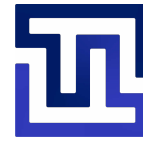


# SNA5000A Series Vector Network Analyzer

 **SIGLENT**<sup>®</sup>



INSTRUMENTS  
**TECHNO  
TEST**

DataSheet DS09050\_E01B



**SIGLENT TECHNOLOGIES CO.,LTD**

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## 1. General Description

The SIGLENT SNA5000A series of Vector Network Analyzers have a frequency range of 9 kHz to 8.5 GHz, which support 2/4-ports scattering-parameter, differential-parameter, and time-domain parameter measurements. The SNA5000A series of VNAs are effective instrumentation for determining the Q-factor, bandwidth and insertion loss of a filter, They feature impedance conversion, movement of measurement plane, limit testing, ripple test, fixture simulation and adapter removal/insertion adjustments. The VNAs have five sweep types: Linear-Frequency mode, Log-Frequency mode, Power-Sweep mode, CW-Time mode and Segment-Sweep mode. The SNA5000A series VNAs also support scattering-parameter correction of SOLT, SOLR, TRL, Response and Enhanced Response for increased flexibility in R&D and manufacturing applications.

## 2. Features

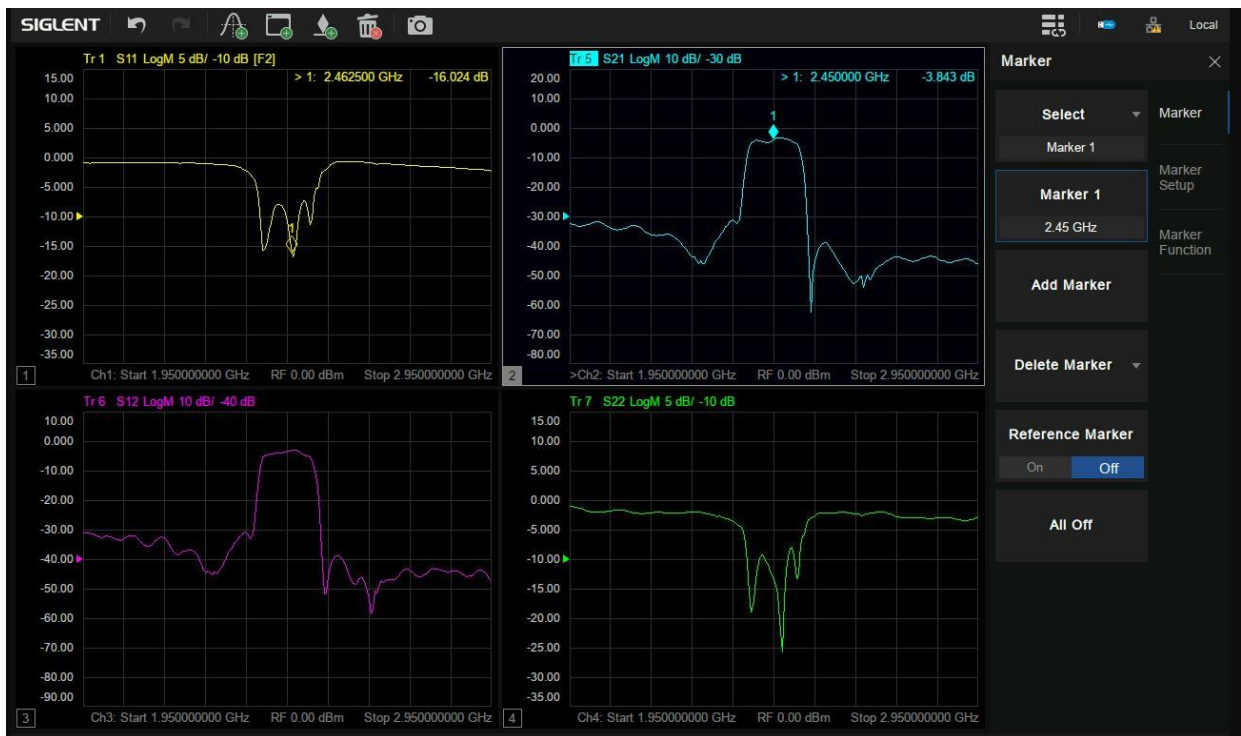
- ◆ Frequency range: 9 kHz - 8.5 GHz
- ◆ Frequency resolution: 1 Hz
- ◆ Level resolution: 0.05 dB
- ◆ Range of IFBW: 10 Hz~3 MHz
- ◆ Setting range of output level: -55 dBm ~ +10 dBm
- ◆ Dynamic range: 125 dB
- ◆ Types of calibration: Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, Full-three port calibration, Full-four port calibration, TRL calibration
- ◆ Types of measurement: Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, limit test, ripple test, impedance conversion, fixture simulation, adapter removal/insertion
- ◆ Support Bias-Tees
- ◆ Interface: LAN, USB Device, USB Host(USB-GPIB)
- ◆ Remote control: SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet/WebServer
- ◆ 12.1-inch touch screen
- ◆ Video output: HDMI

### 3. Models and key specifications

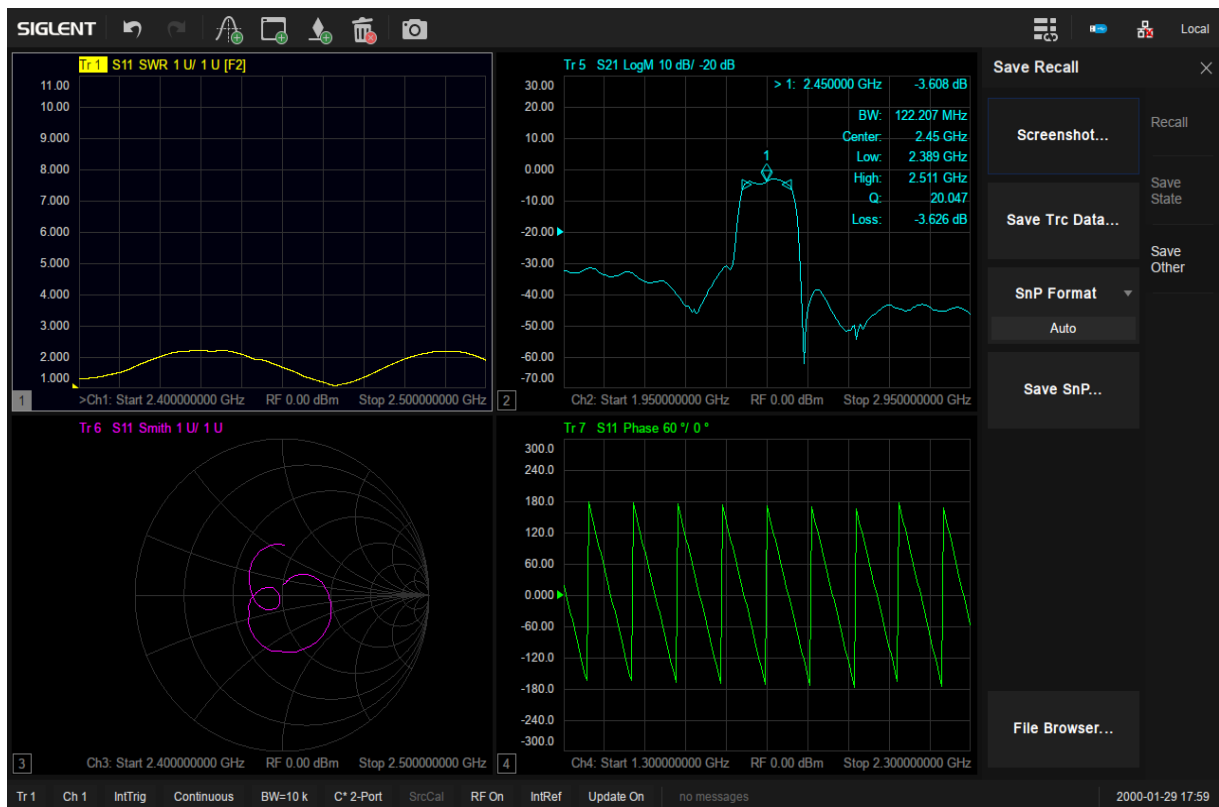
| Model                         | SNA5002A  | SNA5012A       | SNA5004A       | SNA5014A       |
|-------------------------------|---|----------------|----------------|----------------|
| Frequency range               | 9 kHz- 4.5 GHz  | 9 kHz- 8.5 GHz | 9 kHz- 4.5 GHz | 9 kHz- 8.5 GHz |
| Ports                         | 2   | 2              | 4              | 4              |
| Frequency resolution          | 1 Hz  |                |                |                |
| Level resolution              | 0.05 dB   |                |                |                |
| Range of IFBW                 | 10 Hz~3 MHz   |                |                |                |
| Setting range of output level | -55 dBm ~ +10 dBm   |                |                |                |
| Dynamic range                 | 125 dB  |                |                |                |
| Types of calibration          | Response calibration, Enhanced Response calibration, Full-one port calibration, Full-two port calibration, Full-three port calibration, Full-four port calibration, TRL calibration   |                |                |                |
| Types of measurement          | Scattering-parameter measurement, differential-parameter measurement, receiver measurement, time-domain parameter analysis, limit test, ripple test, impedance conversion, fixture simulation, adapter removal/insertion, enhanced time-domain parameter analysis(TDR). |                |                |                |
| Bias-Tees                     | Support   |                |                |                |
| Interface                     | LAN, USB Device, USB Host(USB-GPIB)   |                |                |                |
| Remote control                | SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet/WebServer  |                |                |                |
| Display                       | 12.1-inch touch screen  |                |                |                |
| Video output                  | HDMI  |                |                |                |

## 4. Design Features

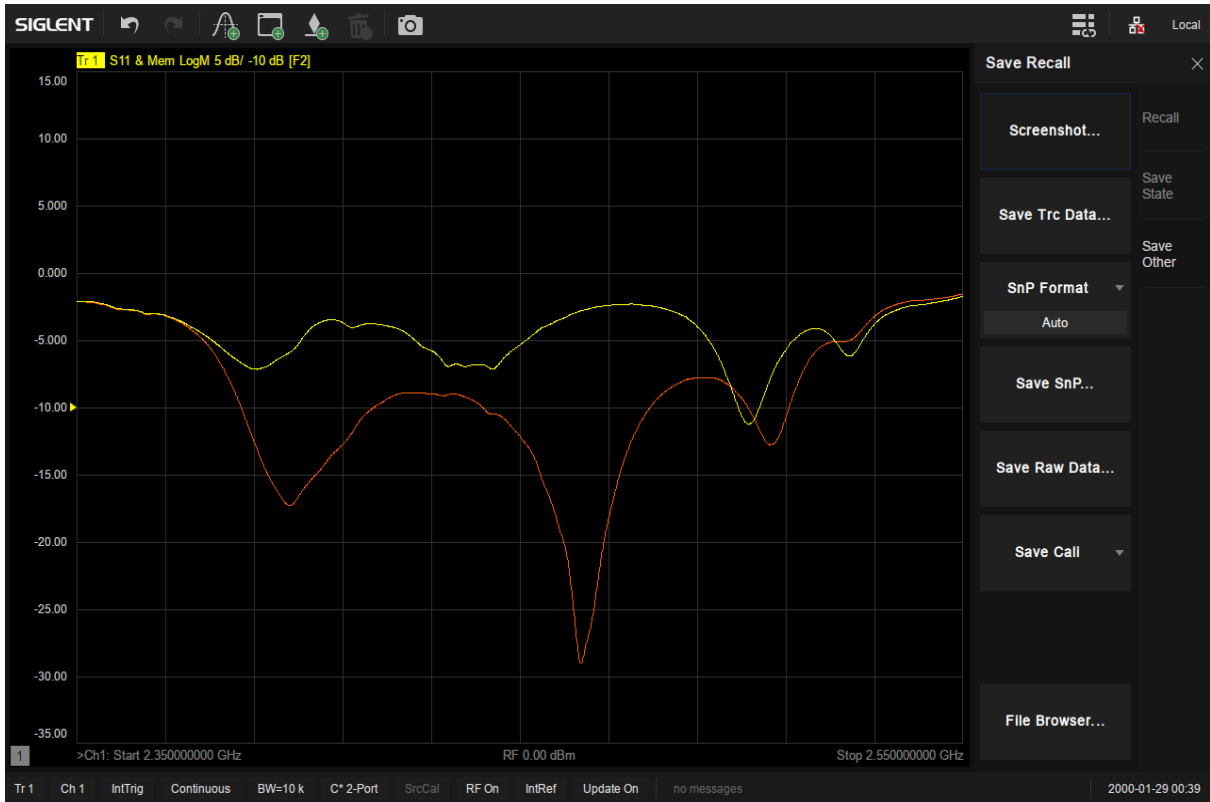
Multi-window display:



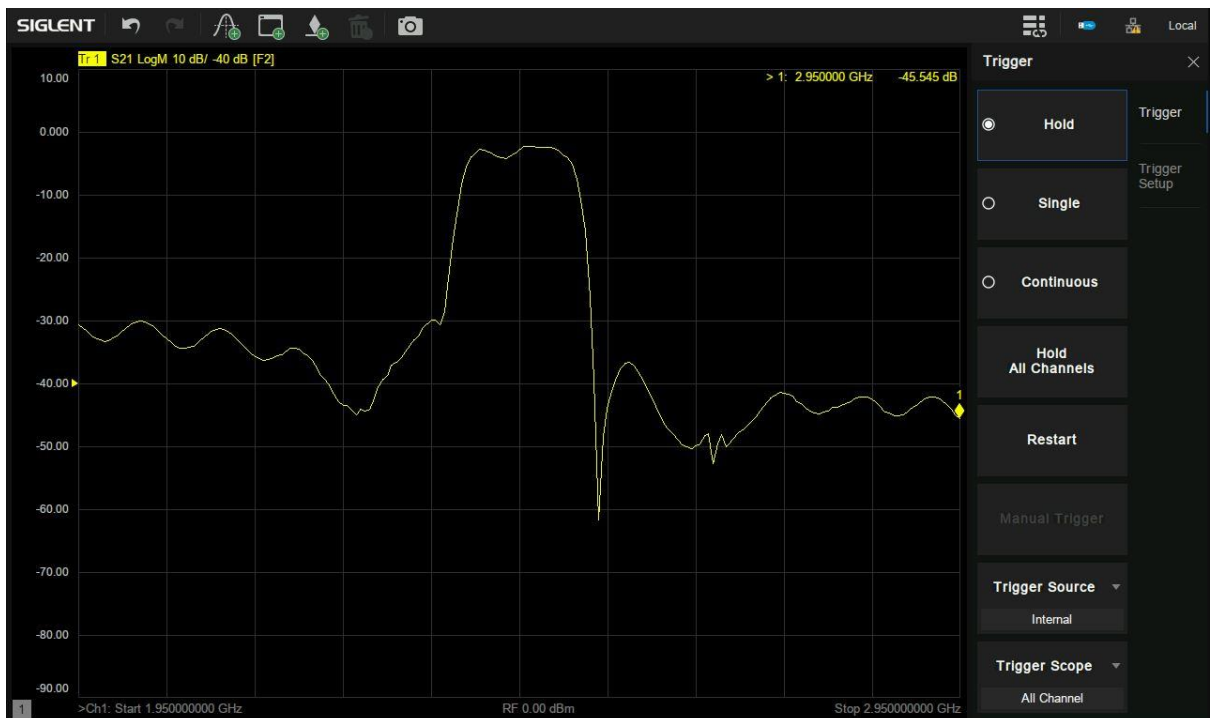
Multi-format display:



Display and compare memory and current data:



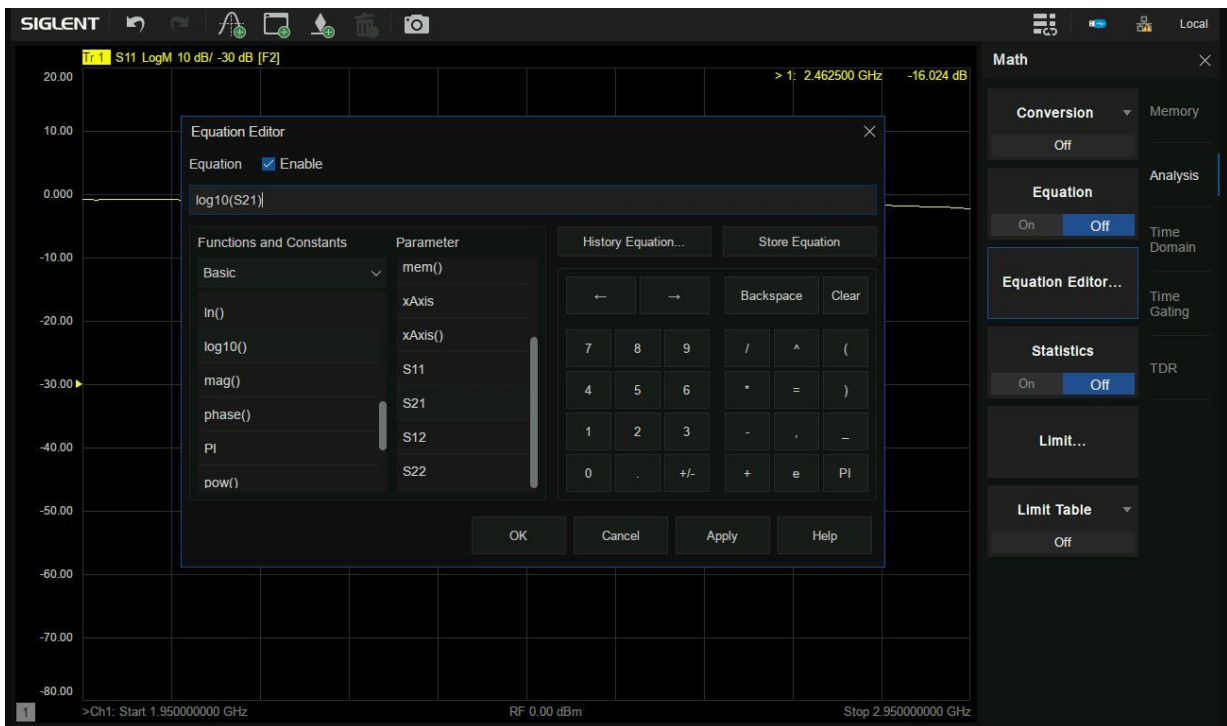
Display data hold:



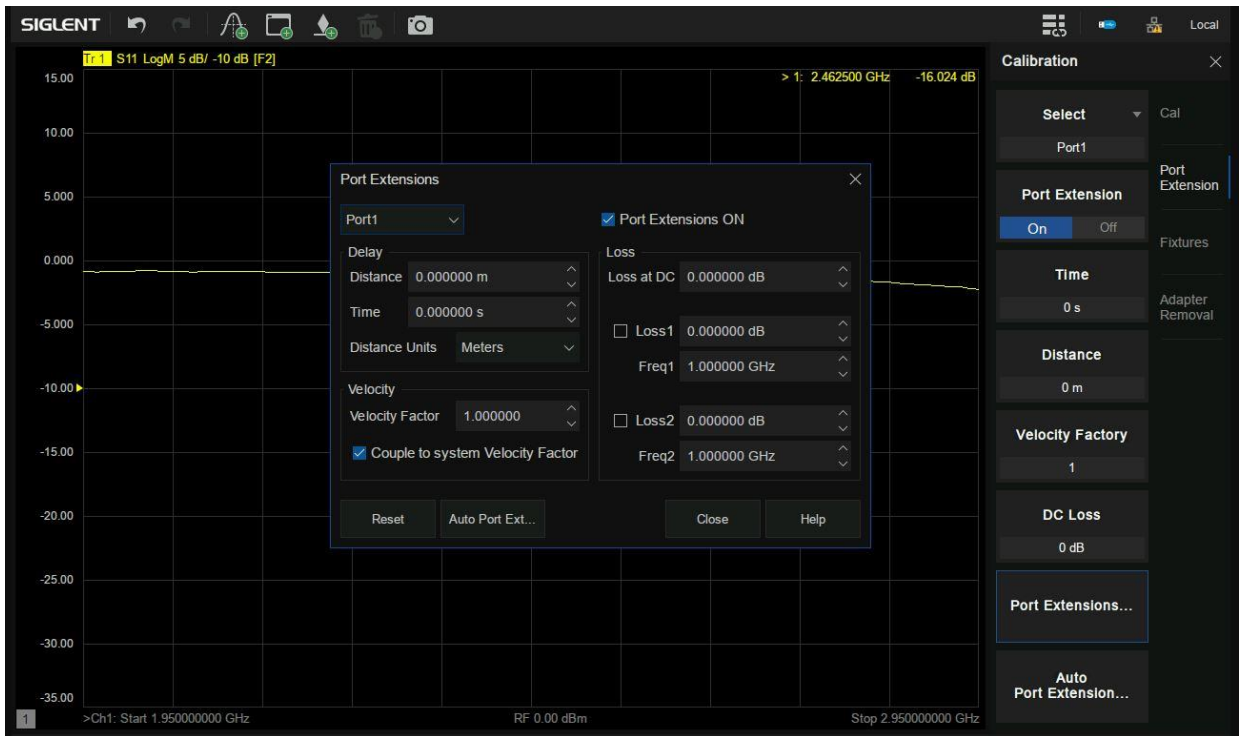
### Impedance conversion:



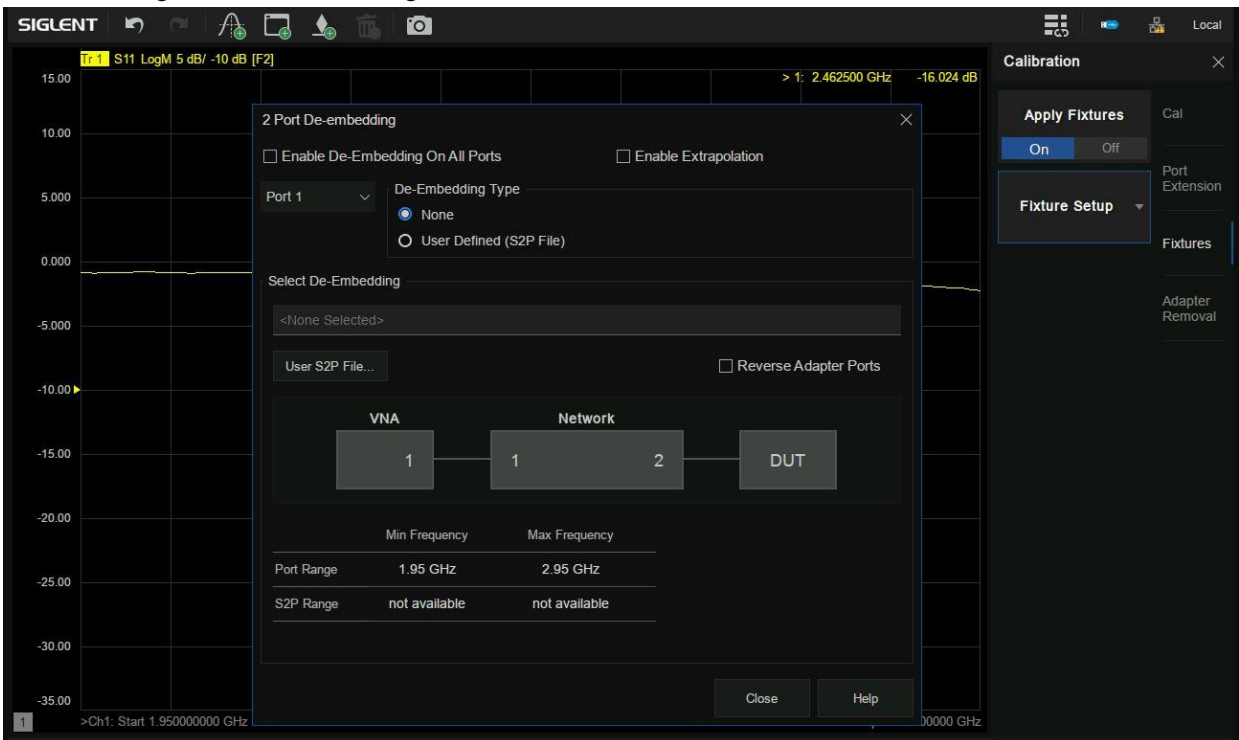
### Equation Editor:



Port Extensions:



Embedding and De-Embedding:



### Time-Domain analysis:



### Enhanced Time-Domain analysis(TDR)



## 5. Definitions

Specifications are valid under the following conditions: The instrument is within the calibration period, has been stored between 0 and 40°C for at least 2 hours before use, and has been powered on and warmed up for at least 90 minutes. The specifications include the measurement uncertainty unless otherwise noted.

**Specifications:** All products are guaranteed to meet published specifications at room temperature (approximately 25°C), unless otherwise noted.

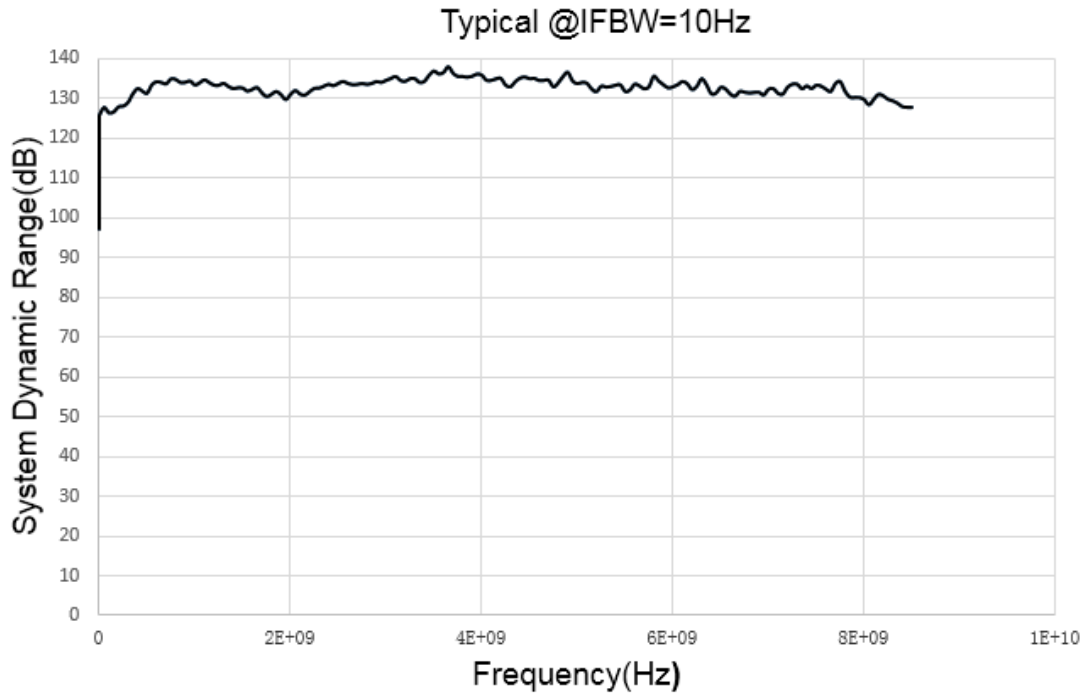
**Typical:** Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 25°C). Typical performance is not warranted and does not include measurement uncertainty.

**Nominal:** This value indicates the expected mean or average performance, or an attribute whose performance is by design, such as the 50 Ohm connector.

## 6. Specifications

### 6.1. Dynamic range

| Frequency range | IFBW  | Specification(dB) |
|-----------------|-------|-------------------|
| 9 kHz-30 kHz    |       | 90                |
| 30 kHz-100 kHz  |       | 98                |
| 100 kHz-30 MHz  | 10 Hz | 115               |
| 30 MHz -7.7 GHz |       | 125               |
| 7.7 GHz -8 GHz  |       | 120               |
| 8 GHz -8.5 GHz  |       | 117               |

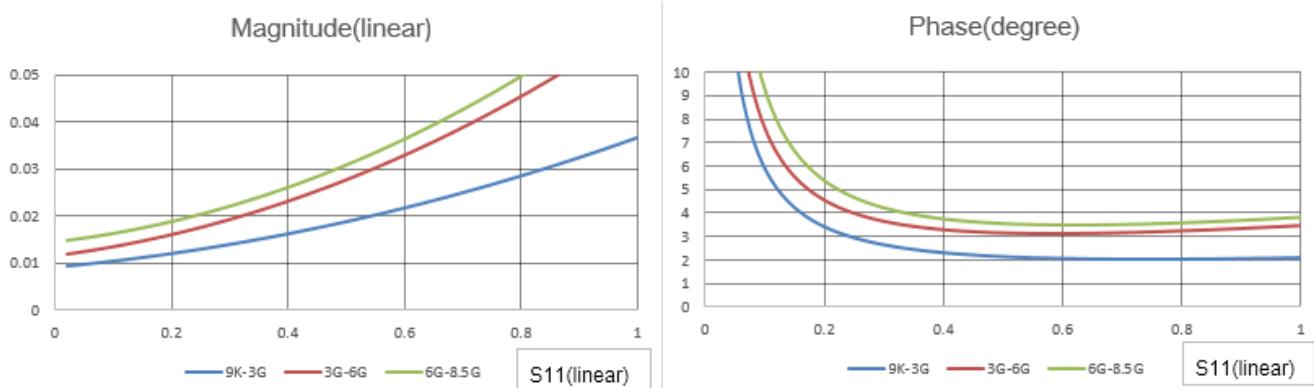


### 6.2. Corrected system performance with calibration kit

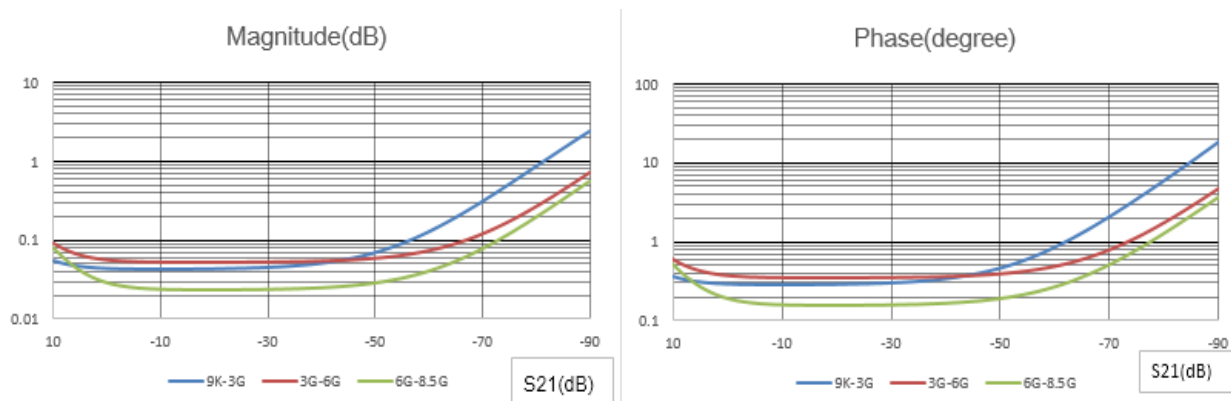
User correction: On, system correction: On; Corrected system performance with Keysight 85052D 3.5mm calibration kit, isolation calibration performed. IFBW is 10 Hz, no averaging applied to data, environmental temperature is 25°C ( $\pm 5^\circ\text{C}$ ), with  $< 1^\circ\text{C}$  deviation from calibration temperature.

| Specification (dB)    | 9 kHz-3 GHz | 3 GHz-6 GHz | 6 GHz-8.5 GHz |
|-----------------------|-------------|-------------|---------------|
| Directivity           | 41          | 39          | 37            |
| Source match          | 36          | 30          | 29            |
| Load match            | 41          | 37          | 35            |
| Reflect tracking      | $\pm 0.004$ | $\pm 0.003$ | $\pm 0.004$   |
| Transmission tracking | $\pm 0.06$  | $\pm 0.09$  | $\pm 0.11$    |

### Reflection uncertainty (Specification, Power: -10 dBm, IFBW:10 Hz):



**Transmission uncertainty (Specification, Power: -10 dBm, IFBW:10 Hz):**



**6.3. Uncorrected system performance**

User correction: Off, system correction: On; IFBW is 10 Hz, no averaging applied to data.

| Specification (dB)    | 9 kHz-3 GHz | 3 GHz-6 GHz | 6 GHz-8.5 GHz |
|-----------------------|-------------|-------------|---------------|
| Directivity           | 22          | 20          | 16            |
| Source match          | 22          | 20          | 16            |
| Load match            | 13          | 11          | 10            |
| Reflect tracking      | ±1.4        | ±1          | ±1            |
| Transmission tracking | ±1.4        | ±1          | ±1            |

**6.4. Test port output (Source)**

**6.4.1. Test port output frequency**

| Description          | Specification                      |
|----------------------|------------------------------------|
| Frequency range      |                                    |
| SNA5002A, SNA5004A   | 9 kHz to 4.5 GHz                   |
| SNA5012A, SNA5014A   | 9 kHz to 8.5 GHz                   |
| Frequency resolution | 1 Hz                               |
| CW accuracy          |                                    |
| Standard             | ± 1.0 ppm (23 ± 3°C )              |
| Option: SNA5000-HPR  | ± 0.1 ppm (23 ± 3°C )              |
| Source stability     |                                    |
| Standard             | ± 1.0 ppm (0 to 40°C )             |
|                      | ± 0.5 ppm/year , ± 3.0 ppm/20 year |
| Option: SNA5000-HPR  | ± 1 ppb (0 to 40°C )               |
|                      | ± 50 ppb/year                      |

### 6.4.2. Test port output power

| Description       | Specification               |
|-------------------|-----------------------------|
| Preset power      | 0 dBm                       |
| Level accuracy    | ±1.5 dB@0 dBm               |
| Level linearity   |                             |
| 9 kHz- 30 kHz     | ±0.5 dB (-20 dBm to 0 dBm)  |
| 30 kHz- 100 kHz   | ±0.5 dB (-20 dBm to 5 dBm)  |
| 100 kHz- 5 GHz    | ±0.5 dB (-20 dBm to 10 dBm) |
| 5 GHz- 7.7 GHz    | ±0.5 dB (-20 dBm to 8 dBm)  |
| 7.7 GHz- 8 GHz    | ±0.5 dB (-20 dBm to 5 dBm)  |
| 8 GHz- 8.5 GHz    | ±0.5 dB (-20 dBm to 2 dBm)  |
| Range             |                             |
| 9 kHz- 30 kHz     | -55 dBm to 0 dBm            |
| 30 kHz- 100 kHz   | -55 dBm to 5 dBm            |
| 100 kHz- 5 GHz    | -55 dBm to 10 dBm           |
| 5 GHz- 7.7 GHz    | -55 dBm to 8 dBm            |
| 7.7 GHz- 8 GHz    | -55 dBm to 5 dBm            |
| 8 GHz- 8.5 GHz    | -55 dBm to 2 dBm            |
| Sweep range       |                             |
| 9 kHz- 30 kHz     | -55 dBm to 0 dBm            |
| 30 kHz- 100 kHz   | -55 dBm to 5 dBm            |
| 100 kHz- 5 GHz    | -55 dBm to 10 dBm           |
| 5 GHz- 7.7 GHz    | -55 dBm to 8 dBm            |
| 7.7 GHz- 8 GHz    | -55 dBm to 5 dBm            |
| 8 GHz- 8.5 GHz    | -55 dBm to 2 dBm            |
| Max leveled power |                             |
| 9 kHz- 30 kHz     | 0 dBm                       |
| 30 kHz- 100 kHz   | 5 dBm                       |
| 100 kHz- 5 GHz    | 10 dBm                      |
| 5 GHz- 7.7 GHz    | 8 dBm                       |
| 7.7 GHz- 8 GHz    | 5 dBm                       |
| 8 GHz- 8.5 GHz    | 2 dBm                       |
| Level resolution  | 0.05 dB                     |

### 6.4.3. Test port output signal purity

| Description                   | Specification |
|-------------------------------|---------------|
| 2nd or 3rd harmonics (0 dBm)  |               |
| 9 kHz to 100 kHz              | <-20 dBc      |
| 100 kHz to 8.5 GHz            | <-28 dBc      |
| Non-harmonic spurious (0 dBm) | <-30 dBc      |

## 6.5. Test port input

### 6.5.1. Test port input levels

| Description               | Specification             | Typical  |
|---------------------------|---------------------------|----------|
| Max input level           |                           |          |
| 9 kHz-8.5 GHz             | +10 dBm                   |          |
| Damage input level        |                           |          |
| 9 kHz-8.5 GHz             | +27 dBm (RF) or 35 V (DC) |          |
| Crosstalk                 |                           |          |
| 9 kHz- 100 kHz            | -100 dB                   |          |
| 100 kHz- 10 MHz           | -110 dB                   |          |
| 10 MHz- 8.5 GHz           | -120 dB                   |          |
| Noise floor               |                           |          |
| 9 kHz- 100 kHz            | -100 dBm/Hz               |          |
| 100 kHz- 30 MHz           | -115 dBm/Hz               |          |
| 30 MHz- 8.5 GHz           | -125 dBm/Hz               |          |
| Compression level(10 dBm) |                           |          |
| Magnitude                 |                           |          |
| 9 kHz- 8.5 GHz            |                           | 0.09 dB  |
| Phase                     |                           |          |
| 9 kHz- 8.5 GHz            |                           | 0.36 deg |

### 6.5.2. Trace noise

| Description                        | Specification |
|------------------------------------|---------------|
| Note:Setting max output power      |               |
| Transmission trace noise magnitude |               |
| 9 kHz- 50 kHz (IFBW=1 kHz)         | 0.003 dB rms  |
| 50 kHz- 1 MHz (IFBW=1 kHz)         | 0.003 dB rms  |
| 1 MHz- 8.5 GHz (IFBW=10 kHz)       | 0.004 dB rms  |
| Reflection trace noise magnitude   |               |
| 9 kHz- 50 kHz (IFBW=1 kHz)         | 0.003 dB rms  |
| 50 kHz- 1 MHz (IFBW=1 kHz)         | 0.003 dB rms  |
| 1 MHz- 8.5 GHz (IFBW=10 kHz)       | 0.004 dB rms  |
| Transmission trace noise phase     |               |
| 9 kHz- 50 kHz (IFBW=1 kHz)         | 0.035 deg rms |
| 50 kHz- 1 MHz (IFBW=1 kHz)         | 0.03 deg rms  |
| 1 MHz- 8.5 GHz (IFBW=10 kHz)       | 0.05 deg rms  |
| Reflection trace noise phase       |               |
| 9 kHz- 50 kHz (IFBW=1 kHz)         | 0.03 deg rms  |
| 50 kHz- 1 MHz (IFBW=1 kHz)         | 0.035 deg rms |
| 1 MHz- 8.5 GHz (IFBW=10 kHz)       | 0.05 deg rms  |

### 6.5.3. Stability

| Description    | Specification | Typical           |
|----------------|---------------|-------------------|
| Magnitude      |               |                   |
| 9 kHz- 3 GHz   |               | $\pm 0.005$ dB/°C |
| 3 GHz- 8.5 GHz |               | $\pm 0.014$ dB/°C |
| Phase          |               |                   |
| 9 kHz- 3 GHz   |               | $\pm 0.1$ deg/°C  |
| 3 GHz- 8.5 GHz |               | $\pm 0.3$ deg/°C  |

### 6.5.4. Dynamic accuracy

| Description                     | Specification   |
|---------------------------------|-----------------|
| Relative to -10 dBm input power |                 |
| Magnitude                       |                 |
| 10 dBm                          | $\pm 0.1$ dB    |
| -30 dBm                         | $\pm 0.05$ dB   |
| -100 dBm                        | $\pm 2$ dB      |
| Phase                           |                 |
| 10 dBm                          | $\pm 2$ deg     |
| -30 dBm                         | $\pm 0.2$ deg   |
| -100 dBm                        | $\pm 10.38$ deg |

## 7. Sweep time

Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 500 kHz.

| Points      | 201   | 401   | 1601   | 6401   |
|-------------|-------|-------|--------|--------|
| Uncorrected | 15 ms | 17 ms | 35 ms  | 141 ms |
| 2-port cal  | 30 ms | 34 ms | 70 ms  | 282 ms |
| 4-port cal  | 60 ms | 68 ms | 140 ms | 564 ms |

Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 100 kHz.

| Points      | 201   | 401   | 1601   | 6401   |
|-------------|-------|-------|--------|--------|
| Uncorrected | 17 ms | 20 ms | 46 ms  | 185 ms |
| 2-port cal  | 34 ms | 40 ms | 92 ms  | 370 ms |
| 4-port cal  | 68 ms | 80 ms | 184 ms | 740 ms |

Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 10 kHz.

| Points      | 201    | 401    | 1601   | 6401    |
|-------------|--------|--------|--------|---------|
| Uncorrected | 33 ms  | 52 ms  | 175 ms | 698 ms  |
| 2-port cal  | 66 ms  | 104 ms | 350 ms | 1396 ms |
| 4-port cal  | 132 ms | 208 ms | 700 ms | 2792 ms |

Start frequency: 100 kHz, Stop frequency: 8.5 GHz; IFBW: 1 kHz.

| Points      | 201    | 401     | 1601    | 6401     |
|-------------|--------|---------|---------|----------|
| Uncorrected | 193 ms | 372 ms  | 1452 ms | 5806 ms  |
| 2-port cal  | 386 ms | 744 ms  | 2904 ms | 11612 ms |
| 4-port cal  | 772 ms | 1488 ms | 5808 ms | 23224 ms |

## 8. General information

| Description   | Characteristics  |
|---|--|
| <b>Operating environment</b>  |  |
| Temperature   | 0 to 40 °C   |
| Humidity  | 85%: 40 °C,24 hours  |
| Altitude  | 0 to 3000 m  |
| <b>Non-operating storage environment</b>                                      |  |
| Temperature   | -20 °C to 60 °C  |
| Humidity  | 85%: 65 °C,24 hours  |
| Altitude  | 0 to 15000 m   |
| Size  | W×H×D=378×284×126 mm   |
| Weight  | 2-port: 5.5 kg, 4-port 7.4 kg  |
| <b>EMC</b>  |  |
| Conducted disturbance: CISPR 11/EN 55011                                      | CLASS A group 1, 150 kHz - 30 MHz  |
| Radiated disturbance: CISPR 11/EN 55011                                       | CLASS A group 1, 30 MHz -1 GHz   |
| Electrostatic discharge(ESD): IEC61000-4-2/<br>EN61000-4-2                    | 4.0 kV (contact), 8.0 kV (air)   |
| Radio-frequency electromagnetic field Immunity:<br>IEC 61000-4-3/EN 61000-4-3 | 10 V/m (80 MHz to 1 GHz)<br>3 V/m (1.4 GHz to 2 GHz)<br>1 V/m (2.0 GHz to 2.7 GHz)   |
| Electrical fast transients (EFT):IEC 61000-4-4/<br>EN 61000-4-4               | 2 kV (AC power ports)  |
| Surges: IEC 61000-4-5/EN 61000-4-5  | 1 kV (Line to line)<br>2 kV (Line to ground)   |
| Radio-frequency continuous conducted Immunity:<br>IEC 61000-4-6/EN 61000-4-6  | 3 V, 0.15-80 MHz   |
| Voltage dips and interruptions: IEC 61000-4-11/<br>EN 61000-4-11              | Voltage dips:<br>0% UT during 1 cycle;<br>40% UT during 10/12 cycles;<br>70% UT during 25/30 cycles<br>Voltage interruptions: 0% UT during 250<br>cycles |
| <b>Safety</b>   |  |
| UL 61010-1:2012/R: 2018-11; CAN/CSA-C22.2 No. 61010-1:2012/A1:2018-11.        |  |
| UL 61010-2-030:2018; CAN/CSA-C22.2 No. 61010-2-030:2018.                      |  |

## 9. Front panel information

| Description   | Characteristics                           |
|---------------|---|
| RF connectors | Type-N, female, 50Ω                       |
| Damage level  | +27 dBm or ±35 VDC                        |
| Display       | 12.1 inch TFT color LCD with touch screen |
| Resolution    | WXGA (1280 x 800)                         |
| USB interface | USB-A 2.0                                 |

## 10. Rear panel information

| Description                       | Characteristics                                |
|-----------------------------------|--|
| Ext trigger input connector       |  |
| Type                              | BNC, female                                    |
| Input level                       | 5V TTL   |
| Ext trigger output connector      |  |
| Type                              | BNC, female                                    |
| Max output current                | 20 mA  |
| Output level                      | 3.3V TTL                                       |
| Ext ref-signal input connector    |  |
| Type                              | BNC, female                                    |
| Input frequency                   | 10 MHz ±10 ppm                                 |
| Input level                       | -3 dBm to +10 dBm                              |
| Input impedance                   | 50Ω  |
| Int ref-signal output connector   |  |
| Type                              | BNC, female                                    |
| Output frequency                  | 10 MHz ± 5 ppm                                 |
| Signal type                       | Sinewave                                       |
| Output level                      | 0 dBm ± 3 dB into 50 Ω                         |
| Output impedance                  | 50 Ω   |
| Bias tee input connector          |  |
| Type                              | BNC, female                                    |
| Max voltage                       | ± 35 VDC                                       |
| Max current                       | ± 300 mA                                       |
| (no degradation RF specification) |  |
| Max current (damage level)        | 500 mA   |
| Video output                      | HDMI   |
| USB(USBTMC) interface             | USB-B 2.0                                      |
| LAN                               | 10/100 BaseT Ethernet                          |
| Power                             | 100~240 Vrms 50/60 Hz<br>100~120 Vrms 400 Hz   |
| Power consumption                 | 2-port: 50 W (typical), 4-port: 70 W (typical) |

## 11. Ordering Information

| Items                | Description   | Order number |
|----------------------|---|--------------|
| Products             | 2 ports, 4.5G Vector Network Analyzer   | SNA5002A     |
|                      | 2 ports, 8.5G Vector Network Analyzer   | SNA5012A     |
|                      | 4 ports, 4.5G Vector Network Analyzer   | SNA5004A     |
|                      | 4 ports, 8.5G Vector Network Analyzer   | SNA5014A     |
| Standard Accessories | One Quick-start, one Power-cable, one USB-cable,<br>One calibration-certificate |              |
| Optional Accessories | High-performance reference source   | SNA5000-HPR  |
|                      | Time-Domain analysis  | SNA5000-TDA  |
|                      | Enhanced Time-Domain analysis   | SNA5000-TDR  |
|                      | N-type, Male, 50Ω Calibration Kit, 0-4.5GHz                                     | F503ME       |
|                      | N-type, Female, 50Ω Calibration Kit, 0-4.5GHz                                   | F503FE       |
|                      | 3.5 mm, Male, 50Ω Calibration Kit, 0-4.5GHz                                     | F603ME       |
|                      | 3.5 mm, Female, 50Ω Calibration Kit, 0-4.5GHz                                   | F603FE       |
|                      | N-type, Male, 50Ω Calibration Kit, 0-9GHz                                       | F504MS       |
|                      | N-type, Female, 50Ω Calibration Kit, 0-9GHz                                     | F504FS       |
|                      | N-type, Male and Female, 50Ω Calibration Kit,<br>0-9GHz                         | F504TS       |
|                      | 3.5 mm, Male, 50Ω Calibration Kit, 0-9GHz                                       | F604MS       |
|                      | 3.5 mm, Female, 50Ω Calibration Kit, 0-9GHz                                     | F604FS       |
|                      | 3.5 mm, Male and Female, 50Ω Calibration Kit,<br>0-9GHz                         | F604TS       |

## About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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