# SHA860A Handheld Signal Analyzer

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Data Sheet

EN02C




SIGLENT TECHNOLOGIES CO., LTD.

## Feature and Benefits

- Frequency Range: 9 kHz~3.6 GHz /7.5 GHz/14 GHz /20 GHz /26.5 GHz, Usable to 5 kHz

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

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

  Analysis Bandwidth: 40 MHz, upgradeable to 110 MHz
- 5G NR OTA Measurement, multi-PCI and multi-beam analysis
- LTE FDD and TDD OTA Measurement, multi-PCI analysis
- General Demodulation, including AM/FM/PM and ASK/FSK/PSK/APSK/MSK/QAM
- Real-Time Spectrum Analysis, 3.51 μs minimum signal duration with100% POI in 110 MHz BW
- IQ Data Acquisition in 110 MHz BW
- Channel Power, Occupied Bandwidth, Adjacent Channel Power, SHI and TOI etc.
- Trace Recording/Playback, Audio Tune & Listening
- Pulse Profile Measurements
- GNSS location, Indoor and Outdoor Map for Coverage Mapping and Interference Analysis
- Field Strength (EMF) Measurements and EMI Measurements
- USB Power Sensor Measurements
- Independent Source up to 26.5 GHz
- Vector Network Analyzer, 1-Path 2-Ports S11 and S21 Network Analysis

  Frequency Range, 100kHz~26.5 GHz, Usable to 30 kHz

  S11 Directionality 40 dB, S21 Dynamic Range 114 dB under 7.5 GHz
- Cable and Antenna Analysis, Distance-to-Fault and Time Domain Analysis
- TTA Measurement, bias out 10~32V DC
- Chargeable Battery working time 2.5 hours, 3.2 kg net weight
- 8.4 Inch Multi-Touch Screen, mouse and keyboard supported

# Design Feature

## 5G NR OTA Measurement



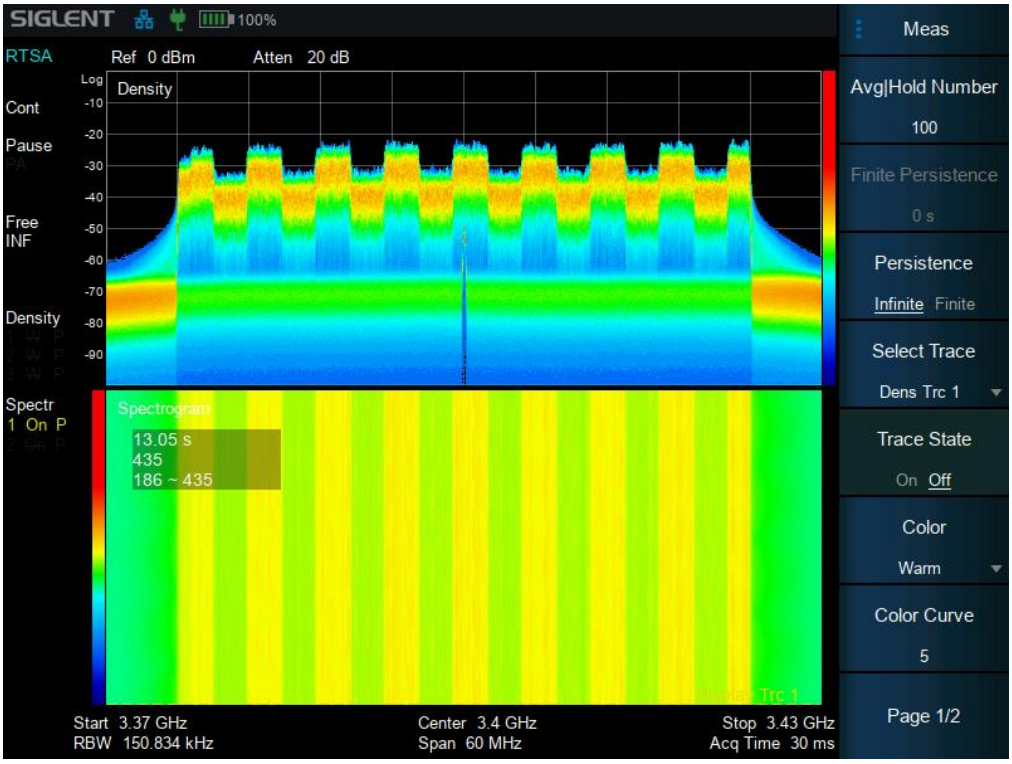

## 5G NR multi-PCI and multi-beam analysis



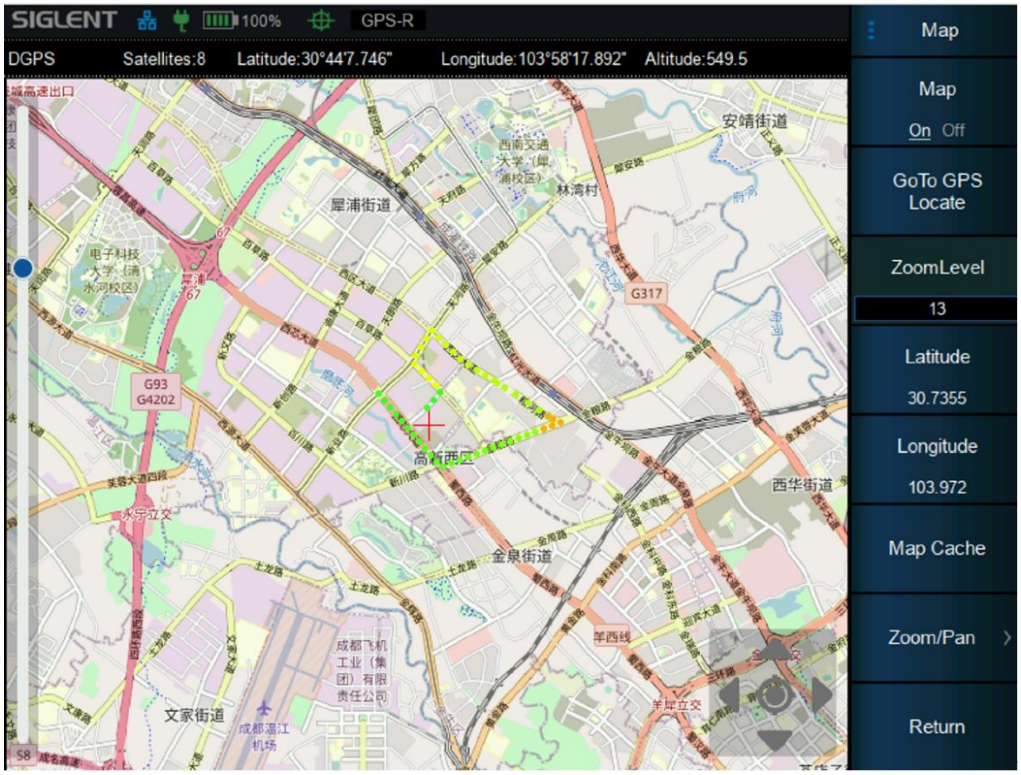
## 5G NR Constellation



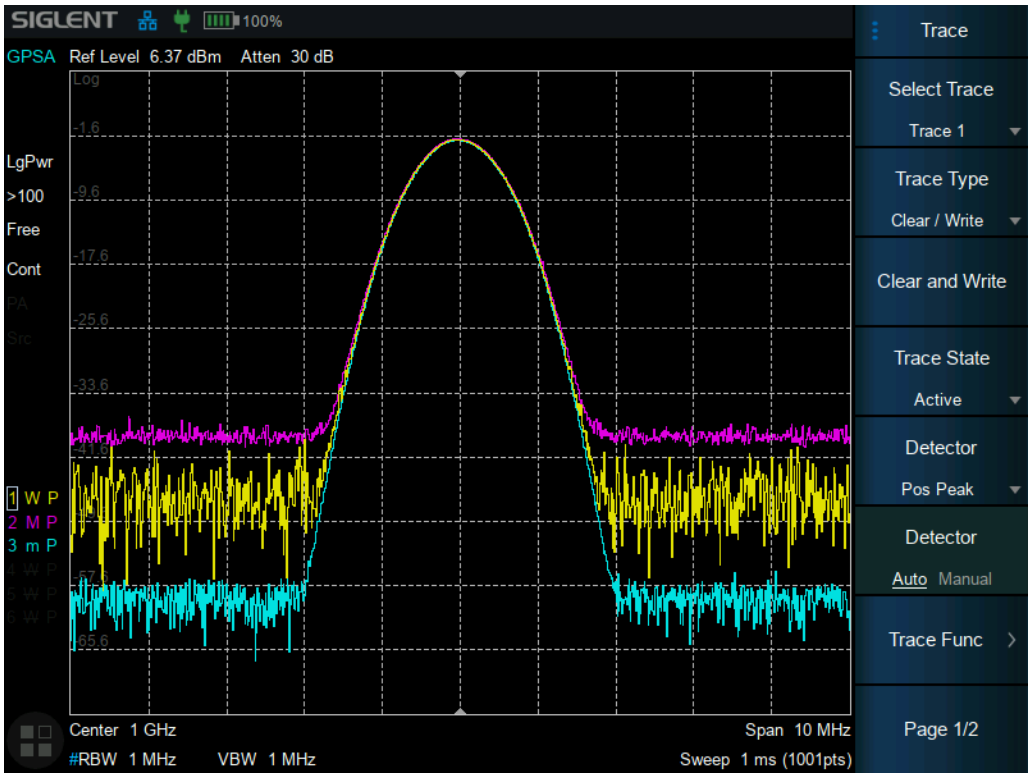

## Real-Time Spectrum Analysis



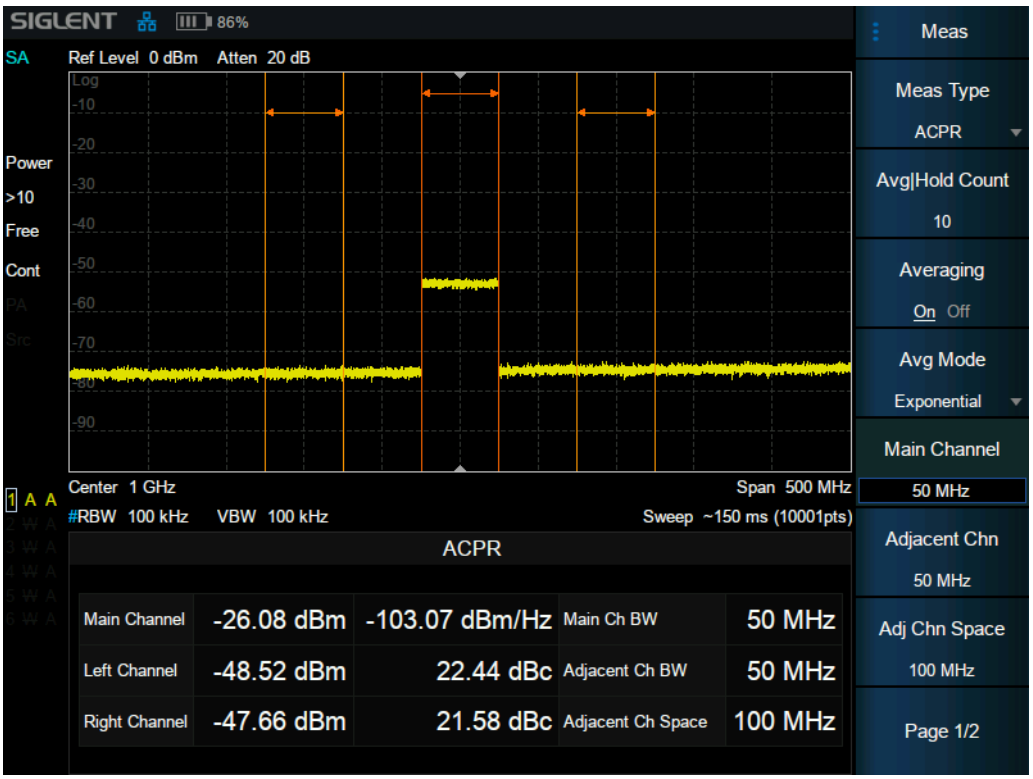
## Indoor and Outdoor mapping, GPS logging



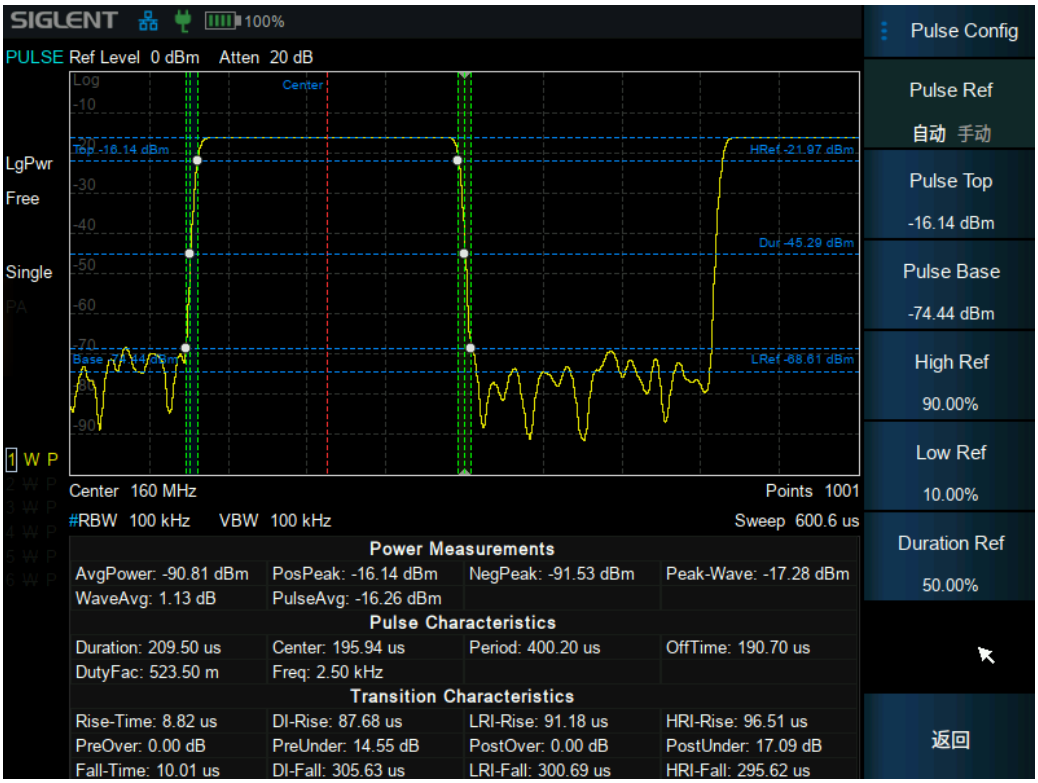

## 8.4 inch multi-touch screen and full keyboard control



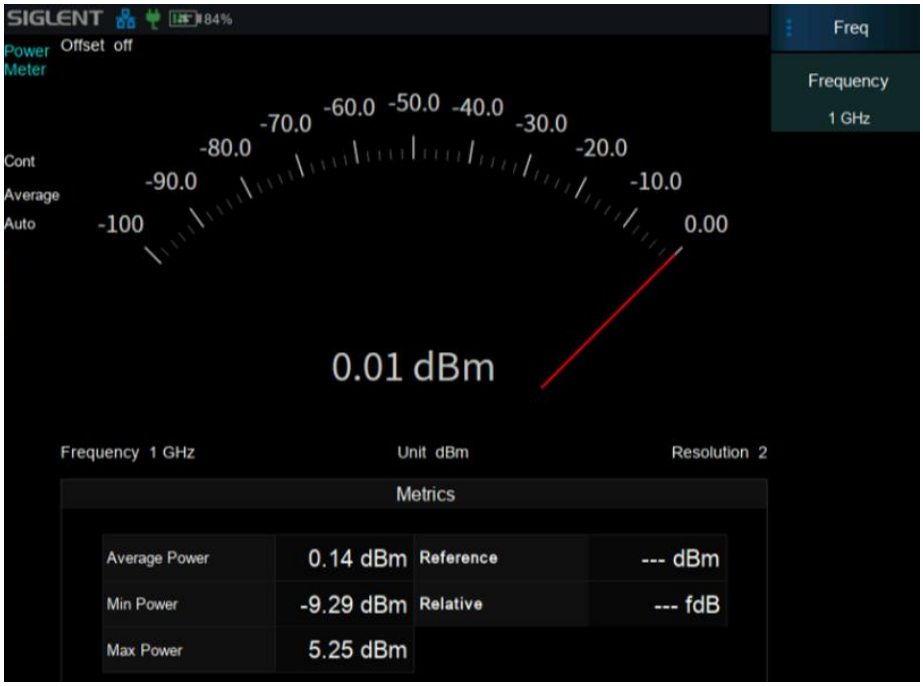
## Channel Power and ACPR measurement




## Pulse Profile Measurements



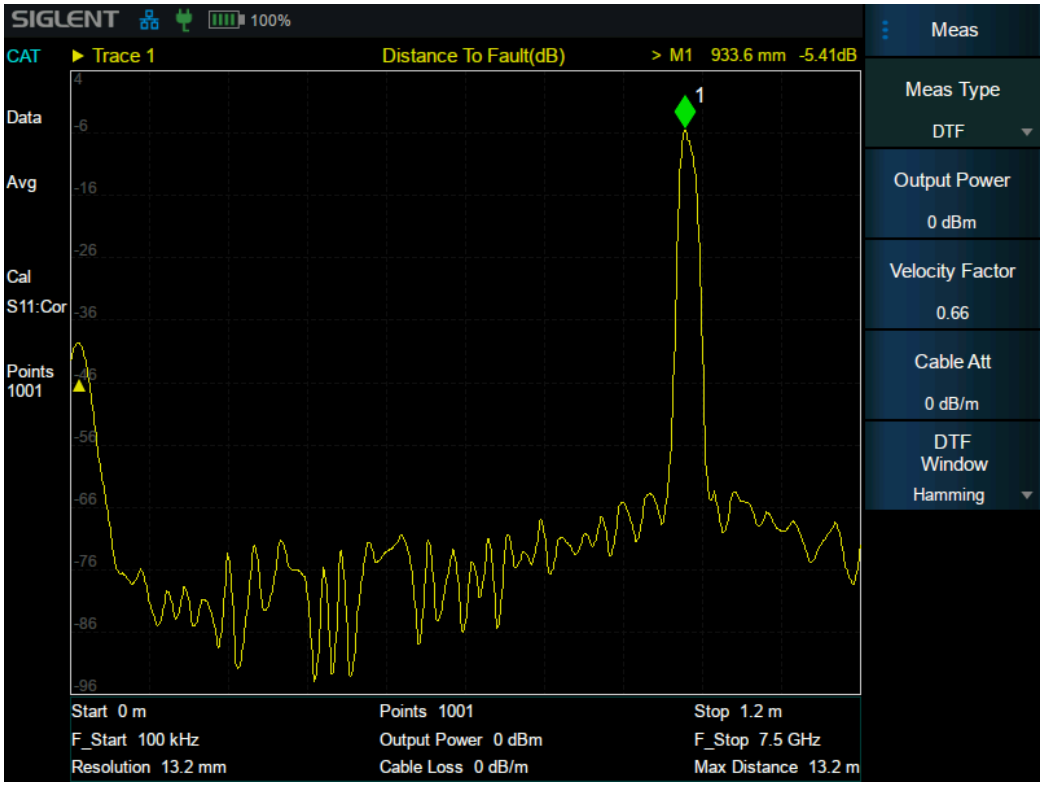
## Power Meter



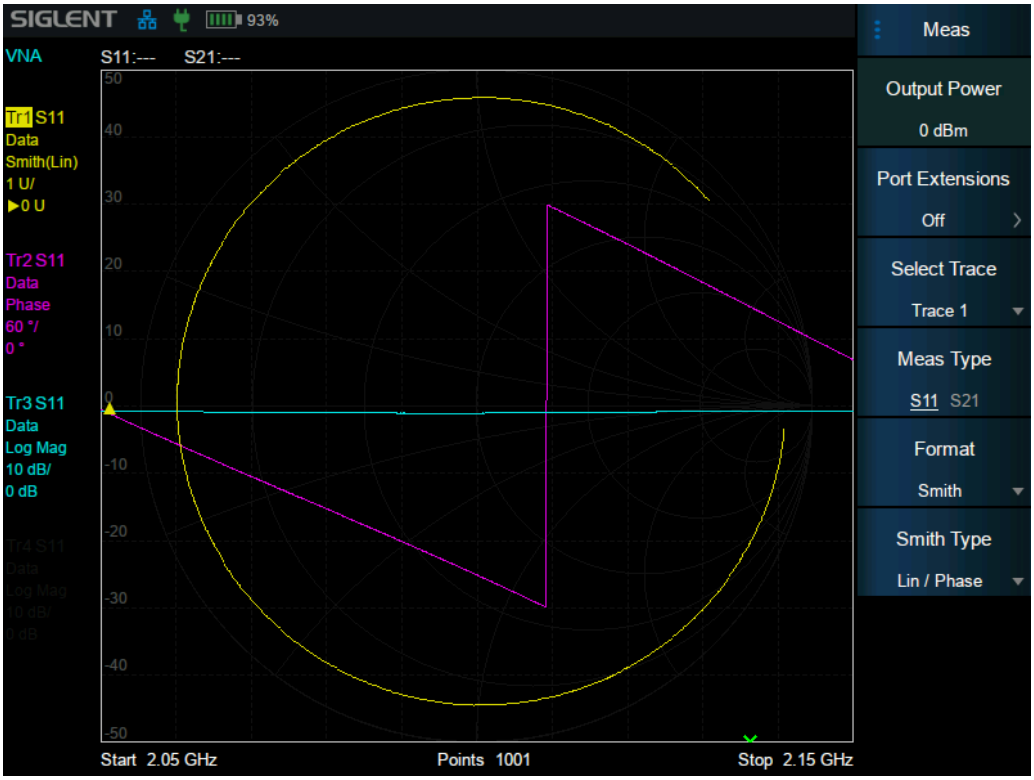

## Interference analysis with directional antenna



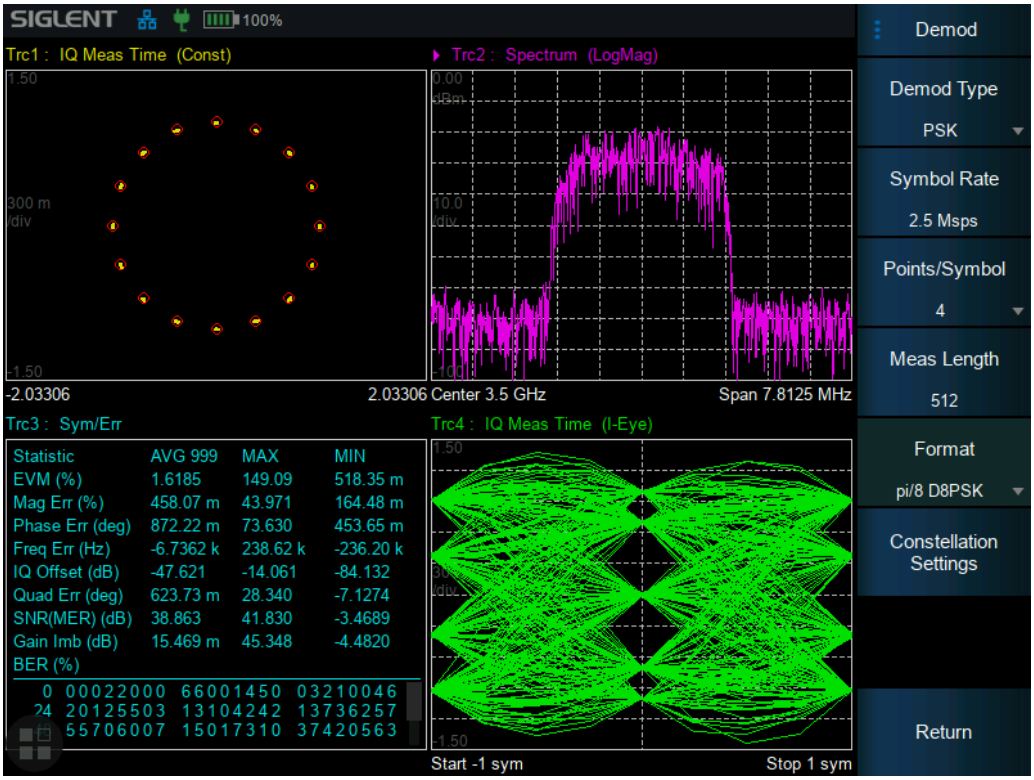
Cable and Antenna Test based on Timing Domain Analysis




Vector Network Analysis S11 and S21 measurement



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



## Accessories

Utility Kit



EMI Near Field Probe Kit



50Ω Calibration Kit



GPS Antenna




Portable Bag



Directional Antenna Kit



# Definitions

Specifications are valid under the following conditions: the instrument is within the calibration period, operates over the 23 ℃ ± 5 ℃ temperature range, and has been powered on and warmed up for at least 20 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

### Specification (spec)

Specifications are warranted performance to meet published specifications when operating at room temperature (approximately 23 ℃), unless otherwise noted.

### Typical

Describes additional product performance information not covered by the product warranty. It is performance beyond specifications that 80% of the units exhibit with a 90% confidence level over the temperature range 23 ℃ ± 5 ℃, unless otherwise noted. Typical performance is not warranted and does not include measurement uncertainty.

### Nominal

A general, descriptive term or design parameter. It is not tested, and not covered by the product warranty. The product must be within its calibration cycle.

# Spectrum Analyzer

## Frequency and Time Characteristic

| Frequency | | |
|---|---|---|
| Frequency range | SHA861A | SHA862A |
| | 9 kHz~3.6 GHz (5 kHz usable) | 9 kHz~7.5 GHz (5 kHz usable) |
| | SHA863A | SHA864A |
| | 9 kHz~14 GHz (5 kHz usable) | 9 kHz~20 GHz (5 kHz usable) |
| | SHA865A | |
| | 9 kHz~26.5 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, 0℃~50℃ |
| Frequency aging rate | <0.5 ppm/first year, 3.0 ppm/20 年 |
| 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 | Noise marker, N dB BW, Frequency Counter |
| Frequency counter resolution | 0.1 Hz |
| Frequency counter uncertainty | ± [frequency indication × reference frequency uncertainty +Frequency counter resolution] |

| Bandwidth | |
|---|---|
| Resolution Bandwidth (-3dB) | 1 Hz ~ 10 MHz, 1-3-10 sequence |
| Resolution filter shape factor | < 4.8 : 1 (60 dB:3 dB) , Quasi-Gaussian |
| RBW uncertainty | < 5% |
| Video bandwidth (-3dB) | 1 Hz ~ 10 MHz, 1-3-10 sequence |
| VBW uncertainty | < 5% |

| Sweep and Trigger | | | |
|---|---|---|---|
| Sweep time | | 1 ms to 5000 s | 1 ms to 7500 s |
| RBW in sweep mode | Sweep | 3 kHz ~ 10 MHz | |
| | FFT | 1 Hz ~ 10 kHz | |
| Sweep points | | 201~10001 | |
| Sweep rule | | Single, Continuous | |
| Trigger source | | Free run, 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<br>DANL to +20 dBm, 1 MHz ~ 7.5 GHz, Preamp off<br>DANL to +20 dBm, 7.5 GHz ~ 26.5 GHz, Preamp off |
| Reference level | -200 dBm to +30 dBm |
| Preamplifier | 25 dB(nom.), SHA861A, SHA862A<br>20 dB(nom.), SHA863A, SHA864A, SHA865A |
| Input attenuator range | 0 ~ 50 dB, in 1 dB steps, SHA861A, SHA862A<br>0 ~ 50 dB, in 2 dB steps, SHA863A, SHA864A, SHA865A |
| Maximum input DC voltage | +/- 50 VDC |
| Maximum input average CW power | 30 dBm, SHA861A, SHA862A<br>20 dBm, SHA863A, SHA864A, SHA865A<br>fc≥10 MHz, >20 dB attenuation, preamp off, in 3 minutes |

| Level Display Range | |
|---|---|
| Logarithmic level axis | 1 dB to 200 dB, 10 divisions |
| 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 |
| Units | dBm/m2, dBw/m2, dBV/m, dBmV/m, dBpV/m, V/m, W/m2, W/cm2, A/m |

| Displayed Average Noise Level (DANL) | | | |
|---|---|---|---|
| 20 °C to 30 °C, 0 dB attenuation, sample detector, trace average > 50, normalized to 1 Hz RBW, Source off | | | |
| | | SHA861A | SHA862A |
| 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~1.8 GHz | -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.) |

| | | SHA863A | SHA864A |
|---|---|---|---|
| Preamp off | 100 kHz ~1 MHz | -125 dBm, -136 dBm (typ.) | -125 dBm, -136 dBm (typ.) |
| | 1 MHz~600 MHz | -138 dBm, -144 dBm (typ.) | -138 dBm, -144 dBm (typ.) |
| | 600 MHz~1.8 GHz | -138 dBm, -144 dBm (typ.) | -138 dBm, -144 dBm (typ.) |
| | 1.8 GHz~3.2 GHz | -135 dBm, -141 dBm (typ.) | -135 dBm, -141 dBm (typ.) |
| | 3.2 GHz~4.1 GHz | -135 dBm, -141 dBm (typ.) | -135 dBm, -141 dBm (typ.) |
| | 4.1 GHz~5.0 GHz | -134 dBm, -139 dBm (typ.) | -134 dBm, -139 dBm (typ.) |
| | 5.0 GHz~5.85 GHz | -133 dBm, -138 dBm (typ.) | -133 dBm, -138 dBm (typ.) |
| | 5.85 GHz~6.7 GHz | -132 dBm, -136 dBm (typ.) | -132 dBm, -136 dBm (typ.) |

| | | | |
|---|---|---|---|
| | 6.7 GHz~7.5 GHz | -133 dBm, -138 dBm (typ.) | -133 dBm, -138 dBm (typ.) |
| | 7.5 GHz~9.3 GHz | -132 dBm, -136 dBm (typ.) | -132 dBm, -136 dBm (typ.) |
| | 9.3 GHz~12 GHz | -133 dBm, -137 dBm (typ.) | -133 dBm, -137 dBm (typ.) |
| | 12 GHz~14 GHz | -134 dBm, -139 dBm (typ.) | -134 dBm, -139 dBm (typ.) |
| | 14 GHz~15.3 GHz | | -134 dBm, -139 dBm (typ.) |
| | 15.3 GHz~20 GHz | | -134 dBm, -140 dBm (typ.) |
| Preamp on | 100 kHz ~1 MHz | -125 dBm, -137 dBm (typ.) | -125 dBm, -137 dBm (typ.) |
| | 1 MHz~600 MHz | -157 dBm, -163 dBm (typ.) | -157 dBm, -163 dBm (typ.) |
| | 600 MHz~1.8 GHz | -157 dBm, -163 dBm (typ.) | -157 dBm, -163 dBm (typ.) |
| | 1.8 GHz~3.2 GHz | -155 dBm, -161 dBm (typ.) | -155 dBm, -161 dBm (typ.) |
| | 3.2 GHz~4.1 GHz | -154 dBm, -159 dBm (typ.) | -154 dBm, -159 dBm (typ.) |
| | 4.1 GHz~5.0 GHz | -154 dBm, -159 dBm (typ.) | -154 dBm, -159 dBm (typ.) |
| | 5.0 GHz~5.85 GHz | -153 dBm, -157 dBm (typ.) | -153 dBm, -157 dBm (typ.) |
| | 5.85 GHz~6.7 GHz | -152 dBm, -156 dBm (typ.) | -152 dBm, -156 dBm (typ.) |
| | 6.7 GHz~7.5 GHz | -154 dBm, -159 dBm (typ.) | -154 dBm, -159 dBm (typ.) |
| | 7.5 GHz~9.3 GHz | -153 dBm, -157 dBm (typ.) | -153 dBm, -157 dBm (typ.) |
| | 9.3 GHz~12 GHz | -153 dBm, -157 dBm (typ.) | -153 dBm, -157 dBm (typ.) |
| | 12 GHz~14 GHz | -153 dBm, -158 dBm (typ.) | -153 dBm, -158 dBm (typ.) |
| | 14 GHz~15.3 GHz | | -153 dBm, -158 dBm (typ.) |
| | 15.3 GHz~20 GHz | | -153 dBm, -158 dBm (typ.) |

| | | SHA865A |
|---|---|---|
| Preamp off | 100 kHz ~1 MHz | -125 dBm, -136 dBm (typ.) |
| | 1 MHz~600 MHz | -138 dBm, -144 dBm (typ.) |
| | 600 MHz~1.8 GHz | -138 dBm, -144 dBm (typ.) |
| | 1.8 GHz~3.2 GHz | -135 dBm, -141 dBm (typ.) |
| | 3.2 GHz~4.1 GHz | -135 dBm, -141 dBm (typ.) |
| | 4.1 GHz~5.0 GHz | -134 dBm, -139 dBm (typ.) |
| | 5.0 GHz~5.85 GHz | -133 dBm, -138 dBm (typ.) |
| | 5.85 GHz~6.7 GHz | -132 dBm, -136 dBm (typ.) |
| | 6.7 GHz~7.5 GHz | -133 dBm, -138 dBm (typ.) |
| | 7.5 GHz~9.3 GHz | -132 dBm, -136 dBm (typ.) |
| | 9.3 GHz~12 GHz | -133 dBm, -137 dBm (typ.) |
| | 12 GHz~14 GHz | -134 dBm, -139 dBm (typ.) |

| | | |
|---|---|---|
| | 14 GHz~15.3 GHz | -134 dBm, -139 dBm (typ.) |
| | 15.3 GHz~20 GHz | -134 dBm, -140 dBm (typ.) |
| | 20 GHz~22.6 GHz | -133 dBm, -139 dBm (typ.) |
| | 22.6 GHz~26.5 GHz | -128 dBm, -134 dBm (typ.) |
| Preamp on | 100 kHz ~1 MHz | -125 dBm, -137 dBm (typ.) |
| | 1 MHz~600 MHz | -157 dBm, -163 dBm (typ.) |
| | 600 MHz~1.8 GHz | -157 dBm, -163 dBm (typ.) |
| | 1.8 GHz~3.2 GHz | -155 dBm, -161 dBm (typ.) |
| | 3.2 GHz~4.1 GHz | -154 dBm, -159 dBm (typ.) |
| | 4.1 GHz~5.0 GHz | -154 dBm, -159 dBm (typ.) |
| | 5.0 GHz~5.85 GHz | -153 dBm, -157 dBm (typ.) |
| | 5.85 GHz~6.7 GHz | -152 dBm, -156 dBm (typ.) |
| | 6.7 GHz~7.5 GHz | -154 dBm, -159 dBm (typ.) |
| | 7.5 GHz~9.3 GHz | -153 dBm, -157 dBm (typ.) |
| | 9.3 GHz~12 GHz | -153 dBm, -157 dBm (typ.) |
| | 12 GHz~14 GHz | -153 dBm, -158 dBm (typ.) |
| | 14 GHz~15.3 GHz | -153 dBm, -158 dBm (typ.) |
| | 15.3 GHz~20 GHz | -152 dBm, -158 dBm (typ.) |
| | 20 GHz~22.6 GHz | -150 dBm, -156 dBm (typ.) |
| | 22.6 GHz~26.5 GHz | -146 dBm, -152 dBm (typ.) |

| SSB Phase Noise | |
|---|---|
| Offset | 20 ℃ to 30 ℃, 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℃~30℃, 30%~70% relative humidity, 20 dB attenuation, relative to 50 MHz | | | |
| | | SHA861A | SHA862A |
| Preamp off | 1 MHz~1.8 GHz | ±0.8 dB, ±0.4 dB (typ.) | ±0.8 dB, ±0.4 dB (typ.) |
| | 1.8 GHz~3.65 GHz | ±0.8 dB, ±0.4 dB (typ.) | ±0.8 dB, ±0.4 dB (typ.) |
| | 3.65 GHz~7.5 GHz | | ±0.8 dB, ±0.4 dB (typ.) |
| Preamp on | 1 MHz~1.8 GHz | ±1.2 dB, ±0.6 dB (typ.) | ±1.2 dB, ±0.6 dB (typ.) |
| | 1.8 GHz~3.65 GHz | ±1.2 dB, ±0.6 dB (typ.) | ±1.2 dB, ±0.6 dB (typ.) |
| | 3.65 GHz~7.5 GHz | | ±1.2 dB, ±0.6 dB (typ.) |
| | | SHA863A | SHA864A |
| Preamp off | 1 MHz~1.8 GHz | ±1.0 dB, ±0.6 dB (typ.) | ±1.0 dB, ±0.6 dB (typ.) |
| | 1.8 GHz~3.65 GHz | ±1.0 dB, ±0.6 dB (typ.) | ±1.0 dB, ±0.6 dB (typ.) |
| | 3.65 GHz~7.5 GHz | ±1.0 dB, ±0.6 dB (typ.) | ±1.0 dB, ±0.6 dB (typ.) |
| | 7.5 GHz~14 GHz | ±1.2 dB, ±0.8 dB (typ.) | ±1.2 dB, ±0.8 dB (typ.) |
| | 14 GHz~20 GHz | | ±1.5 dB, ±1.0 dB (typ.) |
| Preamp on | 1 MHz~1.8 GHz | ±1.5 dB, ±1.0 dB (typ.) | ±1.5 dB, ±1.0 dB (typ.) |
| | 1.8 GHz~3.65 GHz | ±1.5 dB, ±1.0 dB (typ.) | ±1.5 dB, ±1.0 dB (typ.) |
| | 3.65 GHz~7.5 GHz | ±1.5 dB, ±1.0 dB (typ.) | ±1.5 dB, ±1.0 dB (typ.) |
| | 7.5 GHz~14 GHz | ±1.8 dB, ±1.2 dB (typ.) | ±1.8 dB, ±1.2 dB (typ.) |
| | 14 GHz~20 GHz | | ±2.0 dB, ±1.5 dB (typ.) |
| | | SHA865A | |
| Preamp off | 1 MHz~1.8 GHz | ±1.0 dB, ±0.6 dB (typ.) | |
| | 1.8 GHz~3.65 GHz | ±1.0 dB, ±0.6 dB (typ.) | |
| | 3.65 GHz~7.5 GHz | ±1.0 dB, ±0.6 dB (typ.) | |
| | 7.5 GHz~14 GHz | ±1.2 dB, ±0.8 dB (typ.) | |
| | 14 GHz~20 GHz | ±1.5 dB, ±1.0 dB (typ.) | |
| | 20 GHz~22.6 GHz | ±1.5 dB, ±1.0 dB (typ.) | |
| | 22.6 GHz~26.5 GHz | ±2.0 dB, ±1.5 dB (typ.) | |
| Preamp on | 1 MHz~1.8 GHz | ±1.5 dB, ±1.0 dB (typ.) | |
| | 1.8 GHz~3.65 GHz | ±1.5 dB, ±1.0 dB (typ.) | |
| | 3.65 GHz~7.5 GHz | ±1.5 dB, ±1.0 dB (typ.) | |

| | | |
|---|---|---|
| | 7.5 GHz~14 GHz | ±1.8 dB, ±1.2 dB (typ.) |
| | 14 GHz~20 GHz | ±2.0 dB, ±1.5 dB (typ.) |
| | 20 GHz~22.6 GHz | ±2.0 dB, ±1.5 dB (typ.) |
| | 22.6 GHz~26.5 GHz | ±2.5 dB, ±2.0 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℃~30℃, fc = 50 MHz, preamp off, relative to 20 dB attenuation, 0~50 dB attenuation | | |
| | | SHA861A, SHA862A | SHA863A, SHA864A, SHA865A |
| | 50MHz | ±0.5 dB | ±0.5 dB |
| | 10 MHz~3.65 GHz | ±0.5 dB (nom.) | ±0.7 dB (nom.) |
| | 3.65 GHz~7.5 GHz | ±0.5 dB (nom.) | ±0.7 dB (nom.) |
| | 7.5 GHz~14 GHz | | ±1.0 dB (nom.) |
| | 14 GHz~26.5 GHz | | ±1.0 dB (nom.) |
| Absolute amplitude accuracy | 20℃~30℃, fc=50 MHz, RBW=1 kHz, VBW=1 kHz, peak detector , 20 dB attenuation, 95% confidence level | | |
| | | SHA861A, SHA862A | SHA863A, SHA864A, SHA865A |
| | Input signal -20 dBm, Preamp off | ±0.4 dB | ±0.6 dB |
| | Input signal -40 dBm, Preamp on | ±0.5 dB | ±0.7 dB |
| RF input VSWR | 10 dB attenuation, fc≥1 MHz | | |
| | 1 MHz~3.65 GHz | 1.7 (nom.) | |
| | 3.65 GHz~7.5 GHz | 1.7 (nom.) | |
| | 7.5 GHz~14 GHz | 1.9 (nom.) | |
| | 14 GHz~22.6 GHz | 1.9 (nom.) | |
| | 22.6 GHz~26.5 GHz | 2.1 (nom.) | |

| Distortion and Spurious Responses | | | |
|---|---|---|---|
| Second harmonic distortion (SHI) | 20℃~30℃, fc≥50 MHz, input signal -20 dBm, 0 dB attenuation, preamp off | | |
| | | SHA861A, SHA862A | SHA863A, SHA864A, SHA865A |
| | 50 MHz~3.2 GHz | -65 dBc / +45 dBm (nom.) | -65 dBc / +45 dBm (nom.) |
| | 3.2 GHz~3.75 GHz | -80 dBc / +60 dBm (nom.) | -65 dBc / +45 dBm (nom.) |
| | 3.75 GHz~7 GHz | | -65 dBc / +45 dBm (nom.) |
| | 7 GHz~13.25 GHz | | -65 dBc / +45 dBm (nom.) |
| Third-order intercept (TOI) | 20℃~30℃, fc≥50 MHz,-20 dBm two tones spaced by 100 kHz, 0 dB attenuation, preamp off | | |
| | | SHA861A, SHA862A | SHA863A, SHA864A, SHA865A |
| | | +9.5 dBm (typ.) | +11 dBm (typ.) |
| 1 dB gain compression | 20℃~30℃, fc≥50MHz, two tones frequency interval ≥10MHz, RBW<1kHz, 0 dB attenuation, preamp off | | |
| | >8 dBm (nom.), SHA861A, SHA862A<br>>5 dBm (nom.), SHA863A, SHA864A, SHA865A | | |
| Residual response | 20℃~30℃, input terminated to 50 Ω, 0 dB attenuation | | |
| | <-90 dBm | | |
| Input related spurious | 20℃~30℃, mixer level = -30 dBm | | |
| | <-65 dBc | | |

## Source SHA860-SOR

| Frequency | | |
|---|---|---|
| Frequency Range | SHA861A | SHA862A |
| | 100 kHz~3.6 GHz (30 kHz usable) | 100 kHz~7.5 GHz (30 kHz usable) |
| | SHA863A | SHA864A |
| | 100 kHz~14 GHz (30 kHz usable) | 100 kHz~20 GHz (30 kHz usable) |
| | SHA865A | |
| | 100 kHz~26.5 GHz (30 kHz usable) | |
| Frequency resolution | 1 Hz | |
| Source Type | CW | |

| Power | |
|---|---|
| Output power level | -40 dBm ~ 0 dBm (typ.) |
| Output resolution | 1 dB |
| Output flatness | ±2 dB (nom.) |
| Normalization Trace | Ref A/B/C/D-> Ref trace |

| | |
|---|---|
| VSWR | < 2 (nom.), SHA861A, SHA862A<br>< 2.2 (nom.), SHA863A, SHA864A, SHA865A |
| Connector | N-type female, 50Ω, SHA861A, SHA862A<br>2.92mm male, 50Ω, SHA863A, SHA864A, SHA865A |
| Average<br>safe reverse power | 27 dBm (0.5 W), SHA861A, SHA862A<br>20 dBm (0.1 W), SHA863A, SHA864A, SHA865A<br>fc≥10 MHz, within 3min |
| Maximum<br>safe reverse level | ±50 $V_{DC}$ |

## Advanced Measurement Kit SHA860-AMK

| **Power Measurement** | |
|---|---|
| Channel Power(CHP) | Channel Power, Power Spectral Density |
| Adjacent Channel Power Ratio(ACPR) | Main channel Power, Left channel power, Right channel power |
| Occupied Bandwidth (OBW) | Occupied Bandwidth, Transmit Frequency Error |
| Time Domain Power (T-Power) | Zero Span Integrated Power |
| Carrier Noise Ratio (CNR) | Carrier Power, Noise Power |

| **Non-Linear Measurement** | |
|---|---|
| Third-Order Intercept | Measure the third-order products based on two tones |
| Harmonics | Max Harmonic number 10 |

| **Spectrum Monitor Measurement** |
|---|
| Spectrogram |

# 5G NR OTA Measurement (SHA860-NR)

| General Measurement | |
|---|---|
| Frequency Setup | Center Frequency, Phase Compensation (Auto/Manual), SSB Offset,<br>Band Configuration (Manual, Global All or selectable Band #),<br>Absolute Radio Frequency Channel Number (ARFCN),<br>Global Synchronization Raster Channel (GSCN) |
| Measurement Setup | Subcarrier Spacing(15 kHz, 30 kHz),<br>SSB Case(Case A, Case B, Case C),<br>Channel Bandwidth (5 MHz~30 MHz,in steps of 5 MHz； 30 MHz~100 MHz,in steps of10 MHz) |
| Auto SSB Detect | Searches 3GPP defined GSCN raster |
| Sweep | Single/Continuous |
| Amplitude | Attenuator (0 dB ~ 50 dB), Preamplifier (On/Off) |

| 5G NR Single PCI | |
|---|---|
| Single-Beam Measurements | Synchronization and Demodulation Indication, Physical Cell ID (PCI), Sector ID,<br>Cell Group, Frequency Error, Time Offset (μs),<br>SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), SS-RSSI (dB),<br>Block Measurements (PSS, SSS, PBCH, PBCH-DMRS)<br>Average EVM, Peak EVM (@subcarrier/symbol), Power (dBm) |
| Multi-Beam Measurements | Synchronization and Demodulation Indication, Physical Cell ID (PCI), Sector ID,<br>Cell Group, Frequency Error, Time Offset (μs),<br>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 (0~1008) |
| RSRP Accuracy | ± 1.0 dB typica |
| Residual EVM (rms) | 2.0% typica below 7.5G |
| Frequency Error | < ± 10 Hz + time base error, typical (FR1, Channel BW ≤ 50 MHz)<br>< ± 20 Hz + time base error, typical (FR1, Channel BW > 50 MHz) |

| 5G NR Multiple PCI | |
|---|---|
| Measurements | Multiple PCI, Beam Index, GSCN,<br>SS-RSRP (dBm), SS-RSRQ (dB), SS-SINR (dB), SS-RSSI (dB),<br>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 |

| 5G NR Constellation | |
|---|---|
| PCI Summary | Synchronization and Demodulation Indication, 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 |
| Configuration | Modulation (QPSK, BPSK, Auto Setting), Data Select (PBCH, DMRS, PSS, SSS, ALL), Reference Points (ON/OFF) |

# LTE OTA Measurement (SHA860-LTE)

| General Measurement | |
|---|---|
| Channel Bandwidth | 1.4, 3, 5, 10, 15, 20 MHz |
| Sweep | Single/Continuous |
| MIMO Antenna Setup | Antenna (Auto/0/1/2/3) |

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

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

| LTE Constellation | |
|---|---|
| Measurement | PCI, Sector ID, Cell Group,<br>Frequency Error, Time Offset,<br>Cyclic Prefix, Sync Status,<br>Constellation (PBCH/CRS/PSS/SSS) |
| Power Measurement | CRS Power, PSS Power, SSS power,<br>RMS EVM, Peak EVM |
| Configuration | Antenna(Auto/0/1/2/3),<br>Cyclic Prefix(Auto/Normal/Extend),<br>Duplex Type(FDD/TDD),<br>UL/DL Config(TDD Only),<br>Data Select (PBCH/CRS/PSS/SSS),<br>Modulation (QPSK),<br>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 |

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

# Real-Time Spectrum Analysis (SHA860-RTA)

| Frequency and Time | | | |
|---|---|---|---|
| Real-Time Analysis 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 Acquisition time | Density on | 30 ms~40 s | |
| | Density off | 100 µs~40 s | |
| Minimum Analysis Bandwidth | 500 Hz | | |
| Maximum Sample rate | 140.98 MHz | | |
| FFT per second | 300 000 (110 MHz analysis bandwidth) | | |
| Marker number | 8 | | |
| Window function | Kaiser (Default) 、Hanning、Flattop、Gaussian、Blackman-Harris、Rectangular | | |
| Resolution Bandwidth (RBW) | Six RBWs are available for every window function (only one for Rectangular) at any span. Default is min RBW. Some typical cases are listed as below when we choose Kaiser. | | |
| | Span | Min RBW | Max RBW |
| | 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 and Dynamic Range | | |
|---|---|---|
| Trace number | 3 | |
| Detector type | +Peak、-Peak、Sample、Average | |
| Spectrum Density Display | 0~100% (resolution 0.1%) | |
| Dynamic range for Spectrogram | 200 dB | |
| Amplitude | Flatness | < 1.0 dB (nom.) |
| | Resolution | 0.01 dB |
| | SFDR | > 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 | |

| 100% POI Minimum Signal Duration (μs) at Different RBW and Span | | | | | | |
|---|---|---|---|---|---|---|
| Span | 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 |

| RBW factor at different window function and its length | | | | | | |
|---|---|---|---|---|---|---|
| Type\Length | 1024 | 512 | 256 | 128 | 64 | 32 |
| Kaiser (Beta=12) | 397.2904 | 198.4511 | 99.0314 | 49.3216 | 24.4666 | 12.0391 |
| Hann | 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 |

## Pulse Profile Analysis (SHA860-PU)

| Measurement | |
|---|---|
| Points | 201~10001, default is 1001 |
| Trace Function | Clear/Write, Max Hold, Min Hold, Average |
| Trace Number | 6 |
| Detector type | Positive Peak, Negative Peak, Sample, Average, Normal |
| Power Measurement | Trace Average (average of all the points in the trace),<br>Peak Power,<br>Wave Average (average of all the points within all complete periods in the trace),<br>Trace Average-Wave Average,<br>Pulse Average |
| Pulse Characteristic | Pulse Duration, Pulse Center, Pulse Period,<br>Pulse Off Time (Positive Pulse Only),<br>Duty Factor,<br>Rise Time, Fall Time,<br>Pre-Trans-Overshoot,<br>Pre-Trans-Undershoot,<br>Post-Trans-Overshoot,<br>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) |
| Max Sample Rate | 300 MHz |
| Max Signal BW | 110 MHz |
| Bit Resolution | 16-bit |
| Data Sample Size | I=Q=2 Byte |
| Storage Depth | 1 GB |
| Max Sample Length | 250 MB (1GB/4Byte) |
| Sample Time Length | Sample Length / Sample Rate |

# Analog Modulation Analysis (SHA860-AMA)

| General | | |
|---|---|---|
| Carrier Frequency Range | SHA861A | SHA862A |
| | 2 MHz~3.6 GHz | 2 MHz~7.5 GHz |
| | SHA863A | SHA864A |
| | 2 MHz~14 GHz | 2 MHz~20 GHz |
| | SHA865A | |
| | 2 MHz~26.5 GHz | |
| Carrier Power Accuracy | ±2 dB (nom.) | |
| Carrier Power Range | -30 dBm ~ +20 dBm (nom.) | |

| AM (Amplitude Modulation) | | |
|---|---|---|
| Modulation Rate | 20 Hz~100 kHz | |
| Accuracy | 1 Hz (nom.) | Modulation rate < 1 kHz |
| | < 0.1% modulation rate (nom.) | Modulation rate ≥ 1 kHz |
| Modulation Depth | 5%~95% | |
| Accuracy | ±4% (nom.) | |

| FM (Frequency Modulation) | | |
|---|---|---|
| Modulation Rate | 20 Hz~100 kHz | |
| Accuracy | 1 Hz (nom.) | Modulation rate < 1 kHz |
| | < 0.1% modulation rate (nom.) | Modulation rate ≥ 1 kHz |
| Frequency Deviation | 1 kHz~400 kHz | |
| Accuracy | ±4% (nom.) | |

| PM (Phase Modulation) | | |
|---|---|---|
| Modulation Rate | 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)

| General | | |
|---|---|---|
| Carrier Frequency Range | SHA861A | SHA862A |
| | 2 MHz~3.6 GHz | 2 MHz~7.5 GHz |
| | SHA863A | SHA864A |
| | 2 MHz~14 GHz | 2 MHz~20 GHz |
| | SHA865A | |
| | 2 MHz~26.5 GHz | |
| Carrier Power Accuracy | ±2 dB (nom.) | |
| Carrier Power Range | -30 dBm ~ +20 dBm (nom.) | |

| Measurement | |
|---|---|
| Modulation Type | ASK: 2ASK,<br>FSK: 2FSK, 4FSK, 8FSK, 16FSK,<br>MSK: GMSK,<br>PSK: BPSK, QPSK, OQPSK, 8PSK,<br>APSK: 16APSK, 32APSK,<br>DPSK: DBPSK, DQPSK, D8PSK, $\pi/4$ -DQPSK, $\pi/8$ -D8PSK,<br>QAM: 16, 32, 64, 128, 256 |
| Meas Length | 16 to 4096 |
| Points/Symbol | 4, 6, 8, 10, 12, 14, 16 |
| Trigger Holdoff | 500 ms |
| Burst and Search | Burst power sync, Symbol lookup, BERT |

| Filter | |
|---|---|
| Filter Type | Nyquist, Squrt Nyquist, Gauss, Half Sine, Rectang |
| Filter Length | 2 to 128 |
| Alpha/BT | Alpha 0.01~1, BT 0.01~10 |

| Display | |
|---|---|
| Trace Data | IQ Meas Time, IQ Meas Spectrum, IQ Ref Time, IQ Ref Spectrum,<br>Symbol Error Chart, Err Vector Time, Err Vector Spectrum,<br>Time, Spectrum, IQ Mag Err, IQ Phase Err |
| Trace Formats | Log mag, Lin mag, Real, Imag, I-Q, Constellation, I-eye, Q-eye,<br>Wrap Phase, Unwrap Phase, Trellis eye |

| Symbol Error Chart | |
|---|---|
| PSK/DPSK/MSK/QAM | EVM (rms EVM, peak EVM), Magnitude error,<br>Phase error, IQ offset, Carrier offset, SNR Quadrature error,<br>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 | |
|---|---|
| View | Frequency scan, Meter, Signal list |
| Pre-compliance Sequence | Scan, Search, Meas |
| EMI filter RBW (-6dB) | 200 Hz, 9 kHz, 120 kHz, 1 MHz |
| RBW Uncertainty | < 5% (nom.) |
| Detector | Peak, Average, RMS, 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 |
| Trace and Limit | 3 |
| Limit Standards | EN550xx, GB9254, FCC Part15, User defined |
| Attenuator | 0 ~ 50 dB |
| Output Report | Signal List |
| Frequency scale | Linear, Logarithmic |

## Power Meter Measurement (SHA860-PM)

| Measurement | |
|---|---|
| Function | External USB Power Sensor |
| Setup Parameters | Frequency |
| Supported Power Sensors | Keysight |
| | U2000, U2020X, U2040X, U2050X, U2060X, U8480 |
| | N1911/1912A N1913/1914 A/B |
| | Rohde & Schwarz |
| | R&S®NRPxxS/SN/SN-V |
| | R&S®NRPxxP |
| | R&S®NRPxxA/AN |
| | R&S®NRPxxT/TN/TWG/TWGN |
| | R&S®NRQ6 |
| | R&S®NRPxE |

# Cable and Antenna Test (SHA860-CAT)

| General | | |
|---|---|---|
| Frequency Range | SHA861A | SHA862A |
| | 100 kHz~3.6 GHz (30 kHz usable) | 100 kHz~7.5 GHz (30 kHz usable) |
| | SHA863A | SHA864A |
| | 100 kHz~14 GHz (30 kHz usable) | 100 kHz~20 GHz (30 kHz usable) |
| | SHA865A | |
| | 100 kHz~26.5 GHz (30 kHz usable) | |
| Sweep Points | 101~10001, default is 1001 | |
| Port1 Stimulus Power | -40 dBm ~ 0 dBm (nom.) | |
| Max Distance (meters) | (Sweep Points - 1) x Velocity Factor x Light of Speed (m/s) /<br>(2* (Stop Frequency - Start Frequency (Hz) ) ) | |
| Min Distance 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 | |

| Measurement | |
|---|---|
| Trace | Mem, Math, Hold, Overlay |
| Type | DTF,<br>Return Loss,<br>VSWR,<br>Cable Loss(1-Port),<br>Insertion Loss(2-Port),<br>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<br>Distance Unit: Meters, Feet<br>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<br>Distance Unit: as DTF<br>Stimulus Type: Impulse, Step<br>Frequency Type: Low-pass<br>Window Type: Kaiser<br>Kaiser β: 0~13<br>Time Gate Type: Band Pass, Notch<br>Time Gate Shape: Normal, Maximum, Wide, Minimum<br>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 | | |
|---|---|---|
| Frequency Range | SHA861A | SHA862A |
| | 100 kHz~3.6 GHz (30 kHz usable) | 100 kHz~7.5 GHz (30 kHz usable) |
| | SHA863A | SHA864A |
| | 100 kHz~14 GHz (30 kHz usable) | 100 kHz~20 GHz (30 kHz usable) |
| | SHA865A | |
| | 100 kHz~26.5 GHz (30 kHz usable) | |
| Measurement Parameter | 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<br>Smith Chart (Lin/Phase, Log/Phase, Real/Imag, R+j*X, G+j*B),<br>Polar Chart (Lin/Phase, Log/Phase, Real/Imag) | |
| Sweep Points | 101~10001, default is 1001 | |
| Trace | 4 traces, Mem, Math, Hold, Overlay | |
| Marker | (6+Ref)* 4 traces | |

| Calibration | |
|---|---|
| Calibration Type | Short Response |
| | Open Response |
| | Full 1-Port (OSL) |
| | Through Response |
| | Enhanced Response |
| Port Extensions | Port 1, Port 2, Auto Open Port 1 |
| System Impedance (Default) | 50 Ω |
| Velocity Factor | 0.1~1 |

| Directivity | |
|---|---|
| Directivity after Calibration | F504MS, Log mag, Average=100, >50MHz |
| | > 40 dB (nom.) |
| | F606MS, Log mag, Average=100, >50MHz |
| | >40 dB (nom.) <7.5 GHz<br>>30 dB (nom.) 7.5 GHz~14 GHz<br>>20 dB (nom.) 14 GHz~26.5 GHz |

| Dynamic Range | | | |
|---|---|---|---|
| Dynamic Range | S21, IFBW=10 kHz, Port1 level=0 dBm, Log Mag, Average=100 | | |
| | | SHA861A | SHA862A |
| | 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.) |
| | | SHA863A | SHA864A |
| | 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~5.85 GHz | 102 dB, 109 dB (typ.) | 102 dB, 109 dB (typ.) |
| | 5.85 GHz~7.5 GHz | 98 dB, 104 dB (typ.) | 98 dB, 104 dB (typ.) |
| | 7.5 GHz~14 GHz | 98 dB, 104 dB (typ.) | 98 dB, 104 dB (typ.) |
| | 14 GHz~20 GHz | | 98 dB, 104 dB (typ.) |
| | | SHA865A | |
| | 100 kHz~1 MHz | 100 dB, 108 dB (typ.) | |
| | 1 MHz~1.5 GHz | 108 dB, 114 dB (typ.) | |
| | 1.5 GHz~3.6 GHz | 106 dB, 112 dB (typ.) | |
| | 3.6 GHz~5.85 GHz | 102 dB, 109 dB (typ.) | |
| | 5.85 GHz~7.5 GHz | 98 dB, 104 dB (typ.) | |
| | 7.5 GHz~14 GHz | 98 dB, 104 dB (typ.) | |
| | 14 GHz~22.6 GHz | 98 dB, 104 dB (typ.) | |
| | 22.6 GHz~26.5 GHz | 90 dB (nom.) | |

| Reflection trace noise | | | |
|---|---|---|---|
| Reflection Trace noise (IFBW=10 kHz, max output power) | Frequency | Amplitude (dB rms) | Phase (deg rms) |
| | SHA861A, SHA862A | | |
| | 100 kHz~3.5 GHz | 0.02 (nom.) | 0.3 (nom.) |
| | 3.5 GHz~7.5 GHz | 0.03 (nom.) | 0.5 (nom.) |
| | SHA863A, SHA864A, SHA865A | | |
| | 100 kHz~3.5 GHz | 0.02 (nom.) | 0.3 (nom.) |
| | 3.5 GHz~7.5 GHz | 0.03 (nom.) | 0.5 (nom.) |
| | 7.5 GHz~14 GHz | 0.07 (nom.) | 0.8 (nom.) |
| | 14 GHz~22.6 GHz | 0.15 (nom.) | 1.6 (nom.) |
| | 22.6 GHz~26.5 GHz | 0.25 (nom.) | 1.8 (nom.) |

| Transmission trace Noise | | | |
|---|---|---|---|
| Transmission Trace Noise (IFBW=10 kHz, max output power) | Frequency | Amplitude (dB rms) | Phase (deg rms) |
| | SHA861A, SHA862A | | |
| | 100 kHz~3.5 GHz | 0.015 (nom.) | 0.18 (nom.) |
| | 3.5 GHz~7.5 GHz | 0.015 (nom.) | 0.4 (nom.) |
| | SHA863A, SHA864A, SHA865A | | |
| | 100 kHz~3.5 GHz | 0.015 (nom.) | 0.18 (nom.) |
| | 3.5 GHz~7.5 GHz | 0.015 (nom.) | 0.4 (nom.) |
| | 7.5 GHz~14 GHz | 0.015 (nom.) | 0.6 (nom.) |
| | 14 GHz~22.6 GHz | 0.015 (nom.) | 0.8 (nom.) |
| | 22.6 GHz~26.5 GHz | 0.015 (nom.) | 1.0 (nom.) |

# Inputs and Outputs

| Front Panel | |
|---|---|
| RF input, Port 2 | N-type female, 50 Ω, SHA861A, SHA862A<br>2.92mm male, 50 Ω, SHA863A, SHA864A, SHA865A |
| Source, Port 1 | N-type female, 50 Ω, SHA861A, SHA862A<br>2.92mm male, 50 Ω, SHA863A, SHA864A, SHA865A |
| USB Host | USB-A 2.0 |
| Ear Phone Jack | 3.5 mm |
| USB Device | USB-C 2.0 |
| LAN | LAN (VXI-11), 10/100 Base, RJ-45 |
| GPS Receiver<br>(SHA860-GPS) | SMA(F), 50 Ω, 3.3 V, Location, Sync, Timing |
| Bias Out<br>(SHA860-BIAS) | SMB(F), 12 V-32 V, 0.1 V step |
| External Trigger Input | BNC-type female, 1 kΩ, 5V TTL |
| 10 M Reference Input | BNC-type female, 50 Ω, 10 MHz, -5 dBm~+10 dBm (nom.) |

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

# General Specification

| Structure | |
|---|---|
| Dimensions | 310 mm x 215 mm x 78.5 mm (W×H×D) |
| Weight | Net: 3.20 kg (7.0 lb), SHA861A, SHA862A<br>Net: 3.50 kg (7.7 lb), SHA863A, SHA864A, SHA865A |
| Display | TFT LCD, 800x600, 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 V~240 V, 50/60 Hz； 100~120 V, 400 Hz |
| Power consumption | 25 W (typ.), SHA861A, SHA862A<br>30 W (typ.), SHA863A, SHA864A, SHA865A |
| Temperature | Operating temperature: 0℃~50℃,<br>Operating temperature while charging: 0℃~40℃,<br>Storage temperature: -20℃~70℃ |
| Humidity | 0℃~30℃, ≤95% Relative humidity<br>30℃~50℃, ≤75% Relative humidity |
| Altitude | less than 3 km (10000 feet) |

| Electromagnetic Compatibility | |
|---|---|
| EN 61326-1: 2013 /<br>EN 61000-3-2: 2014 | Class A |
| EN 61000-3-3: 2013 | Plt : 0.65 Pst : 1.00, dmax : 4.00 %, dc : 3.00 %, dtLim: 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 40 MHz | SHA861A |
| | Spectrum Analyzer 9 kHz~7.5 GHz, BW 40 MHz | SHA862A |
| | Spectrum Analyzer 9 kHz~14 GHz, BW 40 MHz | SHA863A |
| | Spectrum Analyzer 9 kHz~20 GHz, BW 40 MHz | SHA864A |
| | Spectrum Analyzer 9 kHz~26.5 GHz, BW 40 MHz | SHA865A |
| Standard Accessories | Quick Start, AC-DC adapter, Rechargeable lithium battery, Power cord, Portable bag | |
| Options | SHA861A upgrade to SHA862A | SHA860-F2 |
| | SHA863A upgrade to SHA864A | SHA860-F4 |
| | SHA864A upgrade to SHA865A | SHA860-F5 |
| | Analysis Bandwidth 110MHz | SHA860-B1A |
| | Real-Time Spectrum Analysis | SHA860-RTA |
| | IQ Data Acquisition | SHA860-IQA |
| | 5G NR OTA Measurement | SHA860-NR |
| | LTE TDD/FDD OTA Measurement | SHA860-LTE |
| | Advanced Measurement Kit | SHA860-AMK |
| | EMI Measurement | SHA860-EMI |
| | Pulse Profile Analysis | SHA860-PU |
| | Power Meter | SHA860-PM |
| | Analog Modulation Analysis | SHA860-AMA |
| | Digital Modulation Analysis | SHA860-DMA |
| | 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, 74 Wh | 10V8_BAT |
| | AC-DC adapter, 12 V, 4 A | 12V_AP_4A |
| | Portable bag | BAG-H2 |
| | Near field probe kit: 300 kHz~3 GHz<br>Three H-field probes (20 mm, 10 mm, 5 mm), One E-field probe (5 mm) | SRF5030T |
| | Directional Antenna Suit: SHA861A, SHA862A<br>Three Directional Antennas (10 MHz~200 MHz, 200 MHz~500 MHz, 500 MHz~8 GHz), Handler with preamplifier (10 dB, 9 kHz~8 GHz) | ANT-DA1 |

| | | |
|---|---|---|
| | Directional Antenna Suit: SHA863A, SHA864A, SHA865A<br>One Directional Antennas (8 GHz~26.5 GHz),<br>Handler with preamplifier (10 dB, 8 GHz~26.5 GHz) | ANT-DA2 |
| | Utility Kit:<br>N(M)-SMA(M) cable (6 GHz), N(M)-N(M) cable (6 GHz),<br>N(M)-BNC(F) adaptor x2, N(M)-SMA(F) adaptor x2,<br>10 dB 1W attenuator | UKitSSA3X |
| | GPS antenna, SMA(M), 1000 mm | ANT-GPS1 |
| | 2.92mm(F)-2.92mm(F) coaxial connector, DC~40 GHz | 2.92F-2.92F-40A |
| | 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 |
| | SMA(M)-SMA(M) cable, DC~18 GHz, 1000 mm | SMA-SMA-18L |
| | SMA(M)-SMA(M) cable, DC~26.5 GHz, 1000 mm | SMA-SMA-26L |
| | SMA(F)-SMA(M) cable, DC~26.5 GHz, 1000 mm | SMAF-SMA-26L |
| 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 |
| | 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 |
| | 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 Standard Calibration Kit, Male, DC~9 GHz, 50 Ω | F604MS |
| | 3.5mm type Standard Calibration Kit, Female, DC~9 GHz, 50 Ω | F604FS |
| | 3.5mm type Standard Calibration Kit, Male, DC~26.5GHz, 50 Ω | F606MS |
| | 3.5mm type Standard Calibration Kit, Female, DC~26.5GHz, 50 Ω | F606FS |

## 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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