

Product Datasheet - Technical Specifications



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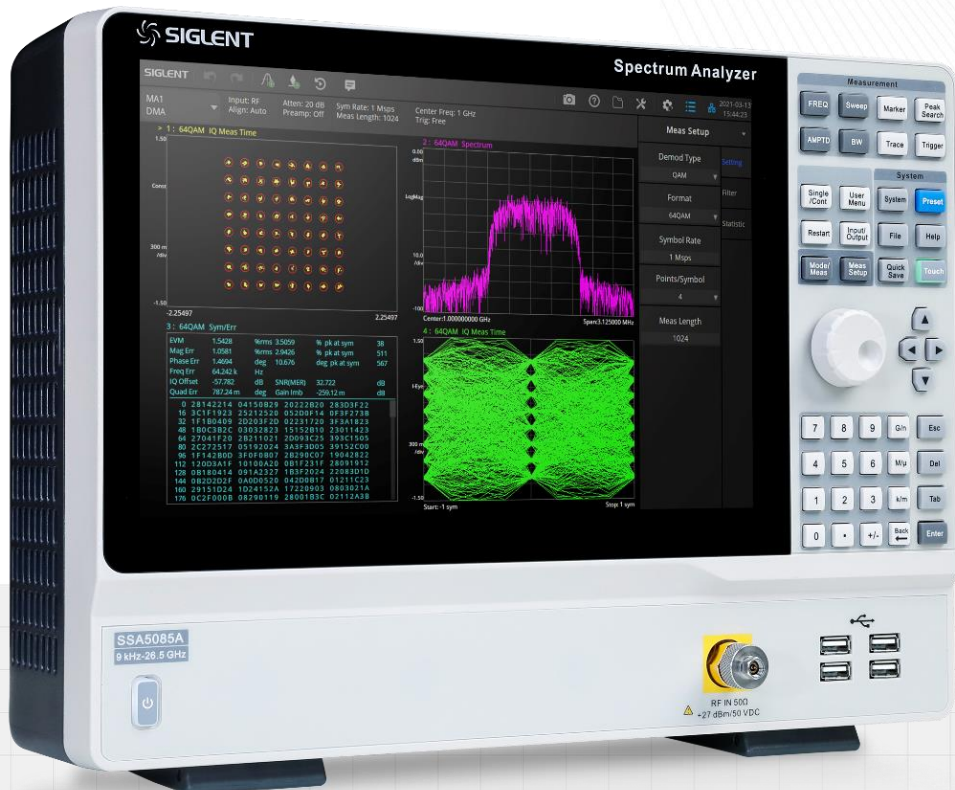
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SSA5000A Spectrum Analyzer

DataSheet

EN_01A



General Description

The SIGLENT SSA5000A spectrum analyzers are powerful and flexible tools for complex RF spectrum and signal analysis. With a capability of real-time spectrum analysis, the analyzer can provide multi-dimensions data displays, advanced triggering to solve modern RF spectrum challenges, like channel power measurement, hopping frequency, conflict channel, spectrum interference.

Applications include broadcast monitoring/evaluation, cellular site, IoT, wlan and bluetooth surveying, research and development, education, production, and maintenance.

Features and Benefits

- ◆ Spectrum Analyzer Frequency Range from 9 kHz up to 13.6 GHz/26.5 GHz
- ◆ -165 dBm/Hz Displayed Average Noise Level (Typ.)
- ◆ -105 dBc/Hz@1 GHz,10 kHz offset SSB Phase Noise (Typ.)
- ◆ 25 MHz/40 MHz Analysis Bandwidth
- ◆ 100% POI 7.20 μ s, Dynamic Range 60 dB, Multi-view for Density, Spectrogram and PVT
- ◆ Channel power, ACPR, OBW, Harmonic, TOI measurement etc.
- ◆ Analog Modulation Analysis and Vector Digital Modulation Analysis
- ◆ 12.1 inch Multi-Touch Screen, HDMI output
- ◆ Web Browser Remote Control on PC and Mobile Terminals and File Operation

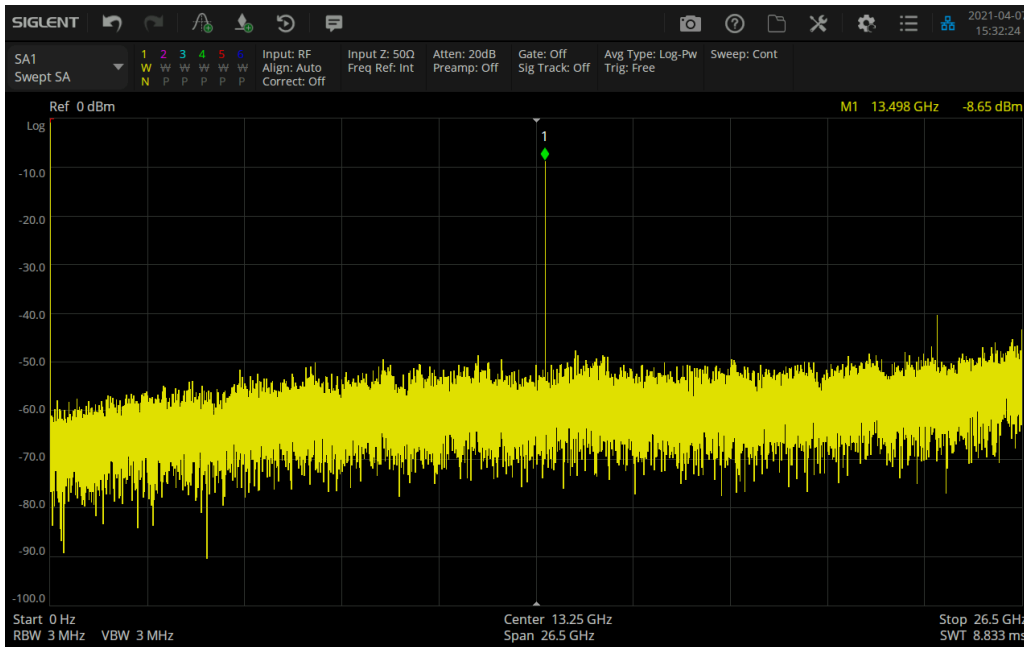
Models and Main index

Model	SSA5083A	SSA5085A
Frequency Range	9 kHz~13.6 GHz	9 kHz~26.5 GHz
Displayed Average Noise Level	-165 dBm/Hz	
SSB Phase Noise	-105 dBc/Hz	
Analysis Bandwidth	25 MHz, 40 MHz(opt.)	

Design Features

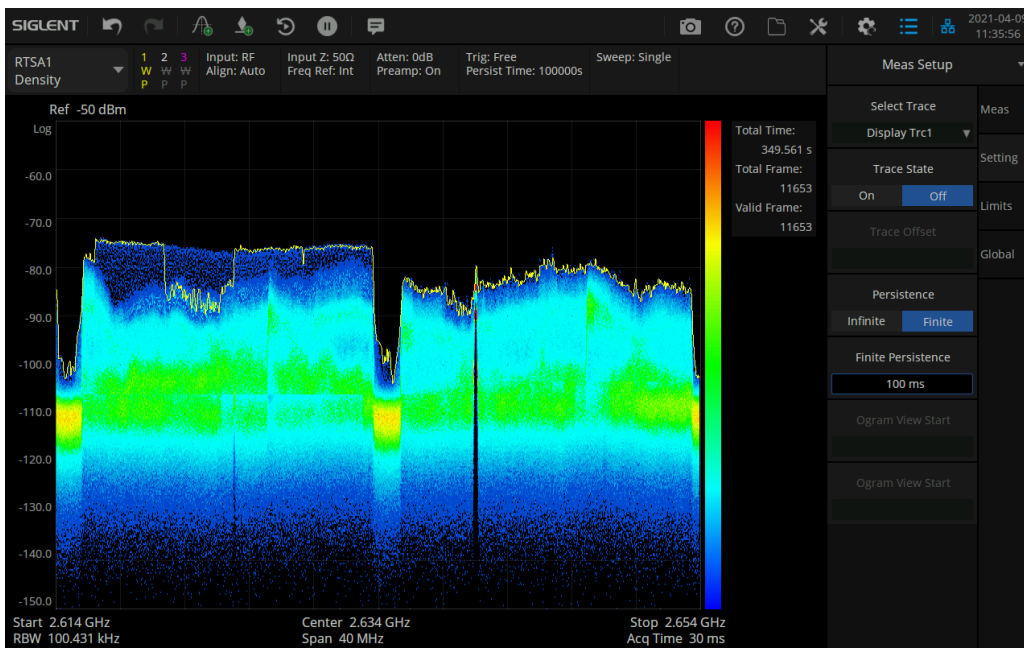
Spectrum Analyzer Mode

Various RF spectrum measurement and analysis



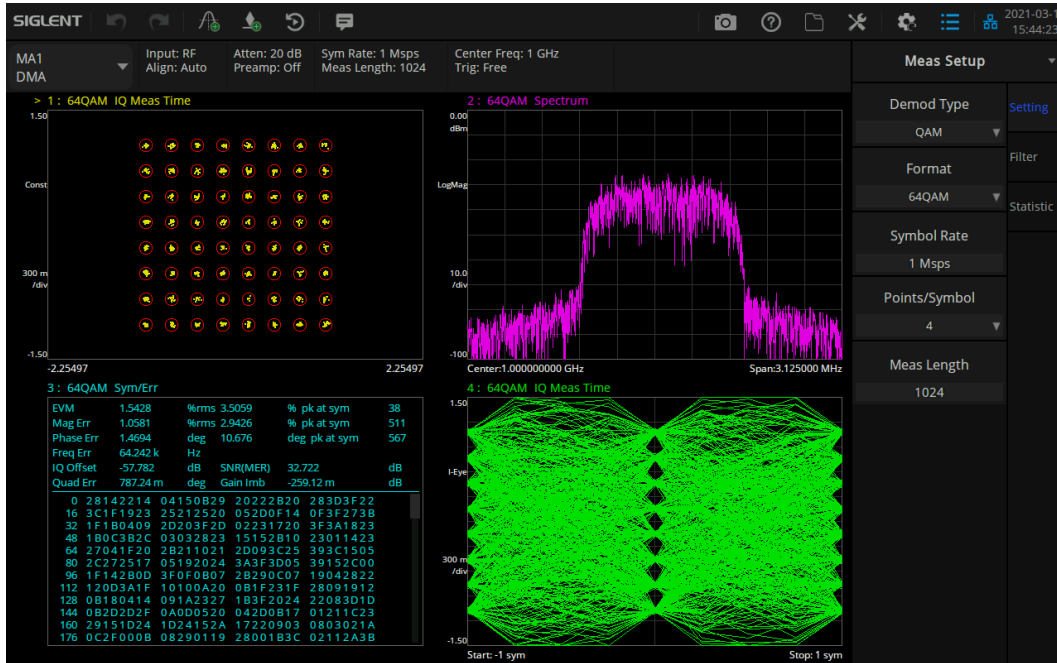
Real Time Analysis Mode

Multi-view and dimensions to monitor complex signals



Modulation Analysis Mode

AM/FM/PM analog modulation, and ASK/FSK/PSK/MSK/QAM digital modulation analysis



Accessories

Utility Kit



Near Field Probe Set



USB-GPIB Adaptor



Definitions and Conditions

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.

Frequency and Time Characteristic

Frequency span		
	SSA5083A	SSA5085A
Frequency range	9 kHz~13.6 GHz	9 kHz~26.5 GHz
Frequency resolution	1 Hz	
Range	0 Hz (Zero Span), 100 Hz to Max Frequency	
Accuracy	$\pm \text{Span} / (\text{number of sweep points} - 1)$	

Internal Reference Source	
Reference frequency	10.000000 MHz
Reference frequency accuracy	$\pm [(\text{time since last adjustment} \times \text{frequency aging rate}) + \text{temperature stability} + \text{initial calibration accuracy}]$

Standard Reference Source	
Initial calibration accuracy	< 1 ppm, 20 °C~30 °C
Temperature stability	< 1 ppm, 0 °C~50 °C
Frequency aging rate	< 0.5 ppm/first year, 3.0 ppm/20 years

OCXO Precise Reference Source (Opt. 10M_OCXO_L)	
Initial calibration accuracy	< 0.1 ppm, 20 °C~30 °C
Temperature stability	< 1 ppb, 0 °C~50 °C
Frequency aging rate	< 50 ppb/year

Marker	
Marker resolution	$\text{Span} / (\text{number of sweep points} - 1)$
Marker uncertainty	$\pm [(\text{frequency indication} \times \text{reference frequency uncertainty} + 10\% \times \text{resolution bandwidth} + \frac{1}{2} * \text{marker resolution} + 1 \text{ Hz})]$
Marker type	Normal, Delta, Fixed, Reference to, Table
Marker Functions	Noise marker, N dB BW, Frequency counter
Frequency Counter resolution	0.1 Hz

Bandwidths	
Resolution bandwidth (-3dB)	1 Hz ~ 10 MHz, in 1-3-10 sequence
Resolution filter shape factor	< 5:1 (60 dB:3 dB) (nom.)
RBW uncertainty	< 5% (nom.)
Video bandwidth (-3dB)	1 Hz ~ 10 MHz, in 1-3-10 sequence
VBW uncertainty	< 5% (nom.)
EMI bandwidth (-6dB)	200 Hz, 9 kHz, 120 kHz, 1 MHz (CISPR16 compliant)
Analysis bandwidth	25 MHz, 40 MHz (opt. SSA5000-B40)

Sweep and Trigger	
Sweep time	1 μ s to 6000 s, Span=0 Hz
	1 ms to 4000 s, Span \geq 100 Hz
Sweep mode	RBW=3k Hz~10 MHz, Swept
	RBW=1 Hz~10 kHz, FFT
Sweep (trace) points	201~10001
Sweep rule	Single, Continuous
Trigger source	Free, Video, External, Period
Trigger delay	-200 ms ~ +500 ms, Span=0 Hz
	1 ms ~ +500 ms, Span \geq 100 Hz, swept and FFT
External trigger	5V TTL level, Rising edge/Falling edge

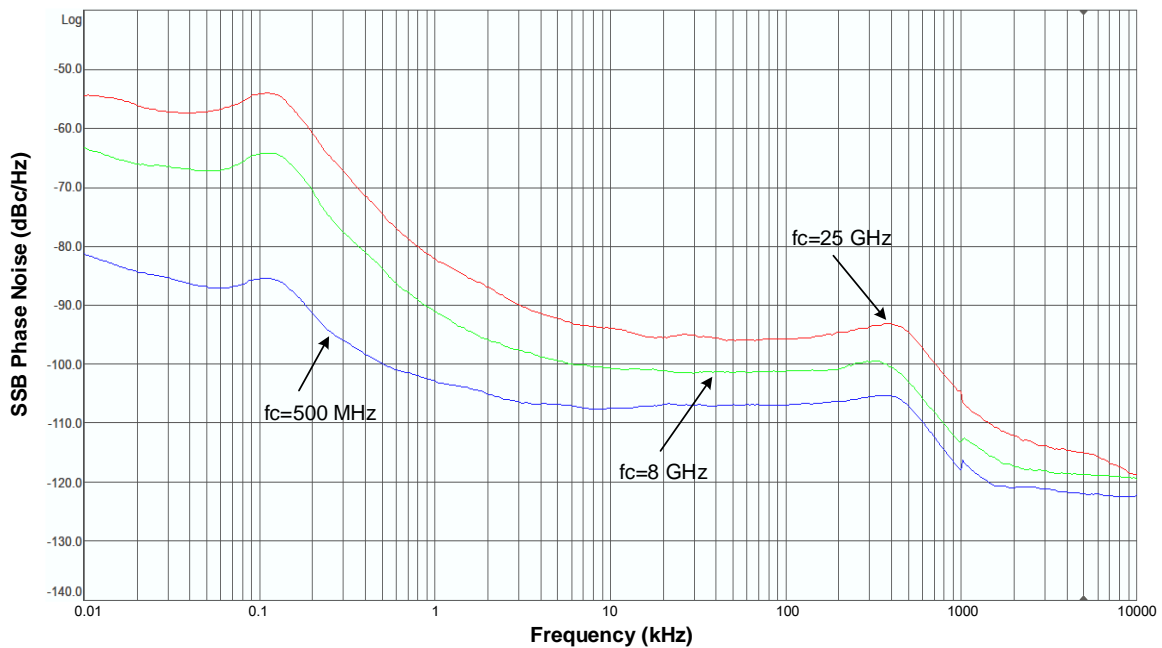
Time gating	
Gate methods	Gated LO, Gated Video, Gated FFT
Gate length	501 μ s~5 s
Gate delay	2 μ s~25 s

Amplitude Accuracy and Range Specifications

Amplitude and Level	
Measurement range	DANL to +10 dBm, 100 kHz ~ 1 MHz, Preamp off DANL to +23 dBm, 1 MHz ~ 26.5 GHz, Preamp off
Reference level	-170 dBm to +23 dBm, 1 dB steps
Preamplifier	20 dB (nom.), 100 kHz~26.5 GHz
Input attenuation	0 ~ 50 dB, 2 dB steps
Maximum input DC voltage	+/- 50 V _{DC}
Maximum average power	27 dBm, 3 minutes, $f_c \geq 10$ MHz, att > 20 dBm, preamp off 27+10*log($f_c/1$ MHz) dBm, $f_c < 1$ MHz, att ≥ 20 dBm

Level Display	
Logarithmic level axis	1 dB to 200 dB
Linear level axis	0 to reference level, 0% to 100%
Units of level axis	dBm, dBmV, dB μ V, dB μ A, Volt, Watt
Number of traces	6
Trace detectors	Positive-peak, Negative-peak, Sample, Normal, Average(Voltage/RMS/Video)
Trace functions	Clear Write, Max Hold, Min Hold, View, Blank, Average, Math

SSB Phase Noise	
Offset	20 °C to 30 °C, $f_c = 1$ GHz, Normalized to 1 Hz
10 kHz	-103 dBc/Hz, -105 dBc/Hz (typ.)
100 kHz	-103 dBc/Hz, -105 dBc/Hz (typ.)
1 MHz	-116 dBc/Hz, -119 dBc/Hz (typ.)



Displayed Average Noise Level (DANL)

	SSA5083A	SSA5085A	
20 °C to 30 °C, att = 0 dB, RBW = 1 Hz, sample detector, trace average > 50			
Preamp off	100 kHz~1 MHz	-130 dBm, -143 dBm(typ.)	-130 dBm, -143 dBm(typ.)
	1 MHz~10 MHz	-143 dBm, -148 dBm(typ.)	-143 dBm, -148 dBm(typ.)
	10 MHz~1.22 GHz	-144 dBm, -148 dBm(typ.)	-144 dBm, -148 dBm(typ.)
	1.22 GHz~3.15 GHz	-140 dBm, -144 dBm(typ.)	-140 dBm, -144 dBm(typ.)
	3.15 GHz~7.22 GHz	-137 dBm, -141 dBm(typ.)	-137 dBm, -141 dBm(typ.)
	7.22 GHz~13.6 GHz	-136 dBm, -140 dBm(typ.)	-136 dBm, -140 dBm(typ.)
	13.6 GHz~18.9 GHz		-134 dBm, -140 dBm(typ.)
	18.9 GHz~24.2 GHz		-132 dBm, -137 dBm(typ.)
	24.2 GHz~26.5 GHz		-124 dBm, -134 dBm(typ.)
Preamp on	100 kHz~1 MHz	-135 dBm, -148 dBm(typ.)	-135 dBm, -148 dBm(typ.)
	1 MHz~10 MHz	-153 dBm, -165 dBm(typ.)	-153 dBm, -165 dBm(typ.)
	10 MHz~1.22 GHz	-159 dBm, -163 dBm(typ.)	-159 dBm, -163 dBm(typ.)
	1.22 GHz~3.15 GHz	-158 dBm, -162 dBm(typ.)	-158 dBm, -162 dBm(typ.)
	3.15 GHz~7.22 GHz	-154 dBm, -158 dBm(typ.)	-154 dBm, -158 dBm(typ.)
	7.22 GHz~13.6 GHz	-154 dBm, -158 dBm(typ.)	-154 dBm, -158 dBm(typ.)
	13.6 GHz~18.9 GHz		-151 dBm, -155 dBm(typ.)
	18.9 GHz~24.2 GHz		-148 dBm, -152 dBm(typ.)
	24.2 GHz~26.5 GHz		-142 dBm, -149 dBm(typ.)

Error and Accuracy	
Resolution bandwidth switching uncertainty	Logarithmic resolution, relative to RBW = 10 kHz ± 0.2 dB (nom.)
Input attenuation switching uncertainty	20 °C to 30 °C, preamp off, relative to att=20 dB 1 MHz~7.22 GHz 0.5 dB 7.22 GHz~26.5 GHz 0.7 dB
Frequency Response relative to 50 MHz	20 °C to 30 °C, 30% to 70% relative humidity, att=20 dB, preamp off 10 MHz ~ 7.5 GHz ± 1.5 dB 7.5 GHz ~ 13.6 GHz ± 2.0 dB 13.6 GHz ~ 26.5 GHz ± 2.5 dB
Absolute amplitude accuracy	20 °C to 30 °C, input signal level=-50~-10 dBm, RBW=VBW=30 kHz, att=20 dB, peak detector, 95% reliability ±0.4 dB, fc=50 MHz ± 0.4 dB + Frequency Response, Preamp off ± 0.5 dB + Frequency Response, Preamp on
RF input VSWR	Att = 10 dB, fc≥10 MHz 10 MHz~13.6 GHz 1.6 (nom.) 13.6 GHz~24.2 GHz 1.9 (nom.) 24.2 GHz~26.5 GHz 2.1 (nom.)
Distortion and Spurious Responses	
Second harmonic distortion (SHI)	20 °C to 30 °C, fc≥50 MHz, input signal level=-20 dBm, att=0 dB, preamp off 10 MHz~7.22 GHz 42 dBm (nom.) 7.22 GHz~13.25 GHz 54 dBm (nom.)
Third-order intercept (TOI)	20 °C to 30 °C, fc≥50 MHz, input signal two -20 dBm tones spaced by 100 kHz, att=0 dB, preamp off 50 MHz~7.22 GHz 11 dBm, 15 dBm (nom.) 7.22 GHz~26.5 GHz 10 dBm, 14 dBm (nom.)
1dB gain compression	20 °C to 30 °C, fc≥50 MHz, input signal two tones spaced larger than 20 MHz, att=0 dB, preamp off >5 dBm (nom.)
Residual response	20 °C to 30 °C, input terminated 50 Ω, att=0 dB < -90 dBm
Input related spurious	20 °C to 30 °C, mixer level -30 dBm <-65 dBc

Advanced Measurement Kit (SSA5000-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 from two tones
Spectrum Monitor Measurement	
Spectrogram	

EMI Measurement (Option SSA5000-EMI)

Measurement	
Measurement View	Frequency scan, Meter, Signal list
Pre-compliance Sequence	Scan, Search, Meas
EMI filter RBW (-6dB)	200 Hz, 9 kHz, 120 kHz, 1MHz(following CISPR 16-1-1)
RBW uncertainty	< 5% (nom.)
Detector	Peak, Voltage Average, Quasi-Peak(following CISPR 16-1-1)
Dwell time	0 us ~ 10 s
RBW/Steps	0.1, 0.3, 0.5, 1, 2, 3
Corrections	4
Limit and Trace	3
Limit Standards	EN550xx, GB9254, FCC Part15, User defined
Attenuator	0-50 dB
Report	Signal List
Frequency scale	Linear, Logarithmic

Analog Modulation Analysis (Option SSA5000-AMA)

Common Parameter		
	SSA5083A	SSA5085A
Carrier Frequency Range	2 MHz~13.6 GHz	2 MHz~26.5 GHz
Carrier Power Accuracy	±2 dB (nom.)	
Carrier Power Range	-30 dBm to +20 dBm (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.)	
PM		
Modulation rate range	50 Hz~50 kHz	
Accuracy	1 Hz(nom.)	Modulation rate < 1 kHz
	< 0.1% modulation rate (nom.)	Modulation rate ≥ 1 kHz
Frequency deviation	0.2~100 rad	
Accuracy	±4%(nom.)	

Digital Modulation Analysis (Option SSA5000-DMA)

Common Parameter		
	SSA5083A	SSA5085A
Frequency Range	2 MHz~13.6 GHz	2 MHz~26.5 GHz
Carrier Power Accuracy	± 2 dB (nom.)	
Carrier Power Range	-30 dBm to +20 dBm (nom.)	
Measurement		
Modulation Type	ASK: 2ASK; FSK: 2FSK, 4FSK, 8FSK, 16FSK; 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 ksp/s to 32 Msp/s, Symbol Rate* Points/Symbol ≤150 Msp/s	
Trigger Holdoff	500 ms	
Burst	Burst power sync, BERT	
Filter		
Meas/Ref Filter	Nyquist, Sqrt Nyquist, Gauss, Half Sine, Rectangular	
Length	2 to 128	
Alpha/BT	Alpha 0.01~1, BT 0.01~10	
Trace		
Trace Data	IQ Meas Time, IQ Meas Spectrum, IQ Ref Time, IQ Ref Spectrum, Time, Spectrum, IQ Mag Err, IQ Phase Err Symbol Error Chart, Err Vector Time, Err Vector Spectrum,	
Trace Formats	Log mag, Lin mag, Real, Imag, I-Q, Constellation, I-eye, Q-eye, Wrap Phase, Unwrap Phase, Trellis eye	
Symbol Error Chart		
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	

Real-Time Spectrum Analysis (Option SSA5000A-RTA1)

Frequency and Time			
Real-Time	25 MHz (Default)		
Bandwidth	40 MHz (Option SSA5000A-B40)		
100% POI Minimum Signal Duration	Full Span, Kaiser Window, Frequency Mask Triggering at full amplitude accuracy 7.20 μ s		
Measurement view	Density	30 ms ~ 50 s	
	3D+Spectrogram	30 ms ~ 50 s	
	Spectrogram	100 μ s ~ 50 s	
	PvT+Spectrum	100 μ s ~ 50 s	
MAX Sample rate	51.2 MHz		
FFT per second	150 000(40 MHz analysis BW)		
Marker	8		
Span min	5 kHz		
Window	Kaiser(Default), Hanning, Flattop, Gaussian, Blackman-Harris, Rectangular Any SPAN, six RBW for every window (only one for Rectangular), default min RBW. Typical RBW for Kaiser:		
RBW	Span	RBW min	RBW MAX
	40 MHz	100.43 kHz	3.3142 MHz
	20 MHz	50.21 kHz	1.657 MHz
	10 MHz	25.11 kHz	828.55 kHz
	1 MHz	2.51 kHz	82.85 kHz
	100 kHz	251 Hz	8.285 kHz
Spectrogram / PvT Maximum stored	50 000 (Loop store)		

Different RBW and span, 100% POI (μ s)						
Analysis BW	RBW1	RBW2	RBW3	RBW4	RBW5	RBW6
40 MHz	26.56	16.56	11.56	9.06	7.81	7.20
20 MHz	46.56	26.56	16.56	11.56	9.06	7.81
10 MHz	86.56	46.56	26.56	16.56	11.56	9.06
1 MHz	806.56	406.56	206.56	106.56	56.56	31.56

Different window length for RBW						
Length\Type	1024	512	256	128	64	32
Kaiser(Beta=12)	398.2849	198.9478	99.2793	49.4450	24.5279	12.0693
Hanning	533.4785	266.4785	132.9785	66.2285	32.8535	16.1660
Flattop	212.2447	106.0182	52.9050	26.3483	13.0700	6.4309
Gaussian(alpha=3.5)	404.8707	202.2399	100.9244	50.2666	24.9376	12.2729
Blackman-Harris	399.2401	199.4250	99.5174	49.5636	24.5868	12.0983
Rectangular	801	400.5000	200.2500	100.1250	50.0625	25.0313

Amplitude Accuracy and Range		
Detector	+Peak, -Peak, Sample, Average	
Trace	3	
Spectrum Density Display	0~100% (resolution 0.1%)	
Dynamic range for Spectrogram	200 dB	
Amplitude	Flatness	< 0.4 dB
	Resolution	0.01 dB
	Dynamic range	< 60 dB
Trigger	Free Run, PvT, External	
Frequency Mask Trigger (FMT)	Source	Traces
	Type	Greater Than, Less Than, Outside Mask, Inside Mask
	Actions	Stop, Beep
Colour Mode	Warm(Default), Cool, Gray	

Inputs and Outputs

Front Panel	
RF input	2.92 mm type Male, 50 Ω (nom.)
USB host	4 USB-A plug, V2.0
Rear Panel	
USB device	USB-B plug, V2.0
LAN	10/100 Base, RJ-45
Video out	HDMI
Audio out	3.5 mm Jack
10 MHz reference output	10 MHz, >0 dBm, BNC-type Female, 50 Ω (nom.)
10 MHz reference input	10 MHz, -5 to +10 dBm, BNC-type Female, 50 Ω (nom.)
External trigger output	3.3V TTL level, 20 mA max, BNC-type Female
External trigger input	5V TTL level, 1 k Ω , BNC-type Female
Remote Control	
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);

General Specification

Structure	
Dimensions	378 mm x 284 mm x 126 mm (WxHxD)
Weight	Net: 7.40 kg (16.3 lb)
Display	TFT LCD, 1200 x 800, 12.1 inch capacitive multi-touch screen
Storage	Internal (eMMC) 4 GB, external (USB storage device) 32 GB
Working Environment	
Source	AC voltage range: 100-240 V, 50/60 Hz or 100-120 V 400 Hz; Power consumption: 80 W (MAX)
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
Altitude	Operating: less than 3000 m
Electromagnetic Compatibility	
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
Safety	
IEC 61010-1:2010/EN 61010-1:2010	
CAN/CSA-C22.2 No.61010-1:2012, UL 61010-1:2012, CAN/CSA-C22.2 No.61010-2-30:2012, UL 61010-2-30:2012	
RoHS	
2011/65/EU	

Ordering Information

Product	Description	Order Number
Product Code	Spectrum Analyzer, 9 kHz~13.6 GHz	SSA5083A
	Spectrum Analyzer, 9 kHz~26.5 GHz	SSA5085A
Standard Accessories	Quick Start, USB Cable, Power Cord, Wireless Mouse, 2.92F-2.92F-40A	
Common Options and Accessories	SSA5083A upgrade to SSA5085A	SSA5000-F5
	Pre-Amplifier, 9 kHz~13.6 GHz	SSA5000-P3
	Pre-Amplifier, 9 kHz~26.5 GHz	SSA5000-P5
	40 MHz analysis bandwidth	SSA5000-B40
	Real-Time Spectrum Analysis	SSA5000-RTA1
	Advanced Measurement Kit	SSA5000-AMK
	OCXO Precise Reference source, Factory installed	10M_OCXO_L
	2.92mm(F)-2.92mm(F) adaptor, DC~40 GHz	2.92F-2.92F-40A
	N(M)-N(M) cable, DC~18 GHz, 1000 mm	N-N-18L
	N(M)-SMA(M) cable, 18 GHz, 1000 mm	N-SMA-18L
	SMA(M)-SMA(M) cable, 18 GHz, 1000 mm	SMA-SMA-18L
	SMA(M)-SMA(M) cable, 26.5 GHz, 1000 mm	SMA-SMA-26L
	SMA(F)-SMA(M) cable, 26.5 GHz, 1000 mm	SMAF-SMA-26L
	USB-GPIB Adaptor	USB-GPIB
Modulation Analysis	Analog Modulation Analysis: AM, FM, PM	SSA5000-AMA
	Digital Modulation Analysis: ASK, FSK, MSK, PSK, QAM	SSA5000-DMA
EMI Measurement	EMI Measurement Mode	SSA5000-EMI
	300 kHz~3 GHz Near Field Probe Kit: 3 H-probes (20/10/5 mm), 1 E-probe (5 mm)	SRF5030T