

# RIGOL



## RSA5000 Series Real-time Spectrum Analyzer

- Ultra-Real technology
- Frequency: up to 6.5 GHz
- Displayed average noise level (DANL):  $<-165$  dBm (typical)
- Phase noise:  $<-108$  dBc/Hz (typical)
- Level measurement uncertainty:  $<0.8$  dB
- 6.5 GHz tracking generator
- Min. RBW 1 Hz
- Up to 40 MHz real-time analysis bandwidth
- Multiple measurement modes
- Various advanced measurement functions
- Vector signal analysis measurement application (option)
- EMI measurement application (option)
- Vector network analyzer application
- Multiple trigger modes and trigger masks
- Density, spectrogram, and other display modes
- PC software options
- 10.1" capacitive multi-touch screen, supporting touch gestures
- USB, LAN, HDMI and other communication and display interfaces

# RSA5000 Series Real-time Spectrum Analyzer

Built-in Linux operating system reliable and stable interface

10.1-inch capacitive multi-touch screen supporting touch gestures

Built-in quad-core processor high processing speed

Support keyboard and mouse operation

TG : 100kHz to 3.2/6.5GHz  
-40 to 0dBm

RF: 9kHz to 3.2/6.5GHz



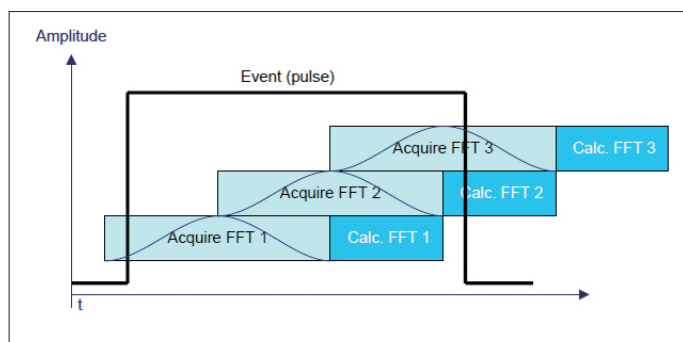
Product Dimensions: Width × Height × Depth = 410 mm × 224 mm × 135 mm

## UltraReal

Based on the Ultra-Real technology, the high-speed real-time measurement mode allows you to acquire the signals in the analysis bandwidth seamlessly and make data analysis. It also provides various display modes, such as Spectrogram, Density, and PVT. Besides, FMT function is also available.

The Ultra-Real technology has the following features:

- Seamless analysis
  - Seamless I/Q data acquisition in the analysis bandwidth
  - Gap-free spectrum analysis



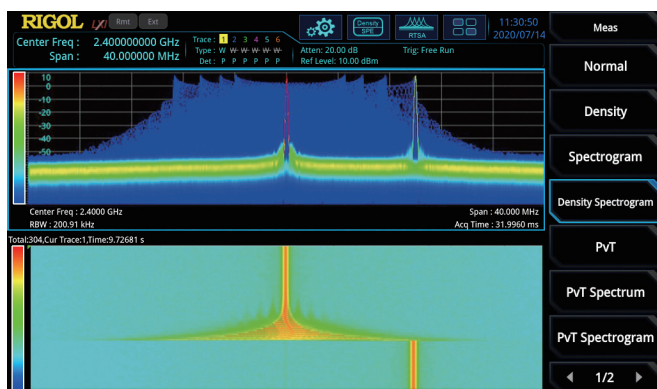
## FMT

Frequency mask trigger (FMT) to trigger the measurement by sporadic or transient events in the spectrum

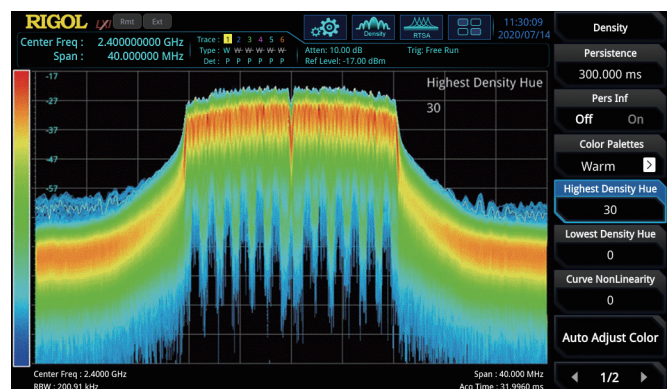


## Composite displays

Spectrogram for gap-free display of the spectrum



Density spectrum for you to visualize how frequently signals occur



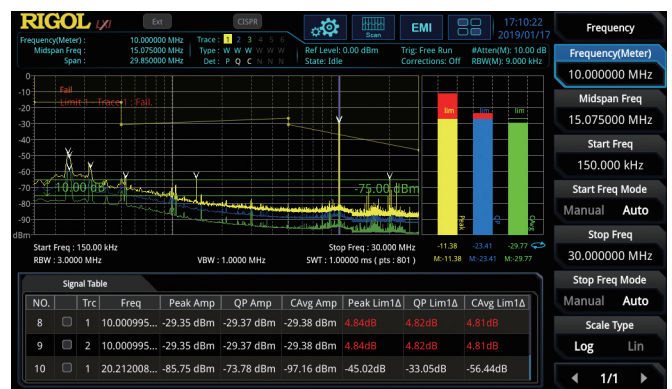
## ► RSA5000 Series Real-Time Spectrum Analyzer

- Integrates five measurement modes to address the challenges for multiple RF test requirements with one single instrument

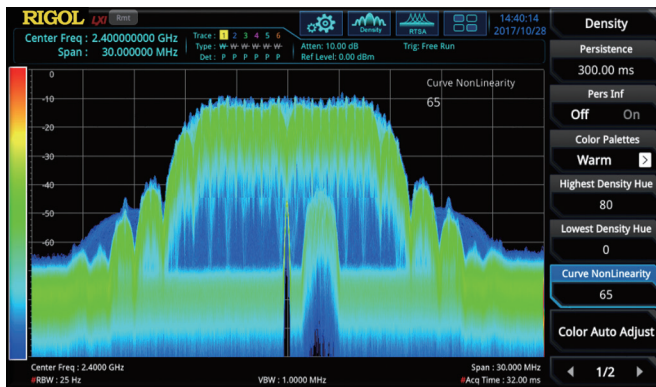
RSA5000 series provides EMI, RTSA, VSA, and VNA modes in addition to the traditional GPSA mode. Engineers may find it convenient to address multiple RF test challenges with just one instrument, effectively reducing their time and costs, greatly improving their working efficiency.



Advanced measurement mode provides test items required for the transmitter test such as multichannel power, ACP, and occupied BW.



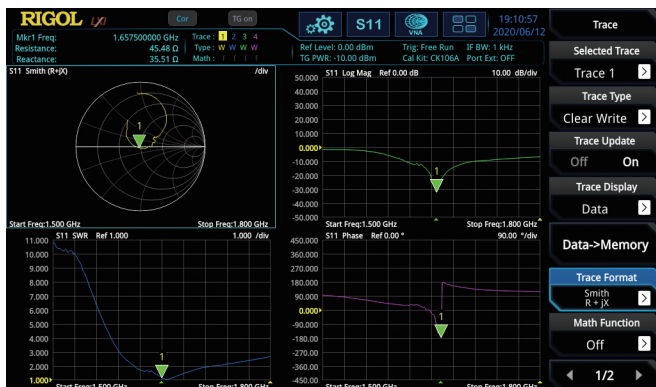
Quickly recall the limit line compliant with the CISPR standard (e.g. EN55011, EN55012, etc.) to carry out pre-test and monitor the target point with three different detectors.



With the Density spectrum, you can find out the exceptional signals hidden behind the high-level signals, and capture them accurately with the FMT.



You can freely set the way to display the measurement results, demonstrate multiple views of the signals at one time to obtain a clearer display effect through flexible adjustment of the display layout.



In VNA mode, you can make S11, S21, and DTF measurements for the components and circuit networks. The network characteristics of the components under test can be accurately demonstrated in Smith chart, Polar chart, and other formats.

## ■ Various operation modes to improve your operation experience

The 10.1-inch capacitive multi-touch screen supports various touch gestures, making it always keep up with the mainstream development trend for screen operation. The gesture-enabled operation such as tapping, dragging, pinching & stretching makes the measurement action smooth and convenient, easy for you to operate the instrument. Meanwhile, the instrument still keeps the knob and key operation as what RIGOL traditional instruments have, optimizing the user-friendly interactive experience to a large extent. It also supports keyboard and mouse operation.



## ■ Multiple interfaces to improve the connectivity of the instruments

The instrument can be connected to a larger display/monitor via the HDMI interface for better display effects. The Web Control function allows you to directly control the device by accessing the device IP address, improving the experience of remote control.



## ► Specifications

Specifications are valid under the following conditions: the instrument is within the calibration period, is stored for at least two hours at 0°C to 50°C temperature, and is warmed up for 40 minutes. Unless otherwise noted, the specifications in this manual include the measurement uncertainty.

**Typical:** characteristic performance, which 80 percent of the measurement results will meet at room temperature (approximately 25°C). This data is not warranted and does not include the measurement uncertainty.

**Nominal:** the expected mean or average performance or a designed attribute (such as the 50  $\Omega$  connector). This data is not warranted and is measured at room temperature (approximately 25°C).

**Measured:** an attribute measured during the design phase which can be compared to the expected performance, such as the amplitude drift variation with time. This data is not warranted and is measured at room temperature (approximately 25°C).

**NOTE:** All charts in this manual are the measurement results of multiple instruments at room temperature unless otherwise noted. The specifications (except the tracking generator specifications) listed in this manual are those when the tracking generator is off.

## Measurement Mode

| Measurement Mode                                     |         |            |          |         |            |          |
|------------------------------------------------------|---------|------------|----------|---------|------------|----------|
| General-Purpose Spectrum Analyzer (GPSA)             |         |            |          |         |            |          |
| Real-time Spectrum Analyzer (RTSA)                   |         |            |          |         |            |          |
| Vector Signal Analysis Measurement Application (VSA) |         |            |          |         |            |          |
| EMI Measurement Application (EMI)                    |         |            |          |         |            |          |
| Vector Network Analyzer Application (VNA)            |         |            |          |         |            |          |
| Measurement Mode and Product Model Adaptation Table  |         |            |          |         |            |          |
|                                                      | RSA5032 | RSA5032-TG | RSA5032N | RSA5065 | RSA5065-TG | RSA5065N |
| GPSA                                                 | √       | √          | √        | √       | √          | √        |
| RTSA                                                 | √       | √          | √        | √       | √          | √        |
| VSA                                                  | O       | O          | O        | O       | O          | O        |
| EMI                                                  | O       | O          | O        | O       | O          | O        |
| VNA                                                  | x       | x          | √        | x       | x          | √        |
| Tracking Generator                                   | x       | √          | √        | x       | √          | √        |

Note: x indicates not supported; √ indicates standard configuration; O indicates optional configuration.

The RSA5000N models include hardware capability not in the RSA5000-TG. The RSA5000-TG models cannot be used in VNA mode.

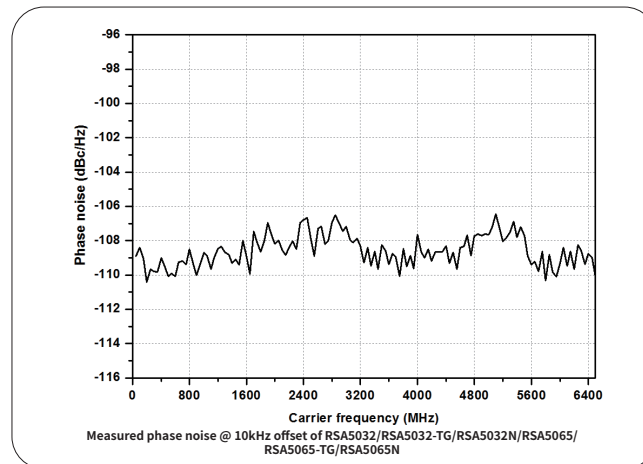
## All Measurement Modes

| Frequency                    |                                                                                                                                   |                  |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------|
|                              | RSA5032/-TG/N                                                                                                                     | RSA5065/-TG/N    |
| Frequency Range              | 9 kHz to 3.2 GHz                                                                                                                  | 9 kHz to 6.5 GHz |
| Internal Reference Frequency |                                                                                                                                   |                  |
| Reference Frequency          | 10 MHz                                                                                                                            |                  |
| Accuracy                     | $\pm[(\text{time since last calibration} \times \text{aging rate}) + \text{temperature stability} + \text{calibration accuracy}]$ |                  |
| Initial Calibration Accuracy | Standard                                                                                                                          | <1 ppm           |
|                              | Option OCXO-C08                                                                                                                   | <0.1 ppm         |
| Temperature Stability        | 0°C to 50°C, with the reference 25°C                                                                                              |                  |
|                              | Standard                                                                                                                          | <0.5 ppm         |
|                              | Option OCXO-C08                                                                                                                   | <0.005 ppm       |
| Aging Rate                   | Standard                                                                                                                          | <1 ppm/year      |
|                              | Option OCXO-C08                                                                                                                   | <0.03 ppm/year   |

## GPSA Mode

### Frequency

| Frequency Readout Accuracy   |         |                                                                                                                                                                              |
|------------------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Marker Frequency Resolution  |         | span/(number of sweep points - 1)                                                                                                                                            |
| Marker Frequency Uncertainty |         | $\pm$ (marker frequency readout x reference frequency accuracy + 1% x span + 10% x resolution bandwidth + marker frequency resolution + LO sweep resolution <sup>[1]</sup> ) |
| Frequency Counter            |         |                                                                                                                                                                              |
| Resolution                   |         | 1 Hz                                                                                                                                                                         |
| Uncertainty                  |         | $\pm$ (marker frequency readout x reference frequency accuracy + counter resolution)                                                                                         |
| Frequency Span               |         |                                                                                                                                                                              |
| Range                        |         | 0 Hz, 10 Hz to maximum frequency                                                                                                                                             |
| Resolution                   |         | 2 Hz                                                                                                                                                                         |
| Uncertainty                  |         | $\pm$ [0.25% x span + span/(number of sweep points - 1) + 12 Hz]                                                                                                             |
| SSB Phase Noise              |         |                                                                                                                                                                              |
|                              |         | 20°C to 30°C, $f_c = 500$ MHz                                                                                                                                                |
| Carrier Offset               | 1 kHz   | <-95 dBc/Hz (typical)                                                                                                                                                        |
|                              | 10 kHz  | <-106 dBc/Hz, <-108 dBc/Hz (typical)                                                                                                                                         |
|                              | 100 kHz | <-106 dBc/Hz, <-108 dBc/Hz (typical)                                                                                                                                         |
|                              | 1 MHz   | <-115 dBc/Hz, <-117 dBc/Hz (typical)                                                                                                                                         |



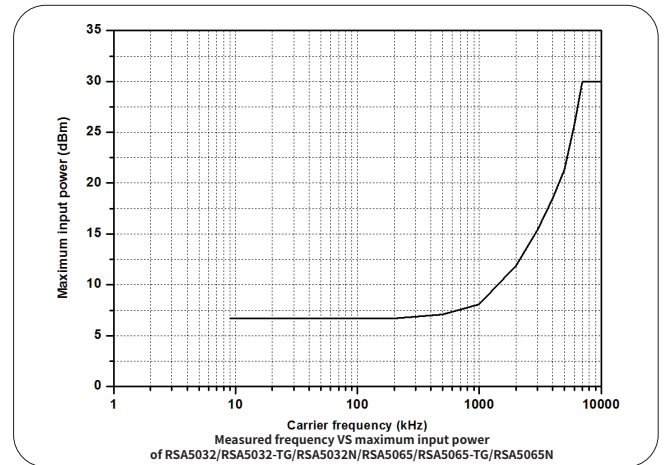
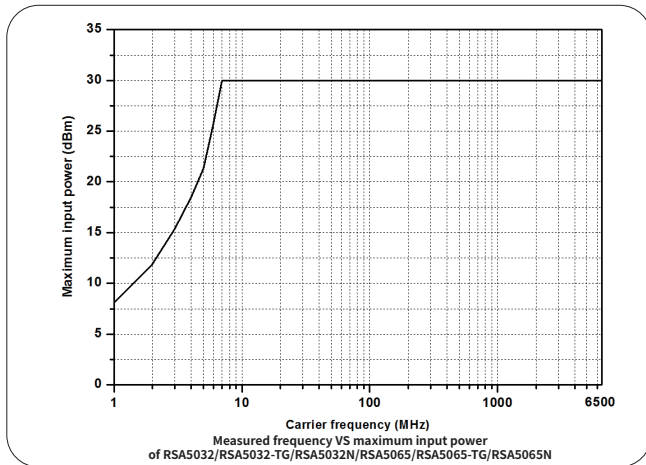
| Residual FM                                  |                                    |
|----------------------------------------------|------------------------------------|
|                                              | 20°C to 30°C, RBW = VBW = 1 kHz    |
| Residual FM                                  | <10 Hz (nominal)                   |
| Bandwidth                                    |                                    |
|                                              | Set "Sweep Time Rule" to "Accy"    |
| Resolution Bandwidth (-3 dB) <sup>[2]</sup>  | 1 Hz to 10 MHz, in 1-3-10 sequence |
| RBW Accuracy                                 | 10 Hz to 1 kHz, <15% (nominal)     |
|                                              | 3 kHz to 1 MHz, <5% (nominal)      |
|                                              | 3 MHz to 10 MHz, <15% (nominal)    |
| Resolution Filter Shape Factor (60 dB: 3 dB) | <5 (nominal)                       |
| Video Bandwidth (-3 dB)                      | 1 Hz to 10 MHz, in 1-3-10 sequence |
| Resolution Bandwidth (-6 dB)                 | 200 Hz, 9 kHz, 120 kHz, 1 MHz      |

Note: [1] LO sweep resolution is 12 Hz.

[2] When the tracking generator is enabled or in zero span mode, the available range of RBW is from 1 kHz to 10 MHz.

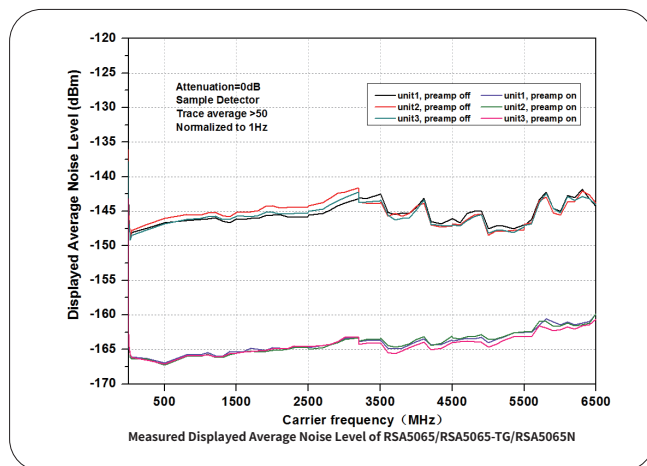
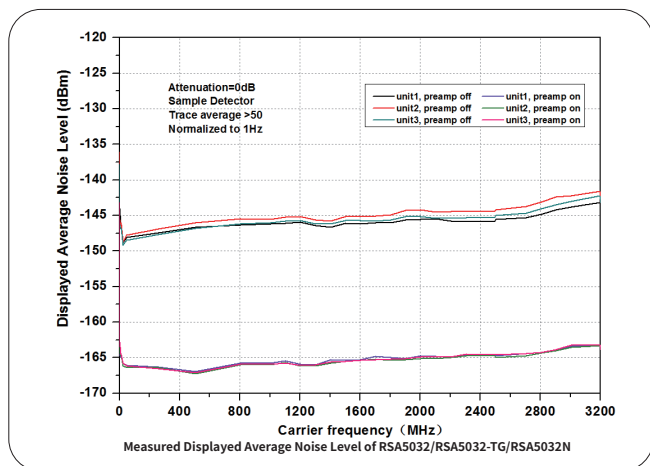
## Amplitude

| Measurement Range                       |                                                                                            |
|-----------------------------------------|--------------------------------------------------------------------------------------------|
| Range                                   | $f_c \geq 10$ MHz<br>DANL to +30 dBm                                                       |
| Maximum Safe Input Level <sup>[1]</sup> |                                                                                            |
| DC Voltage                              | 50 V                                                                                       |
| CW RF Power                             | +30 dBm, attenuation $\geq 40$ dB, preamp off.<br>-10 dBm, attenuation = 20 dB, preamp on. |
| Maximum Damage Level                    |                                                                                            |
| CW RF Power                             | +33 dBm (2 W)                                                                              |



| Displayed Average Noise Level (DANL) |                    |                                                                                                                                                           |                                |
|--------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|
|                                      |                    | RSA5032/-TG/N                                                                                                                                             | RSA5065/-TG/N                  |
|                                      |                    | attenuation = 0 dB, sample detector, trace averages $\geq 50$ , tracking generator off, normalized to 1 Hz, 20°C to 30°C, input impedance = 50 $\Omega$ . |                                |
| Preamp off                           | 9 kHz to 100 kHz   | <-120 dBm (typical)                                                                                                                                       | <-120 dBm (typical)            |
|                                      | 100 kHz to 20 MHz  | <-135 dBm, <-140 dBm (typical)                                                                                                                            | <-135 dBm, <-140 dBm (typical) |
|                                      | 20 MHz to 1.5 GHz  | <-142 dBm, <-145 dBm (typical)                                                                                                                            | <-142 dBm, <-145 dBm (typical) |
|                                      | 1.5 GHz to 2.7 GHz | <-140 dBm, <-143 dBm (typical)                                                                                                                            | <-140 dBm, <-143 dBm (typical) |
|                                      | 2.7 GHz to 3.2 GHz | <-138 dBm, <-141 dBm (typical)                                                                                                                            | <-138 dBm, <-141 dBm (typical) |
|                                      | 3.2 GHz to 5.5 GHz |                                                                                                                                                           | <-138 dBm, <-143 dBm (typical) |
|                                      | 5.5 GHz to 6.5 GHz |                                                                                                                                                           | <-136 dBm, <-141 dBm (typical) |
| Preamp on                            | 100 kHz to 20 MHz  | <-152 dBm, <-160 dBm (typical)                                                                                                                            | <-152 dBm, <-160 dBm (typical) |
|                                      | 20 MHz to 1.5 GHz  | <-162 dBm, <-165 dBm (typical)                                                                                                                            | <-162 dBm, <-165 dBm (typical) |
|                                      | 1.5 GHz to 2.7 GHz | <-160 dBm, <-163 dBm (typical)                                                                                                                            | <-160 dBm, <-163 dBm (typical) |
|                                      | 2.7 GHz to 3.2 GHz | <-158 dBm, <-161 dBm (typical)                                                                                                                            | <-158 dBm, <-161 dBm (typical) |
|                                      | 3.2 GHz to 5.5 GHz |                                                                                                                                                           | <-156 dBm, <-161 dBm (typical) |
|                                      | 5.5 GHz to 6.5 GHz |                                                                                                                                                           | <-154 dBm, <-159 dBm (typical) |

Note: [1] When  $f_c < 10$  MHz, the maximum safe input level is decreased.

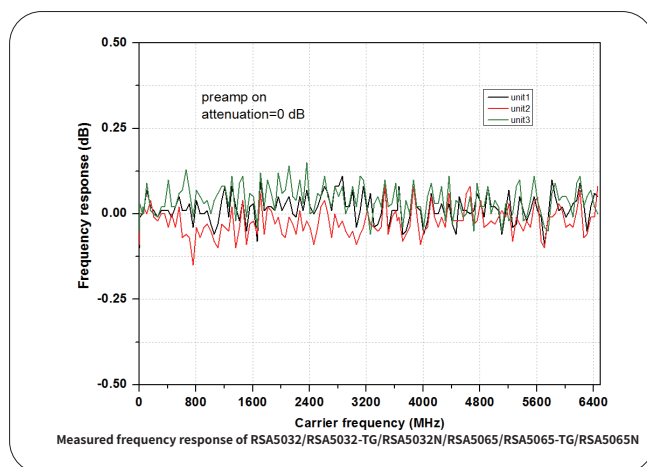
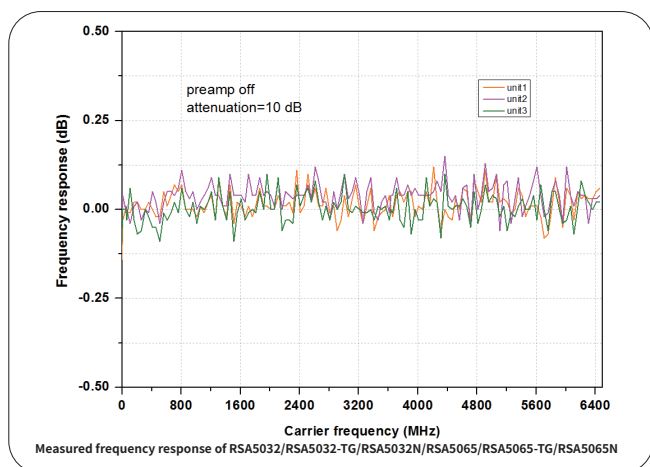


### Level Display

|                          |                                                                                  |
|--------------------------|----------------------------------------------------------------------------------|
| Logarithmic Scale        | 1 dB to 200 dB                                                                   |
| Linear Scale             | 0 to reference level                                                             |
| Number of Display Points | 801                                                                              |
| Number of Traces         | 6                                                                                |
| Trace Detector           | normal, pos-peak, neg-peak, sample, RMS average, voltage average, and quasi-peak |
| Trace Function           | clear write, max hold, min hold, average, view, blank                            |
| Scale Unit               | dBm, dBmV, dBμV, nV, μV, mV, V, nW, μW, mW, W                                    |

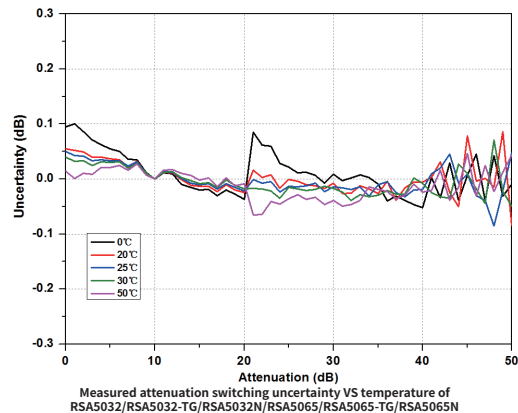
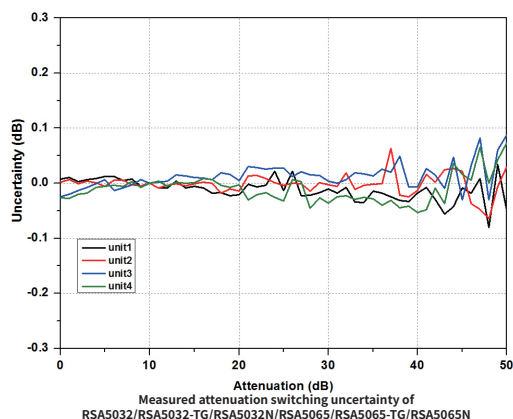
### Frequency Response

|            |                    | RSA5032/-TG/N                                         | RSA5065/-TG/N              |
|------------|--------------------|-------------------------------------------------------|----------------------------|
|            |                    | attenuation = 10 dB, relative to 50 MHz, 20°C to 30°C |                            |
| Preamp off | 100 kHz to 3.2 GHz | <0.5 dB, <0.3 dB (typical)                            | <0.5 dB, <0.3 dB (typical) |
|            | 3.2 GHz to 6.5 GHz |                                                       | <0.7 dB, <0.5 dB (typical) |
|            |                    | attenuation = 0 dB, relative to 50 MHz, 20°C to 30°C  |                            |
| Preamp on  | 100 kHz to 3.2 GHz | <0.7 dB, <0.3 dB (typical)                            | <0.7 dB, <0.3 dB (typical) |
|            | 3.2 GHz to 6.5 GHz |                                                       | <0.9 dB, <0.5 dB (typical) |



### Input Attenuation Switching Uncertainty

|                       |                                                             |
|-----------------------|-------------------------------------------------------------|
| Setting Range         | 0 dB to 50 dB, in 1 dB step                                 |
| Switching Uncertainty | $f_c = 50$ MHz, relative to 10 dB, preamp off, 20°C to 30°C |
|                       | <0.3 dB                                                     |



### Absolute Amplitude Accuracy

|             |                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------|
| Uncertainty | $f_c = 50$ MHz, peak detector, preamp off, attenuation = 10 dB, input signal level = -10 dBm, 20°C to 30°C |
|             | <0.3 dB                                                                                                    |

### Reference Level

|       |                   |                                              |
|-------|-------------------|----------------------------------------------|
| Range | Logarithmic Scale | -170 dBm to +30 dBm, in 0.01 dB step         |
|       | Linear Scale      | 707 pV to 7.07 V, 0.11% (0.01 dB) resolution |

### RBW Switching

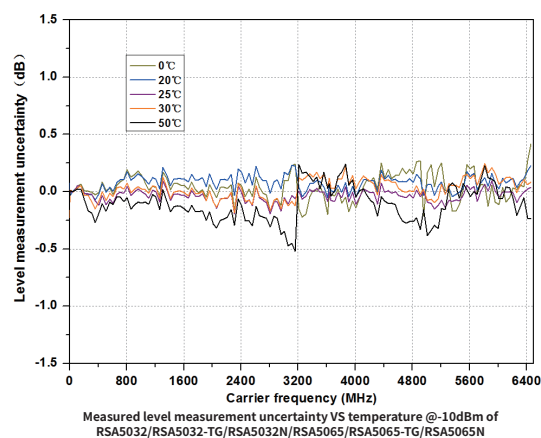
|             |                                                         |         |
|-------------|---------------------------------------------------------|---------|
|             | Set "Sweep Time Rule" to "Accy", relative to 30 kHz RBW |         |
| Uncertainty | 1 Hz to 1 MHz                                           | <0.1 dB |
|             | 3 MHz, 10 MHz                                           | <0.3 dB |

### Preamp (Option RSA5000-PA)

|                 |                    |                    |
|-----------------|--------------------|--------------------|
|                 | RSA5032/-TG/N      | RSA5065/-TG/N      |
| Frequency Range | 100 kHz to 3.2 GHz | 100 kHz to 6.5 GHz |
| Gain            | 20 dB (nominal)    |                    |

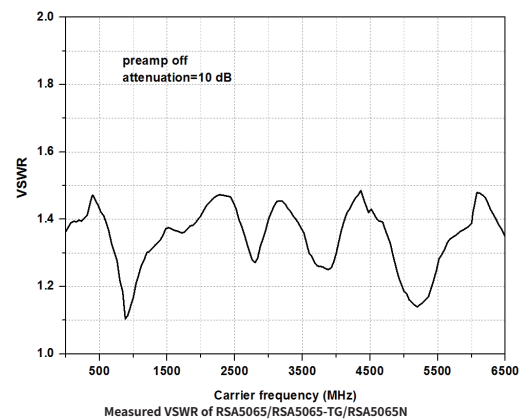
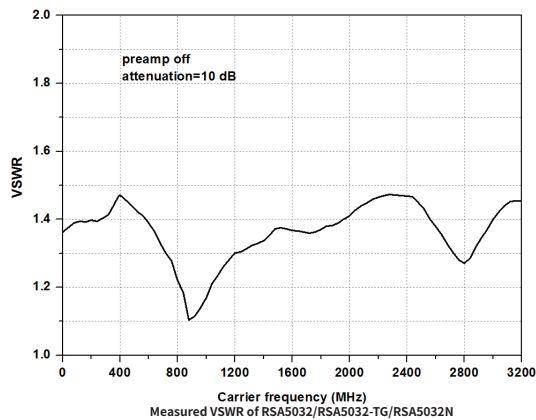
### Level Measurement Uncertainty

|                               |                                                                                                                                                    |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
|                               | 95% confidence level, S/N > 20 dB, RBW = VBW = 1 kHz, preamp off, attenuation = 10 dB, -50 dBm < input level ≤ 0 dBm, $f_c > 10$ MHz, 20°C to 30°C |
| Level Measurement Uncertainty | <0.8 dB (nominal)                                                                                                                                  |



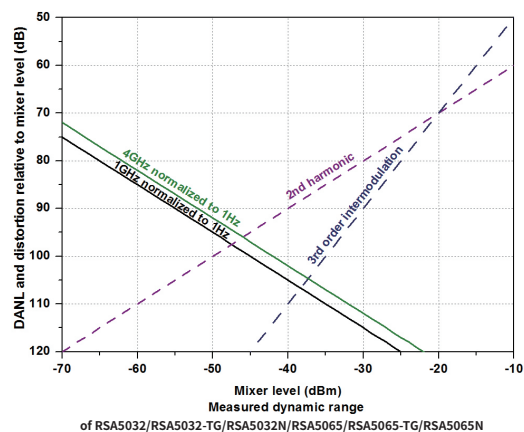
## RF Input VSWR

|      |                    | RSA5032/-TG/N                        | RSA5065/-TG/N  |
|------|--------------------|--------------------------------------|----------------|
|      |                    | attenuation $\geq 10$ dB, preamp off |                |
| VSWR | 300 kHz to 3.2 GHz | <1.6 (nominal)                       | <1.6 (nominal) |
|      | 3.2 GHz to 6.5 GHz |                                      | <1.8 (nominal) |



## Distortion

|                                             |                                                                                                                                      |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Second Harmonic Intercept (SHI)             | $f_c \geq 50$ MHz, input signal level = -20 dBm, attenuation = 0 dB, preamp off.<br>+45 dBm                                          |
| Third-order Intercept (TOI)                 | $f_c \geq 50$ MHz, two -20 dBm tones at input mixer spaced by 200 kHz, attenuation = 0 dB, preamp off.<br>+11 dBm, +15 dBm (typical) |
| 1 dB Gain Compression (P1dB) <sup>[1]</sup> | $f_c \geq 50$ MHz, attenuation = 0 dB, preamp off.<br>0 dBm (nominal)                                                                |



## Spurious Response

|                         |                                                                                                                  |
|-------------------------|------------------------------------------------------------------------------------------------------------------|
| Residual Response       | input terminated with a 50 $\Omega$ load, attenuation = 0 dB, 20°C to 30°C<br><-90 dBm, <-100 dBm (typical)      |
| Intermediate Frequency  | <-60 dBc                                                                                                         |
| System-related Sideband | referenced to local oscillators, referenced to A/D conversion, referenced to subharmonic of first LO<br><-60 dBc |
| Input-related Spurious  | mixer level = -30 dBm<br><-60 dBc                                                                                |

Note: [1] The frequency interval of the two-tone signals should be greater than 10 MHz.

## Sweep

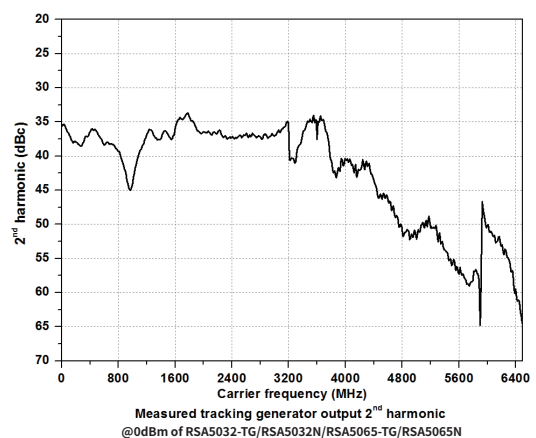
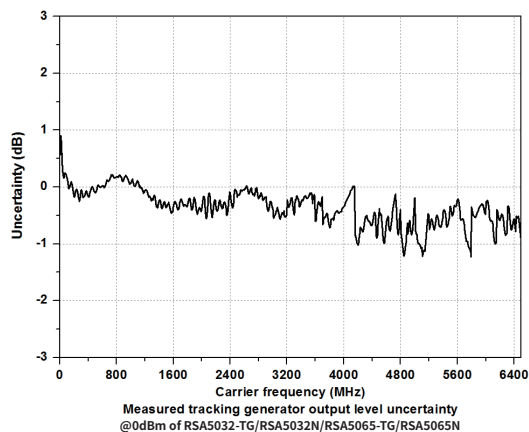
| Sweep                  |                                     |                      |
|------------------------|-------------------------------------|----------------------|
| Sweep Time             | span $\geq 10$ Hz                   | 1 ms to 4,000 s      |
|                        | zero span                           | 1 $\mu$ s to 6,000 s |
| Sweep Time Uncertainty | span $\geq 10$ Hz, RBW $\geq 1$ kHz | 5% (nominal)         |
|                        | zero span (sweep time > 1 ms)       | 5% (nominal)         |
| Sweep Mode             | continue, single                    |                      |

## Trigger

| Trigger        |                                         |             |
|----------------|-----------------------------------------|-------------|
| Trigger Source | free run, external 1, external 2, video |             |
| Trigger Delay  | span $\geq 10$ Hz                       | 0 to 500 ms |
|                | zero span                               | 0 to 500 ms |

## Tracking Generator

| Tracking Generator Output |                      |                    |
|---------------------------|----------------------|--------------------|
|                           | RSA5032-TG/N         | RSA5065-TG/N       |
| Frequency Range           | 100 kHz to 3.2 GHz   | 100 kHz to 6.5 GHz |
| Output Level Range        | -40 dBm to 0 dBm     |                    |
| Output Level Resolution   | 1 dB                 |                    |
| Output Flatness           | relative to 50 MHz   |                    |
|                           | $\pm 3$ dB (nominal) |                    |



## RTSA Mode

|                                                              |                                                                            |                |      |                |      |      |
|--------------------------------------------------------------|----------------------------------------------------------------------------|----------------|------|----------------|------|------|
| Real-time Analysis Bandwidth                                 | 25 MHz                                                                     |                |      |                |      |      |
|                                                              | 40 MHz (Option RSA5000-B40)                                                |                |      |                |      |      |
| Min. Signal Duration for 100% POI at the Full-Scale Accuracy | maximum span, default Kaiser window                                        |                |      |                |      |      |
|                                                              | 7.45 μs                                                                    |                |      |                |      |      |
| Trace Detector                                               | pos-peak, neg-peak, sample, average                                        |                |      |                |      |      |
| Number of Traces                                             | 6                                                                          |                |      |                |      |      |
| Window Type                                                  | Hanning, Blackman-Harris, Rectangular, Flattop, Kaiser, and Gaussian       |                |      |                |      |      |
| Resolution Bandwidth                                         | provides 6 RBWs for each window, except the Rectangular; for Kaiser window |                |      |                |      |      |
|                                                              | Span                                                                       | Min. bandwidth |      | Max. bandwidth |      |      |
|                                                              | 40 MHz                                                                     | 100 kHz        |      | 3.21 MHz       |      |      |
|                                                              | 25 MHz                                                                     | 62.8 kHz       |      | 2.01 MHz       |      |      |
|                                                              | 10 MHz                                                                     | 25.1 kHz       |      | 804 kHz        |      |      |
|                                                              | 1 MHz                                                                      | 2.51 kHz       |      | 80.4 kHz       |      |      |
|                                                              | 100 kHz                                                                    | 251 Hz         |      | 8.04 kHz       |      |      |
| Max. Sample Rate                                             | 51.2 MSa/s                                                                 |                |      |                |      |      |
| FFT Rate                                                     | 146,484/s (nominal)                                                        |                |      |                |      |      |
| Number of Markers                                            | 8                                                                          |                |      |                |      |      |
| Amplitude Resolution                                         | 0.01 dB                                                                    |                |      |                |      |      |
| Frequency Point                                              | 801                                                                        |                |      |                |      |      |
| Acquisition Time                                             | Max. sample rate                                                           |                |      |                |      |      |
|                                                              | >156.5 μs                                                                  |                |      |                |      |      |
| Min. Signal Duration for 100% POI at Different RBWs          |                                                                            |                |      |                |      |      |
|                                                              | Duration Time (μs)                                                         |                |      |                |      |      |
| Span                                                         | RBW1                                                                       | RBW2           | RBW3 | RBW4           | RBW5 | RBW6 |
| 40 MHz                                                       | 26.9                                                                       | 16.9           | 11.9 | 9.32           | 8.07 | 7.45 |
| 25 MHz                                                       | 38.9                                                                       | 22.9           | 14.9 | 10.9           | 8.82 | 7.82 |
| 10 MHz                                                       | 86.8                                                                       | 46.8           | 26.8 | 16.8           | 11.8 | 9.30 |
| 1 MHz                                                        | 807                                                                        | 407            | 207  | 107            | 56.3 | 31.3 |
| Amplitude                                                    |                                                                            |                |      |                |      |      |
| Amplitude Flatness                                           | ±0.5 dB <sup>[1]</sup> (nominal)                                           |                |      |                |      |      |
| SFDR                                                         | <-60 dBc (typical)                                                         |                |      |                |      |      |
| UltraReal Density                                            |                                                                            |                |      |                |      |      |
| Probability Range                                            | 0 to 100% (with a step of 0.1%)                                            |                |      |                |      |      |
| Min. Span                                                    | 5 kHz                                                                      |                |      |                |      |      |
| Persistence Duration                                         | 32 ms to 10 s                                                              |                |      |                |      |      |
| UltraReal Spectrogram                                        |                                                                            |                |      |                |      |      |
| History Depth                                                | 8,192                                                                      |                |      |                |      |      |
| Dynamic Range Covered by Bitmap Color                        | 200 dB                                                                     |                |      |                |      |      |
| UltraReal PVT                                                |                                                                            |                |      |                |      |      |
| Min. Acquisition Time                                        | 187.9 μs                                                                   |                |      |                |      |      |
| Max. Acquisition Time                                        | 40 s                                                                       |                |      |                |      |      |
| Trigger                                                      |                                                                            |                |      |                |      |      |
| Trigger Source                                               | free run, external 1, external 2, power (time), FMT                        |                |      |                |      |      |
| UltraReal FMT                                                |                                                                            |                |      |                |      |      |
| Trigger Diagram                                              | density, spectrogram, normal, PVT                                          |                |      |                |      |      |
| Trigger Resolution                                           | 0.5 dB (nominal)                                                           |                |      |                |      |      |
| Trigger Criteria                                             | enter, leave, inside, outside, enter-leave, leave-enter                    |                |      |                |      |      |

Note: [1] Only applicable to the Normal measurement.

## VSA Mode (Option RSA5000-VSA)

|                           |         |                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Capture Oversampling      |         |                                                                                                                                                                                                                                                                                                                                   |
| Capture Oversampling      |         | 4, 8, 16                                                                                                                                                                                                                                                                                                                          |
| Capture Length            |         |                                                                                                                                                                                                                                                                                                                                   |
| Capture Oversampling = 4  |         | Maximum 4096                                                                                                                                                                                                                                                                                                                      |
| Capture Oversampling = 8  |         | Maximum 2048                                                                                                                                                                                                                                                                                                                      |
| Capture Oversampling = 16 |         | Maximum 1024                                                                                                                                                                                                                                                                                                                      |
| Sample Rate               |         |                                                                                                                                                                                                                                                                                                                                   |
| Maximum Sample Rate       |         | 32 MHz                                                                                                                                                                                                                                                                                                                            |
|                           |         | 51.2 MHz (Option RSA5000-B40)                                                                                                                                                                                                                                                                                                     |
| Symbol Rate               |         |                                                                                                                                                                                                                                                                                                                                   |
| Symbol Rate               |         | depends on capture oversampling                                                                                                                                                                                                                                                                                                   |
|                           |         | = sample rate/capture oversampling, ≥1 kHz                                                                                                                                                                                                                                                                                        |
| Usable I/Q Bandwidth      |         |                                                                                                                                                                                                                                                                                                                                   |
| Usable I/Q Bandwidth      |         | symbol rate x capture oversampling / 1.28                                                                                                                                                                                                                                                                                         |
| Trigger Mode              |         |                                                                                                                                                                                                                                                                                                                                   |
| Trigger Mode              |         | free run, external1, external2, power (time), FMT                                                                                                                                                                                                                                                                                 |
| Modulation Format         |         |                                                                                                                                                                                                                                                                                                                                   |
| FSK                       |         | 2FSK, 4FSK, 8FSK,                                                                                                                                                                                                                                                                                                                 |
| MSK                       |         | including GMSK, can select differential coding or not                                                                                                                                                                                                                                                                             |
| PSK                       |         | BPSK, QPSK, OQPSK, DQPSK, π/4-DQPSK, 8PSK, D8PSK, π/8-D8PSK                                                                                                                                                                                                                                                                       |
| QAM                       |         | 16QAM, 32QAM, 64QAM                                                                                                                                                                                                                                                                                                               |
| ASK                       |         | 2ASK, 4ASK                                                                                                                                                                                                                                                                                                                        |
| Filter Type               |         |                                                                                                                                                                                                                                                                                                                                   |
| Measurement Filter Type   |         | No Filter, RRC, Gaussian, Rectangular, User Defined                                                                                                                                                                                                                                                                               |
| Reference Filter Type     |         | Raised Cosine, RRC, Gaussian, Rectangular, Half Sine, User Defined                                                                                                                                                                                                                                                                |
| Predefined standard       |         |                                                                                                                                                                                                                                                                                                                                   |
| Cellular                  |         | GSM, NADC, WCDMA, PDC, PHP (PHS)                                                                                                                                                                                                                                                                                                  |
| Wireless Networking       |         | Bluetooth, WLAN (802.11b), ZigBee                                                                                                                                                                                                                                                                                                 |
| Others                    |         | TETRA, DECT, APCO-25                                                                                                                                                                                                                                                                                                              |
| Measurement Uncertainty   |         |                                                                                                                                                                                                                                                                                                                                   |
|                           |         | Specifications apply under the following conditions:<br>temperature from +20 °C to +30 °C<br>signal level ≥ −25 dBm<br>properly adjusted reference level<br>offset between device' s center frequency and signal' s center frequency smaller than 5 % of symbol rate<br>Random data sequence<br>Capture oversampling is set to 4. |
| Residual Error for QPSK   |         |                                                                                                                                                                                                                                                                                                                                   |
| Test Signal               |         | The reference filter is RRC with rolloff factor 0.22. The measurement filter is RRC with rolloff factor 0.22. The result length is 150 symbol. The center frequency is 1 GHz.                                                                                                                                                     |
|                           |         | Residual EVM RMS                                                                                                                                                                                                                                                                                                                  |
| Symbol Rate               | 100 kHz | < 1.5% (nominal)                                                                                                                                                                                                                                                                                                                  |
|                           | 1 MHz   | < 2% (nominal)                                                                                                                                                                                                                                                                                                                    |
| Residual Error for FSK    |         |                                                                                                                                                                                                                                                                                                                                   |
| Test Signal               |         | The reference filter is RRC with rolloff factor 0.22. The measurement filter is RRC with rolloff factor 0.22. The FSK reference deviation is a quarter of the symbol rate. The result length is 150 symbols. The center frequency is 1 GHz.                                                                                       |
|                           |         | Residual Frequency Error RMS                                                                                                                                                                                                                                                                                                      |
| Symbol Rate               | 100 kHz | < 2% (nominal)                                                                                                                                                                                                                                                                                                                    |
|                           | 1 MHz   | < 2.5% (nominal)                                                                                                                                                                                                                                                                                                                  |

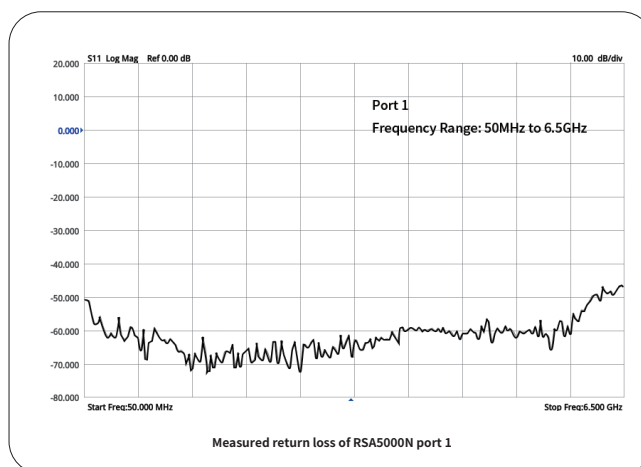
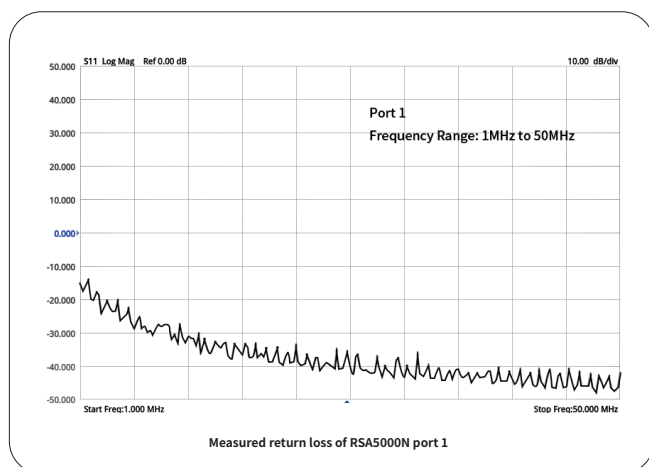
## EMI Mode (Option RSA5000-EMI)

| EMI Resolution Bandwidth     |                                                                     |
|------------------------------|---------------------------------------------------------------------|
| Resolution Bandwidth (-3 dB) | 100 Hz to 10 MHz, in 1-3-10 sequence                                |
| Resolution Bandwidth (-6 dB) | 200 Hz, 9 kHz, 120 kHz, 1 MHz                                       |
| EMI Detector                 |                                                                     |
| Detector                     | pos-peak, neg-peak, average, quasi-peak, CISPR average, RMS average |

| EMI Key Feature   |                         |
|-------------------|-------------------------|
| Key Feature       | CISPR 16-1-1 detectors  |
|                   | CISPR 16-1-1 bandwidths |
|                   | log and linear display  |
|                   | signal table            |
|                   | scan table              |
|                   | simultaneous detectors  |
|                   | automatic limit testing |
|                   | measure at marker       |
|                   | delta to limit          |
|                   | step and swept scans    |
| report generation |                         |

## VNA Mode

| Measurement Setup                        |                                                                                                                                                       |                |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Frequency Range                          | RSA5032N                                                                                                                                              | RSA5065N       |
|                                          | 10 MHz~3.2 GHz                                                                                                                                        | 10 MHz~6.5 GHz |
| Measurement Type                         | Reflection(S11), Transmission(S21), Distance-to-fault (DTF)                                                                                           |                |
| Measurement Bandwidth                    | 1 kHz~10 MHz (in 1-3-10 sequence)                                                                                                                     |                |
| Data Points                              | 101~10001; default 201                                                                                                                                |                |
| Trace Type                               | mem, math, clear write, average, max hold, min hold,                                                                                                  |                |
| Number of Markers                        | 8                                                                                                                                                     |                |
| Mechanical Calibration Kit               | Open, Short, Load, Through; User Calibration Kit                                                                                                      |                |
| Transmission Measurement S <sub>21</sub> |                                                                                                                                                       |                |
| Port Output Power                        | -10 dBm (nom.)                                                                                                                                        |                |
| Format                                   | Lin Mag, Log Mag, Phase, Group Delay                                                                                                                  |                |
| Magnitude Range                          | -500 G to 500 G                                                                                                                                       |                |
| Magnitude Resolution                     | Log: 100f; Lin 1a                                                                                                                                     |                |
| Dynamic Range                            | S21, RBW=10 kHz, Port1 level=0 dBm, Log Mag, Average=50                                                                                               |                |
|                                          | 80 dB (nom.)                                                                                                                                          |                |
| Reflection Measurement S <sub>11</sub>   |                                                                                                                                                       |                |
| Port Output Power                        | -10 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) |                |
| Magnitude Range                          | -500 G to 500 G                                                                                                                                       |                |
| Magnitude Resolution                     | Log: 100f; Lin 1a                                                                                                                                     |                |
| VSWR Range                               | -500 G to 500 G                                                                                                                                       |                |
| Corrected Directivity (With CK106A)      | S11, Log Mag, Average=50                                                                                                                              |                |
|                                          | > 40 dB (nom.)                                                                                                                                        |                |



|                            |                                                         |  |
|----------------------------|---------------------------------------------------------|--|
| Distance to Fault (DTF)    |                                                         |  |
| Port Output Power          | 0 dBm (nom.)                                            |  |
| Format                     | Lin Mag, Log Mag, SWR                                   |  |
| Maximum Distance (meters)  | $8.0 \times 10^{10} \times \text{Velocity Factor/Span}$ |  |
| Fault Resolution in meters | $1.5 \times 10^8 \times \text{Velocity Factor/Span}$    |  |
| Windows                    | Gaussian, Flattop, Rectangular, Hanning, Hamming        |  |
| Velocity Factor            | 0.1~1                                                   |  |

## General Specifications

|                                          |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Display                                  |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Type                                     |                                                                                                                                         | capacitive multi-touch screen                                                                                                                                                                                                                                                                                                                                                                                   |
| Resolution                               |                                                                                                                                         | 1024 x 600 pixels                                                                                                                                                                                                                                                                                                                                                                                               |
| Size                                     |                                                                                                                                         | 10.1"                                                                                                                                                                                                                                                                                                                                                                                                           |
| Color                                    |                                                                                                                                         | 24-bit color                                                                                                                                                                                                                                                                                                                                                                                                    |
| Printer Supported                        |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Protocol                                 |                                                                                                                                         | network printer                                                                                                                                                                                                                                                                                                                                                                                                 |
| Mass Memory                              |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Mass Memory                              | Internal Storage                                                                                                                        | 512 MB (nominal)                                                                                                                                                                                                                                                                                                                                                                                                |
|                                          | External Storage                                                                                                                        | USB storage device (not supplied)                                                                                                                                                                                                                                                                                                                                                                               |
| Power                                    |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Input Voltage Range, AC                  |                                                                                                                                         | 100 V to 240 V (nominal)                                                                                                                                                                                                                                                                                                                                                                                        |
| AC Frequency                             |                                                                                                                                         | 45 Hz to 440 Hz                                                                                                                                                                                                                                                                                                                                                                                                 |
| Power Consumption                        |                                                                                                                                         | 55 W (typical), max. 90 W with all options                                                                                                                                                                                                                                                                                                                                                                      |
| Environment                              |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Temperature                              | Operating Temperature Range                                                                                                             | 0°C to 50°C                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                          | Storage Temperature Range                                                                                                               | -20°C to 70°C                                                                                                                                                                                                                                                                                                                                                                                                   |
| Humidity                                 | 0°C to 30°C                                                                                                                             | ≤ 95% RH                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                          | 30°C to 40°C                                                                                                                            | ≤ 75% RH                                                                                                                                                                                                                                                                                                                                                                                                        |
| Altitude                                 | Operating Height                                                                                                                        | below 3,048 m (10,000 feet)                                                                                                                                                                                                                                                                                                                                                                                     |
| Electromagnetic Compatibility and Safety |                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                 |
| EMC                                      | complies with EMC Directive 2014/30/EU, complies with or above the standard specified in IEC61326-1:2013/EN61326-1:2013 Group 1 Class A |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                          | CISPR 11/EN 55011                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                          | IEC 61000-4-2:2008/EN 61000-4-2                                                                                                         | ±4.0 kV (contact discharge), ±8.0 kV (air discharge)                                                                                                                                                                                                                                                                                                                                                            |
|                                          | IEC 61000-4-3:2002/EN 61000-4-3                                                                                                         | 3V/m (80 MHz to 1 GHz); 3V/m (1.4 GHz to 2 GHz); 1V/m (2.0 GHz to 2.7 GHz)                                                                                                                                                                                                                                                                                                                                      |
|                                          | IEC 61000-4-4:2004/EN 61000-4-4                                                                                                         | 1 kV power                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                          | IEC 61000-4-5:2001/EN 61000-4-5                                                                                                         | 0.5 kV (phase-to-neutral voltage); 1 kV (phase-to-earth voltage); 1 kV (neutral-to-earth voltage)                                                                                                                                                                                                                                                                                                               |
|                                          | IEC 61000-4-6:2003/EN 61000-4-6                                                                                                         | 3 V, 0.15 to 80 MHz                                                                                                                                                                                                                                                                                                                                                                                             |
|                                          | IEC 61000-4-11:2004/EN 61000-4-11                                                                                                       | voltage dip: 0% UT during half cycle; 0% UT during 1 cycle; 70% UT during 25 cycles<br>short interruption: 0% UT during 250 cycles                                                                                                                                                                                                                                                                              |
| Safety                                   |                                                                                                                                         | complies with IEC 61010-1:2010 (Third Edition)/EN 61010-1:2010, UL 61010-1:2012 R4.16 and CAN/CSA-C22.2 No. 61010-1-12+ GI1+ GI2                                                                                                                                                                                                                                                                                |
| Environmental Stress                     |                                                                                                                                         | Samples of this product have been type tested in accordance with RIGOL's reliability test regulations and verified to be robust against the environmental stresses of storage, transportation, and end-use; those stresses include, but are not limited to, temperature, humidity, shock, and vibration. The test methods are compliant with standards specified in GB/T6587 Class 2 and MILPRF-28800F Class 3. |

| Size                             |                                                      |
|----------------------------------|------------------------------------------------------|
| (W x H x D)                      | 410 mm x 224 mm x 135 mm<br>(16.14" x 8.82" x 5.32") |
| Weight                           |                                                      |
| Without Tracking Generator       | 4.65 kg (10.25 lb)                                   |
| With Tracking Generator          | 4.95 kg (10.91 lb)                                   |
| Calibration Interval             |                                                      |
| Recommended Calibration Interval | 18 months                                            |

## Input/Output

| Front Panel Connector                   |              |                                                                                                                          |                                     |
|-----------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| RF Input                                | Impedance    |                                                                                                                          | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | N-type female                       |
| TG Output                               | Impedance    |                                                                                                                          | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | N-type female                       |
| Internal/External Reference             |              |                                                                                                                          |                                     |
| Internal Reference                      | Frequency    |                                                                                                                          | 10 MHz                              |
|                                         | Output Level |                                                                                                                          | +3 dBm to +10 dBm, +7 dBm (typical) |
|                                         | Impedance    |                                                                                                                          | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | BNC female                          |
| External Reference                      | Frequency    |                                                                                                                          | 10 MHz ± 5 ppm                      |
|                                         | Input Level  |                                                                                                                          | 0 dBm to +10 dBm                    |
|                                         | Impedance    |                                                                                                                          | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | BNC female                          |
| External Trigger Input/Output           |              |                                                                                                                          |                                     |
| External Trigger Input 1                | Impedance    |                                                                                                                          | ≥ 1 kΩ (nominal)                    |
|                                         | Connector    |                                                                                                                          | BNC female                          |
|                                         | Level        |                                                                                                                          | 5 V TTL level                       |
| External Trigger Input 2/Trigger Output | Impedance    | on trigger input                                                                                                         | ≥ 1 kΩ (nominal)                    |
|                                         |              | on trigger output                                                                                                        | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | BNC female                          |
|                                         | Level        |                                                                                                                          | 5 V TTL level                       |
| IF Output                               |              |                                                                                                                          |                                     |
| IF Output                               | Frequency    |                                                                                                                          | 430 MHz ± 20 MHz (nominal)          |
|                                         | Amplitude    | RF input power (P <sub>RFin</sub> ) ≤ -10 dBm, attenuation = 0, preamp off.                                              |                                     |
|                                         |              | 50MHz, P <sub>RFin</sub> ± 4 dB (nominal)<br>other frequency, P <sub>RFin</sub> ± 4 dB + RF frequency response (nominal) |                                     |
|                                         | Impedance    |                                                                                                                          | 50 Ω (nominal)                      |
|                                         | Connector    |                                                                                                                          | SMB male                            |
| Communication Interface                 |              |                                                                                                                          |                                     |
| USB Host (4 ports)                      | Connector    |                                                                                                                          | A plug                              |
|                                         | Protocol     |                                                                                                                          | version 2.0                         |
| USB Device                              | Connector    |                                                                                                                          | B plug                              |
|                                         | Protocol     |                                                                                                                          | version 2.0                         |
| LAN                                     | Connector    |                                                                                                                          | 100/1000Base, RJ-45                 |
|                                         | Protocol     |                                                                                                                          | LXI Core 2011 Device                |
| HDMI                                    | Connector    |                                                                                                                          | A plug                              |
|                                         | Protocol     |                                                                                                                          | HDMI 1.4b                           |

## ► Order Information

|                      | Description                                                                                                                                                                                                                                                                       | Order No .                        |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Model                | Real-time Spectrum Analyzer, 9 kHz to 3.2 GHz                                                                                                                                                                                                                                     | RSA5032                           |
|                      | Real-time Spectrum Analyzer, 9 kHz to 6.5 GHz                                                                                                                                                                                                                                     | RSA5065                           |
|                      | Real-time Spectrum Analyzer, 9 kHz to 3.2 GHz (include TG)                                                                                                                                                                                                                        | RSA5032-TG                        |
|                      | Real-time Spectrum Analyzer, 9 kHz to 6.5 GHz (include TG)                                                                                                                                                                                                                        | RSA5065-TG                        |
|                      | Real-time Spectrum Analyzer, 9 kHz to 3.2 GHz (include TG and VNA)                                                                                                                                                                                                                | RSA5032N                          |
|                      | Real-time Spectrum Analyzer, 9 kHz to 6.5 GHz (include TG and VNA)                                                                                                                                                                                                                | RSA5065N                          |
| Standard Accessories | Quick Guide (hard copy)                                                                                                                                                                                                                                                           | -                                 |
|                      | Power Cable                                                                                                                                                                                                                                                                       | -                                 |
| Option               | Vector Signal Analysis Measurement Application                                                                                                                                                                                                                                    | RSA5000-VSA                       |
|                      | EMI Measurement Application                                                                                                                                                                                                                                                       | RSA5000-EMI                       |
|                      | Preamplifier (PA)                                                                                                                                                                                                                                                                 | RSA5000-PA                        |
|                      | High Stability Clock                                                                                                                                                                                                                                                              | OEXO-C08                          |
|                      | Real-time/Analysis Bandwidth 40 MHz                                                                                                                                                                                                                                               | RSA5000-B40                       |
|                      | Advanced Measurement Kit                                                                                                                                                                                                                                                          | RSA5000-AMK                       |
|                      | Spectrum Analyzer PC Software                                                                                                                                                                                                                                                     | Ultra Spectrum                    |
|                      | EMI Pre-compliance Test Software                                                                                                                                                                                                                                                  | S1210 EMI Pre-compliance Software |
| Optional Accessories | High-performance Network Analysis Calibration Kit(frequency range: DC to 6.5 GHz)                                                                                                                                                                                                 | CK106A                            |
|                      | Economical Network Analysis Calibration Kit(frequency range: DC to 1.5 GHz)                                                                                                                                                                                                       | CK106E                            |
|                      | Include: N-SMA cable, BNC-BNC cable, N-BNC adaptor, N-SMA adaptor, 75 $\Omega$ -50 $\Omega$ adaptor, 900 MHz/1.8 GHz antenna (2pcs), 2.4 GHz antenna (2pcs)                                                                                                                       | DSA Utility Kit                   |
|                      | Include: N(F)-N(F) adaptor (1pcs), N(M)-N(M) adaptor (1pcs), N(M)-SMA(F) adaptor (2pcs), N(M)-BNC(F) adaptor (2pcs), SMA(F)-SMA(F) adaptor (1pcs), SMA(M)-SMA(M) adaptor (1pcs), BNC T type adaptor (1pcs), 50 $\Omega$ SMA load (1pcs), 50 $\Omega$ BNC impedance adaptor (1pcs) | RF Adaptor Kit                    |
|                      | Include: 50 $\Omega$ to 75 $\Omega$ adaptor (2pcs)                                                                                                                                                                                                                                | RF CATV Kit                       |
|                      | Include: 6 dB attenuator (1pcs), 10 dB attenuator (2pcs)                                                                                                                                                                                                                          | RF Attenuator Kit                 |
|                      | 30 dB high-power attenuator, with the max power of 100 W                                                                                                                                                                                                                          | ATT03301H                         |
|                      | N(M)-N(M) RF Cable                                                                                                                                                                                                                                                                | CB-NM-NM-75-L-12G                 |
|                      | N(M)-SMA(M) RF Cable                                                                                                                                                                                                                                                              | CB-NM-SMAM-75-L-12G               |
|                      | VSWR Bridge, 1 MHz to 3.2 GHz                                                                                                                                                                                                                                                     | VB1032                            |
|                      | VSWR Bridge, 2 GHz to 8 GHz                                                                                                                                                                                                                                                       | VB1080                            |
|                      | Near-field Probe                                                                                                                                                                                                                                                                  | NFP-3                             |
|                      | Rack Mount Kit                                                                                                                                                                                                                                                                    | RM6041                            |
|                      | USB Cable                                                                                                                                                                                                                                                                         | CB-USBA-USBB-FF-150               |

## Warranty

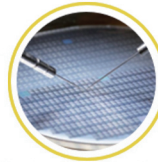
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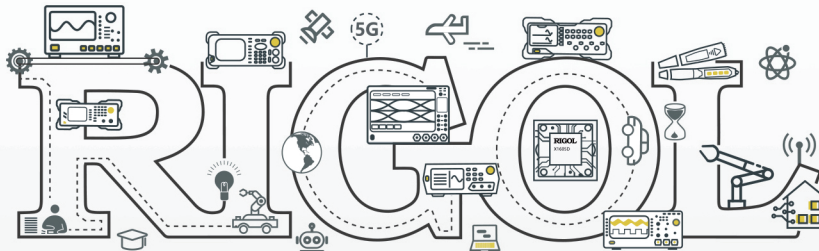
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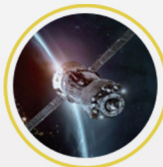


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