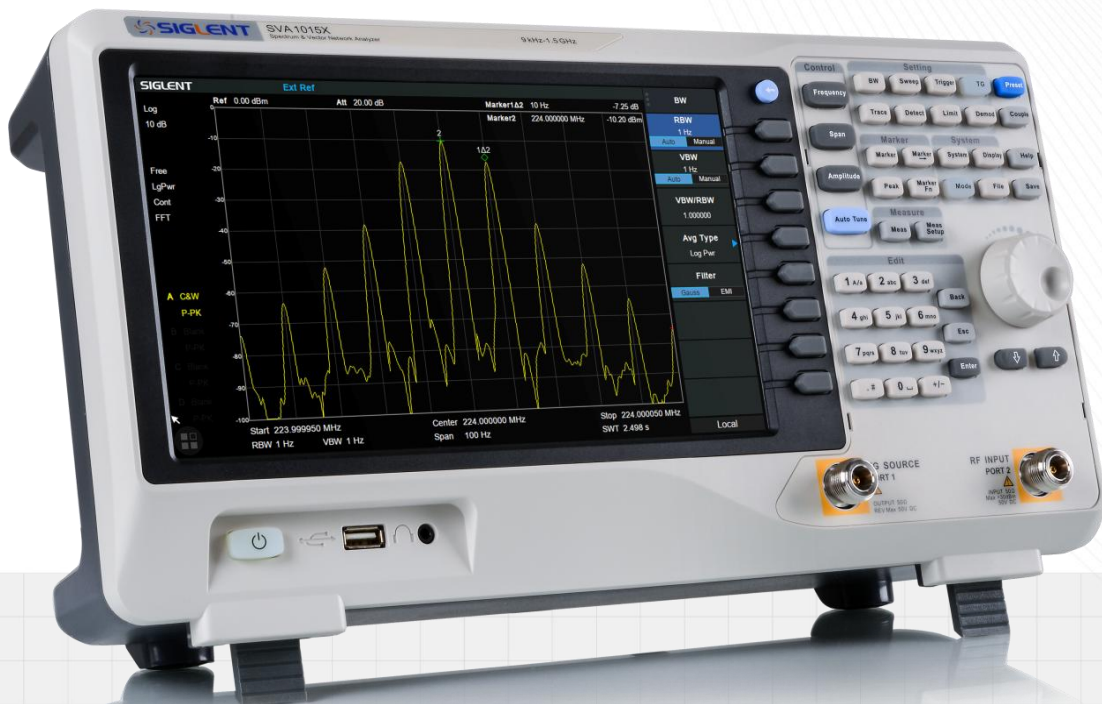


# SVA1000X Spectrum & Vector Network Analyzer



DataSheet DS0701X\_E02A



## General Description

The SIGLENT SVA1000X series spectrum & vector network analyzers are powerful and flexible tools for RF signal and network analysis.

With a frequency range to 3.2 GHz, the analyzer delivers reliable automatic measurements and multiple modes of operation: the base model are a spectrum analyzer and a vector network analyzer, optional functions include a distance-to-fault locator, a vector signal analyzer. Applications include broadcast monitoring/evaluation, site surveying, S-parameter measurement, cable and antenna testing, analog/digital modulation analysis, EMI pre-compliance test, research and development, education, production, and maintenance.

## Features and Benefits

- ◆ Spectrum Analyzer Frequency Range from 9 kHz up to 3.2 GHz
- ◆ Vector Network Analyzer Frequency Range from 100 kHz up to 3.2 GHz
- ◆ -161 dBm/Hz Displayed Average Noise Level (Typ.)
- ◆ -98 dBc/Hz. @ 10 kHz Offset Phase Noise (1 GHz, Typ.)
- ◆ Level Measurement Uncertainty < 0.7 dB (Typ.)
- ◆ 1 Hz Minimum Resolution Bandwidth (RBW)
- ◆ Preamplifier Standard
- ◆ Tracking Generator Standard
- ◆ Distance To Fault (Opt.)
- ◆ Vector Signal Modulation Analysis (Opt.)
- ◆ EMI Filter and Quasi-Peak Detector Kit (Opt.)
- ◆ Advanced Measurement Kit (Opt.)
- ◆ 10.1 Inch Multi-Touch Screen , Mouse and Keyboard supported
- ◆ Web Browser Remote Control on PC and Mobile Terminals and File Operation

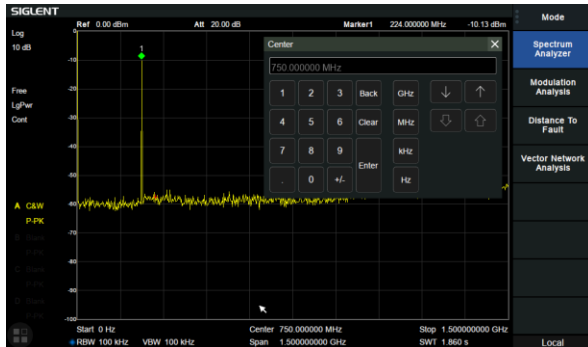
## Models and Main index

Model	SVA1015X	SVA1032X
Spectrum Analyzer Frequency Range	9 kHz~1.5 GHz	9 kHz~3.2 GHz
Vector Network Analyzer Frequency Range	10 MHz~1.5 GHz	100 kHz~3.2 GHz
Resolution Bandwidth	1 Hz~1 MHz	1 Hz~1 MHz
Displayed Average Noise Level	-156 dBm/Hz	-161 dBm/Hz
SSB Phase Noise	<-99 dBc/Hz	<-98 dBc/Hz
Total Amplitude Accuracy	< 1.2 dB	< 0.7 dB
Tracking Generator	5 MHz - 1.5 GHz	100 kHz - 3.2 GHz
Touch Screen	Multi Touch, Mouse and Keyboard supported	
Advanced Measurement	CHP, ACPR, OBW, CNR, Harmonic, TOI, Monitor	
Vector Network Analysis	Vector S11, Vector S21	
Distance to Fault	VNA Timing Domain Analysis	
Modulation Analysis	AM, FM, ASK, FSK, MSK, PSK, QAM	
EMI Test	EMI Filter and Quasi-Peak Detector, Log Scale and Limit Line	
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	NI-MAX, Web Browser, Easy Spectrum software, File Explorer	

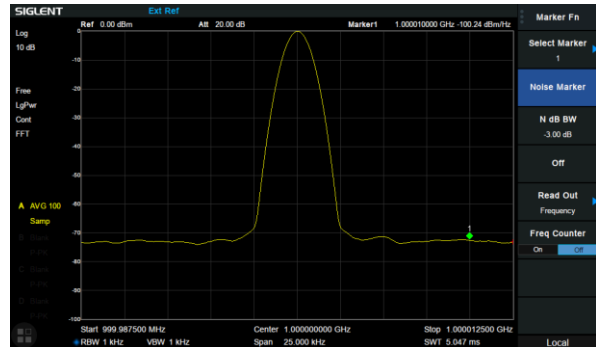
## Design Features

### Spectrum Analyzer Mode

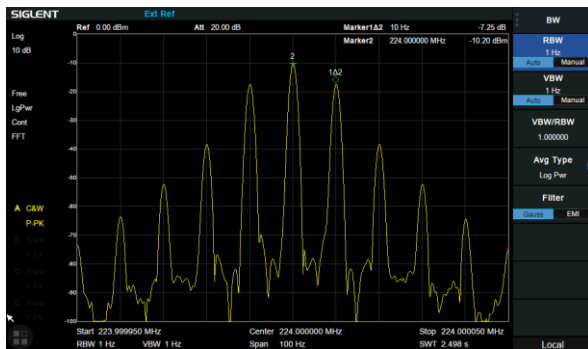
10.1 Inch Display with Multi-Touch Screen



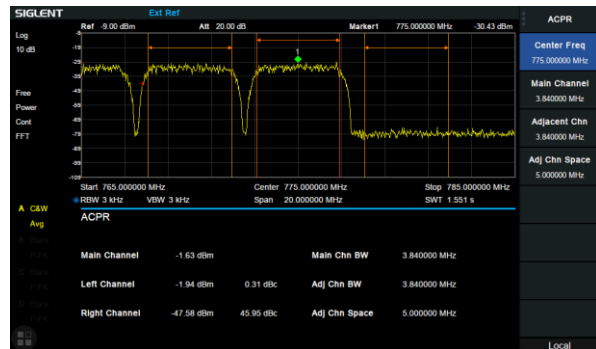
Phase noise <math><-99\text{ dBc/Hz}</math>@1 GHz



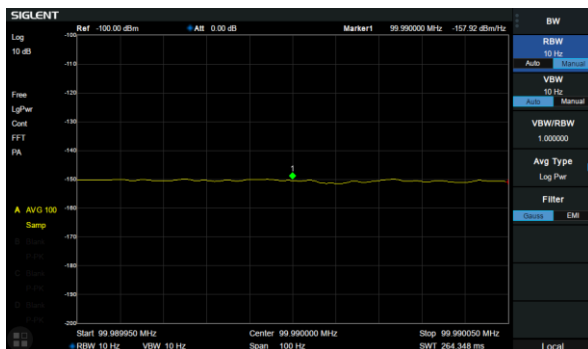
Minimum 1 Hz Resolution Bandwidth (RBW)



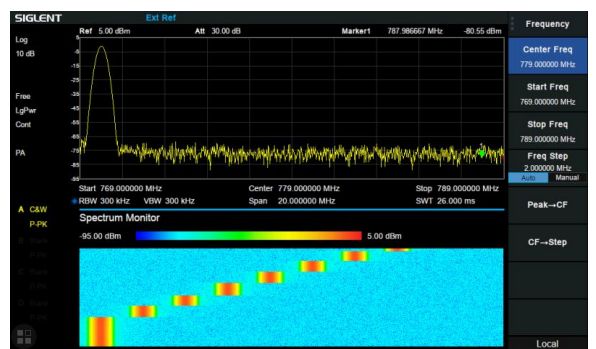
ACPR in Advanced Measurement Kit



-161 dBm/Hz Displayed Average Noise Level

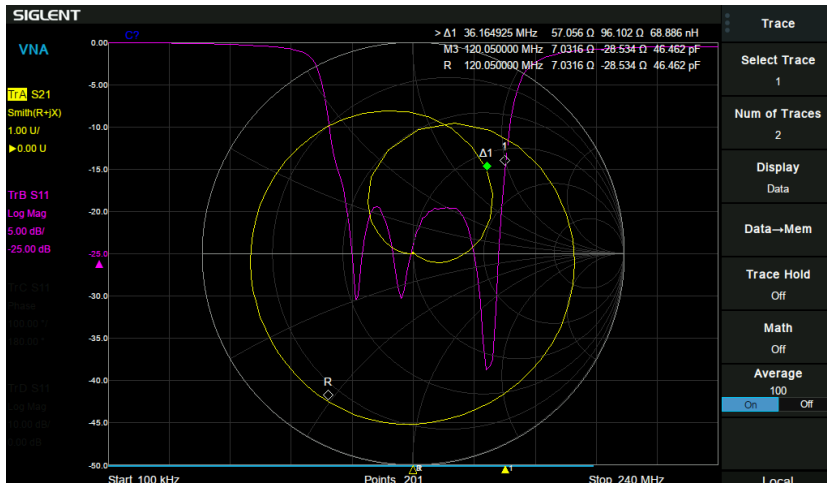


Monitor in Advanced Measurement Kit



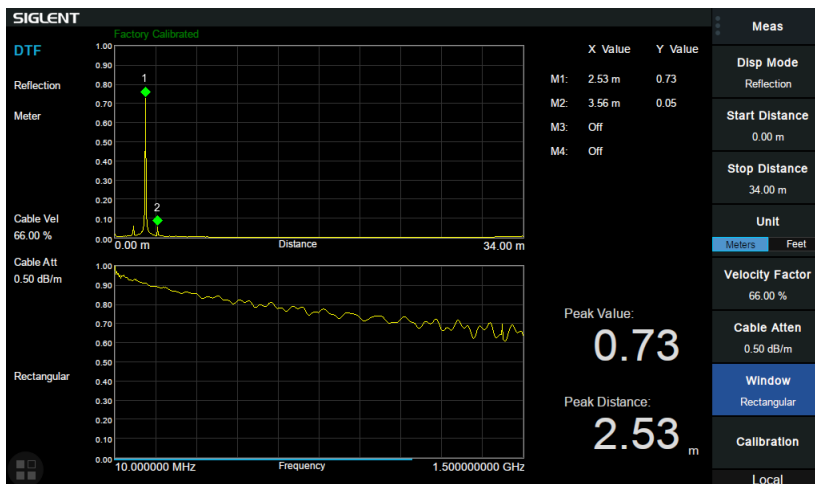
## Vector Network Analyzer Mode

100k-3.2GHz Vector S11 and S21 measurement, Multi Formats Overlay Display.



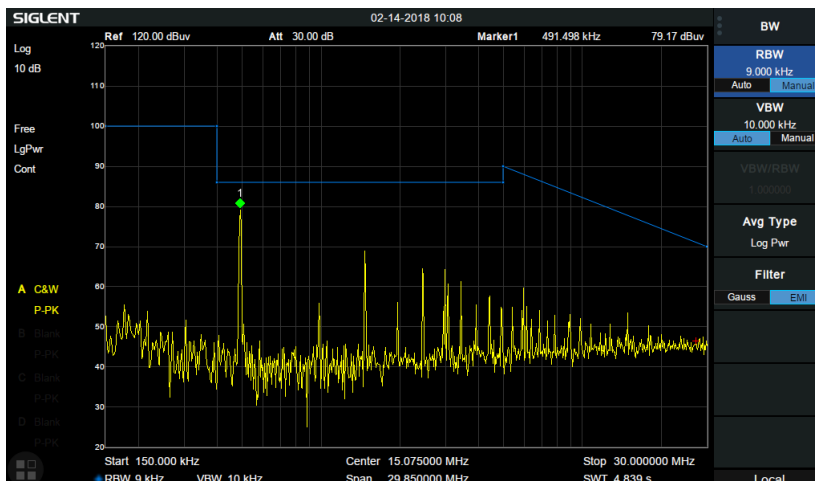
## Distance to Fault Mode

Cable and Antenna Test based on Timing Domain Analysis



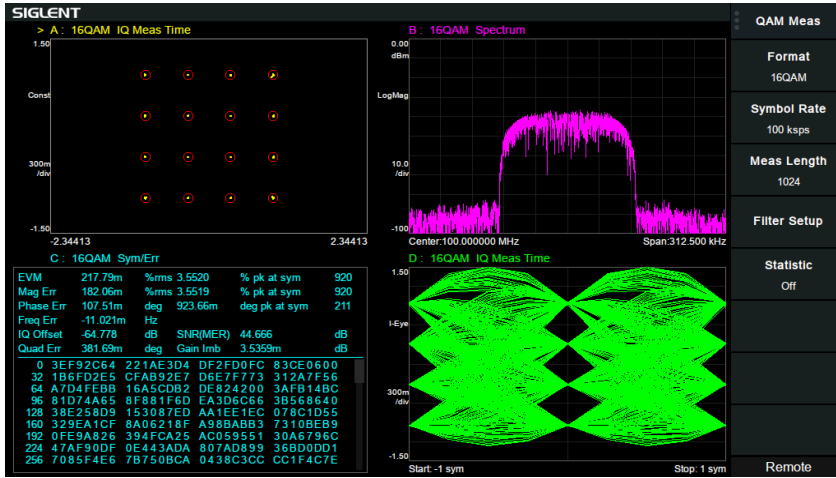
## EMI Test Kit

CISPR 16-1-1 EMI filter and Quasi-peak Detector , Log scale and limit line



# Modulation Analysis Mode

AM/FM,ASK/FSK/PSK/MSK/QAM Vector Signal Modulation Analysis



## Accessories

Utility Kit



50 Ω N-Type

Near Field Probe Set



6U Rack Mount



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 at room temperature (approximately 25°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.

## Mode

Mode
Spectrum Analyzer
Vector Network Analyzer
Distance To Fault
Modulation Analysis

## Spectrum Analyzer Mode

### Frequency and Time Characteristic

Frequency		
	SVA1015X	SVA1032X
Frequency range	9 kHz-1.5 GHz	9 kHz-3.2 GHz
Frequency resolution	1 Hz	
Frequency Span		
Range	0 Hz, 100 Hz to Max Frequency	
Accuracy	$\pm \text{Span} / (\text{number of display points} - 1)$	
Internal Reference Source		
Reference frequency	10.000000 MHz	
Reference frequency accuracy / uncertainty	$\pm [(\text{time since last adjustment} \times \text{frequency aging rate}) + \text{temperature stability} + \text{initial calibration accuracy}]$	
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	
Marker		
Marker resolution	$\text{Span} / (\text{number of display points} - 1)$	
Marker uncertainty	$\pm [\text{frequency indication} \times \text{reference frequency uncertainty} + 1\% \times \text{span} + 10\% \times \text{resolution bandwidth} + \text{marker resolution}]$	
Freq Counter resolution	0.01 Hz	
Bandwidths		
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 ~ 1 MHz, in 1-3-10 sequence	
VBW uncertainty	<5%	
Sweep and Trigger		
Sweep time	1 ms to 3200 s	
Sweep mode	RBW = 100 Hz ~ 1 MHz, Sweep RBW = 1 Hz ~ 10 kHz, FFT	
Sweep rule	Single, Continuous	
Trigger source	Free, Video, External	
External trigger	5V TTL level, Rising edge/Falling edge	



## Amplitude Accuracy and Range Specifications

Amplitude and Level			
Measurement range	DANL to +10 dBm, 100 kHz ~ 1 MHz, preamplifier off DANL to +20 dBm, 1 MHz ~ 3.2 GHz, preamplifier off		
Reference level	-200 dBm to +30 dBm, 1 dB steps		
Preamplifier	20 dB (nom.)		
Input attenuation	SVA1015X	SVA1032X	
	0 ~ 30 dB, 1 dB steps	0 ~ 50 dB, 1 dB steps	
Maximum input DC voltage	+/- 50 V <sub>DC</sub>		
Maximum average power	30 dBm, 3 minutes, $f_c \geq 10$ MHz, att > 20 dBm, preamp off		
Maximum damage level	33 dBm, $f_c \geq 10$ MHz, att > 20 dBm, preamp off		
Displayed Average Noise Level(DANL)			
	SVA1015X	SVA1032X	
	20 °C to 30 °C, att = 0 dB, RBW = VBW = 1 Hz, sample detector, trace average > 50, TG off		
Preamp off	100 kHz ~1 MHz	-101 dBm, -107 dBm (typ.)	-107 dBm, -111 dBm (typ.)
	1 MHz~10 MHz	-124 dBm, -130 dBm (typ.)	-132 dBm, -136 dBm (typ.)
	10 MHz~200 MHz	-128 dBm, -134 dBm (typ.)	-137 dBm, -141 dBm (typ.)
	200 MHz~1.5 GHz	-121 dBm, -127 dBm (typ.)	-135 dBm, -139 dBm (typ.)
	1.5 GHz~3.2 GHz		-126 dBm, -132 dBm (typ.)
Preamp on	100 kHz ~1 MHz	-120 dBm, -128 dBm (typ.)	-132 dBm, -137 dBm (typ.)
	1 MHz~10 MHz	-147 dBm, -152 dBm (typ.)	-148 dBm, -154 dBm (typ.)
	10 MHz~200 MHz	-150 dBm, -156 dBm (typ.)	-156 dBm, -161 dBm (typ.)
	200 MHz~1.5 GHz	-142 dBm, -148 dBm (typ.)	-155 dBm, -158 dBm (typ.)
	1.5 GHz~3.2 GHz		-145 dBm, -149 dBm (typ.)
SSB Phase Noise			
	SVA1015X	SVA1032X	
Offset	20 °C to 30 °C, $f_c = 1$ GHz, Normalized to 1 Hz		
10 kHz	-95 dBc/Hz, -99 dBc/Hz (typ.)	-95 dBc/Hz, -98 dBc/Hz (typ.)	
100 kHz	-96 dBc/Hz, -98 dBc/Hz (typ.)	-96 dBc/Hz, -97 dBc/Hz (typ.)	
1 MHz	-115 dBc/Hz, -120 dBc/Hz (typ.)	-115 dBc/Hz, -117dBc/Hz (typ.)	
Level Display			
Logarithmic level axis	1 dB to 200 dB		
Linear level axis	0 to reference level		
Units of level axis	dBm, dBmV, dB $\mu$ V, dB $\mu$ A, 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		



## Tracking Generator

Frequency Parameter		
Frequency Range	SVA1015X 5 MHz~1.5 GHz	SVA1032X 100 kHz~3.2 GHz
Frequency resolution	1 Hz, Zero Span	
RBW	100 Hz ~ 1 MHz, sweep mode	
Power Parameter		
Output level	-20 dBm ~ 0 dBm	
Output level resolution	1 dB	
Output flatness	+/-3 dB (nom.)	
Normalization Trace	Ref A/B/C->D	
VSWR	< 2 (nom.)	
Connector and Impedence	N-type female, 50 Ω	
Average safe reverse power	Total : 30 dBm (1 W)	
Maximum safe reverse level	Voltage: ±50 V <sub>DC</sub>	

## EMI Filter and Quasi-Peak Detector Kit (Option SVA1000X-DTF)

Measurement	
EMI filter RBW(-6dB)	200 Hz, 9 kHz, 120 kHz, 1MHz (following CISPR 16-1-1)
Detector	Peak, Average, RMS, Quasi-peak(following CISPR 16-1-1)
QPD Dwell time	0 us ~ 10 s
PC Application Software	EasySpectrum EMI pre-compliance test Software
Frequency axis	Linear, Logarithmic

## Advanced Measurement Kit (Option SVA1000X-AMK)

Power Measurement	
CHP, Channel Power	Channel Power, Power Spectral Density
ACPR, Adjacent Channel Power Ratio	Main CH Power, Left channel power, Right channel power
OBW, Occupied Bandwidth	Occupied Bandwidth, Transmit Frequency Error
T-Power, Time Domain Power	Zero Span Integrated Power
CNR, Carrier Noise Ratio	C/N, Noise Power
Non-Linear Measurement	
Harmonic measurement	Max Harmonic number 10
TOI, Third-Order Intercept	Measure the third-order products and intercepts from two tones
Spectrum Monitor Measurement	
Spectrogram	

## Vector Network Analyzer Mode

### Vector Network Analyzer

Stimulus and Measurement		
Frequency Range	SVA1015X	SVA1032X
	10 MHz ~ 1.5 GHz	100 kHz ~ 3.2 GHz
Measurement	S11, S21	
IFBW	10 kHz	
Port1 Stimulus Power	-5 dBm (Nom.)	
Format	Lin Mag, Log Mag, Phase, Group Delay, SWR, Smith Chart (Lin/Phase, Log/Phase, Real/Imag, R+j*X, G+j*B), Polar Chart (Lin/Phase, Log/Phase, Real/Imag)	
Sweep Points	101~751, default 201	
Trace	4 traces, Mem, Math, Hold, Overlay	
Marker	6+Ref	
Calibration		
Directivity of Calibration	S11, Log mag, Average=50, >50MHz > 40 dB	
Dynamic Range	S21, IFBW=10 kHz, Port1 level=-5 dBm, Log Mag, Average=50	
	100 kHz ~ 10 MHz	75 dB
	10 MHz ~ 1.5 GHz	60 dB
	1.5 GHz ~ 3.2 GHz	55 dB
Trace Noise	10 kHz RBW, Log mag, Average=50, >10MHz < 0.1 dB rms	
Calibration	Full 1-Port(OSL), Open Response, Short Response Response Through, Enhanced Response,	
Mechanical Calibration Kit	Open, Short, Load, Through; User Cal Kit	
Port Extensions	Port 1, Port 2, Auto Open Port 1	
System Z0	50 $\Omega$	
Velocity Factor	0.1~1	

## Distance to Fault Mode

### Distance to Fault Mode (Option SVA1000X-DTF)

Measurement		
Frequency Range	SVA1015X	SVA1032X
	10 MHz ~ 1.5 GHz	100 kHz ~ 3.2 GHz
Maximum Distance (meters)	$(7.68 \times 10^{10} \times \text{Velocity Factor}) / (\text{start freq} - \text{stop freq}(\text{Hz}))$	
Resolution (meters)	$(1.50 \times 10^8 \times \text{Velocity Factor}) / (\text{start freq} - \text{stop freq}(\text{Hz}))$	
Windows	Rectangular, Hamming	
Calibration	S11, Full 1-Port(OSL)	
Velocity Factor	0.1~1	

## Modulation Analysis Mode

Common Parameter		
Frequency range	SVA1015X	SVA1032X
	2 MHz to 1.5 GHz	2 MHz to 3.2 GHz
Carrier Power Accuracy	±2 dB (nom.)	
Carrier Power Range	-30 dBm to +20 dBm (nom.)	

### Analog Modulation Analysis (Option SVA1000X-AMA)

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.)	

### Digital Modulation Analysis (Option SVA1000X-DMA)

Measurement	
Modulation Type	ASK: 2ASK; FSK: 2,4,8,16 level; MSK: GMSK; PSK: BPSK,QPSK,OQPSK,8PSK; DPSK: DBPSK, DQPSK, D8PSK, $\pi/4$ -DQPSK, $\pi/8$ -D8PSK; QAM: 16,32,64,128,256
Meas Length	16 to 4096
Points/Symbol	4,6,8,10,12,14,16
Symbol Rate	1 ksps to 2.5 Msps, Symbol Rate* Points/Symbol ≤ 10 Msps

<b>Filter</b>	
Meas/Ref Filter	Nyquist, Squrt Nyquist, Gauss, Half Sine, Rectangular
Length	2 to 128
Alpha/BT	Alpha 0.01 ~ 1, BT 0.01 ~ 10
<b>Trace</b>	
Trace Data	IQ Meas Time, IQ Meas Spectrum, IQ Ref Time, IQ Ref Spectrum, Time, Spectrum, Symbol Error Chart, Err Vector Time, Err Vector Spectrum, IQ Mag Err, IQ Phase Err,
Layout	Single, Stacked 2, Grid 1 2, Grid 2*2
Trace Formats	Log mag, Lin mag, Real, Imag, I-Q, Constellation, I-sys, Q-eye, Wrap Phase, Unwrap Phase, Trellis eye
<b>Symbol Error Chart</b>	
PSK/DPSK/MSK/QAM	EVM (rms EVM, peak EVM), Magnitude error, Phase error, IQ offset, Carrier offset, SNR Quadrature error, Gain imbalance(not support for MSK),
ASK	ASK Error, ASK depth, carrier offset
FSK	FSK Error, Magnitude error, FSK deviation, carrier offset

## Inputs and Outputs

<b>Front Panel</b>	
RF input, Port 2	N-type female, 50 $\Omega$ (nom.)
TG Source, Port 1	N-type female, 50 $\Omega$ (nom.)
USB host	USB-A plug, version 2.0
Ear Phone Jack	3.5 mm
<b>Rear Panel</b>	
USB device	USB-B plug, version 2.0
LAN	10/100 Base, RJ-45
10 MHz reference output	10 MHz, >0 dBm, BNC-type female, 50 $\Omega$ (nom.)
10 MHz reference input	10 MHz, -5 to +10 dBm, BNC-type female, 50 $\Omega$ (nom.)
External trigger input	5V TTL level, BNC-type female, 10 k $\Omega$
<b>Remote Control</b>	
Communication Interface	LAN, USB Device, USB Host (USB-GPIB adaptor)
Remote Control Capability	SCPI / Labview / IVI based on USB-TMC / VXI-11 / Socket / Telnet; NI-MAX; Web Browser (HTML 5 Supported); Easy Spectrum software; File Explorer (FTP)



## General Specification

<b>Structure</b>	
Dimensions	393 mm × 207 mm × 116.5 mm (W×H×D)
Weight	Net: 4.40 kg (9.7 lb); Shipping: 5.20 kg
Display	TFT LCD, 1024 × 600, 10.1 inch multi-touch screen
Storage	Internal (Flash) 256 MB, external (USB storage device) 32 GB
<b>Working Environment</b>	
Source	AC voltage range: 100-240 V, 50/60 Hz or 100-120 V 400 Hz; Power consumption 35: W
Temperature	Working temperature: 0 °C to 40 °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
Altitude	Operating: less than 3 km
<b>Electromagnetic Compatibility</b>	
EN 61326-1: 2013 / EN 61000-3-2: 2014	Class A(The active input power of the EUT is less than 75 W. According to EN 61000-3-2, no limits are necessary.)
EN 61000-3-3: 2013	Plt: 0.65 Pst: 1.00, dmax: 4.00 % dc: 3.00 % dt Lim: 3.30 % dt>Lim: 500ms
IEC 61000-4-2: 2008	AD ±8.0 kV, CD ±4.0 kV
IEC 61000-4-3: 2006 + A1: 2007 + A2: 2010	80 MHz to 1000 MHz: 10V/m, 1.4 GHz to 2.0 GHz:3 V/m, 2.0 GHz to 2.7 GHz:1V/m
IEC 61000-4-4: 2004 + A1: 2010	AC Line:±2.00 kV
IEC 61000-4-5: 2005	Line to Line: 1.0 kV, Line to Earth: 2.0 kV
IEC 61000-4-6: 2008	0.15-80 MHz:3 V 1 KHz 80% AM
IEC 61000-4-8: 2009	30 A/m, 50/60 Hz
IEC 61000-4-11: 2004	Voltage Dips:0%/0.5P; 40%/10P; 70%/25P; Short Interruptions Test Level%UT: 0%/250P
<b>Safety</b>	
IEC 61010-1:2010/EN 61010-1:2010	
CAN/CSA-C22.2 No.61010-1:2012, CAN/CSA-C22.2 No.61010-2-30:2012, UL 61010-1:2012, UL 61010-2-30:2012	
<b>RoHS</b>	
2011/65/EU	

## Ordering Information

Product	Description	Order Number	
Product Code	Spectrum & Vector Network Analyzer, 1.5 GHz	SVA1015X	
	Spectrum & Vector Network Analyzer, 3.2 GHz	SVA1032X	
Standard Accessories	Quick Start, USB Cable, Power Cord		
Common 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-S2	
	6U Rack Mount Kit	SSA-RMK	
	EMI test Options	EMI Measurement Kit: EMI Filter and Quasi Peak Detector, EMI test Mode in EasySpectrum Software	SVA1000X-EMI
		300 kHz~3 GHz Near Field Probe Kit: 3 H-probes (20/ 10/ 5 mm), 1 E-probe (5 mm)	SRF5030T
Vector Network Analysis Options	Distance To Fault	SVA1000X-DTF	
	50 Ω N-type Mechanical Calibration Kit: Open(M), Short(M), Match(M), Through(F-F)	F503ME	
Modulation Analysis Options	ASK, FSK, MSK, PSK, QAM	SVA1000X-DMA	
	AM, FM	SVA1000X-AMA	

## 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, function/arbitrary waveform generators, RF generators, digital multimeters, DC power supplies, spectrum analyzers, vector network analyzers, isolated handheld oscilloscopes, electronic load and other general purpose test instrumentation. Since its first oscilloscope, the ADS7000 series, 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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