SHA860A

Handheld Signal Analyzer

Data Sheet

EN01D

SIGLENT TECHNOLOGIES CO.,LTD

Features and Benefits

- Frequency Range 9 kHz~3.6/7.5 GHz, 5 kHz usable

  Displayed Average Noise Level (DANL) -165 dBm/Hz

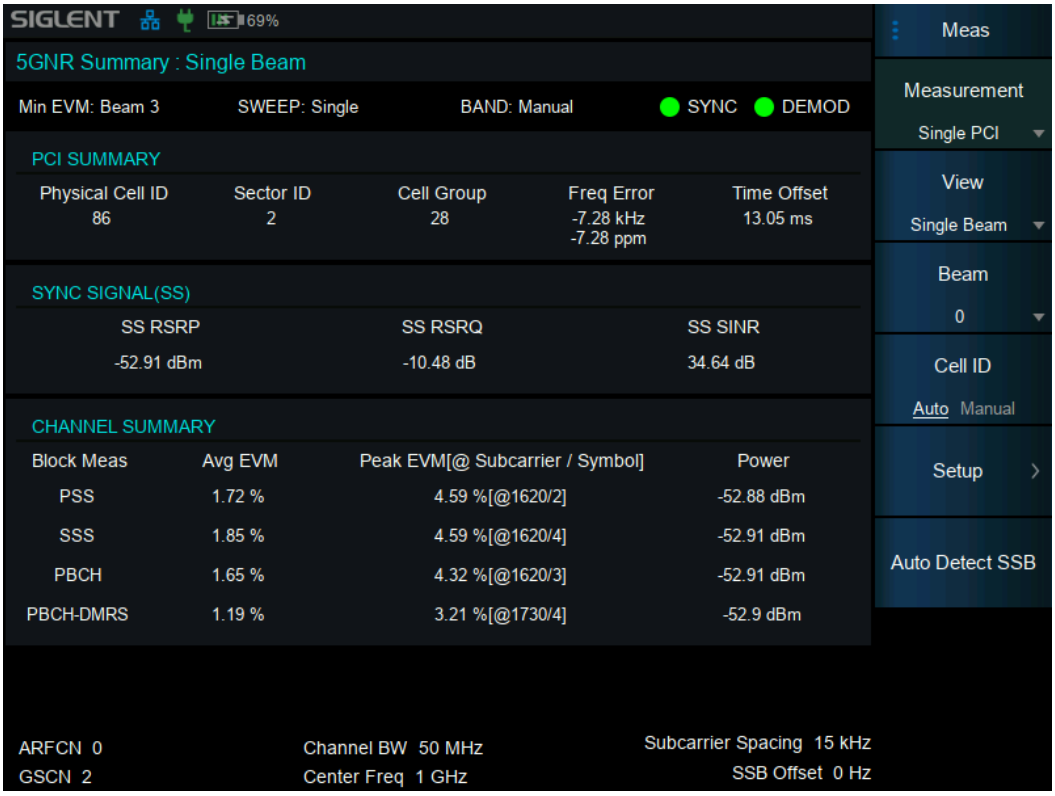
  SSB Phase Noise -104 dBc/Hz.@1 GHz, 10 kHz offset

  Analysis Bandwidth 40/110 MHz
- 5G NR OTA Measurement, multi-PCI and multi-beam analysis
- LTE FDD and TDD OTA Measurement, multi-PCI analysis
- Channel Power, Occupied Bandwidth, Adjacent Channel Power, SHI and TOI etc.
- IQ Data Acquisition in 110 MHz Band Width
- Real-Time Spectrum Analysis in 110 MHz Band Width, 100% POI time 3.51 μs
- Pulse Profile Measurements
- Indoor and outdoor map for Coverage Mapping
- Trace Recording/Playback with GNSS location
- AM/FM/PM Analog Modulation Analysis, and ASK/FSK/PSK/MSK/QAM Digital Modulation Analysis
- AM/FM/PM Analog Modulation Audio Tune & Listening
- Field Strength (EMF) Measurements and EMI Measurements
- Independent Source to 7.5 GHz
- Vector Network Analyzer, 1-Path 2-Ports S11 and S21 Network Analysis

  S11 directionality 40 dB, S21 dynamic 114 dB
- Cable and Antenna Test, Distance To Fault and Time Domain Analysis
- TTA test, bias out 12V to 32V DC
- Chargeable Battery working time 2.5 hours, 3.2 kg net weight
- 8.4 Inch Multi-Touch Screen, mouse and keyboard supported

Design Features

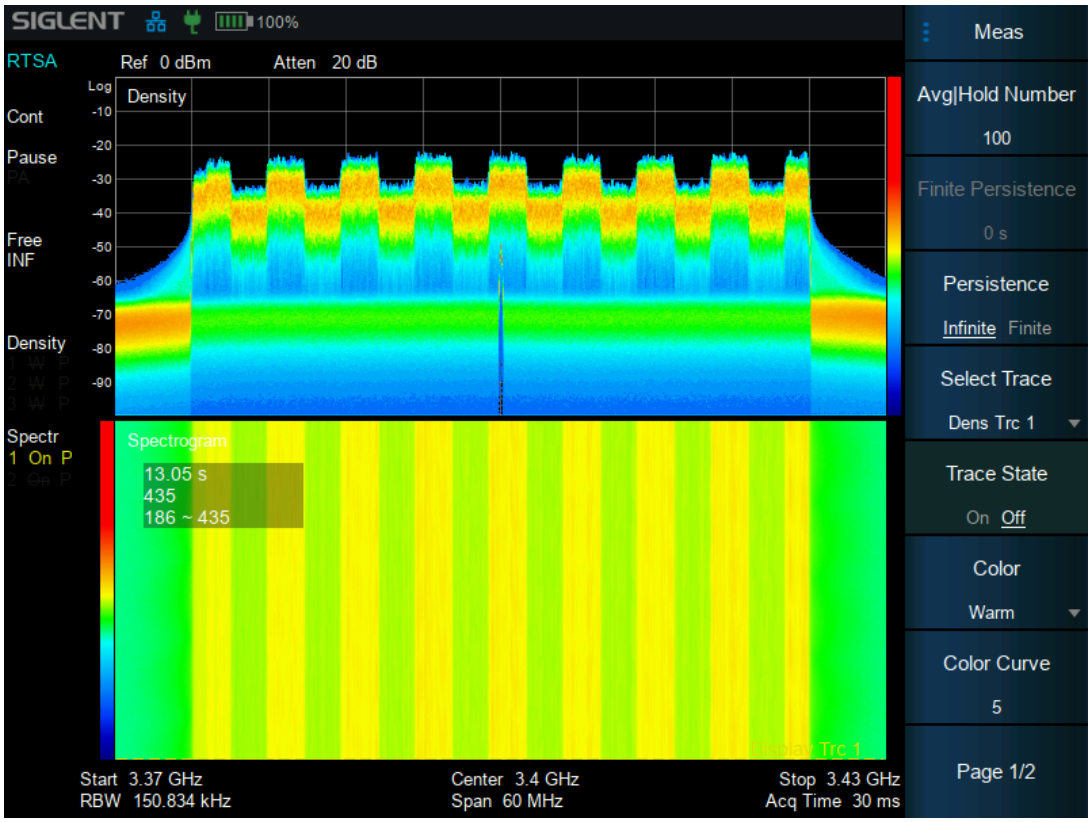
5G NR OTA Measurement



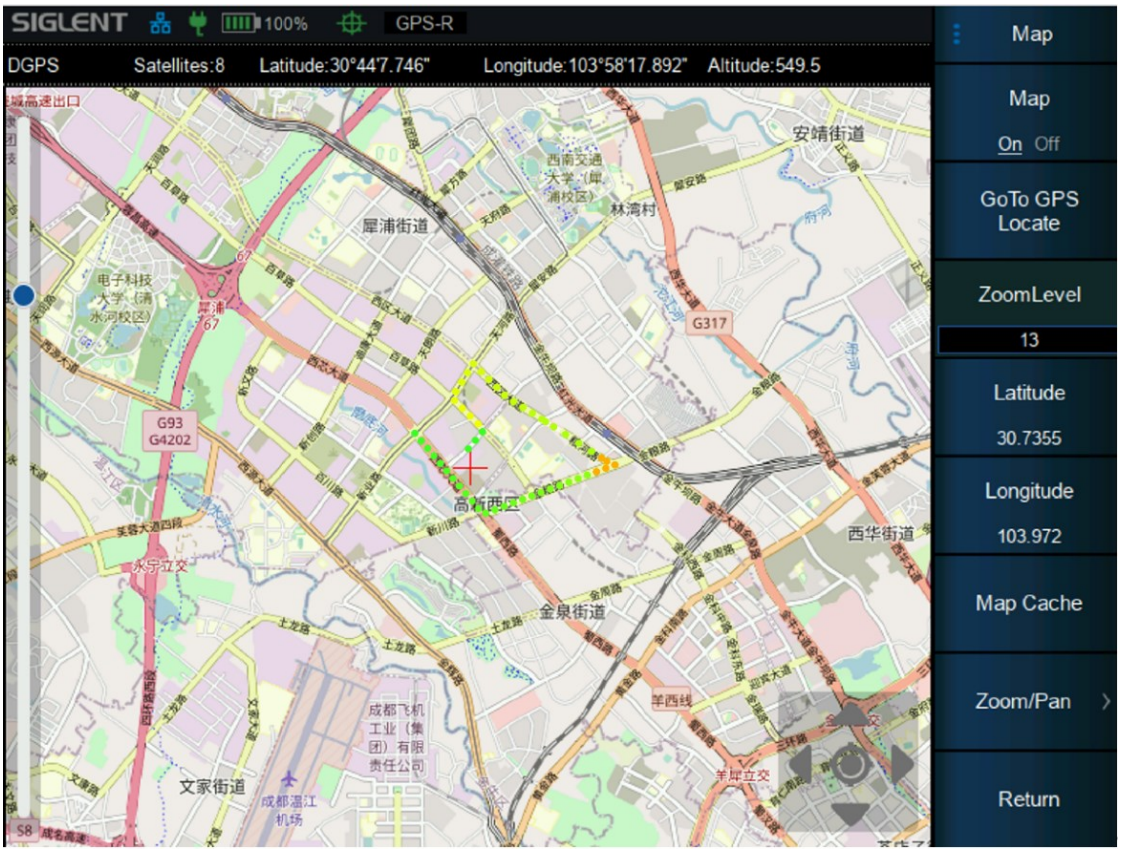
5G NR multi-PCI and multi-beam analysis

5G NR Constellation

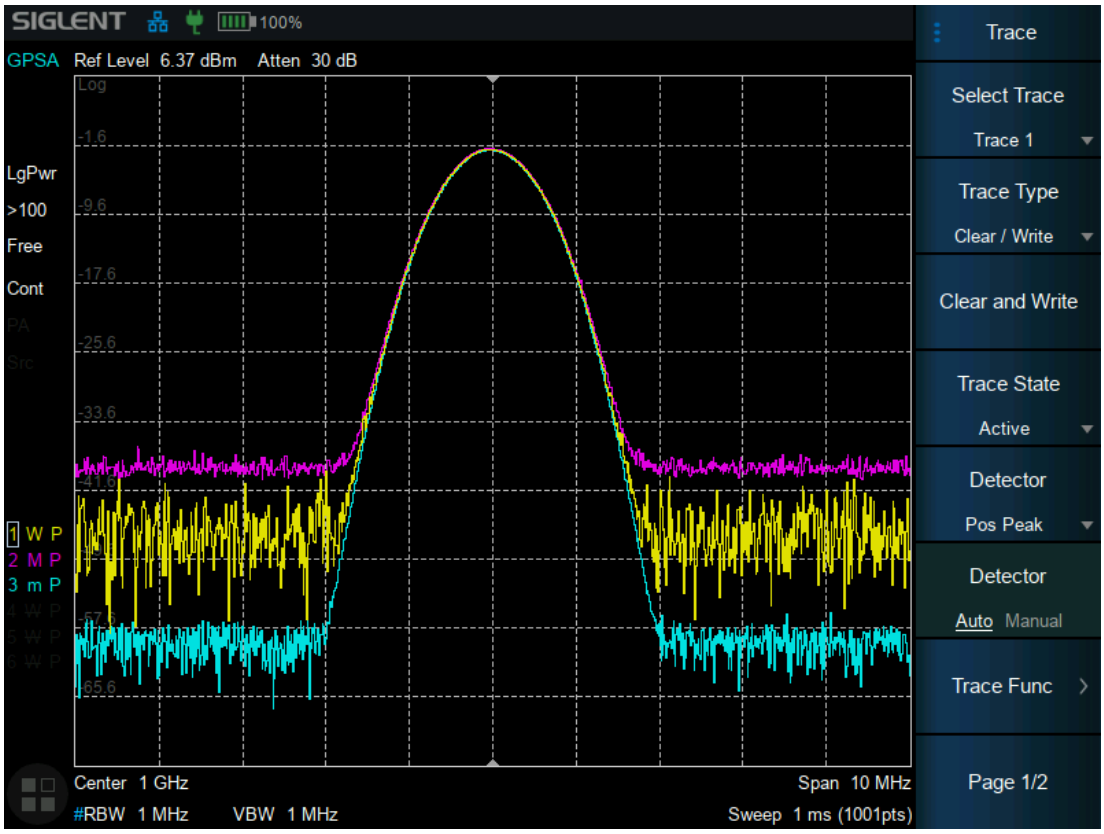
Real-Time Spectrum Analysis



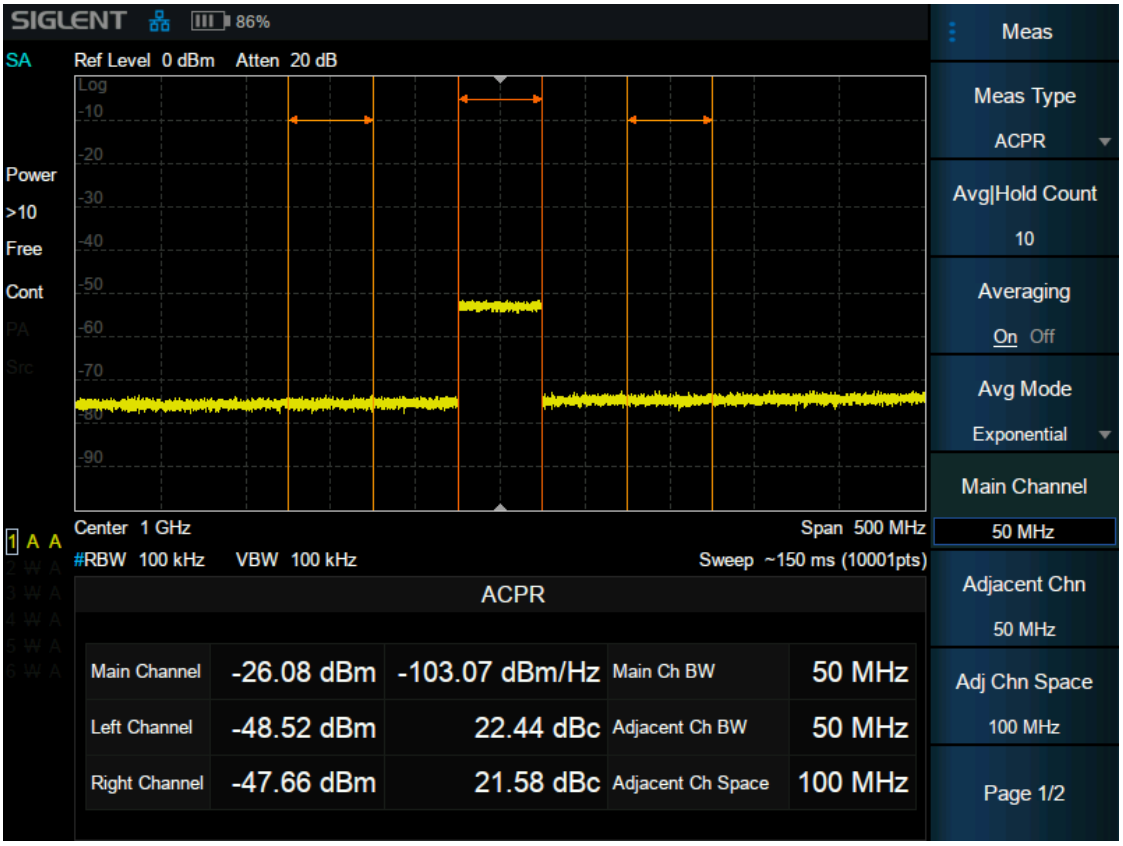
Outdoor and Indoor map, GPS logging



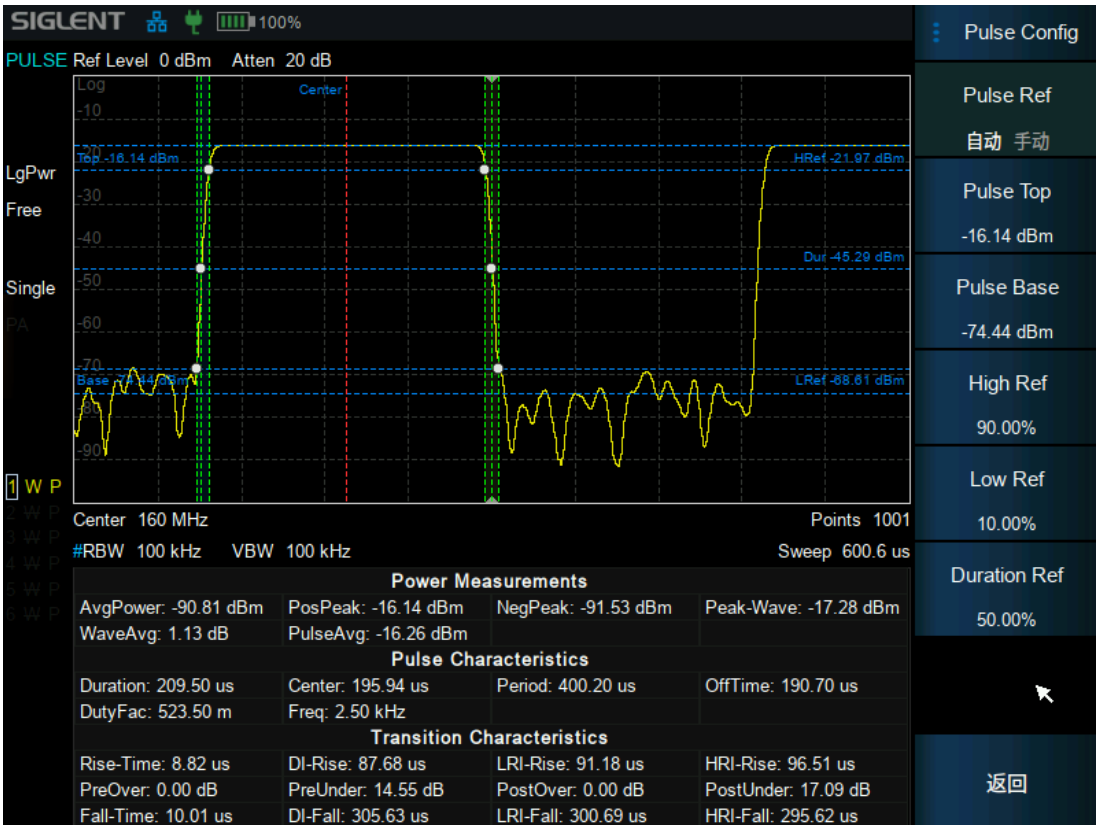
8.4 inch multi-touch screen and full keyboard control



Channel Power and ACPR measurement

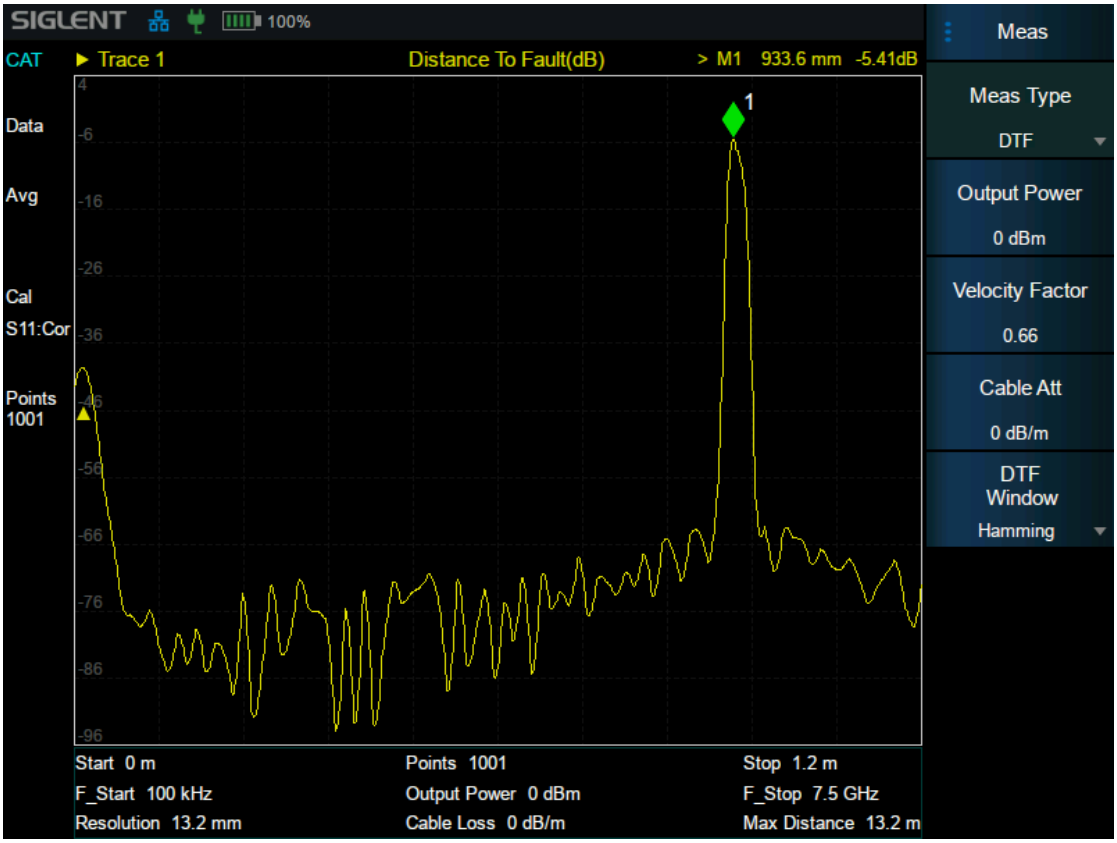


Pulse Profile Measurements

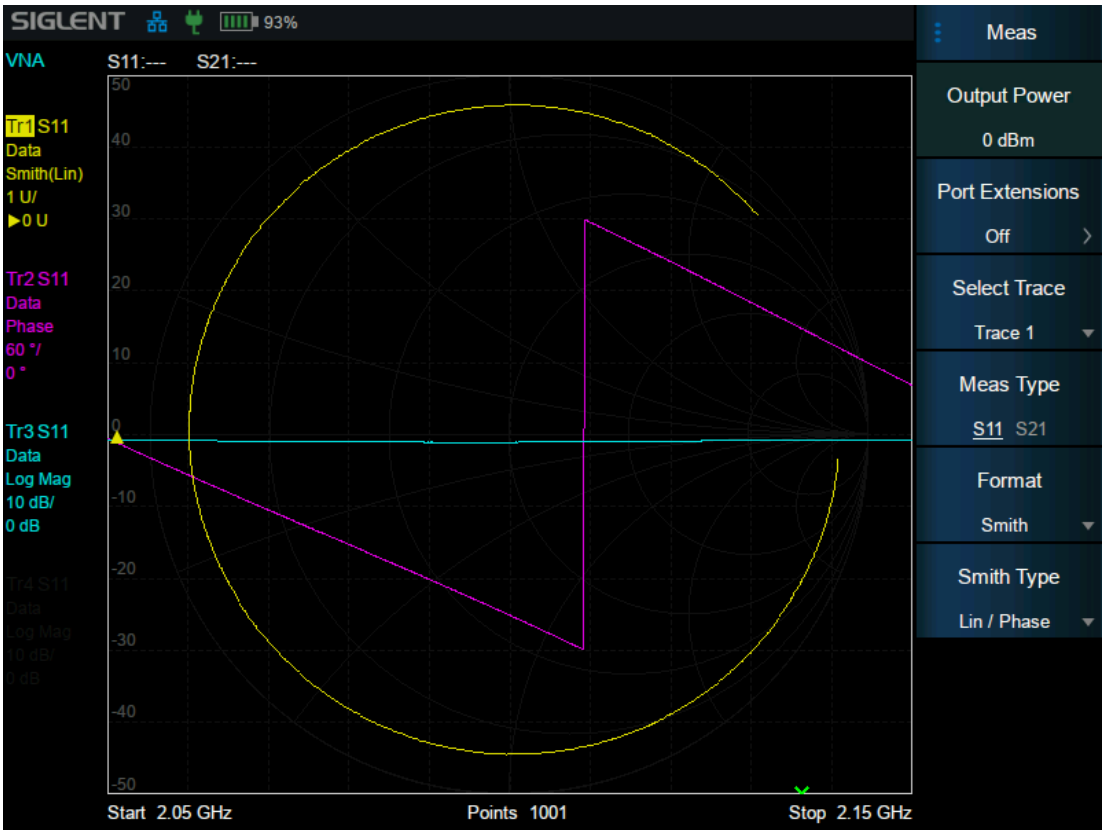


Interference analysis with directional antenna

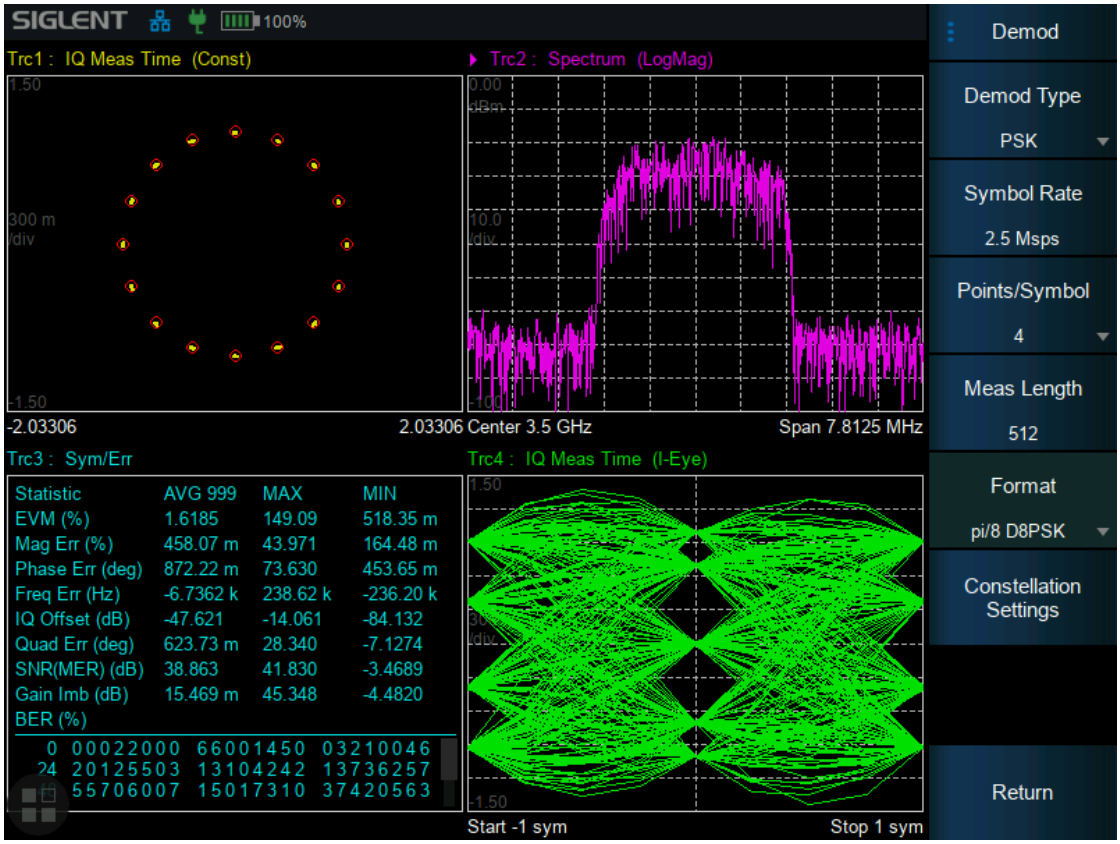
Cable and Antenna Test based on Timing Domain Analysis



Vector Network Analysis S11 and S21 measurement



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



Accessories

Utility Kit

Near Field Probe Set

50Ω Calibration Kit

GPS Antenna

Portable Bag

Directional Antenna 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 60 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.

Spectrum Analyzer

Frequency and Time Characteristic

Frequency		
	SHA861A	SHA862A
Frequency range	9 kHz~3.6 GHz (5 kHz usable)	9 kHz~7.5 GHz (5 kHz usable)
Frequency resolution	1 Hz	
Frequency Span		
Range	0 Hz, 100 Hz to Max Frequency	
Accuracy	± Span / (number of sweep points - 1)	

Internal Reference Source	
Reference frequency	10.000000 MHz
Reference frequency accuracy / uncertainty	± [(time since last adjustment × frequency aging rate) + temperature stability + 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
GPS Receiver (SHA860-GPS)	
Accuracy synced to GPS	±0.01 ppm
Accuracy un-synced to GPS	±0.4 ppm

Marker	
Marker resolution	Span / (number of sweep points - 1)
Marker uncertainty	± [frequency indication × reference frequency uncertainty + 1% × span + ½ * marker resolution + 1 Hz]
Marker type	Normal, Delta, Fixed, Relative to, Marker Table
Marker functions	N dB BW, Noise marker, 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	< 4.8 : 1 (60 dB:3 dB), Gaussian-like
RBW uncertainty	<5%
Video bandwidth (-3dB)	1 Hz ~ 10 MHz, in 1-3-10 sequence
VBW uncertainty	<5%

Sweep and Trigger		
Sweep time		1 ms to 4000 s
RBW	Sweep	3 kHz ~ 10 MHz
	FFT	1 Hz ~ 10 kHz
Sweep points		201~10001
Sweep rule		Single, Continuous
Trigger source		Free, Video, External, Periodic
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, Preamp off DANL to +23 dBm, 1 MHz ~ 7.5 GHz, Preamp off
Reference level	-200 dBm to +23 dBm, 1 dB steps
Preamplifier	25 dB (nom.)
Input attenuation	0~50 dB, 1 dB steps
Maximum input DC voltage	+/- 50 VDC
Maximum damage level	33 dBm, fc ≥ 10 MHz, att > 20 dBm, preamp off, in 3 minutes

Level Display	
Logarithmic level axis	1 dB to 200 dB
Linear level axis	0% to 100% (reference level)
Units of level axis	dBm, dBmV, dBμV, dBμA, 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

Field Strength Measurement	
Antenna factor	4
Unit	dBm/m2, dBw/m2, dBV/m, dBmV/m, dBpV/m, V/m, W/m2, W/cm2, A/m

Displayed Average Noise Level (DANL)			
		SHA861A	SHA862A
	20 °C to 30 °C, att = 0 dB, RBW = 1 Hz, sample detector, trace average > 50, Source off		
Preamp off	100 kHz ~1 MHz	-125 dBm, -136 dBm (typ.)	-125 dBm, -136 dBm (typ.)
	1 MHz~600 MHz	-140 dBm, -147 dBm (typ.)	-140 dBm, -147 dBm (typ.)
	600 MHz~1.8 GHz	-139 dBm, -145 dBm (typ.)	-139 dBm, -145 dBm (typ.)
	1.8 GHz~3.2 GHz	-134 dBm, -140 dBm (typ.)	-134 dBm, -140 dBm (typ.)
	3.2 GHz~3.65 GHz	-136 dBm, -143 dBm (typ.)	-136 dBm, -143 dBm (typ.)
	3.65 GHz~4.1 GHz		-136 dBm, -143 dBm (typ.)
	4.1 GHz~5.0 GHz		-135 dBm, -141 dBm (typ.)
	5.0 GHz~5.85 GHz		-135 dBm, -141 dBm (typ.)
	5.85 GHz~6.7 GHz		-134 dBm, -140 dBm (typ.)
	6.7 GHz~7.5 GHz		-132 dBm, -138 dBm (typ.)
Preamp on	100 kHz ~1 MHz	-125 dBm, -137 dBm (typ.)	-125 dBm, -137 dBm (typ.)
	1 MHz~600 MHz	-156 dBm, -163 dBm (typ.)	-156 dBm, -163 dBm (typ.)
	600 MHz~1.8GHz	-159 dBm, -165 dBm (typ.)	-159 dBm, -165 dBm (typ.)
	1.8 GHz~3.2 GHz	-157 dBm, -163 dBm (typ.)	-157 dBm, -163 dBm (typ.)
	3.2 GHz~3.65 GHz	-157 dBm, -163 dBm (typ.)	-157 dBm, -163 dBm (typ.)
	3.65 GHz~4.1 GHz		-157 dBm, -163 dBm (typ.)
	4.1 GHz~5.0 GHz		-156 dBm, -162 dBm (typ.)
	5.0 GHz~5.85 GHz		-156 dBm, -162 dBm (typ.)
	5.85 GHz~6.7 GHz		-155 dBm, -161 dBm (typ.)
	6.7 GHz~7.5 GHz		-153 dBm, -159 dBm (typ.)

SSB Phase Noise	
Offset	20 °C to 30 °C, fc = 1 GHz, Normalized to 1 Hz
10 kHz	-100 dBc/Hz, -104 dBc/Hz (typ.)
100 kHz	-100 dBc/Hz, -104 dBc/Hz (typ.)
1 MHz	-114 dBc/Hz, -117 dBc/Hz (typ.)

Frequency Response		
	20 °C to 30 °C, 30% to 70% relative humidity, att = 20 dB, relative to 50 MHz	
Preamp off	±0.8 dB, ±0.4 dB (typ.)	
Preamp on	±1.2 dB, ±0.6 dB (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, fc = 50 MHz, preamp off, relative to att = 20 dB, att =0~50dB	
	± 0.5 dB	
Absolute amplitude accuracy	20 °C to 30 °C, fc = 50 MHz, RBW= VBW = 1 kHz, att = 20 dB, peak detector, 95% reliability	
	±0.4 dB, input signal -20 dBm, Preamp off	
	±0.5 dB, input signal -40 dBm, Preamp on	
Total amplitude accuracy	20 °C to 30 °C, fc>100 kHz, input signal -50 dBm ~ 0 dBm, att = 20 dB, RBW=VBW=1 kHz, peak detector, preamp off, 95% reliability	
	±0.7 dB	
RF input VSWR	Att = 10 dB, fc≥1 MHz	
	1 MHz~3.05 GHz	1.7 (nom.)
	3.05 GHz~7.5 GHz	1.5 (nom.)

Distortion and Spurious Responses		
Second harmonic distortion (SHI)	20 °C to 30 °C, fc ≥ 50 MHz, mixer level -20 dBm, att = 0 dB, preamp off	
	50 MHz~3.05 GHz	-65 dBc / +45 dBm (nom.)
	3.05 GHz~3.75 GHz	-80 dBc / +60 dBm (nom.)
Third-order intercept (TOI)	20 °C to 30 °C, fc ≥ 50 MHz, two -20 dBm tones spaced by 100 kHz, att = 0 dB, preamp off	
	50 MHz~3.05 GHz	+9.5 dBm (typ.)
	3.05 GHz~7.5 GHz	+16 dBm (typ.)
1dB gain compression	20 °C to 30 °C, fc ≥ 50 MHz, two tones frequency interval ≥10MHz, RBW<1kHz,att = 0 dB, preamp off	
	> 8 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	

Source (SHA860-SOR)

Frequency		
	SHA861A	SHA862A
Frequency Range	100 kHz ~ 3.6 GHz (30 kHz usable)	100 kHz ~ 7.5 GHz (30 kHz usable)
Frequency resolution	1 Hz	
Source Type	CW，CW Offset	
Power		
Output level	-40 dBm ~ 0 dBm	
Output level resolution	1 dB	
Output flatness	±2 dB (nom.)	
Normalization Trace	Ref A/B/C/D-> Ref trace	
VSWR	< 2 (nom.)	
Connector and Impendence	N-type female, 50 Ω	
Average safe reverse power	Total 27 dBm (0.5 W)	
Maximum safe reverse level	±50 V_{DC}	

Advanced Measurement Kit (SHA860-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	

Real-Time Spectrum Analysis (SHA860-RTA)

Frequency and Time			
Real-Time Bandwidth	40 MHz		
	110 MHz (Option SHA860-B1A)		
100% POI Minimum Signal Duration	Full Span, Kaiser Window, Frequency Mask Triggering at full amplitude accuracy		
	3.51 μs		
Display mode and Acq time	Density on		30 ms ~ 40 s
	Density off		100 us ~ 40 s
Min Analysis Bandwidth	500 Hz		
MAX Sample rate	140.98 MHz		
FFT per second	300 000(110 MHz analysis BW)		
Marker	8		
Window	Kaiser(Default), Hanning, Flattop, Gaussian, Blackman-Harris, Rectangular		
RBW	Any SPAN, six RBW for every window (only one for Rectangular), default min RBW. Typical RBW for Kaiser：		
	Span	RBW min	RBW MAX
	110 MHz	276.88 kHz	9.1369 MHz
	40 MHz	100.68 kHz	3.3225 MHz
	20 MHz	50.34 kHz	1.6612 MHz
	10 MHz	25.17 kHz	830.62 kHz
	1 MHz	2.52 kHz	83.06 kHz
	100 kHz	251.71 Hz	8.31 kHz
Spectrogram / PvT Maximum stored	125 000 (Loop store)		

Amplitude Accuracy and Range		
Trace	3	
Detector	+Peak, -Peak, Sample, Average	
Spectrum Density Display	0~100% (resolution 0.1%)	
Dynamic range for Spectrogram	200 dB	
Amplitude	Flatness	< 1.0 dB
	Resolution	0.01 dB
	Dynamic range	< 60 dB (typ.)
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), Cold, Gray	

Different RBW and span, 100% POI (μs)						
Analysis BW	RBW1	RBW2	RBW3	RBW4	RBW5	RBW6
110 MHz	10.54	6.91	5.10	4.19	3.74	3.51
40 MHz	23.26	13.27	8.28	5.78	4.53	3.91
20 MHz	43.23	23.26	13.27	8.28	5.78	4.53
10 MHz	83.18	43.23	23.26	13.27	8.28	5.78
1 MHz	803.28	403.78	203.03	103.16	53.22	28.25

Different window length for RBW						
Length\Type	1024	512	256	128	64	32
Kaiser(Beta=12)	397.2904	198.4511	99.0314	49.3216	24.4666	12.0391
Hanning	532.1465	265.8132	132.6465	66.0632	32.7715	16.1257
Flattop	211.7147	105.7535	52.7729	26.2825	13.0374	6.4148
Gaussian(alpha=3.5)	403.8598	201.7349	100.6724	50.1411	24.8753	12.2422
Blackman-Harris	398.2432	198.9270	99.2689	49.4399	24.5254	12.0681
Rectangular	799	399.5	199.75	99.875	49.9375	24.9688

5G NR OTA Measurement (SHA860-NR)

General Measurement	
Frequency Setup	Center Frequency, Phase Compensation(Auto/Manual), SSB Offset, Band Configuration (Manual, Global All or selectable Band #), Absolute Radio Frequency Channel Number (ARFCN), Global Synchronization Raster Channel (GSCN))
Measurement Setup	Subcarrier Spacing (15 kHz, 30 kHz), SSB Case (Case A, Case B, Case C), Channel Bandwidth (5 MHz to 30 MHz in steps of 5 MHz; 30 MHz above in steps of 10 MHz)
Status Indicators	Sync and Demod Status Indicators
Auto SSB Detect	Searches 3GPP defined GSCN raster
Sweep	Single/Continuous, Restart
Amplitude	Attenuator (0 dB to 50 dB), Preamplifier (On/Off)
Input Signal Range	-76 dBm ~ +10 dBm

5GNR Single PCI	
Single-Beam Measurements	Physical Cell ID (PCI), Sector ID, Cell Group, Frequency Error, Time Offset (μs), SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), SS-RSSI (dB), Block Measurements (PSS, SSS, PBCH, PBCH-DMRS), Average EVM, Peak EVM (@subcarrier/symbol), Power (dBm)
Multi-Beam Measurements	PCI, Sector ID, Cell Group, Frequency Error, Time Offset (μs), Histogram of SS-RSRP, SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), SS-RSSI (dB)
Views	Multi-Beam (up to 8), Single Beam
Cell ID Configuration	Auto/Manual (0 to 1008)
RSRP Accuracy	± 1.0 dB typical
Residual EVM (rms)	2.0% typical
Frequency Error	< ± 10Hz + time base error，typical (FR1, Channel BW ≤ 50 MHz) < ± 20Hz + time base error，typical (FR1, Channel BW > 50 MHz)

5GNR Multi-PCI	
Multi-PCI Measurements	Multiple PCI, Beam Index, GSCN, SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), SS-RSSI (dB), SS-EVM (%)，Time Offset (ms)
View	Multi PCI Beam Scanner (up to 64 beams), Table
Sort By	PCI, GSCN, RSRP, RSRQ, SINR, EVM, Time Offset
Sort Order	Ascending/Descending Order

5GNR Constellation	
PCI Summary	Physical Cell ID (PCI), Sector ID, Cell Group, Frequency Error, Time Offset (μs)
Measurements	Diagram of Constellation, Beam ID, PBCH-DMRS Power, PSS Power, SSS Power, RMS EVM, Peak EVM
Beam Selection	Beam 0 to 7
Cell ID Configuration	Auto/Manual (0 to 1008)
Constellation Configuration	Modulation (QPSK, BPSK, Auto Setting), Data Select (PBCH, DMRS, PSS, SSS, ALL), Reference Points(ON/OFF)

LTE FDD/TDD OTA Measurement (SHA860-LTE)

General Measurement	
Channel Bandwidth	1.4, 3, 5, 10, 15, 20 MHz
Input Signal Range	–76 dBm to +10 dBm
Sweep	Single/Continuous
MIMO Antenna Setup	Antenna (Auto/0/1/2/3)
Amplitude	Attenuation Level, Pre Amplitude

LTE Single PCI	
PCI Measurement	Physical Cell ID, Sector ID, Cell Group, Frequency Error, Time Offset, Cyclic Prefix
Signal Power Measurements	Physical Broadcast Channel (PBCH), Sync Signal (PSS/SSS), Reference Signal (CRS)
Error Vector Magnitude Measurements	Physical Broadcast Channel EVM (PBCH), S ync Signal EVM (PSS/SSS), Reference Signal EVM (CRS)
Demodulation Summary View	PCI, Sector ID, Cell Group, Sync Status, Frequency Error, Time Offset, Power (PSS/SSS/CRS/PBCH), EVM (PSS/SSS/CRS/PBCH), Average EVM, Peak EVM
Time Alignment Error view	PCI, Sector ID, Cell Group, Frequency Error, Time Offset, Cyclic Prefix, Sync Status, TAE between Antennas, Power (PSS/SSS/CRS/PBCH), EVM (PSS/SSS/CRS/PBCH), Average EVM, Peak EVM
Set Up	Antenna(Auto/0/1/2/3), Cyclic Prefix(Auto/Normal/Extend), Duplex Type(FDD/TDD), UL/DL Config(TDD Only)

LTE Multi PCI	
Measurement	Multiple Physical Cell IDs, PSS/SSS Signal Power, RSRP, RSRQ, SINR, EVM, Peak EVM, Frequency Error (Hz and PPM), Dominance (dB)
Graph Displays	PCI, SINR, RSRP, RSRQ, SSS Power, RMS EVM, Peak EVM, Frequency Error(HZ or PPM), Dominance (dB)
Set Up	Antenna(Auto/0/1/2/3), Cyclic Prefix(Auto/Normal/Extend), Duplex Type(FDD/TDD), UL/DL Config(TDD Only)

LTE Constellation	
Measurement	PCI, Sector ID, Cell Group, Frequency Error, Time Offset, Cyclic Prefix, Sync Status, Constellation (PBCH/CRS/PSS/SSS)
Power Measurement	CRS Power, PSS Power, SSS power, RMS EVM (%), Peak EV
Set Up	Antenna(Auto/0/1/2/3), Cyclic Prefix(Auto/Normal/Extend), Duplex Type(FDD/TDD), UL/DL Config(TDD Only), Data Select (PBCH/CRS/PSS/SSS), Modulation (QPSK), Reference (On/Off)

Outdoor/Indoor Map (SHA860-MAP)

General Measurement	
Type	Indoor Map：PNG, JPEG
	Outdoor Map：Google Tile(Download from EasyMap)
Layer	Indoor Map：None
	Outdoor Map：Tile layer 1-19
Data	Indoor Map：kdata recorder and playback
	Outdoor Map：kml recorder and playback

GPSA Measurement	
Channel Power	

5GNR Measurement	
PCI Summary	PCI, Sector, Group
	Frequency error：Hz, ppm
	Time error：ms
RSRP	dBm
RSRQ	dB
SINR	dB
Channel Summary	PBCH, PBCH-DMRS, PSS, SSS
	EVM, Peak EVM
	Subcarrier and symbol
	Power

Pulse Profile Analysis (SHA860-PU)

Measurement	
Trace Points	201~10001，default to 1001
Trace Function	Clear/Write, Max Hold, Min Hold, Average
Trace Number	6
Detector	Positive Peak, Negative Peak, Sample, Average, Normal
Power Measurement	Trace Average (average of all the points in the trace), Peak Power, Wave Average (average of all the points within all complete periods in the trace), Trace Average–Wave Average, Pulse Average
Pulse Characteristic	Pulse Duration, Pulse Center, Pulse Period, Pulse Off Time (Positive Pulse Only), Duty Factor, Rise Time, Fall Time, Pre-Trans-Overshoot, Pre-Trans-Undershoot, Post-Trans-Overshoot, Post-Trans-Undershoot

IQ Data Acquisition (SHA860-IQA)

Measurement	
Sweep Mode	Single、Continuous
Acquisition Setup	Acq Time、Sample Rate、Save(.txt)、Storage Device(Internal/USB)
Maximum Sample Rate	300 MHz
Maximum Bandwidth	110 MHz
Bit Resolution	16-bit
Data Sample Size	I=Q=2Byte
Storage Depth	1 GB
Maximum Sample Length	250 MB (1GB/4Byte)
Sample Time Length	Sample Length / Sample Rate

Analog Modulation Analysis (SHA860-AMA)

Common Parameter		
	SHA861A	SHA862A
Carrier Frequency Range	2 MHz ~ 3.6 GHz	2 MHz ~ 7.5 GHz
Carrier Power Accuracy	±2 dB (nom.)	
Carrier Power Range	-30 dBm to +20 dBm (nom.)	

Amplitude Modulation, 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.)	
Frequency Modulation, FM		
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
Frequency deviation	1 kHz to 400 kHz	
Accuracy	±4% (nom.)	
Phase Modulation, PM(φM)		
Modulation rate range	50 Hz~50 kHz	
Accuracy	1 Hz(nom.)	Modulation rate < 1 kHz
	< 0.1% modulation rate (nom.)	Modulation rate ≥ 1 kHz
Phase deviation	0.2~100 rad	
Accuracy	±4%(nom.)	

Digital Modulation Analysis (SHA860-DMA)

Common Parameter		
	SHA861A	SHA862A
Frequency Range	2 MHz ~ 3.6 GHz	2 MHz ~ 7.5 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; APSK: 16APSK, 32APSK; DPSK: DBPSK, DQPSK, D8PSK, π/4-DQPSK, π/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 5 Msps, Symbol Rate* Points/Symbol ≤20 Msps
Trigger Holdoff	500 ms
Burst	Burst power sync, BERT
Filter	
Meas/Ref Filter	Nyquist, Squrt 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

EMI Measurement (SHA860-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, 1 MHz (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

Cable and Antenna Test (SHA860-CAT)

Measurement		
	SHA861A	SHA862A
Frequency Range	100 kHz~3.6 GHz (30 kHz usable)	100 kHz~7.5 GHz (30 kHz usable)
Sweep Points	101~10001, default 1001	
Port1 Stimulus Power	-40 dBm ~ 0 dBm (nom.)	
Maximum Distance (meters)	(Sweep Points - 1) x Velocity Factor x Light of Speed (m/s) / (2* (Stop Frequency - Start Frequency (Hz)))	
Resolution (meters)	Maximum Distance / Sweep Points	
Calibration	Open Response，Short Response，Response Through，Full 1-Port (OSL)	
Velocity Factor	0.1~1	
Cable Loss	-10 dB/m ~ 100 dB/m	
Trace	Mem, Math, Hold, Display	
Meas Type	DTF, Return Loss, VSWR, Cable Loss(1-Port), Insertion Loss(2-Port), TDR, DTF & TDR, DTF & Return Loss, TDR & Return Loss	
Distance to Fault (DTF)	Locate problems or faults in a length of cable or transmission line	
	Format: Log Mag(dB), VSWR, Lin Mag Distance Unit: Meters, Feet Window Type: Rectangular, Hamming	
Time Domain Reflectometry (TDR)	Locate problems and identify the type of problem in a length of cable or transmission line.	
	Format: Impedance(ohm), linear rho Distance Unit: as DTF Stimulus Type: Impulse, Step Frequency Type: Low-pass Window Type: Kaiser Kaiser β: 0~13 Time Gate Type: Band Pass, Notch Time Gate Shape: Normal, Maximum, Wide, Minimum Time Gate Range: Start Distance ~ Stop Distance	
Cable Loss(1-Port)	Measure the accumulated losses throughout the length of the cable	
Insertion Loss(2-Port)	Measure the loss through a DUT or cable over a specified frequency range	

Vector Network Analyzer (SHA860-VNA)

Stimulus and Measurement			
	SHA861A		SHA862A
Frequency Range	100 kHz~3.6 GHz(30 kHz usable)		100 kHz~7.5 GHz(30 kHz usable)
Measurement	S11, S21		
IFBW	100 Hz，300 Hz，1 kHz，3 kHz，10 kHz		
Port1 Stimulus Power	-40 dBm ~ 0 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	101~10001, default 1001		
Trace	4 traces, Mem, Math, Hold, Overlay		
Marker	(6+Ref)* 4 traces		

Calibration				
Directivity of Calibration		F504MS, Log mag, Average=100, >50MHz		
		> 40 dB (nom.)		
Dynamic Range		S21, IFBW=10 kHz, Port1 level=0 dBm, Log Mag, Average=100		
	100 kHz ~ 1 MHz	100 dB, 108 dB (typ.)		100 dB, 108 dB (typ.)
	1 MHz ~ 1.5 GHz	108 dB, 114 dB (typ.)		108 dB, 114 dB (typ.)
	1.5 GHz ~ 3.6 GHz	106 dB, 112 dB (typ.)		106 dB, 112 dB (typ.)
	3.6 GHz ~ 6.5 GHz			102 dB, 109 dB (typ.)
	6.5 GHz ~ 7.5 GHz			100 dB, 107 dB (typ.)
Reflection trace noise (IFBW=10 kHz)		frequency	amplitude(dB rms)	phase(deg rms)
		100 kHz~3.5 GHz	0.02	0.3
		3.5 GHz~6.5 GHz	0.03	0.5
Transmission trace Noise (IFBW=10 kHz)		frequency	amplitude(dB rms)	phase(deg rms)
		100 kHz~3.5 GHz	0.015	0.18
		3.5 GHz~7.5 GHz	0.015	0.40
Calibration Type		Short Response		
		Open Response		
		Full 1-Port(OSL)		
		Response Through		
		Enhanced Response		
Port Extensions		Port 1, Port 2, Auto Open Port 1		
System Z0 (Default)		50 Ω		
Velocity Factor		0.1~1		

Inputs and Outputs

Front Panel	
RF input, Port 2	N-type female, 50 Ω (nom.)
Source, Port 1	N-type female, 50 Ω (nom.)
USB Host	USB-A plug, version 2.0
Ear Phone Jack	3.5 mm
USB Device	USB-C plug, version 2.0
LAN	LAN (VXI-11), 10/100 Base, RJ-45
GPS Receiver (SHA860-GPS)	SMA(F), 3.3V, 50Ω(nom.), Location, Sync, Timing
Bias out (SHA860-BIAS)	SMB(F), 12V-32V, 0.1V step
10 MHz reference input	BNC-type female, 50 Ω, 10 MHz, -5 to +10 dBm (nom.)
External trigger input	BNC-type female, 1 kΩ, 5V TTL level

Remote Control	
Communication Interface	LAN, USB-TMC,GPIB (USB-GPIB adaptor)
Remote Control Capability	SCPI / Labview / IVI based on USB-TMC / VXI-11 / GPIB / Socket / Telnet NI-MAX Web Browser (HTML 5 Supported)

General Specification

Structure	
Dimensions	310 mm × 215 mm × 78.5 mm (W×H×D)
Weight	Net: 3.20 kg (7.0 lb)
Display	TFT LCD, 800 × 600, 8.4 inch multi-touch screen
Storage	Internal (Flash) 3.2 GByte, external (USB storage device) 32 GByte
Working Environment	
Source	AC voltage range: 100-240 V, 50/60 Hz or 100-120 V, 400 Hz;
Power consumption	27 W (typ.)
Temperature	Working temperature: 0 °C to 50 °C, Working while charging temperature: 0 °C to 45 °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 (10000 feet)
Calibration cycle	1 year

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
Safety	
CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11 CAN/CSA-C22.2 No. 61010-2-030:2018 UL 61010-1:2012/R:2018-11 UL 61010-2-030:2018	
RoHS	
2011/65/EU	

Ordering Information

Product	Description	Order Number
Product Code	Spectrum Analyzer 9 kHz~3.6 GHz, BW 40MHz	SHA861A
	Spectrum Analyzer 9 kHz~7.5 GHz, BW 40MHz	SHA862A
Standard Accessories	Quick Start, USB type-C cable, Power cord, AC-DC adapter, Rechargeable lithium battery, Portable bag	
Options	SHA861A to SHA862A	SHA860-F2
	Analysis Bandwidth 110 MHz	SHA860-B1A
	Advanced Measurement Kit	SHA860-AMK
	EMI Measurement	SHA860-EMI
	5G NR OTA Measurement	SHA860-NR
	LTE TDD/FDD OTA Measurement	SHA860-LTE
	Real-Time Spectrum Analysis	SHA860-RTA
	IQ Data Acquisition	SHA860-IQA
	Pulse Profile Analysis	SHA860-PU
	Digital Modulation Analysis	SHA860-DMA
	Analog Modulation Analysis	SHA860-AMA
	Source	SHA860-SOR
	Cable and Antenna Test	SHA860-CAT
	Vector Network Analysis	SHA860-VNA
	Bias Out	SHA860-BIAS
	GPS Receiver	SHA860-GPS
	Outdoor/Indoor Map	SHA860-MAP
	Outdoor/Indoor Map Tile Download PC Software	EasyMap
General Accessories	Rechargeable lithium battery, 10.8 V	10V8-BAT
	AC-DC adapter, 12 V, 4 A	12V-AP-4A
	Portable bag	BAG-H2
	GPS antenna, SMA(M), 1000 mm	ANT-GPS1
	Directional Antenna Suit: Antennas (10 MHz~200 MHz, 200 MHz~500 MHz,500 MHz~8 GHz), Handler with preamplifier (10 dB, 9 kHz~8 GHz)	ANT-DA1
	Near field probe kit: H-field probes (20 mm,10 mm,5 mm), E-field probe (5 mm), 300 kHz~3 GHz	SRF5030T
	Utility Kit: N(M)-SMA(M) cable (6 GHz), N(M)-N(M) cable (6 GHz), N(M)-BNC(F) adaptor x2, N(M)-SMA(F) adaptor x2, 10 dB 1W attenuator	UKitSSA3X
	N(M)-BNC(M) cable, DC~2 GHz, 700 mm	N-BNC-2L
	N(M)-SMA(M) cable, DC~6 GHz, 700 mm	N-SMA-6L
	N(M)-N(M) cable, DC~6 GHz, 700 mm	N-N-6L
	N(M)-N(M) cable, DC~18 GHz, 1000 mm	N-N-18L
	N(M)-SMA(M) cable, DC~18 GHz, 1000 mm	N-SMA-18L

Product	Description	Order Number
	SMA(M)-SMA(M) cable, DC~18 GHz, 1000 mm	SMA-SMA-18L
CAT&VNA Accessories	Integrated N type Calibration Kit, Male, DC~9 GHz,50 Ω	Y504MS
	Integrated N type Calibration Kit, Female, DC~9 GHz,50 Ω	Y504FS
	Integrated 3.5mm type Calibration Kit, Male, DC~26.5 GHz, 50 Ω	Y606MS
	Integrated 3.5mm type Calibration Kit, Female, DC~26.5 GHz, 50 Ω	Y606FS
	N type Standard Calibration Kit, Male & Female, DC~9 GHz, 50 Ω	F504TS
	3.5mm type Standard Calibration Kit, Male & Female, DC~9 GHz, 50 Ω	F604TS
	N type Economic Calibration Kit, Male, DC~4.5 GHz, 50 Ω	F503ME
	N type Economic Calibration Kit, Female, DC~4.5 GHz, 50 Ω	F503FE
	N type Standard Calibration Kit, Male, DC~9 GHz, 50 Ω	F504MS
	N type Standard Calibration Kit, Female, DC~9 GHz, 50 Ω	F504FS
	3.5mm type Economic Calibration Kit, Male, DC~4.5 GHz, 50 Ω	F603ME
	3.5mm type Economic Calibration Kit, Female, DC~4.5 GHz, 50 Ω	F603FE
	3.5mm type Standard Calibration Kit, Male, DC~9 GHz, 50 Ω	F604MS
	3.5mm type Standard Calibration Kit, Female, DC~9 GHz, 50 Ω	F604FS

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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