HSA3000-R Series

Spectrum Analyzer User Manual

- **HSA3036-R**
- **HSA3075-R**
- **HSA3140-R**
- **HSA3200-R**

For product support, visit : www.owon.com.hk/download

※: The illustrations, interface, icons and characters in the user manual may be slightly different from the actual product. Please refer to the actual product.

Jun. 2026 edition V1.0.0

Copyright © LILLIPUT Company. All rights reserved.

The LILLIPUT's products are under the protection of the patent rights, including ones which have already obtained the patent rights and those which are applied for. The information in this manual will replace all materials published.

The information in this manual was correct at the time of printing. However, LILLIPUT will continue to improve products and reserves the rights to change specification at any time without notice.

owon® is the registered trademark of the LILLIPUT Company.

Fujian LILLIPUT Optoelectronics Technology Co., Ltd.

No. 19, Heming Road

Lantian Industrial Zone, Zhangzhou 363005 P.R. China

Tel: +86-596-2130430 **Fax:** +86-596-2109272

Web: www.owon.com **E-mail:** info@owon.com.cn

General Warranty

We warrant that the product will be free from defects in materials and workmanship for a period of 2 years (1 year for accessories) from the date of purchase of the product by the original purchaser from our company. This warranty only applies to the original purchaser and is not transferable to a third party.

If the product proves defective during the warranty period, we will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by our company for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of our company.

In order to obtain service under this warranty, the customer must notify our company of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to the designated service centre, a copy of the customers proof of purchase is also required.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. We shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than our company representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of not our supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest Sales and Service Offices for services.

Excepting the after-sales services provided in this summary or the applicable warranty statements, we will not offer any guarantee for maintenance definitely declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. We should not take any responsibilities for any indirect, special or consequent damages.

Table of Contents

1. General Safety Requirements 1

2. Safety Terms and Symbols 3

2.1 General Inspection 3
2.2 Safety Precaution before Operation 4
2.2.1 Check Power Supply 4
2.2.2 Power Cord Selection 4
2.2.3 Electro-static Discharge (ESD) Protection 5
2.3 First Time to Power on 5

3. Primary User Guide 6

3.1 A General Knowledge Of The Structure Of The Instrument 7
3.1.1 Front Panel 7
3.1.2 Top Panel 8
3.1.3 Rear Panel 10
3.2 User Interface 11
3.3 Function Keys 14
3.3.1 Function Softkeys 14
3.3.2 Function HardKeys 15
3.4 Parameter Input 16
3.4.1 Numeric Keypad 16
3.4.2 Rotary Knob 17
3.4.3 Arrow keys 17
3.5 Build-in Help 17
3.6 Touch Screen and External Mouse Control 18
3.7 External Keyboard Control 20
3.8 Basic Measurement 21

4. Menu Interpretation 24

4.1 Frequency 25
4.1.1 Center Freq 25
4.1.2 Start Freq 25
4.1.3 Stop Freq 26
4.1.4 CF Step 26
4.1.5 Freq Offset 27
4.1.6 Freq Ref 27
4.1.7 Scale Type 27
4.2 SPAN 27
4.2.1 Span 27
4.2.2 Full Span 28
4.2.3 Zero Span 28

4.2.4 Last Span 28
4.3 Amplitude 28
4.3.1 Ref Level 28
4.3.2 Attenuation 29
4.3.3 Scale/Div 30
4.3.4 Scale Type 30
4.3.5 Ref Offset 30
4.3.6 Ref Unit> 31
4.3.7 Preamplifier 31
4.4 Auto Tune 31
4.5 Bandwidth 31
4.5.1 RBW 32
4.5.2 VBW 32
4.5.3 EMI Filter 32
4.6 Marker 32
4.6.1 Marker> 33
Marker 33
Trace 34
Normal 34
Delta 34
Off 35
All Off 35
Marker Table 35
4.6.2 Marker Function> 36
Marker 36
Function Off 36
NdB 36
Marker Noise 36
Freq Count> 36
4.6.3 Marker→> 37
Mkr→CF 37
Mkr→CF Step 37
Mkr→Start 37
Mkr→Stop 37
Mkr→Ref Level 38
Mkr△→Span 38
Mkr△→CF 38
4.6.4 Peak> 38
Cont Peak 38
Peak-Peak 38
Next Peak 39
Left Peak 39
Right Peak 39
Auto Track 39

Peak Setup> 39
4.7 Trace 39
4.7.1 Trace 40
4.7.2 State> 40
4.7.3 Operations> 40
4.8 Detector 41
4.8.1 Trace 41
4.8.2 Pos Peak 41
4.8.3 Neg Peak 42
4.8.4 Sample 42
4.8.5 Normal 42
4.8.6 Voltage Avg 42
4.8.7 More> 42
4.9 Display 42
4.9.1 Full Screen 43
4.9.2 Display Line 43
4.9.3 Ampt Graticule 43
4.9.4 Label 43
4.9.5 Menu Hide 43
4.9.6 Brightness 43
4.9.7 Screen Sleep 43
4.10 Sweep 44
4.10.1 Sweep Time 44
4.10.2 Sweep Single 44
4.10.3 Sweep Cont 44
4.11 Trigger 44
4.11.1 Free 44
4.11.2 Video 45
4.11.3 External> 45
4.12 Track Source 45
4.12.1 Track Gen 45
4.12.2 Output Level 45
4.12.3 Reference 45
4.12.4 Position 46
4.12.5 Do Normalize 46
4.12.6 Normalize 46
4.13 Mode 46
4.13.1 Spectrum 46
4.13.2 Demod> 47
4.13.3 Modulation> 47
4.13.4 RSA 50
4.13.5 VNA 51
4.13.6 EMI 51
4.14 System 51

4.14.1 System> 51
4.14.2 Setting> 52
4.14.3 PowerOn/Preset> 53
4.14.4 Save/Recall> 55
4.15 File 57
4.15.1 Storage 57
4.15.2 Type> 57
4.15.3 First Page 57
4.15.4 Prev Page 57
4.15.5 Next Page 58
4.15.6 Last Page 58
4.15.7 Operations> 58
4.16 Help 58
4.17 Measurement 58
4.17.1 Measure Off 58
4.17.2 Time Spec> 58
4.17.3 ACPR> 59
4.17.4 Channel Power> 59
4.17.5 OBW> 59
4.17.6 Pass-Fail> 59
4.17.7 More> 61
4.18 Preset 73
5. Real-time Spectral Analysis Mode 74
5.1 Real-time Spectrum Analysis Mode Interface 74
5.2 Basic Control 74
5.2.1 FREQ 74
5.2.2 SPAN 76
5.2.3 AMPTD 77
5.3 Scan Setting 80
5.3.1 BW 80
5.3.2 Trace 80
5.3.3 Detector 82
5.3.4 Sweep 82
5.4 Trigger Settings 83
5.5 Marker Settings 85
5.5.1 Marker 86
5.5.2 Marker→ 86
5.5.3 Peak 87
5.6 Measurement 89
6. Vector Network Analysis Mode 91
6.1 Vector Network Analysis Mode Interface 91
6.2 Basic Control 91

6.2.1 FREQ 91
6.2.2 SPAN 93
6.2.3 AMPTD 94
6.3 Scan Setting 95
6.3.1 BW 95
6.3.2 Trace 95
6.3.3 Sweep 99
6.4 Marker Settings 100
6.4.1 Marker 100
6.4.2 Marker Fctn 102
6.4.3 Marker→ 102
6.4.4 Peak 103
6.5 Measurement 104
7. EMI Measurement Mode 111
7.1 EMI Measurement Mode Interface 111
7.2 Basic Control 111
7.2.1 FREQ 111
7.2.2 SPAN 113
7.2.3 AMPTD 115
7.3 Scan Settings 117
7.3.1 BW 117
7.3.2 Trace 118
7.3.3 Detector 119
7.3.4 Sweep 119
7.4 Marker Settings 120
7.4.1 Marker 120
7.4.2 Marker→ 121
7.4.3 Peak 122
7.5 Measurement Settings 122
7.5.1 Sequence> 122
7.5.2 Start/Pause 123
7.5.3 Scan Config> 123
7.5.4 Peak Setup> 128
7.5.5 Meas Config> 128
7.5.6 List Control> 129
7.5.7 Meter Config> 130
8. Technical Specifications 133
8.1 Spectrum Analyzer Mode 134
8.2 EMI Measurement Mode 142
8.3 Real-Time Spectrum Analyzer Mode 142
8.4 Modulation Analyzer Mode 144
8.5 Vector Network Analysis Mode 145

8.6 Cable and Antenna Measurement Mode 147
8.7 Inputs and Outputs 147
8.8 General Specification 148
9. Warranty 150
9.1 Troubleshooting 150
9.2 Spectrum Analyzer Repair 151
10. Appendix 152
10.1 Appendix A: Accessories 152
10.2 Appendix B: General Care and Cleaning 152
10.3 Appendix C: USB Disk Requirements 153
10.4 Appendix D: PC Software Requirements 153

1. General Safety Requirements

Before use, please read the following safety precautions to avoid any possible bodily injury and to prevent this product or any other connected products from damage. To avoid any contingent danger, ensure this product is only used within the ranges specified.

- **Use Proper Power Cord.** Use only the power cord supplied with the product and certified to use in your country.
- **Product Grounded.** This instrument is grounded through the power cord grounding conductor. To avoid electric shock, the grounding conductor must be grounded. The product must be grounded properly before any connection with its input or output terminals.
- **Check all Terminal Ratings.** To avoid fire or shock hazard, check all ratings and markings on this product. Refer to the user manual for more information about ratings before connecting to the instrument.
- **Use Proper Overvoltage Protection.** Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might expose to danger of electrical shock.
- **Do not operate without covers**. Do not operate the instrument with covers or panels removed.
- **Avoid exposed circuit**. Be careful when working on exposed circuitry to avoid risk of electric shock or other injury.
- **Do not operate if any damage.** If you suspect damage to the instrument, have it inspected by qualified service personnel before further use. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by qualified service personnel.
- **Use your Oscilloscope in a well-ventilated area.** Make sure the instrument installed with proper ventilation.
- **Do not operate in damp conditions.** In order to avoid short circuiting to the interior of the device or electric shock, please do not operate in a humid environment.
- **Do not operate in an explosive atmosphere.** In order to avoid damages to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.
- **Keep product surfaces clean and dry.** To avoid the influence of dust or moisture in air, please keep the surface of device clean and dry.
- **Electrostatic Prevention.** Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.
- **Protect the Input Terminals of Instrument.** Do not bend or hit the input terminals and the connected devices, (such as filter, attenuator, etc.) as such stress may cause damages to devices and the instrument. Do not mix

the use of 50Ω and 75Ω connectors and/or cables.

- **Do Not Overload the Input.** To avoid damaging the instrument, the signals at input terminal must be less than 50V DC voltage components and 30 dBm (1 W) AC (RF) components.
- **Appropriate Use of Power Meter.** If you are not sure of the characteristics of signal under measure, follow these recommendations to ensure safe operations: if a RF power meter is available, use it to measure the power level of this signal first; or add a rated external attenuator between signal cable and input terminal of the instrument. Maximum attenuation, reference level and maximum span frequency should be selected, so as to make the signals displayed within the screen.
- **Know About the Specification Conditions of the Instrument.** For maximum performance of the instrument, use the analyzer under specified conditions.
- **Handling Safety.** Please handle with care during transportation to avoid damages to buttons, knob, interfaces and other parts on the panels.

2. Safety Terms and Symbols

Safety Terms

Terms in this manual (The following terms may appear in this manual):



WARNING: Warning indicates conditions or practices that could result in injury or loss of life.



CAUTION: Caution indicates the conditions or practices that could result in damage to this product or other property.

Terms on the product (The following terms may appear on this product):

DANGER: Indicates an immediate hazard or injury possibility.

WARNING: Indicates a possible hazard or injury.

CAUTION: Indicates potential damage to the instrument or other property.

Safety Symbols

Symbols on the product (The following symbols may appear on the product):

	Hazardous Voltage		Refer to Manual
	Chassis Ground		

2.1 General Inspection

When you receive your new instrument, it is recommended that you check the instrument following these steps:

1. **Check for transportation damage.**

   If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away until the complete device and its accessories have been electrically and mechanically checked.

2. **Check the Accessories.**

   The supplied accessories are described in the "Appendix A: Accessories" of this Manual. Please ensure that all the listed accessories are present

and undamaged, if any problems are found please contact your distributor or our local office.

3. **Check the Complete Instrument.**

   If there is any physical damage, operational fault, or performance issue please contact your distributor or our local office. If there is any damage to the instrument please ensure you keep the original packaging. Ideally you should always keep the original packaging if the instrument must be returned for repair.

2.2 Safety Precaution before Operation

2.2.1 Check Power Supply

This analyzer can be powered by either the internal lithium battery pack or an AC/DC adapter. The lithium battery is 7.4 V, 9100 mAh. Requirements for the AC/DC adapter are listed in the table below.

Power Supply Parameter	Compatible Range
Output Voltage	12-15VDC
Max. Power	45 W

To prevent or lower the risk of damage to the spectrum analyzer from power interference between instruments, especially from peak pulses produced by large power consumption instruments, a DC regulated power supply is recommended.

2.2.2 Power Cord Selection

When connected to a proper power outlet, the power cord grounds the instrument enclosure. The power cord shall be rated at ≥15 VDC and ≥3 A.

Warning: Improper grounding may cause damage to the instrument, or result in personal injury. Make sure the grounding conductor of the spectrum analyzer is grounded before turning on the instrument. Always use a well-grounded power source. Do not use an external power cable, power cord or an auto transformer without grounded protection. If this product is to be powered via an external auto transformer for voltage reduction, ensure that its common terminal is connected to a neutral (earthed pole) of the power supply.

Warning: Make sure the supply power is stable before turning on the analyzer to protect it from damage. Refer to "First Time to Power on".

2.2.3 Electro-static Discharge (ESD) Protection

ESD is an issue often ignored by users. Damage from ESD on the instrument is unlikely to occur immediately but will significantly reduce the reliability of it. Therefore, ESD precautions should be implemented in the work environment, and applied daily.

Generally, there are two steps to manage ESD protection:

(1) Conductive table mats to connect hands via wrist bands.
(2) Conductive ground mat to connect feet via ankle straps.

Implement both protection methods will provide a good level of anti-static protection. If used alone, the protection will not be as reliable. To ensure user's safety, anti-static components should offer at least 1MΩ isolation resistance.

Warning: The above ESD protections measures cannot be used when working with over 500V!

Make good use of anti-static technology to protect components from damage:

(1) Quickly ground the internal and external conductor of the coaxial cable before it is connected with the spectrum analyzer.
(2) Staff must wear anti-static gloves before touching the connector cord or doing any assemble work.
(3) Assure all the instruments are grounded properly to avoid static storage.

2.3 First Time to Power on

Only use the original AC/DC adapter or supplied battery for power supply.
The maximum RF input level for average continuous power is 30 dBm (or 50 VDC signal input). Do not apply signals exceeding this limit to the analyzer.
Note: Keep ventilation openings unobstructed for proper air circulation and cooling.

Warning: Check the power source before turning on the spectrum analyzer, to protect the device from damage.

(1) Press the power switch on the bottom left of the front panel.
(2) Self-initialization takes about 30 seconds, after the boot screen the spectrum analyzer will default to the scanning curve.
(3) After power on, let the spectrum analyzer warm up for 30 minutes for stabilization to obtain the most accurate results.

3. Primary User Guide

This chapter elaborates the following topics:

- A General Knowledge Of The Structure Of The Instrument
- User Interface
- Function Keys
- Parameter Input
- Build-in Help
- Touch Screen and External Mouse Control
- External Keypad Control
- Basic Measurement

3.1 A General Knowledge Of The Structure Of The Instrument

This chapter gives a brief description and introduction to the operations and functions of the front panel of the instrument, so as to facilitate your operations of the instrument in the shortest time.

3.1.1 Front Panel

On the instrument panel, knobs and function buttons are used to enter different function menus or directly use specific function application.

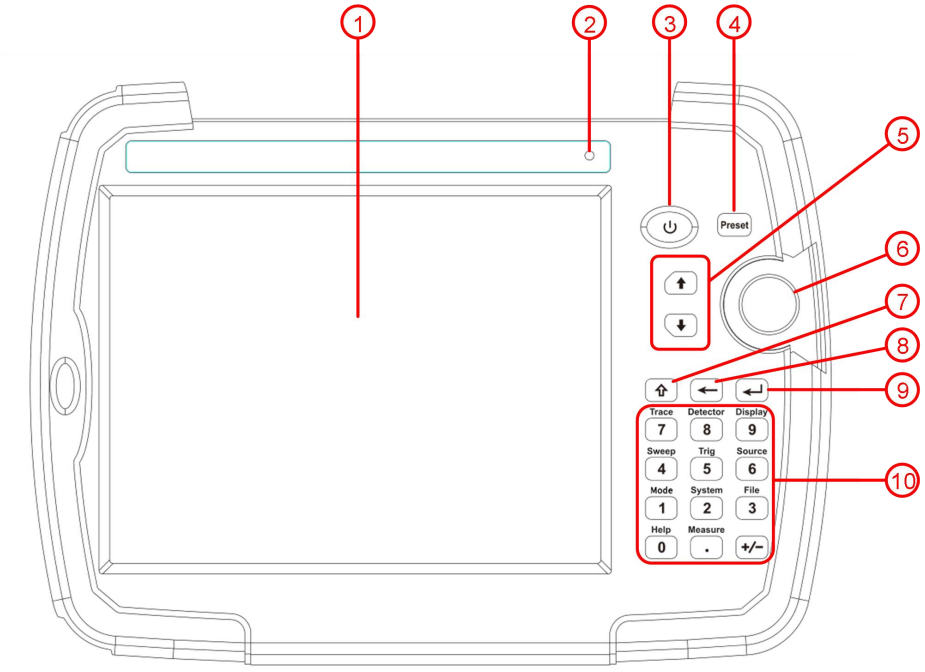


Figure 3-1: Front Panel

NO.	Description
1	LCD touchscreen.
2	**Light Sensor**: Adjusts the screen backlight according to the environmental light. This state can be specified in [Display]→ [ScreenSetting›] → [Brightness Auto].
3	**Power key**: Long push to turn on the analyzer, push to turn on/off the LCD display, long push to turn off the analyzer.
4	**Preset key**: Resets the analyzer to a known state. This state can be specified in [System]→ [PowerOn/Preset›] → [Preset›].
5	Arrow keys.

6	Rotary knob.
7	**Shift key**: Press the Shift key to active it, the light is on. When the Shift key is active, pressing a number key will execute the upper function. Long press the Shift key to active it persistently. To switch to the brief active status, short press the Shift key.
8	**Backspace key**: Deletes the last character from input.
9	**Enter key**: Confirms a parameter selection or configuration.
10	Function / numeric keypad.

3.1.2 Top Panel

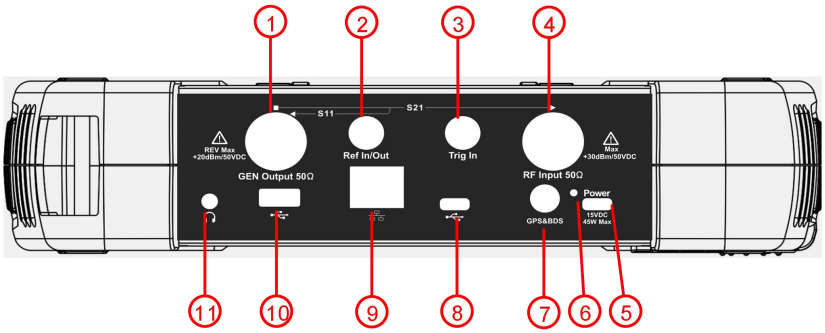


Figure 3-2: Top Panel

NO.	Name	Description
1	GEN Output connector (50 Ω)	The output for the built-in tracking generator.
2	10MHz IN/OUT	Supports reference clock input and output.
3	EXT Trig In connector	Connects to an external TTL signal.
4	RF Input connector (50 Ω)	Connector for RF input.
5	DC power connector	Connect to DC power via the power adapter. Ensure the power supply circuit is properly earthed for protection.
6	LED indicator	Green light when external DC power is connected. Red light when the battery is charging. Blinking light when charge suspend or battery absent.
7	GPS & BDS antenna interface	Connect an external positioning antenna to obtain current satellite positioning coordinates.
8	USB Device interface	MICRO-USB type. Connects to a PC. This USB interface supports PictBridge printer and remote-control connection.
9	LAN interface	Through this interface, the analyzer can be connected to your local network for remote

		control.
10	Mouse keyboard and other USB device interface	Type A. Connects to a USB memory stick.
11	Headphone jack	Insert the headset to listen to the sound after signal demodulation.

Note:

- USB Host



The analyzer may serve as a "host" device to connect to external USB devices. This interface can be used for accessing a USB flash drive or more devices after expansion via USB HUB, such as external keyboard or mouse.

- GEN Output 50Ω (tracking generator output 50Ω), VNA 1 port



The output of the tracking generator can be connected to a receiver through an N type male connector, users can purchase this option if required.
In vector network analysis mode, this port serves as the single port for S11 and the output port for S21.

⚠ **Caution:** Input voltage at RF input port must not be higher than 50 V DC to avoid damage to the attenuator and input mixer tracking generator.

- RF Input 50Ω, VNA 2 port

The RF input may be connected to a device via a N type connector
In vector network analysis mode, this port serves as the input port for S21.

⚠ **Caution:** When input attenuator is higher than 10 dB, the RF port input signal must be less than +30 dBm.

3.1.3 Rear Panel

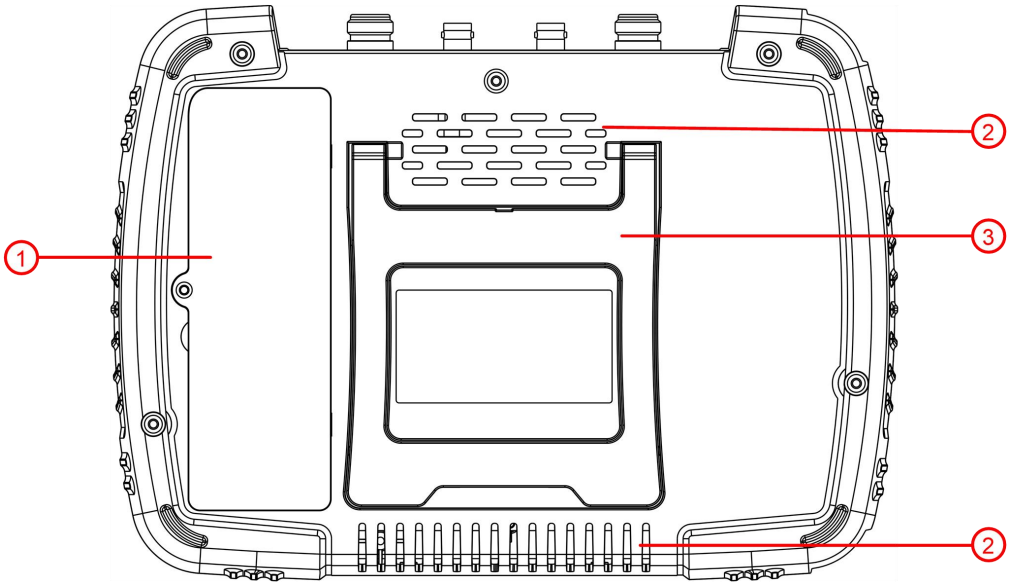


Figure 3-3: Rear Panel

NO.	Description
1	Battery compartment
2	Air vents
3	Tilt stand

3.2 User Interface



Figure 3-4: User Interface

NO.	Name	Description	Related Key
1	File	Display local saved files	File
2	Quick Save	Save the file according to the currently set quick save format type	System→[Save/Recall] → [Set Quick Save]
3	External reference	Set the reference frequency as **Int** (internal) or **Ext** (external) input	FREQ→ [Freq Ref]
4	Preamplifier	Turn on/off the preamplifier	AMPTD→ [Preamplifier]
5	Sweep status	Set the sweep status to **Single** or **Cont** (continuous)	Sweep→ [Sweep Single] or [Sweep Cont]
6	Tracking generator	Turn on/off the source output	Source→[Track GEN]

7	Trigger type	Set the trigger type to **Auto**, **Video**, **Pos** (external positive edge), **Neg** (external negative edge)	Trig
8	Continuous peak search	Enable/Disable continuous peak search	Marker→ [Peak Search]
9	Automatic search	Searching automatically	Auto
10	Audio demodulation	Turn on audio demodulation	Mode→ [Demod＞]
11	FFT mode	When RBW is set to ≤10kHz, automatically switch to FFT mode	
12	Remote control	Turn on remote control	
13	LAN access sign	LAN access sign	
14	USB access sign	USB access sign	
15	UNCAL sign	Measurement is not calibrated	
16	Date/Time	Display the date/time of system. Click to display the interface of date modification	System → [Setting ＞] →[Date/Time＞]
17	Battery icon	Charging and current battery level indicator	
18	Marker readout	Display the frequency value (time during zero scan span) and amplitude value of current frequency standard. Display the frequency standard function of response when the frequency standard function can be enabled	Marker
19	Trace 1	Display the current type of trace 1 is refresh, and peak is detected positive	

20	Trace 2	Display the current type of trace 2 is max. hold, and peak is detected negative	
21	Trace 3	Display the current type of trace 3 is hold, and peak is detected sample	
22	Trace 4	Display the current type of trace 4 is average, and peak is detected normal	
23	Trace 5	Display the current type of trace 5 is view, and peak is detected voltage average	
24	Marker readout	Display the frequency value (time during zero scan span) and amplitude value of current frequency standard. Display the frequency standard function of response when the frequency standard function can be enabled	Marker
25	Menu item	Menu item of current function	
26	Measure mode	Current measurement mode	Mode
27	Sweep Time	System sweep time	Sweep→[Sweep Time]
28	Stop frequency	Display stop frequency	FREQ→ [Stop Freq]
29	Span	Display span width	SPAN→[Span]
30	Center frequency	Display center frequency	FREQ→ [Center Freq]
31	Touchscreen Numeric Keypad	Click on the location where you need to modify the input parameters to bring up the menu.	
32	Video bandwidth	Display video bandwidth	BW→ [VBW]

33	Start frequency	Display start frequency	FREQ→ [Start Freq]
34	Resolution bandwidth	Display resolution bandwidth	BW→[RBW]
35	Marker	Display current activated marker	Marker
36	Amplitude Scale	Display amplitude scale	AMPTD→ [Scale/Div]
37	Amplitude Scale Type	**Log** (logarithmic) or **Line** (linear)	AMPTD→ [Scale Type]
38	Attenuation	Display input attenuation setting	AMPTD→ [Attenuation]
39	Reference level	Reference level	AMPTD→ [Ref Level]

Note:
1~9: The switch can be toggled through touch screen or mouse click.
1~24: The current trace interface can be accessed and modified through touch screen or mouse click.
27, 32, 34, 39: If there is an asterisk (*) displayed before it, indicating that the item is in manual setting mode.
30~34: Click to summon the digital input keyboard interface.

3.3 Function Keys

3.3.1 Function Softkeys

There are 6 function softkeys horizontally arranged along the bottom of the interface screen. Press one of the function softkeys to show the submenu along the right side of the display.



- **FREQ:** Activates the center-frequency function, and accesses the frequency function menu.
- **SPAN:** Activates the frequency sweep span function, and set Full Span\Zero Span\Last Span.
- **AMPT:** Activate the reference level function to pop up the soft menu for amplitude setting. This menu covers spectrum analyzer amplitude parameters, including reference level, attenuator, scale, unit and preamplifier. Note that reference level and attenuator settings are coupled.
- **Auto:** Searches the signal automatically within the full frequency range.
- **BW:** Activate the resolution bandwidth function and operate the corresponding softkey.
- **Marker:** View marker menu.

- **Marker:** Accesses the marker control keys that select the type and number of markers and turns them on and off.
- **Marker Fctn:** Marker measurement function menu, including N dB bandwidth measurement, marker noise, frequency counter and field strength measurement.
- **Marker→:** Accesses the marker function softkeys that allow you to set other system parameters based on the current marker value.
- **Peak:** Places a marker on the highest peak, and accesses the Peak functions menu.

3.3.2 Function HardKeys

Press the ⇧ key, then press a numeric key. The corresponding function will appear in the menu on the right side of the screen.

⇧ **key:**

(1) Press ⇧ key, the light is on.

(2) When the indicator light is on, press the numeric key to activate its corresponding function.

(3) Long press this key to active it persistently.

(4) Short-press again to return to the numeric keypad.



- **Trace:** The trace measurement and display mode can be set, and the related trace can be operated.
- **Detector:** Set the detection mode.
- **Display:** Set the parameters displayed on the screen.
- **Sweep:** The system is set to single or continuous scanning mode. Users can also set the scanning mode and scanning time.
- **Trig:** Set the triggering mode and related parameters of the sweep frequency.
- **Source:** Trace source Settings.
- **Mode:** Switch between scanning spectrum mode, real-time spectrum

mode, network division mode, demodulation mode and other modes.

- **System:** System parameter setting and instrument calibration operation menu.
- **File:** Browse, delete, export, load, power on, and reset stored files.
- **Help:** On the spectrum analyzer help menu, click this key once to open the system help function, and then click again to disable the help function.
- **Measure:** The expanded measurement functions based on the spectrometer platform include adjacent channel power measurement, channel power measurement, occupied bandwidth measurement, etc. For specific measurement function parameter Settings, refer to the measurement Settings menu.

3.4 Parameter Input

Use the numeric keypad, knob and arrow keys to enter parameter values.

3.4.1 Numeric Keypad

Enters a specific value, the submenu typically shows the selectable units. Press the desired unit or press ↵ Enter key to complete the entry.



(1) **Numeric keys:** Numbers 0-9 are available to be used.

(2) . **Decimal key:** A decimal point "." will be inserted at the cursor position when this key is pressed.

(3) +/− **Sign key:** Sign key "+/-" is to toggle the sign of a parameter. When pressed the first time, a "-" will be inserted and changed into "+" following the second press.

(4) ← **Backspace key**

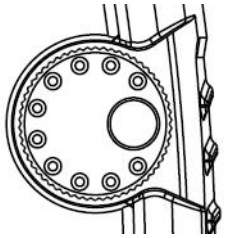
- During the process of parameter editing, this key will delete the characters on the left side of the cursor.
- While in the process of file name editing, pressing this key will delete

characters that have been entered.

(5) **Enter key:** When pressed, the system will complete the input process and insert a default measurement unit for the parameter automatically.

3.4.2 Rotary Knob

During parameter editing, turn the knob clockwise to increase, or counterclockwise to decrease the parameter values at specified steps.



3.4.3 Arrow keys



- Increase or decrease the parameter value at specific steps while editing a parameter.
  Note: Press **FREQ**→[**CF Step**] to set the center frequency step.
- Move the cursor though the directory tree in the **File** function.

3.5 Build-in Help

The built-in help provides information that refers to every function key and menu key on the front panel. Users can view this help information if required.

1. How to acquire built-in help

Short or long press . When the indicator lights up, press **Help** to bring up help prompts in the center of the screen.

2. Page up and down

If help information is displayed in different pages, more information can be displayed through the up and down direction buttons or by clicking and dragging the scroll bar.

3. Acquire the menu help

A message about how to obtain help information will be shown, press the menu keys to get the corresponding help.

4. Acquire the help information of any function key

A help window will pop up in the center of the screen. Press ⇧ to view help information for the corresponding key functions.

5. Close the current help information

Press ⇧ key then press **Help** to close help.

3.6 Touch Screen and External Mouse Control

The display screen is of touchable type. Analyzer can be controlled by different gestures.
Instructions for touch screen and mouse control are as below. Operation can also be realized via the buttons/knobs in bracket.

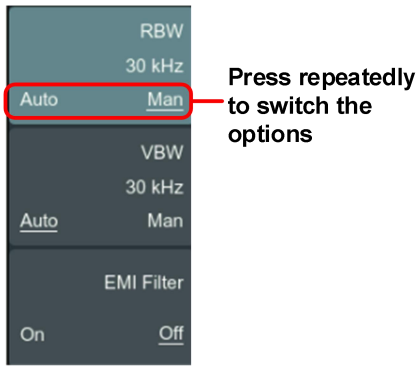
- Click the menu at the top of the screen to switch the corresponding switch or option. For details, refer to the User Interface on Page 11.



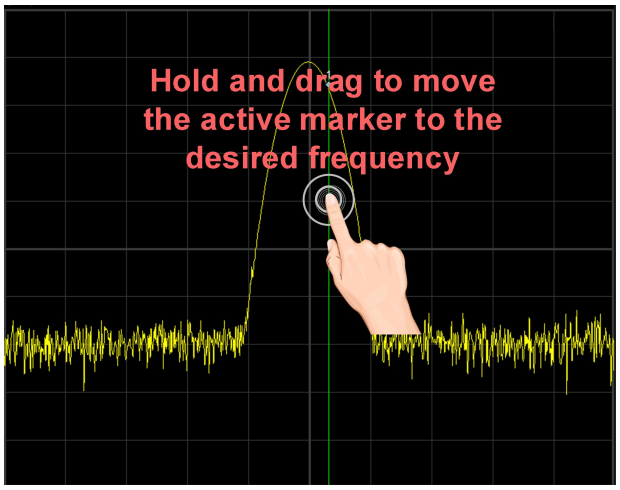
- **Menu softkey**: Touch the menu softkeys in the bottom.



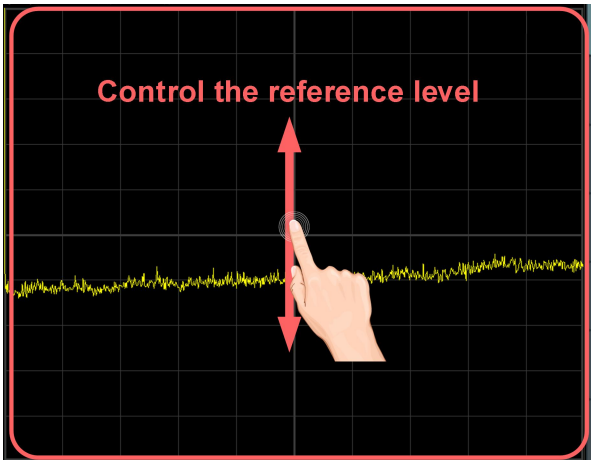
- **Menu items:** Any options in the menu can be switched in the area of touch menu item.



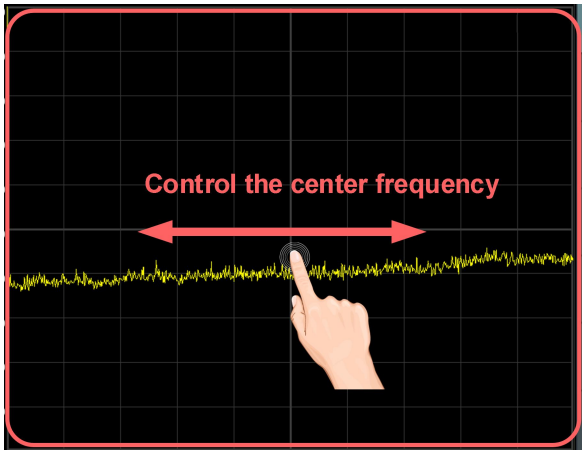
- **Move the frequency standard to the frequency required (Marker → [Marker >]):** When a marker has been activated, press and drag it to the required location and then release it.



- **Set reference level (AMPT → [Ref Level]):** Hold it in trace display area and drag it up or down to decrease or increase the reference level in order to drag the trace up and down.

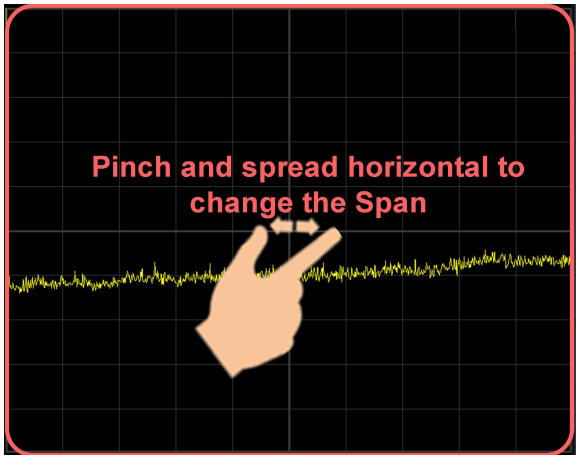


- **Set center frequency (FREQ→ [Center Freq]):** Press it in the trace display area and drag it to the left or right to modify the center frequency, in order to drag the trace to the left or right.

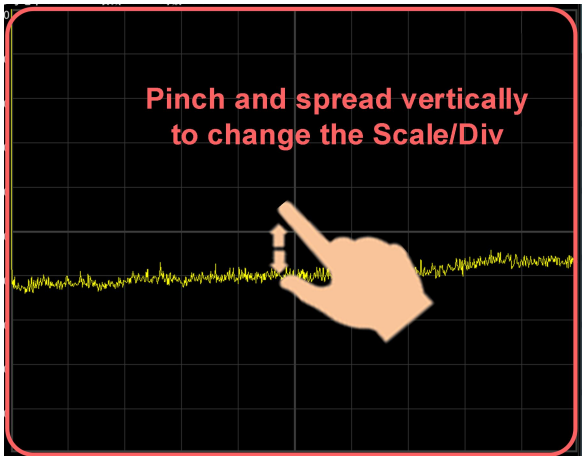


- Trace will suspend refreshing after pressing the trace area and will continue with refreshing after releasing.

- **Set scan span (SPAN→ [Span]):** Place two fingers on the touch screen in a horizontal direction in trace display area, and make them close to or separate from each other to decrease/increase scan span, so as to enlarge/reduce trace horizontally.



- **Set scale/cell (AMPT → [scale/Div]):** Place two fingers on the touch screen in a vertical direction in trace display area, and make them close to or separate from each other to increase/decrease scale/cell, so as to enlarge/reduce trace scale vertically.



3.7 External Keyboard Control

Insert the keyboard into the USB port on the front panel. Control and input can be realized by keyboard. Buttons are corresponding to the following:

Button	Description	Button	Description	Button	Description
F	Frequency	S	Span	A	Amplitude
R	Auto Tune	B	Band Width	D	Detector
W	Sweep	O	Track Gen	T	Trace
V	Display	I	Trig	M	Mode
Y	System	Q	Quick Save	P	Peak
K	Marker	X	File	L	Save/Recall

N	Preset	H	Help	J	Measure
F1~F7	F1~F7	F9	GHz/dBm	F10	MHz/dB
F11	kHz/dBmV	F12	Hz/mV	0~9	0~9
Backspace	<-	Esc	X	Enter	enter

3.8 Basic Measurement

Basic measurements include, input signal frequency and amplitude display, marked by a frequency marker. Follow these four simple steps below to implement input signal measurement.

Operation:

1. Find the signal frequency across the full sweep width.
2. Setting center frequency.
3. Setting span and resolution bandwidth.
4. Activate marker.
5. Setting amplitude.

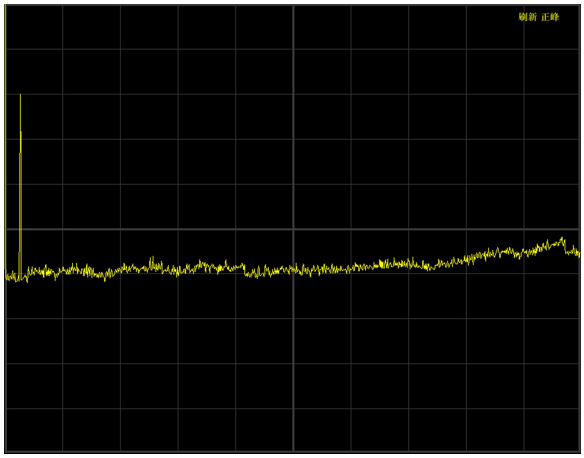
For example, to measure a 100MHz -10dBM signal, you must turn on the spectrum analyzer and ensure it is warmed up for 30 minutes to ensure measurement accuracy.

(1) Equipment connection

Connect the signal source generating RF signals to the RF input port of the spectrum analyzer. Set the signal source as follows: Frequency: 100 MHz; Amplitude: -10 dBm.

(2) Setting parameters

1) Press **Preset** to restore the analyzer to its factory-defined state. The Spectrum analyzer will display the spectrum from 9kHz to the maximum span width. The signal generated will display as a vertical line at 100MHz. As shown in the below figure.



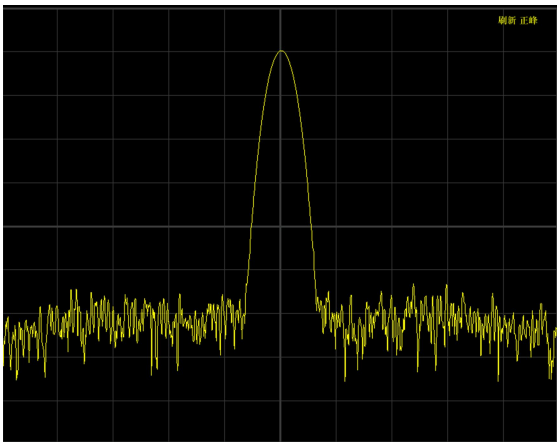
To clearly observe the signal, reduce the frequency span to 1 MHz and set the center frequency to 100MHz.

2) Setting Center Frequency: Press **FREQ**, select [Center frequency] on corresponding pop up menu. Input "100" and select the unit as MHz on the numeric keypad. The keys can be used to set the exact value but the knob and directional keys can also be used to set the center frequency.

3) Setting Frequency Span

- Press **SPAN**, input "**1**" and select **MHz** as its unit using the numeric keypad; or press ↓ to decrease to 1MHz.
- Press **BW**, set [resolution bandwidth] to manual, and input "**30**" and select **kHz** as its unit using the numeric keypad; or press ↓ to decrease to 30kHz.
- Press **Detector**, set the detection type to positive peak.

The below figure shows the signal at a higher resolution. Please note that resolution bandwidth, video bandwidth and frequency span are self-adapted. They adjust to certain values according to frequency span. Sweep time can be self-adapted too.



4) Activate Marker

- Press **Marker** softkey on the bottom,the button is located at the bottom of the screen. Then select [**Marker** >] softkey on the right screen. And press the softkey to select [Marker 1 2 3 4 5 6 7 8], select Marker 1, the marker is located at horizontal center by default, that is the signal peak point or its neighbor.
- Press **Marker** softkey on the bottom, the button is located at the bottom of the screen.Then select [**Peak** >] on the right screen. And select [**Max Search**]. Frequency and amplitude values are read by the marker and shown on the top right of the display area.

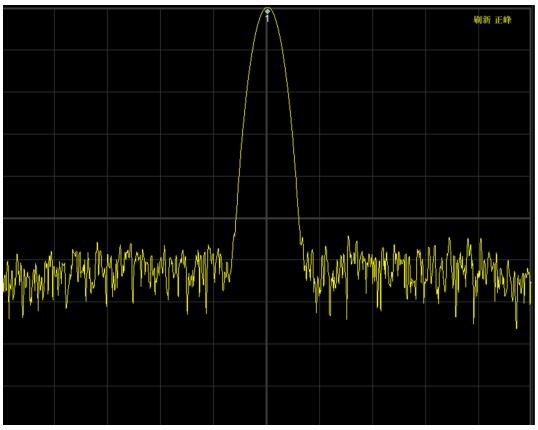
Frequency and amplitude values are read by the marker and shown on the top right of the display area.

5) Setting amplitude

The reference level will be shown at the top of the display grid. To get a better dynamic range, the real signal peak point should be located at or near the top of display grid (reference level). The reference level is also the maximum value on Y axis. Here we reduce to 20dB reference level to increase the dynamic range.

Press **AMPTD**, the amplitude setting menu will pop up, and the [reference level] soft key will be activated. The reference level can be input at the top left of the display grid. Input "-10" using the numeric keypad and set the unit to dBm. You can also use the ↓ key or the knob for adjustment.

The reference level is set at -10dBm, which is the signal peak value near the top of the grid. The balance between the signal peak value and noise is dynamic range.



4. Menu Interpretation

This section provides you with the information on using the front panel of the spectrum analyzer.

This chapter mainly elaborates on the following sections:

- Frequency
- SPAN
- Amplitude
- Auto Tune
- Bandwidth
- Marker
- Trace
- Detector
- Display
- Sweep
- Trigger
- Track Source
- Mode
- System
- File
- Help
- Measurement
- Preset

4.1 Frequency

Key access: **[FREQ]** softkey at the bottom of the screen.
The frequency range of a channel can be expressed by either of two groups of parameters: Start Frequency and Stop Frequency; or Center Frequency and Span. If any such parameter is changed, the others would be adjusted automatically in order to ensure the coupling relationship among them:

$$f_{center} = (f_{stop} + f_{start}) / 2$$

$$f_{span} = f_{stop} - f_{start}$$

f_{center}, f_{stop}, f_{start} and f_{span} denotes the center frequency, the stop frequency, the start frequency and the span respectively.

4.1.1 Center Freq

Sets the center frequency of the sweep. When pressed, the frequency mode is switched to Center Freq and Span in order to enter the desired parameter data.
Key Points:

- The start and stop frequencies vary with the center frequency when the span is constant.
- Changing the center frequency horizontally shifts the current sweep channel and the adjustment is limited by the specified frequency range.
- In Zero Span mode, the start frequency, stop frequency and center frequency are always equal. If one is changed the others are updated to match.
- This parameter can be modified via numeric keys, knob, direction keys, softkey interface and trace dragging.

4.1.2 Start Freq

Sets the start frequency of the sweep. When pressed, the frequency mode is switched to Start Freq and Stop Freq in order to enter the desired parameter data.
Key Points:

- The span and center frequency are changed automatically according to the start frequency. The change of the span would have influence on other system parameters. For more details, please refer to "Span".

- In Zero Span mode, the start frequency, stop frequency and center frequency are always equal. If one is changed the others are updated to match.
- This parameter can be modified via numeric keys, knob, direction keys, softkey interface and trace dragging.
- If start freq is larger than stop freq when setting, then stop freq will increase automatically to the same value of start freq.

4.1.3 Stop Freq

Sets the stop frequency of the sweep. When pressed, the frequency mode is switched to Start Freq and Stop Freq in order to enter the desired parameter data.

Key Points:

- Modifying the stop frequency changes the span and center frequency, and the change of span influences other system parameters, see "Span".
- This parameter can be modified via numeric keys, knob, direction keys, softkey interface and trace dragging.
- If stop freq is larger than start freq when setting, then start freq will decrease automatically to the same value of stop freq.

4.1.4 CF Step

Sets the step of center frequency. Changing the center frequency in a fixed step continuously switches the channel to be measured.

Key Points:

- The frequency step type could be "Manual" or "Auto". In Auto mode, the CF step is 1/10 of span if it is in Non-zero span mode or equals 25% of RBW while in Zero span mode; in Manual mode, you can set the step using the numeric, step keys or knob. Then activate [Center Freq], press step, center frequency will change as setting step.
- After you set an appropriate frequency step and select center frequency, you can use using up and down direction keys to switch between measurement channels in a specified step in order to sweep the adjacent channels manually.
- This parameter can be modified using numeric keys, knob, direction keys and softkey interface.

Frequency step lends itself to detect the harmonic waves and bandwidths that are beyond the current span. For example, for order of harmonic of a 300 MHz signal, you can use set both the center frequency and frequency step to 300 MHz, and press the up direction key continuously to increase the center frequency to 600MHz, that is secondary harmonic. Press frequency steps to increase center frequency by 300MHz, which reaches 900MHz. [CF Step Auto

Man] shows the auto or manual mode to setting the steps. When step is under manual mode, press [CF Step Auto Man] to return to auto mode.

4.1.5 Freq Offset

You can set a frequency offset to displayed frequency value, including freq marker value. This movement won't influence sweep frequency range.
While this function activated (frequency offset isn't 0), you can modify this parameter using the numeric keys, knob or direction keys.

4.1.6 Freq Ref

Set the reference frequency as internal or external input, this is regarded as whole device reference. If the external signal is not locked according to judgment after switching to external, the prompt "10 MHz external reference not detected" will pop up and it will switch back to internal automatically.

4.1.7 Scale Type

Set the scale type the frequency axis to linear or logarithmic; linear is the default.

4.2 SPAN

Key access: **[SPAN]** softkey at the bottom of the screen.
Set the spectrum analyzer to span mode. When press **SPAN**, [Span], [Full Span], [Zero Span] and [Last Span] will be available to configure. You can modify span using the numeric keys, knob or direction keys. Use numeric key or [Zero Span] to clear span.

4.2.1 Span

Sets the frequency range of the sweep. When pressed, the frequency mode is switched to Center Freq/Span.
Key points:

- The start and stop frequencies are changed with the span automatically.
- In non-zero span mode, the span can be set down to 100Hz. And up to the full span described in "Specification". When it is set to the maximum span, it enters full span mode.
- Zero Span Setting: In non-FFT mode (RBW greater than 3K), set the zero span to 0Hz by manually entering the value. You can also enter the zero

span mode by pressing the Zero Span menu or using the SCPI command.

- Modifying the span in non-zero span mode may cause an automatic change in both CF step and RBW if they were in Auto mode, and the change of RBW may influence VBW (in Auto VBW mode).
- In non-zero span mode, variation in the span, RBW or VBW would cause a change in sweep time.
- This parameter can be modified using numeric keys, knob, direction keys and softkey interface.

4.2.2 Full Span

Set the sweep width to maximum.

4.2.3 Zero Span

Sets the span of the analyzer to 0 Hz. Both the start and stop frequencies will equal the center frequency and the horizontal axis will denote time. The analyzer here is measuring the time domain characteristics of amplitude, located at the corresponding frequency point. This will help to observe the signal (especially for modulated signal) at time domain.

4.2.4 Last Span

Changes the span to the previous span setting.

4.3 Amplitude

Key access: **[AMPT]** softkey at the bottom of the screen.
Sets the amplitude parameters of the analyzer. Through these parameters, signals under measurement can be displayed at an optimal view with minimum error. The pop out amplitude menu includes [Ref Level], [Attenuation Auto Man], [Scale/Div], [Scale Type LIN LOG], [Ref Offset], [Ref Unit>], and [Preamplifier On Off].

4.3.1 Ref Level

Activate reference level function and sets the maximum power or voltage for display window.
Key points:

- This value is affected by a combination of maximum mixing level, input attenuation, and preamplifier. When you adjust it, the input attenuation is

adjusted under a constant max mixing level, meeting:

$$L_{Ref} - a_{RF} + a_{PA} \leq L_{mix}$$

L_{Ref}, a_{RF}, a_{PA} and L_{mix} denotes the reference level, the input attenuation, the preamplifier, and the max mixing level, respectively.

- This parameter using the numeric keys, knob, or direction keys.
- Reference level located at the top of axis grid. Measurement near the reference level would gain better accuracy, but input signal amplitude should not exceed the reference level; if it exceeds, the signal will be compressed and distorted, result in wrong measurement. Analyzer's input attenuation is related with reference level, it can self-adjust to avoid signal compression. Minimum reference level is -120dBm at Log scale under 0dB attenuation.

4.3.2 Attenuation

Sets the front attenuator of the RF input in order to permit big signals (or small signals) to pass from the mixer with low distortion (or low noise). It only works under internal mixer mode to adjust input attenuator insider analyzer. In Auto mode, input attenuator is related with reference level.

Key points:

- When the preamplifier is On, the input attenuation could be set up to 40 dB. You can adjust the reference level to ensure that the specified parameters meet the requirement.
- Modifying the reference level may cause an automatic change in attenuation value; But the change of attenuation value won't influence reference level.
- This parameter using the numeric keys, knob, or direction keys.
- Attenuator adjustment is to make the maximum signal amplitude pass from mixer less than or equal to -10dBm. E.g. if the reference level is +12dBm, the attenuator value is 22dB, then the input level in mixer is -18dBm (12-22-8=-18), its mainly purpose is to avoid signal compression. Switch [Attenuation Auto Man] to manual mode, adjust the attenuator manually. The highlight under auto or manual stands for auto coupling and manual coupling. When attenuator is under manual mode, press [Attenuation Auto Man] will match the attenuator and reference level again.
- Maximum input signal amplitude of input attenuator (10dB input attenuation at least) is +30dBm, higher power signal will damage input attenuator or mixer.

4.3.3 Scale/Div

Set the vertical axis tick mark interval size. This feature is only available when the tick mark type is logarithmic. You can set logarithmic amplitude ticks from 0.01 to 1000 dB. The default value is 10dB per tick mark.

Key points:

- By changing the scale, the displayed amplitude range is adjusted.
- The amplitude that can be displayed is from reference level minus 10 times the current scale value to the reference level.
- This parameter can be modified using numeric keys, knob, direction keys and softkey interface.

4.3.4 Scale Type

Sets the Scale Type of Y-axis to LIN or LOG, the default is Log. It only works under internal mixer mode. In general, select **V** as Lin amplitude scale unit. Of course there would be other units for select.

Key points:

- In Log scale type: the Y-axis denotes the logarithmic coordinates, the value shown at top of the grid is the reference level and the grid size is equal to the scale value. The unit of Y-axis will be automatically switched into the default "dBm" when the scale type is changed from Lin to Log.
- In Lin scale type: the Y-axis denotes the linear coordinates, the value shown at the top of the grid is the reference level and the bottom of the grid shows 0 V. The grid size is 10% of the Reference level and the Scale/Div is invalid. The unit of Y-axis will be automatically switched into the default "**V**" when the scale type is changed from Log to Lin.
- Other than as mentioned above, the unit of Y-axis is independent of the Scale Type.

4.3.5 Ref Offset

Assigns an offset to the reference level to attempt to compensate for gains or losses generated between the device under measurement and the analyzer.

Key points:

- The changing of this value changes both the readout of the reference level and the amplitude readout of the marker, but will not impact the position of the curve on the screen.
- You can modify this parameter using the numeric keys.
- This offset use dB as absolute unit, will not change with selected scale and unit.

4.3.6 Ref Unit>

Sets the unit of the Y-axis to [dBm], [dBμW], [dBμA], [dBmV], [dBμV], [W] or [V].
Key points:

- [dBm]: Choose decibel equals to 1mW as amplitude unit.
- [dBμW]: Choose decibel equals to 1μW as amplitude unit.
- [dBμA]: Choose decibel equals to 1μA as amplitude unit.
- [dBmV]: Choose decibel equals to 1mV as amplitude unit.
- [dBμV]: Choose decibel equals to 1μV as amplitude unit.
- [W]: Choose Watts as amplitude unit.
- [V]: Choose Voltage as amplitude unit.

4.3.7 Preamplifier

Sets the status of preamplifier located at the front of the RF signal path. Turning on the preamplifier reduces the displayed average noise level in order to distinguish small signals from the noise when working with small signals.

4.4 Auto Tune

Key access: **[Auto]** softkey at the bottom of the screen.
Automatically search for stable signals across all frequency bands and adjust frequency and amplitude parameters to optimal levels. Press the button to initiate signal search and automatic parameter setting. During the auto-tuning process, press the **Preset** key will exit auto-tuning mode and return to the previous state. If no signal is found or the signal is unstable, the search will fail and return to the original state.
Key points:

- Some parameters such as reference level, scale, and input attenuation may be changed during the auto tune.

4.5 Bandwidth

Key access: **[BW]** softkey at the bottom of the screen.
Sets the RBW (Resolution Bandwidth) and VBW (Video Bandwidth) parameters of the analyzer. Pop out the setting menu includes [RBW Auto Man], [VBW Auto Man], [EMI Filter On Off].

4.5.1 RBW

Adjust the resolution bandwidth ranging from 1Hz~5MHz. Use numeric key, step key or knob to switch resolution bandwidth. The underline under Auto or Manual means Auto mode or Manual mode. Press [RBW Auto Man] and hold it until underline under Auto has been highlighted. Then the resolution bandwidth is under auto coupling mode.

Key points:

- Reducing the value of RBW will increase the frequency resolution, but may also cause sweeps to take longer (Sweep Time is effected by a combination of RBW and VBW when it is in Auto mode).
- RBW decreases with the span (non-zero span) in Auto RBW mode.

4.5.2 VBW

Sets the desired video bandwidth in order to remove the band noise. Set the video resolution displays in function area, ranging from 10Hz to 5MHz by sequence step. You can modify this parameter by numeric key, step key or knob. The underline under Auto or Manual means Auto mode or Manual mode. Press [VBW Auto Man] and hold it in manual until the underline highlighted under Auto to return auto mode.

Key points:

- Reducing the VBW to smooth the spectrum line and differentiate small signals from the noise. However, this may cause a longer sweep time. (Sweep Time is effected by a combination of RBW and VBW when it is in Auto mode).
- VBW varies with RBW when it is set to Auto.

4.5.3 EMI Filter

Turn on or off EMI measurement resolution bandwidth.
Currently, when opening an EMI filter (-6dB bandwidth), the resolution bandwidth can only be 200 Hz,9 kHz, 120 kHz, or 1 MHz. At this time, the detection method can be selected as "quasi-peak".

4.6 Marker

Key access: **[Marker]** softkey at the bottom of the screen.
A marker is a diamond-shaped symbol used to mark points on the trace. Through markers, you can read the amplitude, frequency, or scanning time points of each point on the trace.

4.6.1 Marker>

Key access: [Marker] bottom softkey → [Marker >] right softkey

Marker

Switch the selected marker. Tap this menu item to switch the active marker, which will be underlined for indication.

Key points:

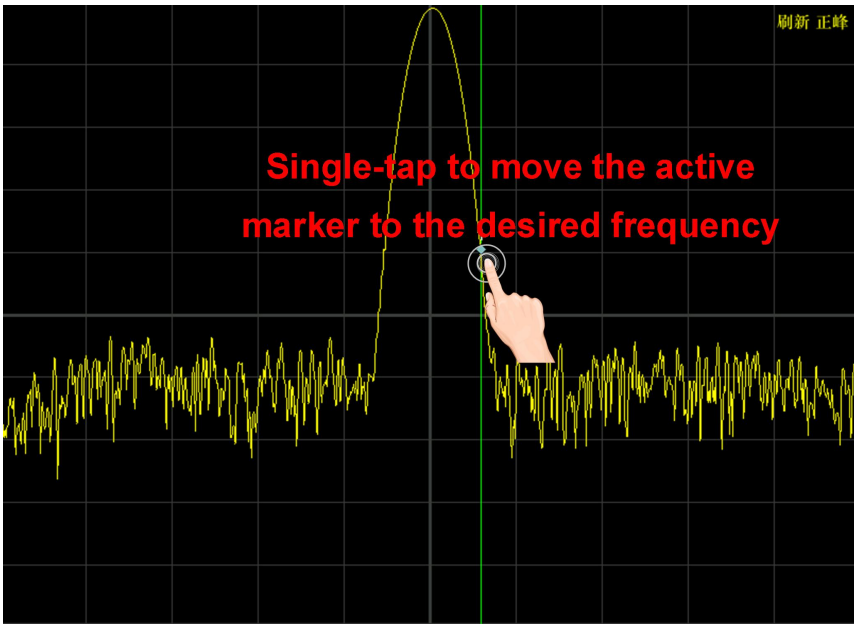
- Up to 8 frequency markers can be displayed simultaneously, but only one pair or single marker can be activated at a time.
- Under the frequency marker menu, you can input frequency or time using numeric keys, knobs, and direction keys, and view readings at different points on the trace.

Selects one marker, the default is Marker1, and place the marker at the center of the trace. If a delta marker is activated, this softkey changes to the menu under the [Delta] function.

If there is already a marker, this command will not produce any operation. If there are already two markers (e.g. in [Delta] mode), [Marker] changes the active marker to a new single marker. Frequency and amplitude information can be obtained from the marker (time and amplitude information when the span is set as Zero Span), and these values are displayed in the active function area and in the upper right corner of the screen. You can use the knob, touch screen, or the numeric keys to move the active marker.

The marker reads data from the current active track (this track may be track A or track B). If both tracks are active or both tracks are in static display mode, the marker will read data from track A.

Touchscreen Control: When a marker is active, single-tap in the display area (at any level) to quickly move the marker to the desired frequency.



Trace

Display the trace number of the current frequency marker. Select this menu item will switch and modify the trace to which the current frequency marker belongs. For example, change frequency marker 1 to the frequency marker of trace 2.

Normal

One of the marker types, which is used to measure the values of X (Frequency or Time) or Y (Amplitude) at certain point of the trace. When selected, a marker will appear with its own digital ID such as "1" on the trace.
Key points:

- If no active marker exists currently, a one will be enabled automatically at the center frequency of current trace.
- You can use the knob, direction keys or numeric keys to move the marker. The readouts of the marker will be displayed on the upper right of the screen.
- The readout resolution of the X-axis corresponds to the span and sweep points. For higher resolution, add sweep points or reduce the span.

Delta

One of the marker types, which is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the Reference point and certain point on the trace. When selected, a pair of markers appears on the trace, which are the Reference Marker and the Delta Marker. Will be in the active area and the display area of the upper right corner, showing the amplitude delta value between the two markers and frequency difference. If a single marker already exists, [Delta] will place a static marker and an active marker to the original position and a single marker position. Use the knob, step

key, or number keys to move the marker. If there are two markers, press [Delta] directly. However, if [Delta] has been activated, press [Delta] to place the still frequency scale to the active marker. The displayed amplitude difference is expressed in dB, or is the linear unit in terms of the corresponding scale.
Key points:

- The Reference Marker will be activated at the position of current marker, or else both the reference marker and Delta Marker will be simultaneously activated at the center frequency location if no marker is active at the present.
- The location of the Reference Marker is always fixed (both in the X-axis and the Y-axis), while the Delta Marker is active. You can use the numeric keys, knob or direction keys to change the location of Delta Marker.
- The delta of both the Frequency/Time and the amplitude between the two markers are displayed at the upper right of the screen.
- Two ways to enable a certain point as the reference:
  - Open a "Normal" marker and locate it onto a point and then switch the marker type into "Delta", creating a new reference, then you can modify the location of the delta point to achieve the delta measurement.
  - Open a Delta Marker and place it onto a point, then reselect the Delta menu to locate the marker you opened onto this points, then you can modify the location of the delta point to achieve the delta measurement.
- You can modify the position of frequency markers and difference markers on the trace line by directly clicking and dragging them.

Off

Close the currently open frequency marker and its related functions. The frequency marker will no longer be displayed.

All Off

Close all open frequency markers and their related functions. The frequency markers will no longer be displayed.

Marker Table

Turns on or off the display of all marker table. Open the frequency marker list to display a list of all opened frequency markers in colors corresponding to their respective trace lines at the bottom of the screen, including marker number, marker type, trace line, frequency time, and marker amplitude. This is used for observing the spectral information of multiple frequency markers.

4.6.2 Marker Function>

Key access: [Marker] bottom softkey → [Marker Fctn>] right softkey
Enter the frequency standard function related soft menu.

Marker

Switch frequency standards selected at present. Press this menu item to switch the frequency standards selected at present and display them with underline.

Function Off

Turn off marker measurement function.

NdB

Turn on the NdB bandwidth measurement function, or set the NdB value. NdB bandwidth refers to the frequency difference between two points where the amplitude decreases by NdB on both sides of the current frequency marker.
Key points:

- After the measurement starts, first find two frequency points that are N dB away from the current frequency marker, one on the left and one on the right. If found, display the frequency difference between them in the active function area.
- You can change the value of N using the numeric keys. The default value of N is 3.

Marker Noise

Turn on or off the frequency noise function. The function of marking noise is applied to the selected cursor, and then the noise Power Spectral Density at the cursor is read. When turned on, the average noise level read at the frequency scale is normalized to 1 Hz bandwidth for noise power.

Freq Count>

Activate the frequency counter function and display the counting results in the top right corner of the screen. The counter only counts signals displayed on the screen.

1. **Freq Count**

   Turn on or off the frequency counter mode. This function is invalid when the trace signal generator is activated. The count value is displayed in the upper right corner of the screen.

2. **Resolution**

   Counter resolution is divided into 1 kHz, 100 Hz, 10 Hz, 1Hz. Changing the counter resolution can change the counter accuracy. The higher the

resolution, the higher the counting accuracy.

3. **Return**

Return to the previous menu.

4.6.3 Marker→>

A soft menu associated with the marker function is popped out for setting the other system parameters (such as Center frequency, Reference level) by current marker readings. These menus relate to the frequency of the spectrum analyzer, whether the sweep width and marker are in normal or delta marker mode.

Mkr→CF

Sets the center frequency of the analyzer based on the frequency of the current marker. This feature quickly moves the signal to the center of the screen.

Key points:

- If Normal is selected, the center frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the center frequency will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

Mkr→CF Step

Sets the center frequency step of the analyzer based on the frequency of the current marker.

Key points:

- If Normal is selected, the center frequency step will be set to the frequency of current marker.
- If Delta Marker is selected, this function is invalid.
- The function is invalid in Zero span mode.

Mkr→Start

Sets the start frequency of the analyzer based on the frequency of the current marker.

Key points:

- If Normal is selected, the start frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.
- The function is invalid in Zero span mode.

Mkr→Stop

Sets the stop frequency of the analyzer based on the frequency of the current

marker.
Key points:

- If Normal is selected, the stop frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.
- The function is invalid in Zero span mode.

Mkr→Ref Level

Sets the reference level of the analyzer based on the amplitude of the current marker.
Key points:

- If Normal is selected, the reference level will be set to the amplitude of the current marker.
- If Delta Marker is selected, this function is invalid.

Mkr△→Span

Changes the span of the analyzer to the frequency difference between the two markers.

Mkr△→CF

Set the center frequency of spectrometer to make it equal to the frequency standard difference.

4.6.4 Peak>

Key access: [Marker] bottom softkey → [Peak>] right softkey
Executes peak searching immediately and opens the Peak setting menu.
Key points:

- If Max is selected from the Peak Search option, it will search and mark the maximum on the trace.
- The peak search of Next Peak, Peak Right, Peak Left or peaks in the peak table must meet the specified parameter condition.
- The spurious signal at the zero frequency caused by LO feed through is ignored.

Cont Peak

Turn on/off continuous search peak, default is off.

Peak-Peak

Execute peak search and a min. search at the same time and mark “difference pair” frequency standard. In particular, mark peak search result with the difference frequency standard and the min. search result with the reference frequency standard.

Next Peak

Searches the peak whose amplitude is the closest to that of the current peak. The peak is then identified with a marker. When this key is pressed repeatedly, you can quickly find a lower peak.

Left Peak

Searches the nearest peak located to the left side of the current peak and meets the current peak and peak thresholds condition. The peak is then identified with a marker.

Right Peak

Searches the nearest peak located to the right side of the current peak and meets the current peak and peak thresholds condition. The peak is then identified with a marker.

Auto Track

Enable or disable the auto-tracking function. The spectrum analyzer will lock onto qualified peaks.

Peak Setup>

Enter peak setup interface.

1. **Peak Excursion**

   Set Peak Excursion.

2. **Peak Mode**

   Set the search under Max. or Min. value mode.

3. **Sort**

   Set the sorting of peak value list by frequency or amplitude.

4. **Peak List**

   Enable or disable peak list. If the peak value list is enabled, all the frequency standard marks meeting the peak value requirements will be displayed on the trace according to sorting mode. All the frequency standard lists meeting the peak value requirements will be listed below with trace color.

5. **Return**

   Return to the previous menu.

4.7 Trace

Key access: Press  key, then **Trace** hardkey (7 in numeric keypad).

As the sweep signal is displayed as a trace on the screen, you can set

parameters about the trace using this key. The analyzer allows for up to five traces to be displayed at one time, and press this key to check the menu for trace line settings and operations.

4.7.1 Trace

Select trace. The spectrum analyzer provides traces 1, 2, 3, 4 and 5, and the number and state menu item of the selected trace will be underlined. In particular, the color of number corresponds to the color of trace.

4.7.2 State>

Set the refresh state type of spectral traces.

1. **Clear & Write**

   Refresh the current spectrum curve by collecting real-time scanned data at each point of the trace to display the analyzer trace.

2. **Max Hold**

   Maintains the maximum for each point of the trace. It continuously receive scan data and select positive peak value detect mode.

3. **Min Hold**

   Maintains the minimum for each point of the trace. It continuously receive scan data and select negative peak value detect mode.

4. **Average**

   Average the current trace. Each point of the trace displays the averaged result of multiple scans, resulting in a smoother display of this type of trace. Times of trace: 100 on average (by default) and 1,000 at maximum.

5. **View**

   Stops updating trace data and display current trace for observation.

6. **Blank**

   Clear the trace on screen. But the trace stock will keep still without refreshing.

7. **Return**

   Return to the previous menu.

4.7.3 Operations>

Enter trace math related sub menu.

1. **1↔2**

   Exchange the trace stock 1 data with trace stock 2 and place them in

display mode.

2. **2-DL→2**

   Deduct display line value in trace stock 2. This function execute once when activated. Press [2 - DL → 2] again to execute it the second time. When this function activated, display line will also be activated.

3. **2↔3**

   Exchange the trace stock 2 data with trace stock 3 and place them in display mode.

4. **1→3**

   Exchange the trace stock 1 data with trace stock 3 and place them in display mode.

5. **2→3**

   Exchange the trace stock 2 data with trace stock 3 and place them in display mode.

6. **Return**

   Return to the previous menu.

4.8 Detector

Key access: Press  key, then **Detector** hardkey (8 in numeric keypad).

While displaying a wider span, each pixel contains spectrum information associated with a larger subrange. That is, several samples may fall on one pixel. Which of the samples will be represented by the pixel depends on the selected detector type. Press this key to pop out the relevant menu includes [Pos Peak], [Neg Peak],[Sample] , [Normal], [Voltage Avg], [More>].

4.8.1 Trace

Select the trace. The spectrum analyzer provides 1, 2, 3, 4, and 5 traces. The selected trace number and its corresponding status menu item will be underlined. The color of the number corresponds to the color of the trace.

4.8.2 Pos Peak

Searches the maximum from the sampling data segment and displays it at the corresponding pixel. Positive peak detector will be selected when [Max Hold] pressed.

4.8.3 Neg Peak

Searches the minimum from the sampling data segment and displays it at the corresponding pixel.

4.8.4 Sample

Set the detector to the sampling detector mode. This mode is usually used for video averaging and noise frequency Maker.

4.8.5 Normal

When noise is detected, the positive and negative peaks are alternately displayed, otherwise only positive peaks are displayed.

4.8.6 Voltage Avg

Set the detector to the Voltage Average detector mode. This mode calculates the average voltage of all the samples in the sample bucket.

4.8.7 More>

Enter detector more menus.

1. **RMS Avg**

   Set the detector to the RMS Average detector mode. This mode calculates the RMS average power of all the samples in the sample bucket.

2. **Quasi-Peak**

   Set the detector to the Quasi-Peak detector mode. This mode is available when EMI filter is turned on. The quasi-peak detector is a peak detector that is weighted by the duration and repetition rate of the signal, as specified by the CISPR 16-1-1 standard. Quasi-peak detection is characterized by a fast charge time and slow decay time.

3. **Return**

   Return to the previous menu.

4.9 Display

Key access: Press  key, then **Display** hardkey (9 in numeric keypad).

Controls the screen display of the analyzer, such as full screen, setting the on or off for window zoom, display line, amplitude scale, grid and label.

4.9.1 Full Screen

Set to full-screen display graphical interface, press any key to exit.

4.9.2 Display Line

When this menu is on, an adjustable horizontal reference line is activated on the screen.

4.9.3 Ampt Graticule

Turn on or Off amplitude scale function.

4.9.4 Label

Defines the content displayed or hidden in the comments that appear in the display grid area.

4.9.5 Menu Hide

Display and hide the menu at the right side of the screen. When the menu hiding is enabled, the menu will be hidden if there is no any button operation within the preset menu hiding time (optional menu hiding time: 5-50 s). Recover menu display by pressing any button.

4.9.6 Brightness

Set screen brightness display within 1%~100%.

4.9.7 Screen Sleep

Set the time for enabling or disabling automatic screen off function. When the automatic screen off function is enabled, the screen will be off automatically if there is no any operation within the set automatic screen off time (optional screen off time: 1-60 min). Recover screen display by pressing any button.

4.10 Sweep

Key access: Press ⇧ key, then **Sweep** hardkey (4 in numeric keypad).

Sets parameters about the Sweep time and mode including [Sweep Time Auto Man], [Sweep Single], [Sweep Cont].

4.10.1 Sweep Time

Sets the time interval for the analyzer to complete a sweep.
Key points:

- In non-zero span, the analyzer uses the shortest sweep time on the basis of the current RBW and VBW settings if Auto is selected.
- This parameter using the numeric keys, knob, or direction keys.

4.10.2 Sweep Single

Press [Sweep Single] to set the sweep mode to Single. Press [Sweep Single] to restart the scan when the next trigger signal arrives.

4.10.3 Sweep Cont

Press [Sweep Cont] to activate the sweep scan mode. Allows you to set continuous scan mode.

4.11 Trigger

Key access: Press ⇧ key, then **Trig** hardkey (5 in numeric keypad).

Sets the trigger type and other associated parameters, menu includes [Free], [Video], [External>].

4.11.1 Free

Set the trigger mode to the free trigger mode so that the scan trigger is as fast as possible with the spectrum analyzer. It meets the trigger conditions at any time, that is, continue to generate a trigger signal.

4.11.2 Video

This indicates a trigger signal will be generated when the system detects a video signal in which the voltage exceeds the specified video trigger level.

4.11.3 External>

1. **Positive Edge**
   Positive Edge refers to the edge triggered when setting is external trigger.
2. **Negative Edge**
   Negative Edge refers to the edge triggered when setting is external trigger.
3. **Trigger Delay**
   Set the trigger delay time when using external triggers.
4. **Return**
   Return to the previous menu.

4.12 Track Source

Key access: Press ⇧ key, then **Source** hardkey (6 in numeric keypad).

When the Source is turned on, an independent signal or a signal with the same frequency of the current sweep signal will be output from the GEN Output 50 Ω terminal on the front panel. Press the key will pop out related menu includes [Track Gen On Off], [Output Level], [Reference], [Position], [Do Normalize], [Normalize]. The source is turned off in the power-on and reset states.

4.12.1 Track Gen

Select the tracking generator to be on or off. The RF output and spectrum reception are fully synchronized in frequency scanning, and the tracking source frequency cannot be set independently.

4.12.2 Output Level

Set the output power of the tracking source signal.

4.12.3 Reference

After enabling normalization, adjust the vertical position of trace on the screen

by adjusting the reference level value.

4.12.4 Position

After enabling normalization, adjust the vertical position of normalized reference level on the screen by adjusting the reference position.
Key points:

- It is similar to the function realized by normalized reference level, which is at the bottom of the screen grid when it is 0% or at the top of the screen grid when it is 100%.
- The parameter can be changed via numeric buttons, knob, or direction buttons.

4.12.5 Do Normalize

This soft menu is used to track the user's field calibration of the source network measurements. After connecting the instrument's RF output to the RF input, press the **Normalize** soft menu and the display shows a straight line on the 0dB scale.
Key points:
Disable normalization before the operation above.

4.12.6 Normalize

This soft-menu is used to turn normalization on or off after executing normalization.

4.13 Mode

Key access: Press  key, then **Mode** hardkey (1 in numeric keypad).

Select the operating mode of spectrum analyzer from [Spectrum], [Demod>], [Modulation>], [RSA], [VNA] and [EMI]. This spectrometer supports audio demodulation and AM / FM / PM analog demodulation. The functions of menus and buttons differ under different modes.

4.13.1 Spectrum

Enter the operation mode of spectrum analysis.

4.13.2 Demod>

Enter audio demodulation mode to select AM or FM analog demodulation mode.

1. **Demod Mode>**

   Enter audio demodulation mode ,including AM or FM analog demodulation mode.

2. **Sound**

   Adjust the output volume of loudspeaker after enabling AM demodulation.
   Adjust the output volume of loudspeaker after enabling FM demodulation.

3. **Carrier Freq**

   Set the center frequency after enabling AM demodulation.
   Set the center frequency after enabling FM demodulation.

4. **Return**

   Return to the previous menu.

4.13.3 Modulation>

Enter audio demodulation mode to select AM, FM or PM analog demodulation mode.

1. **AM>**

   Enter AM demodulation soft menu.

   (1) Carrier Freq

   Set the carrier frequency of the AM modulation signal.

   (2) IF BW

   Set the demodulation bandwidth of the AM modulated signal.

   (3) Setup>

   1) **Time Axis>**

      Set the time axis parameters.

      a. **Ref. Value**

         Set the starting reference time on the time axis.

      b. **Position**

         Set the reference position of the waveform on the time axis.

      c. **Scale/Div**

         Automatically or manually set the grid division scale.

      d. **Return**

         Return to the previous menu.

   2) **Depth Axis>**

      Set the depth axis parameters.

      a. **Ref Depth**

         Set the reference offset position as a vertical percentage.

b. Position
Set the reference position of the waveform on the depth axis.

c. Scale/Div
Automatically or manually set the grid division scale.

d. Return
Return to the previous menu.

3) AF Trigger>
Set the AF triggering conditions.

a. AF Trigger
Set the AF trigger to be On or Off.

b. Edge
Set the trigger to rising or falling edge.

c. Trigger Mode
Set the triggering mode to single trigger or continuously trigger.

d. Trigger Level
Set the trigger level.

e. Trigger Delay
Set the trigger delay time.

f. Return
Return to the previous menu.

4) Return
Return to the previous menu.

(4) Data Reset
Set the maximum, minimum, and average data reset under the AM modulated signal.

(5) Return
Return to the previous menu.

2. FM>
Enter FM demodulation soft menu.

(1) Carrier Freq
Set the carrier frequency of the FM modulation signal.

(2) IF BW
Set the demodulation bandwidth of the FM modulated signal.

(3) Setup>

1) Time Axis>
Set the time axis parameters.

a. Ref. Value
Set the starting reference time on the time axis.

b. Position
Set the reference position of the waveform on the time axis.

c. Scale/Div
Automatically or manually set the grid division scale.

d. Return
Return to the previous menu.

2) Deviation Axis>

Set the depth axis parameters.

a. Ref Deviation

Set the reference offset position as a vertical percentage.

b. Position

Set the reference position of the waveform on the depth axis.

c. Scale/Div

Automatically or manually set the grid division scale.

d. Return

Return to the previous menu.

3) AF Trigger>

Set the AF triggering conditions.

a. AF Trigger

Set the AF trigger to be On or Off.

b. Edge

Set the trigger to rising or falling edge.

c. Trigger Mode

Set the triggering mode to single trigger or continuously trigger.

d. Trigger Level

Set the trigger level.

e. Trigger Delay

Set the trigger delay time.

f. Return

Return to the previous menu.

4) Return

Return to the previous menu.

(4) Data Reset

Set the maximum, minimum, and average data reset under the FM modulated signal.

(5) Return

Return to the previous menu.

3. PM>

Enter PM demodulation soft menu.

(1) Carrier Freq

Set the carrier frequency of the PM modulation signal.

(2) IF BW

Set the demodulation bandwidth of the PM modulated signal.

(3) Setup>

1) Time Axis>

Set the time axis parameters.

a. Ref. Value

Set the starting reference time on the time axis.

b. Position

Set the reference position of the waveform on the time axis.

c. **Scale/Div**
Automatically or manually set the grid division scale.

d. **Return**
Return to the previous menu.

2) **Phase Axis>**
Set the depth axis parameters.

a. **Ref Phase**
Set the reference offset position as a vertical percentage.

b. **Position**
Set the reference position of the waveform on the depth axis.

c. **Scale/Div**
Automatically or manually set the grid division scale.

d. **Return**
Return to the previous menu.

3) **AF Trigger>**
Set the AF triggering conditions.

a. **AF Trigger**
Set the AF trigger to be On or Off.

b. **Edge**
Set the trigger to rising or falling edge.

c. **Trigger Mode**
Set the triggering mode to single trigger or continuously trigger.

d. **Trigger Level**
Set the trigger level.

e. **Trigger Delay**
Set the trigger delay time.

f. **Return**
Return to the previous menu.

4) **Return**
Return to the previous menu.

(4) Data Reset
Set the maximum, minimum, and average data reset under the PM modulated signal.

(5) Return
Return to the previous menu.

4. Return
Return to the previous menu.

4.13.4 RSA

Enter the Real-time Spectrum Analysis mode. Please refer to "Real-time Spectrum Analysis Mode" on page 74 .

4.13.5 VNA

Enter the Vector Network Analysis mode. Please refer to "Vector Network Analysis Mode" on page 91.

4.13.6 EMI

Enter the EMI measurement mode. Please refer to "EMI Measurement Mode" on page 111.

4.14 System

Key access: Press ⇧ key, then **System** hardkey (2 in numeric keypad).

A soft menu for system parameter settings pops up. Including [System＞], [Setting＞], [PowerOn/Preset＞] [Save/Recall＞]. For first time you use the spectrum analyzer, set the date and time, the system will store the settings, restart the machine after power off won't change the settings.

4.14.1 System>

Soft menus of system information, which includes [System Info], [Firmware Update], [Option>].

1. **System Info**

   Press to display system information.

2. **Firmware Update**

   1) Create a new folder on the USB drive, name it "spectrum" (in lowercase), and then copy the upgrade firmware file "Spe.update" into the "spectrum" folder.
   2) Insert the USB memory device into the front-panel USB connector on your instrument. Press ⇧ key, then press [System>], and press [System Info>], press [Firmware Update] to execute firmware update.
   3) The analyzer will perform the update process. The upgrade procedure will take approximately 30 seconds. During the update process, do not remove the USB memory device, do not power off the instrument or press any key. If the update process fails, please report the problem to your distributor or our technical support.
   4) Once the upgrade is completed, the instrument will automatically restart.

3. **Option>**

   Enter system option configuration. EMI is available for selection.

4. **Return**

   Return to the previous menu.

4.14.2 Setting>

Enter the setup menu of the spectrum analyzer system.

1. **LAN>**

   Pop out the relative menu for network configuring.

   1) **IP**

      Used to set the IP address of the LAN port.

   2) **Mask**

      Set the subnet mask parameter.

   3) **Gate**

      Set default gateway address.

   4) **DHCP**

      One of the setting methods of IP address. The DHCP server assigns an IP address, subnet mask and gateway to the analyzer on the basis of the current network status.

   5) **Return**

      Return to the previous menu.

2. **Shutdown**

   Enable or disable the automatic shutdown time of the spectrometer. When the spectrometer is idle, execute automatic shutdown according to the time parameters set.

3. **Language >**

   To set the system language.

4. **Date/Time >**

   Used to set the device date, time, and their format.

   1) **Date/Time**

      Turn on or off Date/Time display.

   2) **Date Set**

      Set the display date for spectrum analyzer. Format is YYYY.MM.DD. E.g. June 22th,2012 should display as 2012.06.22.

   3) **Time Set**

      Set the display time for spectrum analyzer. Format is HH.MM.SS. E.g. 16:55:30 should display as 16.55.30.

4) Return

Return to the previous menu.

5. Return

Return to the previous menu.

4.14.3 PowerOn/Preset>

Used to set the analyzer power on parameters or reset parameters.

1. Power Set >

Power-on parameter settings include [Factory] and [User >].

2. Preset >

Preset parameter settings include [Factory] and [User >].

Key points: To save the current system configuration as a user-defined configuration, press ⇧ key and press **System** panel key, then press the [**Save/Recall>]** and press [Save>] item, and select the [User Status] menu item.

Parameter	**Value**	
Frequency		
Center Frequency	3.6G	1.800000000GHz
	7.5G	3.750000000GHz
	14.0G	7.000000000GHz
	20.0G	10.00000000GHz
Start Frequency	0Hz	
Stop Frequency	3.6G	3.600000000GHz
	7.5G	7.500000000GHz
	14.0G	14.00000000GHz
	20.0G	20.00000000GHz
Frequency Step	3.6G	Auto 360.000000MHz
	7.5G	Auto 750.000000MHz
	14.0G	Auto 1400.00000MHz
	20.0G	Auto 2000.00000MHz
Frequency Offset	0Hz	
Frequency Reference	Internal	
Scale Type	LIN	
SPAN		
Span	3.6G	3.600000000GHz
	7.5G	7.500000000GHz
	14.0G	14.00000000GHz
	20.0G	20.00000000GHz

AMPTD	
Reference Level	0.00dBm
Attenuator	Auto 10 dB
Scale/div	10.00dB
Scale Type	LOG
Reference Offset	0.00dB
Unit	dBm
Preamplifier	Off
BW	
Resolution Bandwidth	Auto5MHz
Video Bandwidth	Auto5MHz
EMI Filter	Off
Detector	
Trace	1
Detector Type	Pos Peak
Sweep	
Sweep Time	HSA3036: Auto 14.153ms HSA3075: Auto 28.903ms HSA3140: Auto 48.966ms HSA3200: Auto 53.908ms
Sweep Mode	Continuous Sweep
Source	
Tracking Source	Off
Trace	
Trace	1
Trace Type	Clear Write
Trace 1 Math	1<- ->2
Trig	
Trigger Mode	Auto
Mode	
Spectrum	
Peak	
Peak Search	Off
Peak Excursion	10.00dB
Peak Mode	Max
Sort Mode	Amplitude
Peak List	Off
Marker Fctn	
NdB	Off
Marker Noise	Off
Frequency Count	Off
Marker	

Marker	1
Trace	1
Marker List	Off
Meas	
Time Spectrum	Off
Adjacent Power	Off
Channel Power	Off
Occupied Bandwidth	Off
Pass-Fail	Off

3. Return

Return to the previous menu.

4.14.4 Save/Recall>

You can save, recall, or set quick saves for screenshots, trace data, user settings, or saved limit lines.

1. Save >

It's available to save screenshot, trace data, or user state.

1) Screen Pixmap>

Enter screenshot save soft menu, you can choose to save screenshots to local or flash memory, the image file format is bmp, the screen status display bar will display the saved screenshots information.

2) Trace Data >

Enter the trace data save soft menu, you can choose to save the trace data to the local or flash memory, trace data file format is csv, the screen status display trace data saving information.

3) User State

Save the current system configuration as a user self-defined configuration. Save it in local. The information on saving the user status will display in the status bar of the bottom left corner of the screen.

4) Limit Line

Save the limit line file at local site. The format of limit line file is sp. A progress display box (pop-up window) in the middle of the screen will display relevant information about saved limit lines.

Key points: The save limit line can only be loaded in the area measurement mode (Meas → Pass-Fail > → Limit Meas).

5) CISPR Config

Save the CISPR file locally. The file format is prj. A progress dialog box

(pop-up window) will appear in the center of the screen displaying relevant information about saving CISPR settings.

Key points: CISPR must be saved only when the EMI measurement is in the enabled mode.

6) Antennae

Save the antenna file locally. The antenna file format is "ant". A progress dialog box will appear in the center of the screen displaying relevant information about saving the antenna settings.

Key points: The antenna can only be loaded when the field measurement or EMI measurement is enabled.

7) Return

Return to the previous menu.

2. Recall >

Retrieve screen images, trace data, user configurations, scatter plots, CISPR configurations, antenna information, or all relevant data.

1) Type >

You can select file types including screen images, trace data, user configurations, scatter plots, or all types to download to your local device. Screen images are saved in bmp format, trace data in csv format, user configurations in user format, and scatter plots in sp format. A progress box will display in the center of the screen with information about successful downloads.

2) Sort >

Select screen images, trace data, user configurations, scatter plots, or all files to view relevant information sorted by name, time, or size as desired.

3) First Page

Display the first page of the current directory.

4) Prev Page

Display the previous page.

5) Next Page

Display the next page.

6) Load>

Load the relevant information of the selected file.

7) Return

Return to the previous menu.

3. QuickSaveSet >

Set the file type for quick save as screenshot, trace data or user state.

1) Screen Pixmap

Set the file type for quick save as screenshot.

2) **Trace Data**
   Set the file type for quick save as trace data.
3) **User State**
   Set the file type for quick save as user state.
4) **Limit Line**
   Set the file type for quick save as user state.
5) **CISPR**
   Set the file type for quick save as CISPR.
6) **Antennae**
   Set the file type for quick save as antennae.
7) **Return**
   Return to the previous menu.

4. **Return**
   Return to the previous menu.

4.15 File

Key access: Press  key, then **File** hardkey (3 in numeric keypad).

Pop up file management soft menu.

4.15.1 Storage

Select file storage location: Internal or external.

4.15.2 Type>

Used to view file types under the directory, including screen images, trace data, user configurations, limit lines, CISPR, antennas, or display all types.

4.15.3 First Page

Display first page of current directory.

4.15.4 Prev Page

Display Previous page.

4.15.5 Next Page

Display next page.

4.15.6 Last Page

Display last page of current directory.

4.15.7 Operations>

Enter file operation soft menu, including [Sort>], [Delete>], [Export>], [Load>], [Set as Power On], [Set as Preset].

4.16 Help

Key access: Press  key, then **Help** hardkey (0 in numeric keypad).

Spectrum analyzer help menu, press this key once to open the system help, press any key to display the help content, and press this key again to close the help function.

4.17 Measurement

Key access: Press  key, then **Measure** hardkey (Decimal key in numeric keypad).

Provide a variety of advanced measurement functions, pop-up spectrum analyzer built-in and user-defined measurement function soft menu, turn on or off the time spectrum, adjacent channel power measurement, channel power measurement, occupied bandwidth, Pass-Fail measurement menu.

4.17.1 Measure Off

You can directly close the currently running measurement function, you can also choose to close the measurement menu.

4.17.2 Time Spec>

Turn on time spectrum measure mode.

4.17.3 ACPR>

Turn on or off the adjacent channel power measurement. Press ⇧ key and press **Measure**, then press **Meas Setup>** to pop up the parameters of the adjacent channel power measurement soft menu. The adjacent channel power is used to measure the ratio of the adjacent channel power of the transmitter. The absolute value of the main channel power and the absolute value of the adjacent channel power are obtained by the linear power integration method, so that the adjacent channel power ratio is gained.

4.17.4 Channel Power>

Turn on or off channel power measurements. Press ⇧ key and press **Measure**, then press **Meas Setup>** to pop up the channel power measurement parameter settings soft menu. The channel power is used to measure the transmitter channel power, according to the user set the channel bandwidth, through the linear power integration method to obtain the absolute value of the main channel power.

4.17.5 OBW>

Turn on or off the occupied bandwidth measurement. Press ⇧ key and press **Measure**, then press **Meas Setup>** to pop up the parameter setting soft menu for occupying the bandwidth measurement. Occupied Bandwidth is a measure of the bandwidth occupied by the transmitter signal can be measured from the total power ratio within the in-band power span, with a default value of 99% (the user can set this value).

4.17.6 Pass-Fail>

Enter the pass / fail measurement function soft menu. Pass / fail measurement has two modes of window measurement and limit measurement.

1. **Window Meas>**

   Enter Window measurement soft menu.

   1) **Window Meas**

      Turn on or off window measurement mode.

   2) **Limit Line**

Turns the amplitude line on or off, and the amplitude line turns on when the window measurement is on.

3) **Freq Line**

Turns the frequency line on or off, and the frequency line turns on when the window measurement is on.

4) **Limit Set**

Used to edit the upper and lower limit on the amplitude line.

5) **Freq Set**

Start and stop frequencies for scanning line for editing.

6) **Window Sweep**

Turns window sweep on or off. When the window sweep is on, only the window formed by the intersection of the amplitude line and the frequency line is scanned. The peripheral stops scanning; the full frequency is scanned when it is closed.

7) **Return**

Return to the previous menu.

2. Limit Meas>

Enter limit measurement soft menu.

1) **Limit Meas**

Turn on or off limit measurement mode.

2) **Line Up**

When the upper limit line is turned on or off, the upper limit line is opened by default when the area measurement is on.

3) **Line Low**

When the lower limit line is turned on or off, the lower limit line is opened by default when the area measurement is on.

4) **Offset X/Y**

Frequency: For the actual measurement, the edited area as a whole superimposed on a frequency, so that it can implement left or right shift, easy to measure. Does not affect the frequency and marker of the spectrum analyzer settings.

Amplitude: The region has been edited on the whole superimposed on a degree, so that it can move up or down, easy to measure. Does not affect the amplitude setting of the spectrum analyzer.

5) **Edit >**

For limit measurement parameter editing.

a. **LineUpEdit >**

Upper line editing is used to edit the control line above the trace, depending on the trace.

b. LineLowEdit >

Lower line editing is used to edit the control line above the trace, depending on the trace.

c. Save Line

Save the currently selected constraint line.

d. Load Line>

Call the restricted lines saved internally in the device.

e. Return

Return to the previous menu.

6) Return

Return to the previous menu.

3. Return

Return to the previous menu.

4.17.7 More>

Enter the soft menu for more measurement functions. The additional measurements include: harmonic measurement, phase noise measurement, third-order intermodulation distortion measurement, spectrum emission mask measurement, power CCDF statistical measurement, spurious emission measurement, transmitted power measurement, field measurement and map measurement.

1. Harmonic >

Enter the harmonic measurement menu.

H[dBc] = PH [dBm] - PC [dBm]

H[dBc]:Harmonic distortion value;

PH[dBm]:Harmonic distortion signal level;

PC [dBm]:Fundamental signal level.

THD = sqrt(sum[W] / P_C [W]) * 100%;

THD denotes total harmonic distortion and sum denotes power of individual harmonic signals.

Parameter	Description
Harmonic	The harmonic of the fundamental frequency
Frequency	A multiple of the fundamental frequency
Amplitude	The amplitude of the harmonic frequency in dBm
dBc	Harmonic distortion value, the amplitude of the harmonic frequency relative to the fundamental frequency
THD	Total harmonic distortion in % or dBc

Bar chart	The frequencies listed in the table correspond to the amplitudes, with the number 1 representing the fundamental frequency and the remaining numbers representing the individual harmonic frequencies.The trace of this mode is only used as a rough reference to facilitate the observation of the position of all harmonics, which is not consistent with the amplitude in the bar charts and tables, and the specific data are mainly in tables or bar charts. If the frequency value of the tenth harmonic exceeds the upper limit of the spectrum meter measurement, the harmonic position will deviate from the bar chart.

1) Harmonic

Enable or disenable the harmonic measurement mode.

2) Fundamental Freq

Set the fundamental frequency,when the harmonic measurement mode is turned on, the center frequency in the spectrum mode is set according to the number of harmonics.

3) Number of Harmonic

Set the number of harmonics that can be displayed, up to the tenth harmonic can be displayed. When the fundamental frequency is set, the upper limit of the number of harmonics will vary due to the limited measurement range of the spectrum instrument.

4) RBW

Adjust the resolution bandwidth ranging from 1Hz~5MHz. Use numeric key, step key or knob to switch resolution bandwidth. The underline under Auto or Manual means Auto mode or Manual mode. Press [RBW Auto Man] and hold it until underline under Auto has been highlighted. Then the resolution bandwidth is under automatic mode.

Key points:

- Reducing the value of RBW will increase the frequency resolution, but may also cause sweeps to take longer (Sweep Time is effected by a combination of RBW and VBW when it is in Auto mode).
- RBW decreases with the span (non-zero span) in Auto RBW mode.

5) Return

Return to the previous menu.

2. Phase Noise >

Enter the phase noise measurement mode menu.
POffset [dBc] = PSSB [dBm] - PC [dBm] - 10 * log(1.2 * RBW) + 2.5
POffset denotes phase noise power at the frequency offset;

PSSB denotes single-sideband phase noise power;
PC denotes carrier power;
RBW denotes resolving bandwidth.

Parameter	Description
Position	Combine the phase noise values of each frequency band at 6 frequency points to obtain a complete phase noise trace, and plot the trace on a logarithmic scale.
Frequency Offset	Adjust the stop frequency in spectrum mode based on the starting frequency offset and stop frequency offset, obtain the amplitude values at various frequency points within this frequency band, and calculate the phase noise values.
Source trace	In spectrum mode, the original trace data obtained for the start and stop frequencies is referred to as the yellow trace.
Average trace	The trace data resulting from averaging the original trace data ten times is labeled as the blue trace.

1) Phase Noise

Enable or disenable the phase noise measurement mode.

2) Auto Tune

Automatically search for stable signals across the entire frequency band and adjust frequency and amplitude parameters to optimal states. One-button operation for signal search and automatic parameter setting. During auto-tuning, clicking **Preset** will exit auto-tuning mode and return to the original state. If no signal is found or the signal is unstable, the search fails and returns to the original state. Once the signal is found, set its frequency as the carrier frequency.

Key points: some parameters such as reference level, scale, and input attenuation may be changed during the auto tune.

3) Carrier Freq

Set the carrier frequency, when the phase noise measurement mode is on, set the carrier frequency to the starting frequency in the spectrum mode.

4) Start Offset

The starting frequency offset value is fixed, and the phase noise value at this frequency offset is measured in increments of a factor of 10.

5) Stop Offset

The stop frequency offset value is fixed as the upper limit of the frequency offset value.

6) Return

Return to the previous menu.

3. TOI >

Enter the TOI measurement mode menu.

f lowTOI = 2 f 1 - f 2

f highTOI =2 f 2 - f 1

f lowTOI denotes low third order intermodulation frequency;

f highTOI denotes high third order intermodulation frequency;

f 1 denotes low monophonic frequencies;

f 2 denotes high monophonic frequencies.

[C / IM] = 10 * log(PC [dBm] / PIM [dBm])

[C / IM] denotes third order intermodulation distortion ratio;

PC denotes fundamental output power;

P_{IM} denotes third order intermodulation product output power.

Parameter	Description
Marker	1,2,3,4 marker corresponding to f_{lowTOI},f_1 ,f_2 , $f_{highTOI}$ respectively.
Frequency	f_{lowTOI},f_1 f_2 ,$f_{highTOI}$ corresponding frequency.
Amplitude	f_{lowTOI},f_1 , f_2 ,$f_{highTOI}$ corresponding amplitude.
dBc	The relative amplitude of [C/IM], f_1, and f_2 to the amplitudes of f_{lowTOI} and $f_{highTOI}$.
Trace	Draw traces based on the data obtained by scanning the start and stop frequency in spectrum mode,and obtain four frequency markers from the peak list. If the calculated high and low third order intermodulation frequencies exceed the scan range, they will be displayed as *."

1) TOI

Enable or disenable the TOI measurement mode.

2) Low Monophonic Freq

Press[Low Monophonic Freq Auto Man] and hold it until underline under Auto has been highlighted. Then the low monophonic frequency is under auto mode.According to the peaklist, select the frequency corresponding to the amplitude of the second peak as the low single-tone frequency.When switched to manual mode, the frequency is set by the user.

3) High Monophonic Freq

Press[High Monophonic Freq Auto Man] and hold it until underline under Auto has been highlighted. Then the high monophonic frequency is under auto mode.According to the peaklist, select the frequency corresponding to the amplitude of the maximum peak as the high single-tone frequency.When switched to manual mode, the frequency is set by the user.

4) Return

Return to the previous menu.

4. SEM>

Enter the spectrum emission template measurement menu.

Parameter	Description
Offset	Indicate the number of offsets. Up to 5 offsets can be configured, each represented by a different color.
Start	Starting frequency of this offset.
Stop	Stop frequency of this offset.
RBW	RBW of this offset.
Lower Freq	The frequency point corresponding to the maximum amplitude in the lower frequency segment of the offset trace data.
Higher Freq	The frequency point corresponding to the maximum amplitude in the higher frequency segment of the offset trace data.
Peak(dBm P/F)	The maximum value within the frequency band, green "P" indicates that this offset segment passed the template, while red "F" indicates that this offset segment failed to pass the template.
Channel IBW	Calculate the power value within the test main channel.
Total Power	Calculate the reference value based on the total power within the channel, the channel integrated bandwidth, and the channel resolution bandwidth.
PSD	Calculate the reference value based on the total power within the channel and the channel RBW.

1) SEM

Enable or disenable the spectrum emission template measurement.

2) Center Freq

Set the center frequency value.

3) Ref Level

Set the reference level value.

4) Userconfig Mask>

a. Channel Setup>

Set the parameter of the main channel.

① **Channel IBW**

Set the channel integrated bandwidth,it is used to calculate the power within the main channel.

② **Channel Span**

Set the channel span value.

③ **RBW**

Set the resolution bandwidth value.

④ **Measure Ref Type**

Select the TotalPwr or PSD as the reference value.

⑤ **Total Pwr Ref**

Set the total power reference value of carrier waveform,when switch into automatic mode,calculate the reference value based on the total power within the channel,the channel integrated bandwidth and the channel resolution bandwidth.Under the manual mode,the reference value is set by user.

⑥ **PSD Ref**

Set the power spectral density reference value,when switch into automatic mode,calculate the reference value based on the total power within the channel and the channel integrated bandwidth. Under the manual mode,the reference value is set by user.

⑦ **Return**

Return to the previous menu.

b. Offset Setup>

Set the frequency,power and other template parameters of selected offset.

① **Select Offset**

Select the offset index.

② **Offset Limit**

Enable or disenable the offset limit.If the offset is off or the start frequency is equal to the stop frequency when it is on, the offset segment trace and template are not displayed.

③ **Start Freq**

Set the starting frequency of the selected offset.

④ **Stop Freq**

Set the stop frequency of the selected offset.

⑤ **RBW**

Set the resolution bandwidth of the selected offset.

⑥ **More>**

- **Select Offset**

  Select the offset index.

- **Pass/Fail Mask**

  Select to use Absolute or Relative templates.

- **Abs Start Ampt**

Set the absolute start amplitude of the selected offset.

- **Abs Stop Ampt**

  Set the absolute stop amplitude of the selected offset.When switch into automatic,set to the same value as the absolute starting amplitude.Under manual mode,the reference is set by user.

- **Rel Start Ampt**

  Set the relative start amplitude of the selected offset.

- **Rel Stop Ampt**

  Set the relative stop amplitude of the selected offset.When switch into automatic,set to the same value as the relative starting amplitude.Under manual mode,the reference is set by user.

- **Return**

  Return to the previous menu.

⑦ **Return**

Return to the previous menu.

c. Preset

Restore the user configuration template parameters to their initial state.

d. Return

Return to the previous menu.

5) Stationary Mask >

a. 3GPP>

User can select stationary as spectrum emission template.

① **3GPP**

Enable or disenable the 3GPP template.

② **Channel Setup >**

Please refer to P65 "**SEM>**", "**4)Userconfig Mask>**", **a.Channel Setup >**.

③ **Offset Setup >**

Please refer to P65 "**SEM>**", "**4)Userconfig Mask>**", **b.Offset Setup >**.

④ **Duplex Mode >**

- **Duplex Mode**

  Select FDD or TDD as the duplex mode.

- **FDD Config >**

  - **Transmission**

    Select BS or UE as the transmission mode.

- **Max Out Pwr >**
  Select the maximum output power with the options P >= 43,39 <= P < 43,31 <= P < 39,P < 31.
- **Add Max Out Pwr >**
  When the maximum output power is selected P < 31,it will has additional option None,6 <= P < 20,P < 6.
- **Return**
  Return to the previous menu.

- **TDD Config >**
  - **Transmission**
    Select BS or UE as the transmission mode.
  - **Chip Rate**
    Select the chip rate with the options 1.28M, 3.84M, 7.68M.
  - **Max Out Pwr >**
    Select the maximum output power with the options P >= 43, 39 <= P < 43, 31 <= P < 39, P < 31; P >= 34, 26 <= P < 34, P < 26. When the chip rate is 1.28M, the last three terms are selected, and when the chip rate is 3.84M and 7.68M, the first four terms are selected.
  - **Return**
    Return to the previous menu.
- **Return**
  Return to the previous menu.

⑤ **Return**
Return to the previous menu.

b. 802.11b>

Set 802.11b as the spectrum emission template.

① **802.11b**
Enable or disenable the 802.11b template.

② **Channel Setup >**
Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **a.Channel Setup >**.

③ **Offset Setup >**
Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **b.Offset Setup >**.

④ **Return**
Return to the previous menu.

c. 802.11g>

Set 802.11g as the spectrum emission template.

① **802.11g**

Enable or disenable the 802.11g template.

② **Channel Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **a.Channel Setup >**.

③ **Offset Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **b.Offset Setup >**.

④ **Modulation >**

Select modulation mode:OFDM or DSSS/PBCC/CCK.

⑤ **Return**

Return to the previous menu.

d. 802.11n>

Set 802.11n as the spectrum emission template.

① **802.11n**

Enable or disenable the 802.11n template.

② **Channel Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **a.Channel Setup >**.

③ **Offset Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **b.Offset Setup >**.

④ **Channel BW>**

The channel bandwidth is chosen to be 20M or 40M.

⑤ **Return**

Return to the previous menu.

e. 802.16>

Set 802.16 as the spectrum emission template.

① **802.16**

Enable or disenable the 802.16 template.

② **Channel Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **a.Channel Setup >**.

③ **Offset Setup >**

Please refer to P61 "**SEM>**", "**4)Userconfig Mask>**", **b.Offset Setup >**.

④ **Channelization >**

The channelization parameter is chosen to be 10M or 20M.

⑤ **Return**

Return to the previous menu.

f. Return

Return to the previous menu.

6) Return

Return to the previous menu.

5. Power CCDF Start >

Enter the soft menu for power CCDF statistical measurement mode.

Power CCDF Statistical Measurement: The power CCDF statistical measurement describes the percentage of samples in a signal sample set whose power level is greater than or equal to a specific value.

Parameter	Description
Average Power/Percent	Indicates the average power calculated from the power values of statistical points within the center frequency and channel bandwidth. Represents the percentage corresponding to the average power.
Peak	Calculate the maximum value of statistical point amplitude and the maximum relative power.
Percent	Probability of Complementary Cumulative Distribution Function.
Relative Ampt	The probability at this point corresponds to the amplitude value relative to the average power.
Gauss Curve	The curve of Gaussian complementary cumulative distribution function.
Statistic Curve	The statistical curve calculated from the center frequency, channel bandwidth, and number of statistical points.
xx/xx Points	Points Counted / Total Points to Count

1) Power CCDF Stat

Enable or disenable the power CCDF statistical measurement.

2) Center Freq

Set the center frequency value.

3) Channel BW

Set the channel bandwidth. Measure and record the amplitude data within the range defined by the channel bandwidth, centered at the center frequency.

4) Statistic Points

Set the number of statistical points. The more statistical points there

are, the longer the statistical time will be, and the more accurate the statistics will be.

5) Return

Return to the previous menu.

6. More>

1) Spurious Emissions >

Enter the spurious emissions measurement menu.

Parameter	Description
Spurious	Spurious values 1-10, arranged in ascending order of magnitude
Range	Current selection range
Frequency	Scattered frequency at that location
Ampt	Scattered amplitude at that location
Limitation	Current selection range limit settings
DeltaLimit	The relative magnitude of stray and limited amplitude at that point
P/F	If the stray amplitude at this point does not exceed the limit amplitude, then pass (P), otherwise fail (F).

a. Spurious Emissions

Enable or disenable the spurious emissions measurement.

b. Select Range

Select scan segments 1, 2, 3, 4, and 5.

c. Limit Ampt

Set the limit range line.

d. Start Freq

Set the start frequency for this scan segment.

e. Stop Freq

Set the stop frequency for this scan segment.

f. RBW

Set the resolution bandwidth for this scan segment.

g. Return

Return to the previous menu.

2) Burst Power >

Enter the soft menu for transmit power measurement mode.

Parameter	Description
Power	Maximum power, minimum power

Amplitude	Corresponding amplitude value
absThreshold	the sum of relative threshold and maximum power value
relThreshold	Fixed at -30dB

a. Burst Power

Enable or disenable the burst power measurement.

b. Peak Trig

Enable or disable peak triggering, which triggers when the scan encounters a rising edge of amplitude value.

c. Frequency

Set the center frequency for measurement.

d. Sweep Time

Set the sweep time for measurement.

e. Return

Return to the previous menu.

3) Field Strength>

Enter field strength menu.

a. Field

Enable or disable field measurement.

b. Antenna Gain

Enable or disable antenna gain.

c. Antenna Config>

Enter antenna configuration menu.

① **Edit>**

Edit antenna parameters.

② **Save Antennae**

Save the configured antenna factor parameters.

③ **Load Antennae>**

Load the preconfigured antenna profile.

d. Return

Return to the previous menu.

4) Map>

Enter map menu.

a. Signal Location>

① **Signal Location**

Enable or disable signal location function.

② **Signal Mask**

Select signal marker.

③ **Start**

Start signal marking.

④ **Mark Display**

Enable or disable displayed marker information.

⑤ **Mark Del**

Delete marked signals.

⑥ **Return**

Return to the previous menu.

b. **Signal Trace>**

① **Signal Trace**

Enable or disable signal trace.

② **Meas Conf>**

Save, recall or clear signal traces.

③ **Return**

Return to the previous menu.

c. Return

Return to the previous menu.

5) Return

Return to the previous menu.

7. Return

Return to the previous menu.

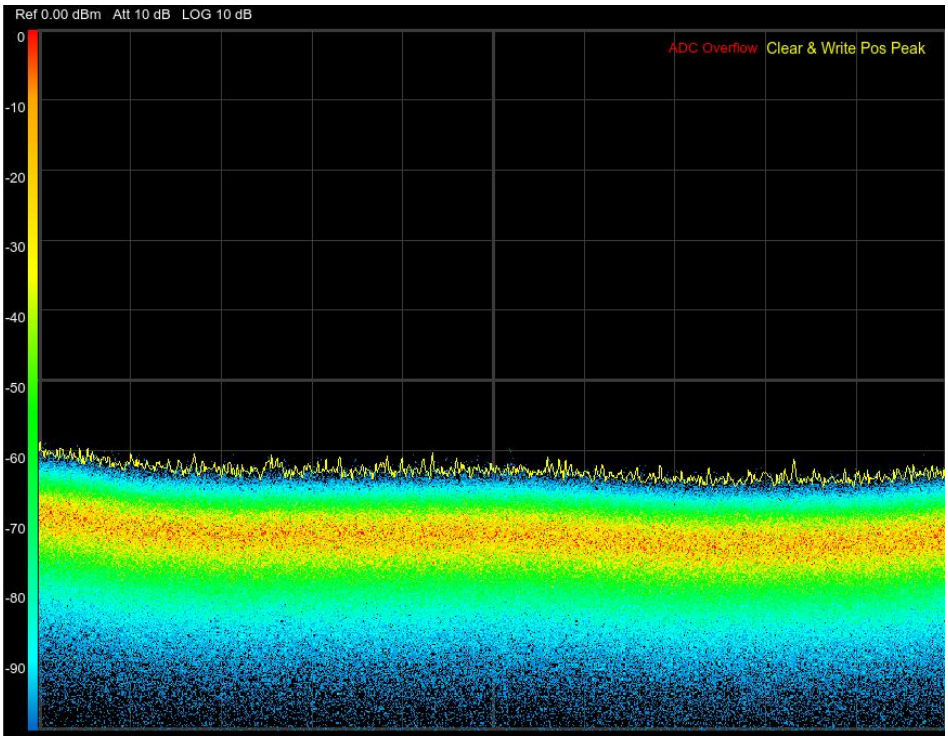
4.18 Preset

Press the front panel **Preset** button allows you to restore factory default settings or user-defined settings with a single click. By default, the Preset button is used to restore factory settings.

5. Real-time Spectral Analysis Mode

5.1 Real-time Spectrum Analysis Mode Interface

Press ⇧ key, then **Mode** hardkey (1 in numeric keypad) and select [RSA] to enter the RSA measurement mode interface,as shown in the below figure.
Note: The default value may vary depending on bandwidth limitations of different models. Here we take HSA3200-R as an example.



5.2 Basic Control

5.2.1 FREQ

Press **[FREQ]** to enter frequency menu.

1. **Center Freq**

   Set the current scanning center frequency.
   Key points:

   - The value of center frequency and sweep width will be modified together when the span does not reach the minimum value (please refer to the "SPAN" description of P27 for parameter modification caused by span change), and the stop frequency will be changed if the

span continues to increase after it reaches the minimum value.

Parameter	Description
Default value	10G
Range	2.5 kHz ~ (full span - 2.5 kHz)
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Start frequency, stop frequency

2. Start Freq

Set the start frequency.

Parameter	Description
Default value	9.95GHz
Range	0 Hz ~ (full span - 5 kHz)
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Center frequency, stop frequency and related parameters

3. Stop Freq

Set the stop frequency.

Parameter	Description
Default value	10.05GHz
Range	5 kHz ~ full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Start frequency, center frequency and related parameters

4. Freq Step

Set the frequency step.

Parameter	Description

Default value	Span/10
Range	1 Hz ~ full span
Unit	GHz, MHz, kHz, Hz
Knob step	1MHz
The arrow keys step	1, 2, 5 multiple steps
Association	Span and related parameters

5. Freq Offset

Set the frequency offset.

Parameter	Description
Default value	0Hz
Range	-9 GHz ~ 9 GHz
Unit	GHz, MHz, kHz, Hz
Knob step	1MHz
The arrow keys step	1, 2, 5 multiple steps
Association	Span and related parameters

6. Freq Ref

Set the frequency reference to either internal or external time base input as the system reference. When switched to external reference, if the external signal is not locked, a prompt message will appear and the system will automatically switch back to internal reference.

5.2.2 SPAN

Press **[SPAN]** to enter the span menu. The change of span will cause the change of frequency parameters. When the span is changed, it stops the running sequence.

1. Span

The sweep width of a real-time spectrum analyzer and that in SA mode are not exactly the same. Here, the sweep width refers to the real-time analysis bandwidth of the real-time spectrum analyzer.

Sweep width sets the frequency range of the current channel, displaying the start frequency, center frequency, stop frequency, and sweep width at the bottom.

Key points:

- Adjusting the span will automatically modify the start and stop frequency of the spectrum analyzer.

- When manually setting the sweep width, the minimum value that can be set is 5kHz, and the maximum value is 100MHz. This maximum sweep width corresponds to the real-time analysis bandwidth of the real-time spectrum analyzer.
- Change the span. If frequency step and RBW are in auto mode, the frequency step and RBW will be automatically adjusted.
- Sweep width, RBW, and changes in either of them will affect the acquisition time.

Parameter	Description
Default value	100MHz
Range	5 kHz ~ 100 MHz
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	1, 2, 5 multiple steps
Association	Start frequency, stop frequency

2. Full Span

Set the span to the maximum value, which is the real-time analysis bandwidth.

3. Last Span

Set the span to the previous span value.

5.2.3 AMPTD

Press **[AMPTD]** to enter the amplitude menu. Sets the amplitude parameters of the analyzer. Through these parameters, signals under measurement can be displayed at an optimal view with minimum error.After the amplitude parameter is changed, the span starts again.

1. Ref Level

Set the reference level, which represents the maximum power/level that can be displayed on the current grid. This value is also shown in the top left corner of the screen. Changing the reference level will modify the front-end parameters, and its setting must satisfy the condition:

Reference level ≤ Input Attenuation - Preamplifier - 20 dBm.

The reference level is a critical parameter of the spectrum analyzer, indicating the upper limit of the dynamic range of the current spectrum analyzer. When the energy of the signal under test exceeds the reference level, nonlinear distortion or even overload warnings may occur.

It is important to understand the nature of the signal under test and carefully select the reference level to achieve optimal measurement

results and protect the spectrum analyzer.

Parameter	Description
Default value	0 dBm
Range	-120 dBm ~ 30dBm
Unit	dBm, dBμW, dBμA, dBmV, dBμV, W, V
Knob step	Low knob step=(scale/div)/100 Quick knob step=(scale/div)/10
The arrow keys step	Scale/div
Association	Attenuator, preamplifier, and related parameters

Note:The maximum reference level may be different for different machine models, please refer to the Specification for details.

2. Attenuation

Sets the front attenuator of the RF input in order to permit big signals (or small signals) to pass from the mixer with low distortion (or low noise).

Reference Level≤Input attenuation-Preamplifier-20 dBm

The input attenuation can be set to automatic and manual attenuation modes:

- The attenuation value in automatic mode is automatically adjusted according to the preamplifier state and the current reference level value.
- The preamplifier is turned on in manual mode, and the input attenuation can be set to a maximum of 40dB. When the set parameters do not satisfy the above formula, it is guaranteed by adjusting the reference level.

Parameter	Description
Default value	10 dB
Range	0 dB ~ 40 dB
Unit	dB
Knob step	1 dB
The arrow keys step	10 dB
Association	Reference level, preamplifier, and related parameters

3. Scale/Div

Sets the vertical scale size per grid to adjust the current range of

magnitudes that can be displayed. This feature is only available if the scale type is logarithmic.Note the following points during use:
Adjust the current range of magnitudes that can be displayed by setting different scales. The range of signal amplitudes that can currently be displayed:
Minimum value:Reference level-10*Current scale
Maximum value:Reference level.

Parameter	Description
Default value	10 dB
Range	0.01 dB ~ 10 dB
Unit	dB
Knob step	Low knob step=0.01dB Quick knob step=0.1dB
The arrow keys step	1, 2, 5 multiple steps
Association	Reference level

4. Ref Offset

Assigns an offset to the reference level to attempt to compensate for gains or losses generated between the device under measurement and the analyzer.

- The changing of this value changes both the readout of the reference level and the amplitude readout of the marker, but will not impact the position of the curve on the screen.

Parameter	Description
Default value	0 dB
Range	-120 dB ~ 120 dB
Unit	dB
Knob step	Low knob step=0.01dB Quick knob step=0.1dB
The arrow keys step	Scale/div
Association	None

5. Ref Unit>

Please refer to P28 “Menu Description”--“AMPTD”--“Ref Unit>”.

6. Preamplifier

Sets the status of preamplifier located at the front of the RF signal path. Turning on the preamplifier reduces the displayed average noise level in

order to distinguish small signals from the noise when working with small signals.

When the preamplifier enable, the PA appears in the left status area of the screen.

5.3 Scan Setting

5.3.1 BW

Press **[BW]** to enter bandwidth menu.

1. **Filter>**

   Set the RBW filter type. The instrument supports multiple filter types.

Filter Type	RBW Range
Kaiser	251.076kHz ~8.28548MHz
Hanning	187.448kHz ~6.185822MHz
Flattop	471.154kHz ~15.549923MHz
Gaussian	246.992Hz ~8.148033MHz
Blackman	250.475kHz~ 8.265624MHz
Rectangular	124.843kHz

2. **RBW**

   Set the resolution bandwidth to distinguish between two signals with similar frequencies.

   Key points:

   - Narrowing the RBW can achieve higher frequency resolution.
   - When RBW is in automatic mode, it will decrease as the sweep width decreases.
   - Under the rectangular window filter, only one RBW range is available.
   - The RBW range is related to the filter type. Please refer to the filter type section for details.

5.3.2 Trace

Press ⇧ key, then **Trace** hardkey (7 in numeric keypad) to enter the trace menu. As the sweep signal is displayed as a trace on the screen.

1. **Trace**

   Up to three traces can be displayed by default and in density spectrum

measurement mode, corresponding to 1, 2, and 3 respectively. Each trace is identified by a different color (Trace 1 - yellow, Trace 2 - white, Trace 3 - red).

When entering spectrum monitoring, 3D spectrum, or time-domain power view, only two traces can be displayed at most. These traces can be used to view historical data, corresponding to channels 1 and 2 respectively. Each trace is identified by a different color (Trace 1 - purple, Trace 2 - green).

2. State

1) Clear & Write

Each point of the trace takes the data after real-time scanning.

2) Max Hold

Each point of the trace keeps displaying the maximum value of multiple scans, and updates the data display when a new maximum value is generated.

3) Min Hold

Each point of the trace keeps displaying the minimum value of multiple scans, and updates the data display when a new minimum value is generated.

4) Average

Set the trace average.

Parameter	Description
Default value	100
Range	2 ~ 1000
Unit	None
Knob step	1
The arrow keys step	10
Association	None

5) View

Stop updating trace data to facilitate observation and reading. Traces that are loaded to the system from storage devices or remotely. The default type is view.

6) Blank

Clear the trace on screen. But the trace stock will keep still without refreshing.

7) Return

Return to the previous menu.

5.3.3 Detector

Press ⇧ key, then **Detector** hardkey (8 in numeric keypad) to set the display detector type.

Real-time spectrum analyzers display captured signals on the screen using traces. For each point on the trace, the spectrum analyzer always captures all data within a specific time interval. Then, the captured data is processed using the currently selected type of detector, and the processed data is displayed on the screen.

Key points:

- Different types of detection methods should be selected based on practical applications to ensure measurement accuracy.
- The selectable detection modes include positive peak, negative peak, average, and sampling. The default mode is positive peak.
- Different observation domain detection methods can be set separately.

1. **Trace**

   Up to three traces can be displayed, corresponding to 1, 2, and 3 respectively. Each trace will be identified by a different color.

2. **Pos Peak**

   For every point on the trace, the positive peak detection displays the maximum value of the sampled data within the corresponding time interval.

3. **Neg Peak**

   For every point on the trace, the negative peak detection displays the minimum value of the sampled data within the corresponding time interval.

4. **Sample**

   For every point on the trace, the sampling detection displays the transient level corresponding to a fixed time point within the corresponding time interval. Sampling detection is suitable for noise or noise-like signals.

5. **Voltage Avg**

   For every point on the trace, the average detection display shows the average of the sampled data within the corresponding time interval.

5.3.4 Sweep

Press ⇧ key, then **Sweep** hardkey (4 in numeric keypad) to enter the sweep menu.

1. **Acquire Time**

Set the acquisition time for the real-time spectrum analyzer to complete data collection within the real-time analysis bandwidth. This is different from the sweep time in SA. Generally, the acquisition time can be understood as the time it takes to refresh one frame in the spectrogram, which is the acquisition time. The acquisition time can be set manually or automatically, with automatic being the default setting.

Parameter	Description
Default value	30.003ms
Range	30.003ms ~ 40s
Unit	s, ms, us, ns
Knob step	Sweep time /100, Minimum 1 POI Time
The arrow keys step	Step by 1-2-5-10

2. **Sweep Signal**

   Press [Sweep Signal] will restart the scan when the next trigger signal arrives or the parameters are changed.

3. **Sweep Cont**

   Press [Sweep Cont] to activate continuous scanning mode. Continuous scanning mode can be set.

4. **Pause/Start**

   After pressing the **Pause** button, the operation will pause only after completing the current frame scan; when pressing the **Start** button, if in continuous scan mode, the real-time spectrum analyzer will continue scanning, and if in single scan mode, the spectrum analyzer will complete the remaining scans of the single scan sequence. Resuming after pausing will not clear historical data.

5. **Restart**

   Press the Restart key to restart waveform scanning.

5.4 Trigger Settings

Press ⇧ key, then **Trig** hardkey (5 in numeric keypad) to enter the trigger menu.

1. **Free**

   Set the trigger mode to free-running mode to enable scanning triggers as fast as possible within the spectrum analyzer's specifications. Trigger conditions are met at any time, resulting in continuous trigger signals.

2. **External>**

1) Positive Edge

Set the trigger edge to positive edge when using external trigger.

2) Negative Edge

Set the trigger edge to negative edge when using external trigger.

3) Trigger Delay

Set the trigger delay time when using external triggers.

4) Return

Return to the previous menu.

3. PvT Trigger>

1) Trigger Level

Set the trigger level for time-domain power triggering. The screen interface displays the trigger level line and its corresponding value.

Parameter	Description
Default value	0 dBm
Range	-220 dBm ~ 30dBm
Unit	dBm, dBμW, dBμA, dBmV, dBμV, W, V
Knob step	Low knob step=(scale/div)/100 Quick knob step=(scale/div)/10
The arrow keys step	Scale/div

2) Trigger Delay

Set the trigger delay when the PvT trigger is activated.

Parameter	Description
Default value	0 s
Range	0 ~ 25 s
Unit	s, ms, us, ns
Knob step	10 us
The arrow keys step	Step by 1, 2, 5, 10

3) Return

Return to the previous menu.

4. FMT>

1) FMT Enable

Enable or disable the template.

2) Mask Type>

Users can customize template shapes and select frequency template

restriction types (greater than, less than, within template, and outside template) based on actual needs.

3) **Action>**

Select the trigger action as normal, buzzer or stop.
Normal: Display the restricted area on screen once the limit is exceeded.
Buzzer: The buzzer sounds when exceeding the limit range.
Stop: The waveform stops refreshing once it exceeds the limit range.

4) **Amplitude**

Set the amplitude value of the template.

5) **Offset X/Y**

Frequency: For actual measurements, apply an offset frequency to the entire edited region to shift it left or right, facilitating measurement. This does not affect the frequency settings of the spectrum analyzer and frequency markers.
Amplitude: Apply a uniform offset to the entire edited region, either shifting it upward or downward for measurement convenience. This adjustment does not affect the spectrum analyzer's amplitude settings.

6) **Edit>**

a. **MaskPoint Edit>**

Edit each point of the template.

b. **Save Masks**

Save the template file locally. The template file format is sp. A progress dialog box (pop-up window) will display in the middle of the screen showing relevant information about saving the template.

c. **Load Masks>**

Load the saved template.

d. **Return**

Return to the previous menu.

7) **Return**

Return to the previous menu.

5.5 Marker Settings

Press **[Marker]** to enter marker setting menu. Frequency markers are used to mark points on the trace line. By using frequency markers, one can read the amplitude, frequency, or scanning time points of each point on the trace line.
Key points:

- The analyzer allows for up to eight markers to be displayed at one time,

but only one single marker is active every time.

- Under the frequency marker menu, you can adjust the frequency marker parameters through numeric keys, knobs, directional keys, or directly dragging the touchscreen.

5.5.1 Marker

[Marker] bottom softkey → [Marker>] right softkey

1. **Marker**

   You can set a total of 8 different cursors, and each trace can have multiple cursors.

2. **Trace**

   Up to three traces can be displayed, corresponding to numbers 1, 2, and 3 respectively. Each trace is identified by a different color (Trace 1 - yellow, Trace 2 - white, Trace 3 - red).

3. **Normal**

   Please refer to P32 “Marker”.

4. **Delta**

   Please refer to P32 “Marker”.

5. **Off**

   Close the currently opened frequency marker and its related functions. The frequency marker will no longer be displayed.

6. **All Off**

   Close all open frequency markers and their related functions. The frequency markers will no longer be displayed.

7. **Return**

   Return to the previous menu.

5.5.2 Marker→

[Marker] bottom softkey → [Marker→>] right softkey

1. **Mkr→CF**

   Sets the center frequency of the analyzer based on the frequency of the current marker. This feature quickly moves the signal to the center of the screen.

   Key points:

- If Normal is selected, the center frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the center frequency will be set to the frequency at which the Delta Marker is located.

2. **Mkr→CF Step**

   Sets the center frequency step of the analyzer based on the frequency of the current marker.

   Key points:

- If Normal is selected, the center frequency step will be set to the frequency of current marker.
- If Delta Marker is selected, this function is invalid.

3. **Mkr→Start**

   Sets the start frequency of the analyzer based on the frequency of the current marker.

   Key points:

- If Normal is selected, the start frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.

4. **Mkr→Stop**

   Sets the stop frequency of the analyzer based on the frequency of the current marker.

   Key points:

- If Normal is selected, the stop frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.

5. **Mkr→Ref Level**

   Sets the reference level of the analyzer based on the amplitude of the current marker.

   Key points:

- If Normal is selected, the reference level will be set to the amplitude of the current marker.
- If Delta Marker is selected, this function is invalid.

6. **Mkr△→Span**

   Changes the span of the analyzer to the frequency difference between the two markers.

7. **Mkr△→CF**

   Set the center frequency of spectrometer to make it equal to the frequency standard difference.

5.5.3 Peak

[Marker] bottom softkey → [Peak>] right softkey

1. **Max Peak**

   Automatically search for extreme value amplitude.

2. Peak-Peak

Set the current cursor to difference mode, with the reference marker at the frequency of minimum amplitude value, and the Marker at the frequency of maximum amplitude value.

3. Next Peak

Find the peak on the trace that is located under the current peak grid and has the smallest amplitude difference from it, meeting the search criteria, and mark it with a cursor.

4. Left Peak

Find the peak located on the left side of the current peak on the trace, which is the closest to the current peak and meets the search criteria, and mark it with a cursor.

5. Right Peak

Find the peak located on the right side of the current peak on the trace, which is the closest to the current peak and meets the search criteria, and mark it with a cursor.

6. Continue Track

When this function is enabled, qualified peaks will be tracked automatically.

7. Peak Setup>

1) Peak Excursion

Set the peak excursion.

2) Peak Mode

Set the search to maximum or minimum mode.

3) Sort

Set the sorting order of the peak list to frequency or amplitude mode.

4) Peak List

Turn on or off the peak list. When the peak list is enabled, all frequency markers meeting the peak conditions will be displayed on the trace in sorted order, and a list of all frequency markers meeting the peak conditions will be shown below in trace colors.

5) Return

Return to the previous menu.

5.6 Measurement

Press the ⇧ key, then press the **Measure** key (decimal point key) to access the measurement setup soft menu.

1. **Measure Off**

   Turn off this function.

2. **Density**

   In addition to plotting traditional spectrograms, density maps use color temperature (warm to cool) to represent the probability of waveform points from one frame (one capture period) being mapped to corresponding coordinate points. By controlling the brightness of historical mapping points in the density map, a persistence effect is achieved. Therefore, density maps can simultaneously display multiple frames of waveforms while distinguishing the probability of occurrence of each event, ideally revealing detailed frequency domain characteristics.
   The density map uses a bitmap to represent the signal density corresponding to each frequency and amplitude point. Density is defined as the probability of a frequency and amplitude point being hit during the capture period.
   In this view, the X-axis represents frequency, the Y-axis represents amplitude, and the Z-axis represents hit probability. Therefore, this view displays three-dimensional data on a two-dimensional display, using color to represent the hit probability of the third dimension.

3. **Spectrogram**

   Used for real-time monitoring and analysis of electromagnetic wave signals within specific frequency bands, to understand the utilization of spectrum resources, identify signal characteristics, and detect and locate interference sources.

4. **3D Spectrogram**

   The 3D Waterfall Chart is an observation window that displays waveform data in real-time using time, frequency, and amplitude as axes. It allows for visualizing the relationship between frequency characteristics and time variation of events, with color temperature representing amplitude levels.
   This diagram serves only as an observation window corresponding to the spectrum monitoring chart.

5. **PvT**

   The trace of the time-domain power plot shows the relationship between the sampled signal power and time within one acquisition cycle. The horizontal axis represents time, and the vertical axis represents amplitude

(power).
Referring to the relationship between the spectrum and spectrogram, the pvt waveform can also access 50,000 historical data points. Similarly, the acq time serves as the coupling condition for both the spectrum trace and pvt trace in the spectrogram. Therefore, when operating the Display Trace (D1, D2) to access historical spectrogram data, the waveform will also dynamically change and refresh accordingly.

6. Measure Set>

Open the parameter setting menu corresponding to the currently selected measurement window. This menu only displays settings related to the current measurement function. Please refer to the current measurement window to view the relevant menu.

1) Afterglow Time

Density spectrum mode only. Set persistence time to finite or infinite.

2) View Playback>

Only 3D spectrogram mode and spectrum analyzer mode are available, and playback is only possible after pausing.

a. Playback

Turn on or off the view playback function.

b. View Start

Set the starting point for view playback.

c. View Stop

Set the view playback endpoint.

d. Return

Return to the previous menu.

3) Burst Power>

Time-domain power mode only. This function can be enabled.

a. Burst Power

Enable or disable burst power function.

b. Threshold Level

Set threshold level to absolute or relative value.

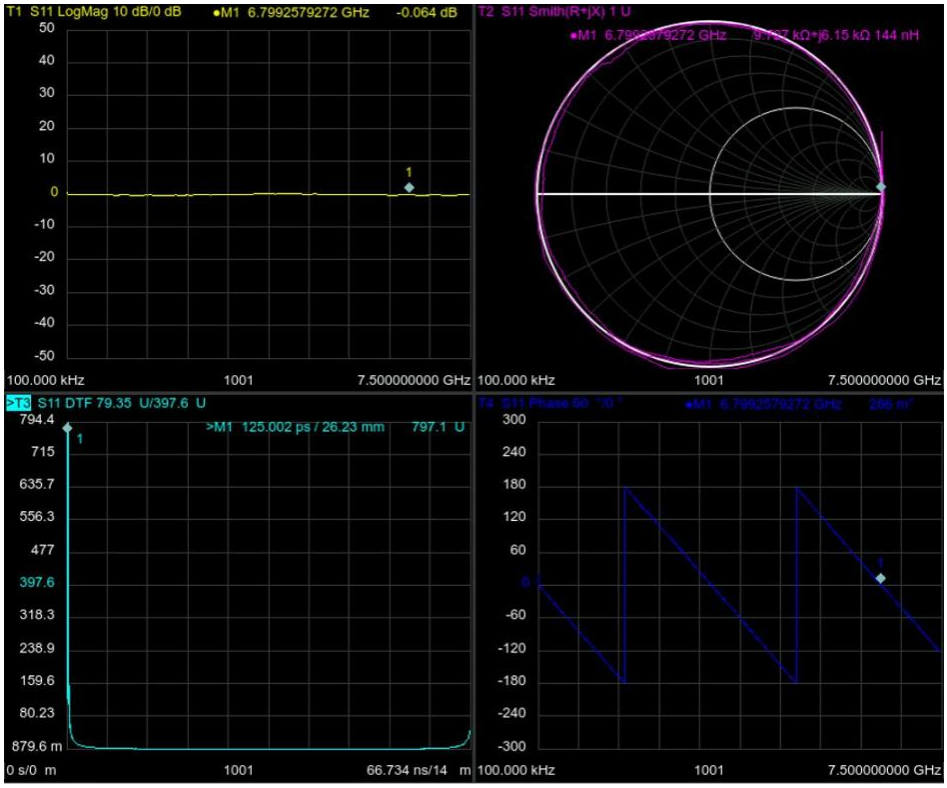
c. Return

Return to the previous menu.

6. Vector Network Analysis Mode

6.1 Vector Network Analysis Mode Interface

Press ⇧ key, then **Mode** hardkey (1 in numeric keypad) and select [VSA] to enter the VSA measurement mode interface,as shown in the below figure.
Note: The default value may vary depending on bandwidth limitations of different models. Here we take HSA3075-R as an example.



6.2 Basic Control

6.2.1 FREQ

Press **[FREQ]** to enter frequency menu.

1. Center Freq

Set the current scanning center frequency.
Key points:

- The value of center frequency and sweep width will be modified together when the span does not reach the minimum value (please refer to the "SPAN" description of P27 for parameter modification

caused by span change), and the stop frequency will be changed if the span continues to increase after it reaches the minimum value.

Parameter	Description
Default value	Full span/2+50kHz
Range	100 kHz ~ Full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency Step
Association	Start frequency, stop frequency

2. Start Freq

Set the start frequency.

Parameter	Description
Default value	100kHz
Range	100 kHz ~ Full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency Step
Association	Center frequency, stop frequency and related parameters

3. Stop Freq

Set the stop frequency.

Parameter	Description
Default value	Full span
Range	100 kHz ~ Full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency Step
Association	Start frequency, center frequency and related parameters

4. CF Step

Set the frequency step.

Parameter	Description
Default value	Span/10
Range	1 Hz ~ full span
Unit	GHz, MHz, kHz, Hz
Knob step	1MHz
The arrow keys step	1, 2, 5 multiple steps
Association	Span and related parameters

6.2.2 SPAN

Press **[SPAN]** to enter the span menu. The change of span will cause the change of frequency parameters. When the span is changed, it stops the running sequence.

1. **Span**

   Set the frequency range of the current channel.

   Key points:

   - Modifying the sweep width will automatically adjust the start and stop frequencies while keeping the center frequency constant.
   - In vector network analysis mode, the minimum sweep width is 100Hz.
   - When the span is set to maximum, the spectrum analyzer enters full sweep mode.

Parameter	Description
Default value	Full span-100kHz
Range	0 Hz ~ Full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	1, 2, 5 multiple steps
Association	Start frequency, stop frequency

2. **Full Span**

   Set the span to the maximum value.

3. **Zero Span**

   Set the span to 0.

4. **Last Span**

   Set the span to the previous span value.

6.2.3 AMPTD

Press **[AMPTD]** to enter the amplitude menu.

1. **Ref Level**

   Set the reference level, which represents the maximum vertical axis value currently displayable on the grid. This setting is not applicable to polar coordinates and Smith charts. The value is simultaneously displayed in the status bar.

2. **Scale Auto**

   Automatically adjust the grid scale and reference level of the currently selected trace, ensuring the trace is fully displayed in the center of the screen.

3. **Position**

   The vertical position of the currently selected trace on the screen can be adjusted by changing the reference position.

4. **Scale**

   Set the vertical axis scale interval to adjust the current display range.

5. **Reset**

   Restore zoom and position to default values.

6. **Attenuation**

   Set the attenuator to enable large signals to pass through the mixer with low distortion, while allowing small signals to pass with low noise.
   Reference level ≤ Input Attenuation - Preamplifier - 20 dBm.
   The input attenuation can be set to two modes: automatic and manual attenuation.

   - In automatic mode, the attenuation value is automatically adjusted based on the preamplifier status and the current reference level.

Parameter	Description
Default value	10 dB
Range	0 dB ~ 40 dB
Unit	dB
Knob step	1 dB
The arrow keys step	10 dB
Association	Reference level and related parameters

6.3 Scan Setting

6.3.1 BW

Press **[BW]** to enter bandwidth menu.

1. IFBW

Set the intermediate frequency bandwidth.
Parameter Range: 300Hz, 500Hz, 1kHz, 3kHz, 5kHz, 10kHz.

6.3.2 Trace

Press ⇧ key, then **Trace** hardkey (7 in numeric keypad) to enter the trace menu. As the sweep signal is displayed as a trace on the screen. A trace is a series of measurement data points. The settings of the trace will affect the mathematical calculations and display of measurement data. Only when the trace is selected can its settings be changed.

1. Select Trace

Select the desired trace by pressing keys. Once a trace is selected, you can adjust its reference level and other parameters. Alternatively, you can select traces by tapping the trace indicator displayed in the status bar on the touchscreen.
After selecting the trace, the background color will appear on the trace indicator in the status bar.
Key points:

- The currently selectable traces are affected by the "Number of Traces" parameter in Trace. If the number of traces is set to 1, only Trace 1 is selectable; if set to 2, both Trace 1 and Trace 2 are selectable, and so on.

2. New >

Click this menu allows users to select and create new traces of different types.

1) Measure>

a. S11

Select S11 as the new trace measurement type.

b. S21

Select S21 as the new trace measurement type.

c. Return

Return to the previous menu.

2) Format>

Set new trace format.

a. Log Mag

Display amplitude information in decibel (dB) units.

Applications: Return Loss, Insertion Loss and Gain

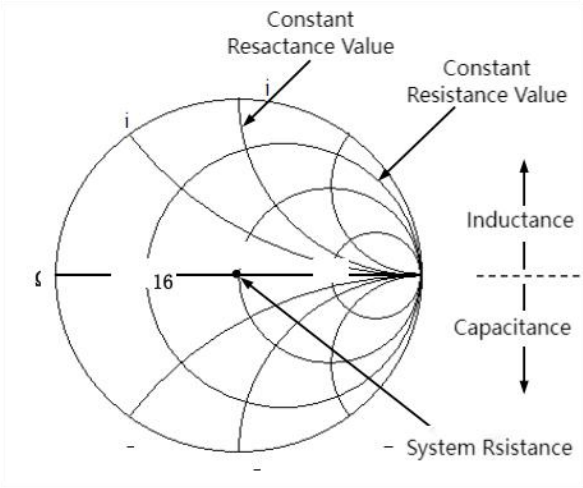
b. Phase

Display the phase of complex measurements between -180 degrees and +180 degrees.

Applications: Phase measurement, such as phase distortion and linear phase deviation.

c. Smith>

As shown in the figure, the Smith chart is a tool for mapping the reflection measurement data of the device under test (DUT) into impedance. Each point on the chart represents a complex impedance composed of a real resistance (R) and imaginary reactance (± jX). The resistance value, reactance value, and equivalent capacitance and inductance values of the DUT can be read through the cursor.



The following unit conversions are available:

① **Log/Phase**

The magnitude of complex numbers is displayed in logarithmic/phase units.

② **Line/Phase**

The magnitude of the complex number is displayed in linear/phase units.

③ **Real/IM**

Complex numbers are displayed in complex format, consisting of real and imaginary parts.

④ **R+jX**

The Smith chart displays impedance in the form of impedance circles.

⑤ **G+jB**

The Smith chart is displayed in the form of an admittance chart.

⑥ **Return**

Return to the previous menu.

d. 故 DTF

By measuring the scattering parameters (S-parameters) of the tested network and analyzing the time-domain step response, the cable fault distance can be determined.

e. SWR

Calculate the Standing Wave Ratio (SWR) based on the measured quantity (usually the reflected S-parameter), and display it on a Cartesian graph.

Characteristic: SWR (or Voltage Standing Wave Ratio, VSWR) measures the reflected power at the input of the DUT. On the transmission line connecting the analyzer and the device under test, the superposition of incident wave I and reflected wave R creates an interference with variable envelope voltage. SWR is the ratio of maximum envelope voltage to minimum envelope voltage along the line, that's:

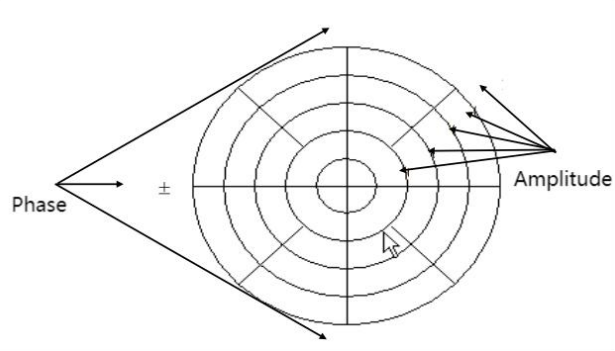
$\mathrm{SWR} = \frac{V_{Max}}{V_{Min}} = (|V_I| + |V_R|)/(|V_I| - |V_R|) = \frac{1+|S_{ii}|}{1-|S_{ii}|}$, i represents the port number of DUT.

Applications: Reflection measurement converting complex S-parameters to real quantity SWR.

f. More>

① **Polar>**

Select the polar coordinate graph to display complex measurement results. The polar coordinate format shown in the figure contains both magnitude and phase information.



The distance from the trace to the polar coordinate origin

represents the magnitude of the measurement results. The polar trace format allows users to select either of the following data sets as the display result of the Marker.

- Log / Phase
- Line / Phase
- Real / IM

Features: The polar plot displays measurement data (response values) in the complex plane with a horizontal real axis and a vertical imaginary axis. The magnitude of the complex value is determined by its distance from the origin, and the angle between the line connecting it to the origin and the positive half of the X-axis represents the phase of the measurement result. Compared to the Smith chart, the polar plot has linear axis scales.

Applications: Reflection or transmission measurement.

Note: There is no frequency information in polar coordinate graphs, but the cursor can provide the frequency value at any measurement point.

② **Group Delay**

Calculate the group delay based on the measured quantity (usually the transmitted S-parameters).

Group delay measurement reflects the phase distortion of the device under test (DUT), representing the actual transit time of the signal through the DUT, which varies with frequency.

Group delay is: $\text{Group Delay} = \frac{-d\emptyset}{d\omega} = \frac{-1}{360°} \cdot \frac{d\theta}{df}$

- Measurement of device phase distortion.
- The relationship between transit time and frequency of signals through devices.
- The phase characteristic derivative of the device with respect to frequency.

③ **Line Mag**

Select a rectangular coordinate system with linear scale on the vertical axis to display the magnitude of complex measurement values.

Characteristic: The horizontal axis represents the excitation quantity. Magnitude of complex number C, that's: $|C| = \text{sqrt}(\text{Re}(C)^2 + Im(C)^2)$, displayed on the vertical axis with a linear scale.

④ **Real**

Show the real part of complex data.

⑤ **Imaginary**

Display the imaginary part of complex data.

⑥ **Return**

Return to the previous menu.

g. Return

Return to the previous menu.

3) Return

Return to the previous menu.

3. Delete

Delete the currently selected trace. If there is only one trace in the current window, the corresponding window will also be deleted. If there is only one window and one trace, the deletion will be invalid. After deleting a trace, select the next trace.

4. Measure>

Select the measurement type for the currently selected trace as S11 or S21.

5. Format>

Set the format of the currently selected trace, following the format settings described above for adding new traces.

6. Hold>

Set the current selected trace to: No Hold, Hold, Max Hold, or Min Hold.

7. Average

Set the currently selected trace for averaging calculation, and specify the number of averages, with the range set from 1 to 1000.

6.3.3 Sweep

Press ⇧ key, then **Sweep** hardkey (4 in numeric keypad) to enter the sweep menu.

1. Sweep Time

Set the sweep time of vector network analysis. When the sweep time is set to automatic, the analyzer will perform the scan at the fastest speed. The minimum sweep time depends on the number of scan points and intermediate frequency bandwidth. The larger the number of scan points and the smaller the intermediate frequency bandwidth, the longer the sweep time, and vice versa. The maximum sweep time can be set to 3000s.

2. Sweep Single

Press [Sweep Single] to restart the scan when the next trigger signal arrives.

3. **Sweep Cont**

   Press [Sweep Cont] to activate the sweep scan mode.Allows you to set continuous scan mode.

4. **Sweep Points**

   Set the total number of points for the trace to scan from the start frequency to the stop frequency.

   The more sweep points there are, the smaller the measurement step will be, but the longer the sweep time will be. Conversely, the fewer scan points there are, the shorter the scanning time will be, allowing for faster acquisition of measurement results.

Parameter	Description
Default value	201
Range	201 ~ 10001
Unit	None
Knob step	1
The arrow keys step	10
Association	None

6.4 Marker Settings

Press **[Marker]** to enter the marker menu. Markers are used to mark points on the trace line. By using markers, one can read the amplitude, frequency, or scanning time points of each point on the trace line.

6.4.1 Marker

[Marker] bottom softkey → [Marker>] right softkey

1. **Select Trace**

   Set the currently selected trace.

2. **Select Marker**

   Set and select the marker.

3. **New>**

   Create a new marker on the currently selected trace, and the type of the new marker can be set through the following menu.

   1) **Normal**

      One type of marker used to measure the coordinate values of a specific point on a trace.

After selecting "Normal", a cursor marked with the current optical number appears on the trace, such as "1".

Key points:

- If there is no active cursor currently, activate a cursor at the center frequency of the current trace.
- Enter values using the numeric keys, knob, or directional keys to move the cursor. The current cursor position is displayed in the top right corner of the screen.
- The resolution of X-axis readings is related to the sweep width and number of scan points. To achieve higher reading resolution, you can reduce the sweep width and increase the number of scan points.

2) Delta

One type of frequency marker used to measure the differences in X and Y axis between a "reference point" and "a certain point on the trace".

After selecting "Delta", the cursor displays the current cursor number, the symbol "Δ" and the reference cursor number, such as "2Δ1".

Key points:

- The reference cursor can select any cursor on the current trajectory as a reference, including itself.
- When the reference cursor is deleted, the original reference cursor's sequence number shall still be used as reference.

3) Couple

Select the marker type as coupled. When selecting the coupled function of the marker, set and move the cursor during coupled operations for all traces within the channel. If the marker is in non-coupled mode, set and move the cursor individually for each trace.

4) Filter

Select the marker type for filter measurement function.

5) Return

Return to the previous menu.

4. Delete

Delete the currently selected marker.

5. Delete All

Delete all markers.

6. Normal

Set the marker to normal type.

7. Delta>

1) Delta

Set the current marker delta.

2) **Reference Marker**

Set the current reference frequency marker number.

3) **Return**

Return to the previous menu.

6.4.2 Marker Fctn

[Marker] bottom softkey → [Marker Fctn>] right softkey

1. **Select Trace**

   Select current trace.

2. **Select Marker**

   Select current marker.

3. **Couple**

   Turn on or off couple function, default is off state. When selecting the couple function of marker, set and move the cursor during coupling operations for all traces within the channel. If the frequency marker is in non-coupling mode, set and move the cursor individually for each trace.

4. **Filter>**

   1) **Filter**

      The filter function can only be enabled when the trace format is in logarithmic amplitude. The cursor will calculate and display filter parameters such as bandwidth, loss, and Q factor.

   2) **Band Level**

      Set the band level value. Default is 3dB.

   3) **Band Stop Filter**

      Turn on or off band stop filter, default is off state.

   4) **Return**

      Return to the previous menu.

6.4.3 Marker→

[Marker] bottom softkey → [Marker→>] right softkey

1. **Mkr→CF**

   Sets the center frequency of the analyzer based on the frequency of the current marker. This feature quickly moves the signal to the center of the

screen.

Key points:

- If Normal is selected, the center frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the center frequency will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

2. **Mkr→Start**

   Sets the start frequency of the analyzer based on the frequency of the current marker.

   Key points:

- If Normal is selected, the start frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.
- The function is invalid in Zero span mode.

3. **Mkr→Stop**

   Sets the stop frequency of the analyzer based on the frequency of the current marker.

   Key points:

- If Normal is selected, the stop frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, this function is invalid.
- The function is invalid in Zero span mode.

4. **Mkr→Ref Level**

   Set the amplitude of the current frequency marker to the reference level of the analyzer, so that the trace displays within the grid.

   Key points:

- If Normal is selected, the reference level will be set to the amplitude of the current marker.
- If Delta Marker is selected, this function is invalid.

5. **Mkr△→Span**

   Set the sweep width of the analyzer to the frequency difference between the current frequency markers. This is used to observe the trace between the difference frequency marker and the reference frequency marker.

6. **Return**

   Return to the previous menu.

6.4.4 Peak

[Marker] bottom softkey → [Peak>] right softkey

1. **Max**

   Find the maximum value on the trace.

2. **Min**

   Find the minimum value on the trace.

3. **Next Peak**

   Search for the next highest or lowest peak on the current trace that meets the specified conditions, and move the cursor to that position.

4. **Left Peak**

   Search for the first peak satisfying the conditions on the current trace to the left, and move the cursor to that position.

5. **Right Peak**

   Search for the first peak satisfying the conditions on the current trace to the right, and move the cursor to that position.

6. **Peak>**

   1) **Peak Threshold**

      Set a peak threshold value, and if the amplitude falls below this threshold, it will be judged as non-peak.

   2) **Peak Excursion**

      Set the peak excursion.

   3) **Peak Mode**

      Set the search to maximum or minimum mode.

   4) **Return**

      Return to the previous menu.

7. **Track**

   Turn on or off tracking search, default is off. When enabled, it will continuously search for maximum or minimum values.

6.5 Measurement

Set the measurement type of the current trace to S11 or S21.

Press the ⇧ key, then press the **Measure** key (decimal point key) to access the measurement setup soft menu.
The S-parameter (scattering parameter) is used to evaluate the performance of DUT's reflected and transmitted signals. The S-parameter is defined by the ratio of two complex numbers, which contains information about signal

amplitude and phase. The S parameter is typically expressed as:
S Output Input
Output: DUT Port Number for Output Signal.
Input: DUT Port Number of Input Signal.

1. S11

S11 is the ratio of the output signal at port 1 of DUT to the input signal at port 1 of DUT, with both output and input signals represented in complex form. Select S11 as the current measurement project. This value will simultaneously display in the status bar on the left side of the screen.

2. S21

S21 is the ratio of the output signal at port 2 of DUT to the input signal at port 1 of DUT, with both output and input signals represented in complex form. Select S21 as the current measurement project. This value will simultaneously display in the status bar on the left side of the screen.

3. Measure Set>

Open the parameter settings menu corresponding to the currently selected measurement window. This menu only displays settings related to the current measurement function. Please refer to the current measurement window to view the relevant menu.

1) Calibration>

Calibration is the process of eliminating one or more systematic errors using an error model. The analyzer solves for the error terms in the error model by measuring high-quality calibration standards (such as open circuits, short circuits, loads, and through standards). The measurement accuracy after calibration depends on the quality of calibration standards and the precision of model definition of calibration standards in the calibration piece definition file. The calibration definition file is stored in the analyzer. To ensure measurement accuracy, the actual calibration standard used must match the calibration definition file.

a. Port1>

In 1-port calibration, the calibration data is measured by connecting the open standard, short standard, and load standard to the required test port. This calibration method can effectively eliminate the frequency response reflection tracking error, directivity error, and source matching error of the test device in reflection testing using this port.

① **Open Calibration**

When performing open circuit calibration, only connect the Open load to Port 1.

② **Short Calibration**

When performing short circuit calibration, only connect the Short load to Port 1.

③ **Load Calibration**

When performing load calibration, only connect the Load load to Port 1.

④ **Finish**

When the open circuit calibration, short circuit calibration, and load calibration are all completed, you can click to finish Port 1 calibration.

⑤ **Cancel**

Cancel port 1 calibration.

b. Trough>

In through calibration, the calibration data is measured by connecting the through standard to the required test port. This calibration method can effectively eliminate the frequency response tracking errors of the test device in transmission tests using that port.

① **Trough Calibration**

Please connect Port 1 and Port 2 of the spectrum analyzer with a straight-through adapter. The normalization operation will move the measurement reference plane to both ends of the straight-through adapter.

② **Finish**

After the direct calibration is completed, click "Finish".

③ **Return**

Return to the previous menu.

c. Save

Save the calibration file locally. The calibration file format is "cal".

d. Recall>

Load the saved calibration file and select the required calibration file.

e. Return

Return to the previous menu.

2) Calibration KIT>

The calibration parts specified for mechanical calibration.
If the standard connector type in the calibration kit has polarity (distinguishing between male and female contacts), the standard category definition of the calibration kit needs to be changed

according to the actual standard being used.

If a non-predefined calibration kit is used, it needs to be defined.

a. Kit Select>

Select the file corresponding to the calibration name and load it.

Note: If the default calibration parameters are accidentally deleted or modified, click the "**Reset**" button to restore the default calibration values.

b. Kit Save

Save the current calibration kit parameters to a file.

c. Reset

Reload the calibration parameter file to achieve reset.

d. Open Standard>

[C0], [C1], [C2], [C3] define the edge capacitance of the open circuit components.

Delay: The parameter defining the offset from the calibration plane to the ideal open circuit, including delay (offset length) and attenuation.

e. Short Standard>

[L0], [L1], [L2], [L3] define the residual inductance of short-circuit components.

Delay: The parameter defining the offset from the calibration plane to the ideal short circuit, including delay (offset length) and attenuation.

f. Through Standard>

Define the delay parameters for through components/cables, including delay (offset length) and attenuation.

g. Return

Return to the previous menu.

3) Port Extension>

Calibration has been performed, but an additional cable segment is needed. The port extension feature allows the analyzer to add cable length to specific ports; when direct calibration is not possible, port extension can compensate for the time delay (phase shift) caused by fixtures.

a. Port 1>

① **Port1 Extension**

Please set whether to enable port extension function according to the actual instrument device. It is disabled by default.

② **Delay**

Set the delay for port 1 port extension.

The port delay is directly proportional to the port length, as follows:

Port length = Port delay * Speed of light * Velocity factor

Port delay is linked with port length.

③ **Distance**

Set the port 1 extension length.

④ **Velocity Factor**

Set the velocity factor for port 1 port extension.

⑤ **Loss>**

Set the loss value for port 1 port extension.

⑥ **Auto**

Automatically measure the delay and length of port 1.

⑦ **Return**

Return to the previous menu.

b. Port 2>

① **Port2 Extension**

Please set whether to enable port extension function according to the actual instrument device. It is disabled by default.

② **Delay**

Set the delay for port 1 port extension.

The port delay is directly proportional to the port length, as follows:

Port length = Port delay * Speed of light * Velocity factor

Port delay is linked with port length.

③ **Distance**

Set the port 2 extension length.

④ **Velocity Factor**

Set the velocity factor for port 2 port extension.

⑤ **Loss>**

Set the loss value for port 2 port extension.

⑥ **Return**

Return to the previous menu.

c. Return

Return to the previous menu.

4) Port Math>

Network matching is achieved by simulating series-parallel combinations of LCR components or transmission lines. The switching sequence of components is combined in series or parallel configurations to form specific topologies (such as L-type, π-type, and T-type networks).

a. Port Math

Enable or disable port simulation matching, defaulting to disabled state.

b. Series R

Set the resistance value, enable or disable the series resistance, default to disabled state.

c. Series L

Set the inductance value, enable or disable the series inductor, default is disabled.

d. Series C

Set the capacitance value, enable or disable the series capacitor, default is disabled.

e. Series Line>

Set the transmission line length, loss, enable or disable series transmission line, default is disabled.

f. More>

According to the requirements, enter more sub-menus and set the required parallel parameters.

① **Shunt R**

Set the resistance value, enable or disable parallel resistors, default to disabled state.

② **Shunt L**

Set the inductance value, enable or disable parallel resistors, default to disabled state.

③ **Shunt C**

Set the capacitance value, enable or disable parallel resistors, default to disabled state.

④ **Shunt Open Line>**

Set the transmission line length, loss, and enable or disable parallel open transmission lines, with default set to disabled.

⑤ **Shunt Short Line>**

Set the transmission line length, loss, and enable or disable parallel short-circuited transmission lines, with default set to disabled.

⑥ **Return**

Return to the previous menu.

g. Return

Return to the previous menu.

5) Velocity Factor

Set the velocity factor of the cable under test relative to the speed of light in vacuum. Ensure that the velocity factor of the cable under test corresponds to reality, otherwise the calibration data will not be accurate.

6) Impedance

Set the system's input impedance to the default value of 50 Ω. When measuring devices with non-50 Ω impedance, the system impedance must be changed.

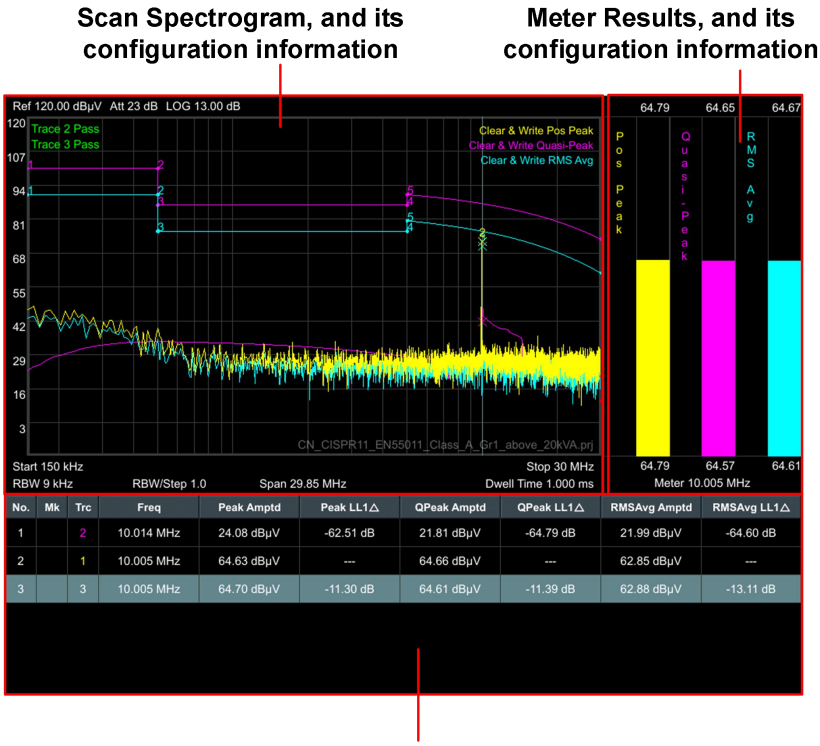
7) Return

Return to the previous menu.

7. EMI Measurement Mode

7.1 EMI Measurement Mode Interface

Press  key, then **Mode** hardkey (1 in numeric keypad) and select [EMI] to enter the EMI measurement mode interface,as shown in the below figure.
Note: The default value may vary depending on bandwidth limitations of different models. Here we take HSA3200-R as an example.



7.2 Basic Control

7.2.1 FREQ

Press **[FREQ]** to enter frequency menu.

1. **Meter Freq**

   Set the meter frequency.

Parameter	Description
Default value	165MHz
Range	0 Hz ~ Full Span

Unit	GHz, MHz, kHz, Hz
Knob step	Step=Span/200;the minimum value is 1Hz
The arrow keys step	Span/10
Association	None

2. Center Freq

Set the center frequency of the current sweep.

Key points:

- The value of center frequency and sweep width will be modified together when the span does not reach the minimum value (please refer to the "SPAN" description of P27 for parameter modification caused by span change), and the stop frequency will be changed if the span continues to increase after it reaches the minimum value.

Parameter	Description
Default value	165MHz
Range	50 Hz ~ (full span - 50 Hz)
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Start frequency, stop frequency

3. Start Freq

Set the start frequency.

Parameter	Description
Default value	30MHz
Range	0 Hz ~ (full span - 100 Hz)
Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Center frequency, stop frequency and related parameters

4. Stop Freq

Set the stop frequency.

Parameter	Description
Default value	300MHz
Range	100 Hz ~ full step

Unit	GHz, MHz, kHz, Hz
Knob step	Step=frequency step/100
The arrow keys step	Frequency step
Association	Start frequency, center frequency and related parameters

5. Freq Step

Set the frequency step.

Parameter	Description
Default value	Span/10
Range	1 Hz ~ full span
Unit	GHz, MHz, kHz, Hz
Knob step	1MHz
The arrow keys step	1, 2, 5 multiple steps
Association	Span and related parameters

6. Freq Offset

Set the frequency offset.

Parameter	Description
Default value	0Hz
Range	-9 GHz ~ 9 GHz
Unit	GHz, MHz, kHz, Hz
Knob step	1MHz
The arrow keys step	1, 2, 5 multiple steps
Association	Span and related parameters

7. Freq Ref

Set the reference frequency as internal or external input, this is regarded as whole device reference. If the external signal is not locked according to judgment after switching to external, the prompt will pop up and it will switch back to internal automatically.

7.2.2 SPAN

Press **[SPAN]** to enter the span menu. The change of span will cause the change of frequency parameters. When the span is changed, it stops the running sequence.

1. Span

Set the span.Under the same CISPR configuration, a larger span results in a correspondingly larger number of scan points.

For example, the CISPR segmentation configuration parameters are as follows:

Start Freq =150kHz Stop Freq =30MHz

RBW=9kHz RBW/Step =1.0

Maxspan = 800 * (RBW / RBW/Step)

The start frequency of the system scan is S1 = 1MHz,stop frequency of the system scan is S2=20MHz

n = (S2 - S1) / Maxspan

Maxspan denotes the maximum sweep width of a segment

n represents the number of frequency bands spanned, and one number of scan points represents the size of the frequency interval of one RBW/ RBW/Step

Key points:

- Adjusting the span will automatically modify the start and stop frequency of the spectrum analyzer.
- When manually setting the span, the minimum setting is 100 Hz. Setting the span to the maximum value puts the spectrum analyzer into full span mode.
- Changing the span will automatically modify the frequency step if it is in automatic mode.
- The maximum value of n is 100, and its maximum sweep width is 100* $Max_{span.}$

Parameter	Description
Default value	270MHz
Range	100 Hz ~ full span
Unit	GHz, MHz, kHz, Hz
Knob step	Step = frequency step /100
The arrow keys step	1, 2, 5 multiple steps
Association	Start frequency, stop frequency, and CISPR configuration

2. CISPR Band >

Access the file list and load the CISPR configuration file. Prior to conducting EMI scans, it is mandatory to load a CISPR configuration; otherwise, scanning will not be permitted.

7.2.3 AMPTD

Press **[AMPTD]** to enter the amplitude menu.Sets the amplitude parameters of the analyzer. Through these parameters, signals under measurement can be displayed at an optimal view with minimum error.After the amplitude parameter is changed, the span starts again.

1. Ref Level

Set the reference level, which represents the maximum power/level that can be displayed on the current grid. This value is also shown in the top left corner of the screen. Changing the reference level will modify the front-end parameters, and its setting must satisfy the condition:
Reference level ≤ Input Attenuation - Preamplifier - 20 dBm.
The reference level is a critical parameter of the spectrum analyzer, indicating the upper limit of the dynamic range of the current spectrum analyzer. When the energy of the signal under test exceeds the reference level, nonlinear distortion or even overload warnings may occur.
It is important to understand the nature of the signal under test and carefully select the reference level to achieve optimal measurement results and protect the spectrum analyzer.

Parameter	Description
Default value	0 dBm
Range	-120 dBm ~ 30dBm
Unit	dBm, dBμW, dBμA, dBmV, dBμV, W, V
Knob step	Low knob step = (scale/div) /100 Quick knob step = (scale/div) /10
The arrow keys step	Scale/div
Association	Attenuator, preamplifier, and related parameters

Note:The maximum reference level may be different for different machine models, please refer to the Specification for details.

2. Attenuation

Sets the front attenuator of the RF input in order to permit big signals (or small signals) to pass from the mixer with low distortion (or low noise).
Reference Level≤Input attenuation-Preamplifier-20 dBm
The input attenuation can be set to automatic and manual attenuation modes:

- The attenuation value in automatic mode is automatically adjusted according to the preamplifier state and the current reference level value
- The preamplifier is turned on in manual mode, and the input

attenuation can be set to a maximum of 40dB. When the set parameters do not satisfy the above formula, it is guaranteed by adjusting the reference level.

Parameter	Description
Default value	10 dB
Range	0 dB ~ 40 dB
Unit	dB
Knob step	1 dB
The arrow keys step	10 dB
Association	Reference level, preamplifier, and related parameters

3. Scale/Div

Sets the vertical scale size per grid to adjust the current range of magnitudes that can be displayed. This feature is only available if the scale type is logarithmic.Note the following points during use:

Adjust the current range of magnitudes that can be displayed by setting different scales. The range of signal amplitudes that can currently be displayed:

Minimum value: Reference level-10*Current scale

Maximum value: Reference level.

Parameter	Description
Default value	10 dB
Range	0.01 dB ~ 1000 dB
Unit	dB
Knob step	Low knob step=0.01dB Quick knob step=0.1dB
The arrow keys step	1, 2, 5 multiple steps
Association	Reference level

4. Scale Type

Sets the Scale Type of Y-axis to LIN or LOG, the default is LOG.

- The scale value is immutable under the linear scale, and the display range is 0% to 100% of the reference level.
- In Log scale type: the Y-axis denotes the logarithmic coordinates, the value shown at top of the grid is the reference level and the grid size is equal to the scale value. The unit of Y-axis will be automatically switched into the default "dBm" when the scale type is changed from LIN to LOG.
- In Lin scale type: the Y-axis denotes the linear coordinates, the value shown at the top of the grid is the reference level and the bottom of the

grid shows 0 V. The grid size is 10% of the Reference level and the Scale/Div is invalid. The unit of Y-axis will be automatically switched into the default "V" when the scale type is changed from LOG to LIN.

- Other than as mentioned above, the unit of Y-axis is independent of the Scale Type.

5. Ref Offset

Assigns an offset to the reference level to attempt to compensate for gains or losses generated between the device under measurement and the analyzer.

- The changing of this value changes both the readout of the reference level and the amplitude readout of the marker, but will not impact the position of the curve on the screen.
- You can modify this parameter using the numeric keys.

Parameter	Description
Default value	0 dB
Range	-120 dB ~ 120 dB
Unit	dB
Knob step	Slow knob step=0.01dB Quick knob step=0.1dB
The arrow keys step	Scale/div
Association	None

6. Ref Unit >

Please refer to P111 “EMI Measurement Mode” --“Measurement Settings”--“Scan Config>” --“Measure Mode”

7. Preamplifier

Sets the status of preamplifier located at the front of the RF signal path. Turning on the preamplifier reduces the displayed average noise level in order to distinguish small signals from the noise when working with small signals.

When the preamplifier enable, the PA appears in the left status area of the screen.

7.3 Scan Settings

7.3.1 BW

Press **[BW]** to enter bandwidth menu.

1. Scan RBW>

Please refer to P111 “EMI Measurement Mode”--“Measurement

Settings”--“Scan Config>”-- “CISPR Edit--4) RBW” .

2. Meter RBW

Set the meter resolution bandwidth.

Parameter	Description
Default value	9 kHz
Range	200Hz, 9kHz, 120kHz, 1MHz
Unit	MHz, kHz, Hz
Knob step	Step up one gear
The arrow keys step	Step up one gear
Association	None

7.3.2 Trace

Press ⇧ key, then **Trace** hardkey (7 in numeric keypad) to enter the trace menu. As the sweep signal is displayed as a trace on the screen.

1. Trace

Up to three traces can be displayed, corresponding to 1, 2, and 3. Each trace is colored differently (trace 1- yellow, trace 2- purple, trace 3- light blue).

2. State

1) Clear & Write

Each point of the trace takes the data after real-time scanning.

2) Max Hold

Each point of the trace keeps displaying the maximum value of multiple scans, and updates the data display when a new maximum value is generated.

3) Min Hold

Each point of the trace keeps displaying the minimum value of multiple scans, and updates the data display when a new minimum value is generated.

4) Average

Set the trace average.

Parameter	Description
Default value	100
Range	2 ~ 1000

Unit	None
Knob step	1
The arrow keys step	10
Association	None

5) View

Stop updating trace data to facilitate observation and reading. Traces that are loaded to the system from storage devices or remotely.The default type is view.

6) Blank

Clear the trace on screen. But the trace stock will keep still without refreshing.

7) Return

Return to the previous menu.

7.3.3 Detector

The detection type supports three detection types:Positive peak, Quasi-Peak, and RMS Average.

7.3.4 Sweep

Press  key, then **Sweep** hardkey (4 in numeric keypad) to enter sweep menu.

1. Scan >

1) Scan Mode >

The default is Sweep cont, sweep continuous only after Meas Setup-> Sequence -> Scan and then start measurement,the scanning process is performed sweep continuous. Single scan, the scan will stop after the completion of the number of scans.

2) Sweep Count

Valid only if scan mode is set to sweep single.

3) Select Section

According to the CISPR configuration file, select the current section, which defaults to 1.

4) RBW/Step

Please refer to P111 “EMI Measurement Mode”--“Measurement Settings”--“Scan Config>”--“CISPR Edit--4) RBW”.

5) **Dwell Time**

Please refer to P111 “EMI Measurement Mode”--“Measurement Settings”--“Scan Config>”--“CISPR Edit--6) More”.

6) **Return**

Return to the previous menu.

2. Meter >

1) **Meter Mode >**

The default is Sweep cont, sweep continuous only after Meas Setup-> Sequence -> Scan and then start measurement, the scanning process is performed sweep continuous. Single scan, the scan will stop after the completion of the number of scans.

2) **Dwell Time**

Please refer to P111 “EMI Measurement Mode”--“Measurement Settings”--“Meter Config>”--“Dwell Time”.

3) **Return**

Return to the previous menu.

7.4 Marker Settings

Press **[Marker]** to enter the marker menu.The marker appears as a rhombic sign (shown below) for identifying the point on the trace. We can easily readout the parameters of the marked point on the trace, such as the amplitude, frequency and sweep time.

Key points:

- The analyzer allows for up to eight markers to be displayed at one time, but only one single marker is active every time.
- You can use the numeric keys, knob or direction keys to enter the desired frequency or time when any marker type menu is active, so as to view the readouts of different points on the trace.

7.4.1 Marker

[Marker] bottom softkey → [Marker Fctn>] right softkey

1. Marker

A total of eight different cursors can be set, and each trace can have multiple cursors.

2. Trace

Up to three traces can be displayed, corresponding to 1, 2, and 3. Each trace is colored differently (trace 1- yellow, trace 2- purple, trace 3- light blue).

3. **Normal**

   Please refer to “Marker” on P32.

4. **Delta**

   Please refer to “Marker” on P32.

5. **Off**

   The marker information displayed on the screen and functions based on the marker will be turned off and won’t show up again.

6. **All Off**

   Turns off all the opened markers and the related functions. The marker won’t show again.

7. **Marker Table**

   Turns on or off the display of all marker table.Open the list of frequency, the list of all open frequency will be displayed in the color of the frequency trace at the bottom of the screen, including the frequency sequence number, frequency type, frequency trace, frequency time and frequency amplitude.It is used to observe the spectrum information of multiple frequency.

7.4.2 Marker→

[Marker] bottom softkey → [Marker →>] right softkey

1. **Marker**

   The default is 1, and the currently selected marker will be displayed in the upper right corner of the scanning interface. Set the marker function for the current marker.

2. **Mkr→List**

   The frequency corresponding to the current marker is added to the peak list.

3. **Mkr→Meter**

   The frequency measured by the Meter is set to the frequency corresponding to the current marker.

4. **Meter→Mkr**

   The frequency of the current selected marker is set to the Meter frequency.

5. **Return**

   Return to the previous menu.

7.4.3 Peak

[Marker] bottom softkey → [Peak>] right softkey

1. **Peak Search**

   Auto search for maximum and minimum amplitude values.

2. **Peak-Peak**

   The current cursor is set to the difference state, and the reference is marked as the frequency at the minimum amplitude value, and the Marker is marked as the frequency at the maximum amplitude value.

3. **Next Peak**

   Search for the peak value on the trace that is currently under the highest grid, and find the peak value that has the smallest difference in magnitude with it. Mark it with a cursor.

4. **Left Peak**

   Search for the peak value on the trace that is to the left of the current peak value, and find the peak value that has the closest distance to it. Mark it with a cursor.

5. **Right Peak**

   Search for the peak value on the trace that is to the right of the current peak value, and find the peak value that has the closest distance to it. Mark it with a cursor.

6. **Cont Peak**

   Automatic research extreme amplitude.

7. **Return**

   Return to the previous menu.

7.5 Measurement Settings

Press the  key, then press the **Measure** key (decimal point key) to access the measurement setup soft menu.

7.5.1 Sequence>

Setting different processes results in variations in the measured content.

1. **Scan Only**

Measurements related only to scan.

2. **Search Only**

   Search the current trace and it is meaningful to search only after the trace scan is completed, otherwise the measured signal will be inaccurate.

3. **Scan & Search & Meas**

   The sequence of operations is scanning, searching, and then measuring.

4. **Scan & Search**

   Combine scanning and searching for measurement purposes.

5. **Search & Meas**

   Combine searching and measuring for measurement purposes.

6. **Meas**

   Measure each frequency in the peak signal list sequentially. If the measurement result exceeds the corresponding limit line frequency value, display the difference in the list as red.

7. **Return**

   Return to the previous menu.

7.5.2 Start/Pause

To start the measurement, import the required CISPR configuration file([Meas Setup]->[Scan Config]->[CISPR Band]),after importing the file, you can also change its related configuration, and finally press the [Start] button to scan([Meas Setup]->[start]),according to the CISPR Band in the scan configuration, the test is started or stopped after selecting the process. When the scan is completed, enter the Meter for measurement.

7.5.3 Scan Config>

1. **CISPR Band>**

   Enter the list of file,import CISPR file,a CISPR profile must be loaded before EMI scan, otherwise scanning is not allowed.

2. **CISPR Edit>**

   User is required to load a CISPR configuration file from the file list, which describes the frequency range, dwell time, peak value settings for scanning, as well as the corresponding limit lines for different detectors.

   1) **Select Section**

      According to CISPR configure file and select section,the default

section is 1.

2) Start Freq

Edit the start frequency of the current segment.

Parameter	Description
Default value	CISPR configuration file Settings
Range	0 Hz ~ (full span - 100 Hz)
Unit	GHz, MHz, kHz, Hz
Knob step	Current segment span/200
The arrow keys step	Current segment span/10
Association	stop frequency

3) Stop Freq

Edit the stop frequency of the current segment.

Parameter	Description
Default value	CISPR configuration file Settings
Range	100 Hz ~ (full span)
Unit	GHz, MHz, kHz, Hz
Knob step	Current segment span/200
The arrow keys step	Current segment span/10
Association	start frequency

4) RBW

Set the RBW under the currently selected section.

Parameter	Description
Default value	CISPR configuration file Settings
Range	200Hz, 9kHz, 120kHz, 1MHz
Unit	MHz, kHz, Hz
Knob step	Step up one gear
The arrow keys step	Step up one gear
Association	None

5) RBW/Step

Set the RBW/Step under the currently selected section.

Max RBW=Scan Points *(RBW / RBW Step)

Parameter	Description
Default value	CISPR configuration file Settings
Range	0.1, 0.3, 0.5, 1, 2, 3
Unit	None
Knob step	Step up one gear
The arrow keys step	Step up one gear
Association	None

6) More>

a. Dwell Time

Set the dwell time under the currently selected section.

Parameter	Description
Default value	CISPR configuration file Settings
Range	1ms ~ 1s
Unit	s, ms, μs, ns
Knob step	Step = one-tenth of the current unit For example:120ms step=1ms*0.1
The arrow keys step	Step in integer multiples of 1, 2, and 5
Association	None

b. Peak Setup>

① Peak Threshold

Specify the minimum value of peak amplitude, where only peaks exceeding the peak limit value can be considered as valid peaks.

Set the peak threshold under the currently selected section.

Parameter	Description
Default value	CISPR configuration file Settings
Range	-180dBm ~ 30dBm
Unit	dBm, dBμW, dBμA, dBmV, dBμV, W, V
Knob step	1dBm

The arrow keys step	Step in integer multiples of 1, 2, and 5
Association	None

② **Peak Offset**

Specify the difference between the peak value and the amplitude of the adjacent local minima on both sides. Peaks with a difference greater than the peak offset are considered as valid peaks.

Set the peak threshold under the currently selected section.

Parameter	Description
Default value	CISPR configuration file Settings
Range	0dB ~ 120dB
Unit	dB
Knob step	1dB
The arrow keys step	10dB
Association	None

③ **Peak Number**

Specify maximum peak number of current section.

Set the peak number under the currently selected section.

Parameter	Description
Default value	CISPR configuration file Settings
Range	1 ~ 20
Unit	None
Knob step	1
The arrow keys step	5
Association	None

④ **Return**

Return to the previous menu.

c. Return

Return to the previous menu.

7) Return

Return to the previous menu.

3. Measure Mode

Measure mode is divide into near filed measurement and far field measurement.

Near filed measurement:the measurement unit is dBm, dBμW, dBμA, dBmV, dBμV, W, V.

Far field measurement:the measurement unit is dBμV/m,dBμA/m or dBpT.

4. Limit Edit>

1) Limit

The default limit is 1, the index 1 in the menu list serves as the limit line for positive peaks, 2 serves as the limit line for quasi-peaks, and 3 serves as the limit line for average values.Different CISPR configuration have different limit lines, and the user can also edit the limit lines for different detectors separately.

2) Pos Peak Limit>

a. Limit Edit>

Add, insert, delete, clear the list of limit lines, and modify the frequency and amplitude of a screen point.

b. Save Line

Save the currently selected limit line.

c. Load Line>

Retrieve the limit lines saved internally in the device.

d. Return

Return to the previous menu.

3) Offset X/Y

All limits are biased in amplitude and frequency.

4) Return

Return to the previous menu.

5. Antennae>

Set the far field measurement configuration.

1) Edit>

Set the antenna factor.

2) Save Antennae

Save as an.ant file.

3) Load Antennae>

Load the saved.ant file.

4) Return

Return to the previous menu.

6. Save CISPR

Save the current CISPR configuration, including but not limited to start frequency, stop frequency, scan section, limit lines, etc.

7. Return

Return to the previous menu.

7.5.4 Peak Setup>

1. Select Section

According to CISPR configure file to select current section,and the default is 1.

2. Peak Threshold

Please refer to P123 “EMI”--“Measurement Settings”--“Scan Config>”.

3. Peak Offset

Please refer to P123 “EMI”--“Measurement Settings”--“Scan Config>”.

4. Peak Number

Please refer to P123 “EMI”--“Measurement Settings”--“Scan Config>”.

5. Return

Return to the previous menu.

7.5.5 Meas Config>

1. Meas Signal>

1) Current Signal

Only the currently signal in the peak list is measured, valid if and only if the process is a measurement.

2) All Signal

All signals in the peak list are measured and valid if and only if the process is a measurement.

3) Marker Signal

Only the marker signal in the peak list is measured, valid if and only if the process is a measurement.

2. Select Detector

The default selection is 1,1 is used only as a positive peak detector, 2 as a quasi-peak detector, and 3 as an RMS average detector.

3. Pos Peak>

1) Switch

Enable or disenable the positive detector.

2) **Dwell Time**

Set the dwell time of current detector.

Parameter	Description
Default value	CISPR configuration file Settings
Range	1ms ~ 1s
Unit	s, ms, μs, ns
Knob step	Step = one-tenth of the current unit Foe example:120ms step=1ms*0.1
The arrow keys step	Step in integer multiples of 1, 2, and 5
Association	None

3) **Return**

Return to the previous menu.

4. **Return**

Return to the previous menu.

7.5.6 List Control>

1. **Select Signal**

The default current signal is 1,the index is used as the current signal.When different signals are selected, the Meter Freq will change accordingly.

2. **Marker Signal**

Mark the current signal.

3. **Clean Signal**

Clear the mark of the current signal.

4. **Marker All**

Mark all signals in the peak signal list.

5. **Clean All Marker**

Clean the marker of all signal in the peak signals.

6. **More>**

1) **Delete Signal**

Removes the current signal from the list.

2) **Delete All**

Removes all signals from the signal list.

3) **Delete Marker**

Remove all marked signals.

4) **Sort>**

a. **Frequency**

Sort all signals in the signal list by frequency.

b. **Detector Result**

Detector result 1: Sort the magnitude of positive peak values;

Detector result 2: Sort the magnitude of true RMS values;

Detector result 3: Sort the magnitude of average effective voltage.

c. **Difference Result**

Difference result 1: Sort the magnitude of positive peak difference;

Difference result 2: Sort the magnitude of true RMS difference;

Difference result 3: Sort the magnitude of average effective voltage difference.

d. **Return**

Return to the previous menu.

5) **Sequence**

The list of peak signals is sorted in ascending or descending order.

6) **Return**

Return to the previous menu.

7. **Return**

Return to the previous menu.

7.5.7 Meter Config>

1. **Meter Mode>**

Set the scanning mode of Meter measurement, which is divided into single and continuous sweep.

1) **Sweep Signal**

Sweep will stop after sweeping the metering frequency only once.

2) **Sweep Cont**

The measurement frequency is sweep continuously.

3) **Return**

Return to the previous menu.

2. **Dwell Time**

Set the dwell time of meter mode.

Parameter	Description
Default value	10 ms
Range	1ms ~ 1s
Unit	s, ms, μs, ns
Knob step	Step = one-tenth of the current unit For example:120ms step=1ms*0.1
The arrow keys step	Step in integer multiples of 1, 2, and 5
Association	None

3. **Reset MaxHold**

   Reset the historical maximum values measured by the meters of the three types of detectors.

4. **Close All**

   All the detector interfaces in the Meter measurement are closed, and the measurement results are not displayed.

5. **Detector Config>**

   1) **Meter Select**

      The default choice is 1 as the current measurement. Set different metering parameters.

   2) **Meter Switch**

      Enable or disenable the current selected meter detector.

   3) **Meter Detector>**

      The default menu button list: Meter 1 corresponds to the positive peak detector, Meter 2 corresponds to the true RMS detector, and Meter 3 corresponds to the average voltage detector. You can switch the current meter selection to any of the three detectors mentioned.

   4) **Meter Limit>**

      a. **Limit Switch**

         Whether to display the limit values of the current measurement.

      b. **Limit Value**

         Set the limit values for the current meter detector. Used to determine if the amplitude at this meter frequency under measurement conditions exceeds the limit standards.

      c. **Limit To Value**

         Read limit line data under the meter detector according to the meter frequency.

      d. **Return**

Return to the previous menu.

5) Return

Return to the previous menu.

6. Return

Return to the previous menu.

8. Technical Specifications

This chapter lists the technical specifications and general technical specifications of the spectrum analyzer. Unless otherwise stated, the technical specifications apply to the following conditions:

- The instrument has been preheated for 30 minutes before use.
- The instrument is in the calibration cycle and has been self-calibrated.

"Typical" and "nominal" for this product are defined as follows:

- Typical: Refers to the performance of the product under certain conditions.
- Nominal: Refers to the approximate value under product application process.

Characteristics	**Descriptions**			
Model	**HSA3036-R**	**HSA3075-R**	**HSA3140-R**	**HSA3200-R**
Frequency Range	9 kHz~3.6 GHz	9 kHz~7.5GHz	9 kHz~14.0 GHz	9 kHz~20.0 GHz
Frequency Resolution	1 Hz~5 MHz	1 Hz~5 MHz	1 Hz~5 MHz	1 Hz~5 MHz
Display average noise level	-165 dBm/Hz	-165 dBm/Hz	-165 dBm/Hz	-165 dBm/Hz
SSB Phase Noise	<-106 dBc/Hz	<-106 dBc/Hz	<-100 dBc/Hz	<-100 dBc/Hz
Third-order intercept (TOI)	+14 dbm	+14 dbm	+14 dbm	+14 dbm
Amplitude Accuracy	< 0.7 dB	< 0.7 dB	< 0.7 dB	< 0.7 dB
Tracking generator	100 kHz - 3.6 GHz	100 kHz - 7.5 GHz	--	--
Real-time bandwidth analysis	100MHz			
Real-time analysis of spurious-free dynamic range	60 dB			
100% POI Minimum Signal Duration	6.25 μs			

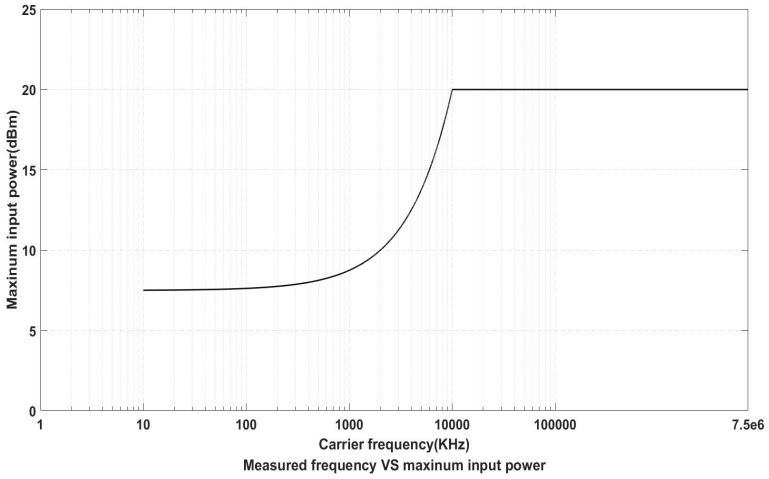
Real-time spectrum view	Probability Density Spectrum, Waterfall Plot, 3D Spectrum, Time-Power Spectrum	
Vector Network Analysis	Vector S11, Vector S21	--
Network Analysis Dynamic Range	90 dB	--
Cable Fault Location	Cable Fault Location	--
Touch Control	Multitouch, supports mouse and keyboard	
Advanced Measurement Functions	CHP, ACPR, OBW, CNR, Harmonic, Monitor, CCDF, SEM, TOI	
Modulation Analysis	AM, FM, PM	
Communication Port	LAN, USB Device, USB Host	
Remote Control Capability	SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet	
Remote Control	NI-MAX, Web Browser, Spectrum Vision software	

8.1 Spectrum Analyzer Mode

Characteristics	**Descriptions**			
Model	**HSA3036-R**	**HSA3075-R**	**HSA3140-R**	**HSA3200-R**
Frequency				
Frequency range	9 kHz~3.6 GHz	9 kHz~7.5 GHz	9 kHz~14.0 GHz	9 kHz~20.0 GHz
Frequency resolution	1Hz			
Span				
Span range	0 Hz, 100 Hz to the maximum frequency of the instrument			
Span accuracy	± Span / (span points - 1)			

Internal Reference Source	
Reference Frequency	10.000000 MHz
Reference Frequency Accuracy	± [(Time since last adjustment × Frequency aging rate) + Temperature stability + Initial accuracy]
Initial Accuracy	<1 ppm
Temperature Stability	<1 ppm, 0℃~50℃
Frequency Aging Rate	<0.5 ppm / first year, 3.0 ppm / 20 year
Marker	
Frequency Resolution	Span /(Screen resolution -1)
Frequency Uncertainty	± [Marker reading × Reference frequency accuracy + 1% × Sweep width + 0.5 × Cursor frequency resolution + 1 Hz]
Type	Normal, Delta, Stable
Function	Noise Marker, N dB Bandwidth, Frequency counter
Frequency Counter Resolution	1 Hz
Frequency Counter Uncertainty	±[Marker frequency reading × Reference frequency accuracy + Frequency counter resolution]
Bandwidth	
RBW Resolution (-3dB)	1 Hz ~ 5 MHz, step by 1-3-5-10
Discrimination Filter Shape Factor	< 5:1(60 dB:3 dB) (nom.)
RBW Uncertainty	< 5% (nom.)
Video Bandwidth (-3dB)	10 Hz~5 MHz, step by 1-3-5-10
Sweep and Trigger	
Sweep Time	29.688 us to 3000 s

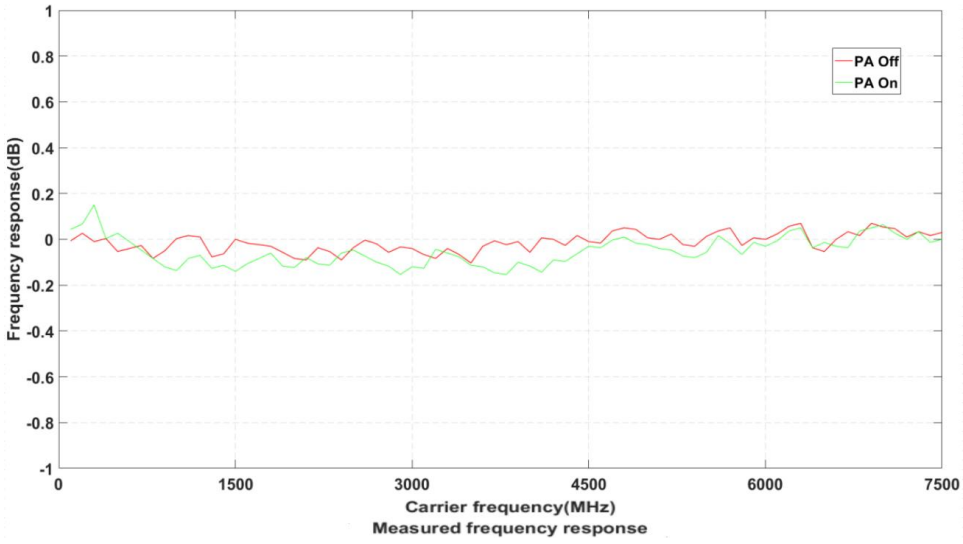
Sweep Mode: RBW-Sweep	30 kHz ~ 5 MHz
Sweep Mode: RBW-FFT	1 Hz ~ 10 kHz
Sweep Rules	Continuous/Single
Trigger Source	Free, Video, External
External Trigger Setting	Level (5V TTL), Rising / Falling
Amplitude and Level	
Amplitude Measurement Range	DANL to +10 dBm, 100 kHz~1 MHz, preamp off DANL to +20 dBm, 1 MHz~7.5 GHz, preamp off
Reference Level	-120 dBm to +30 dBm, Step by 0.1 dB
Preamplifier	20 dB (nom.)
Input Attenuation	0 ~ 40 dB, Step by 1 dB
Maximum Input DC Voltage	+/- 50 VDC
Maximum Continuous Wave Radio Frequency Power	+20dBm(100mV)



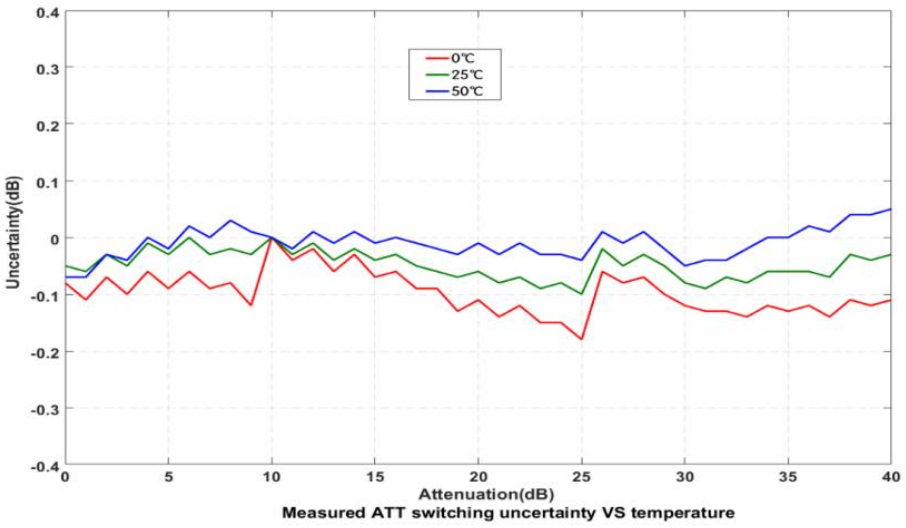
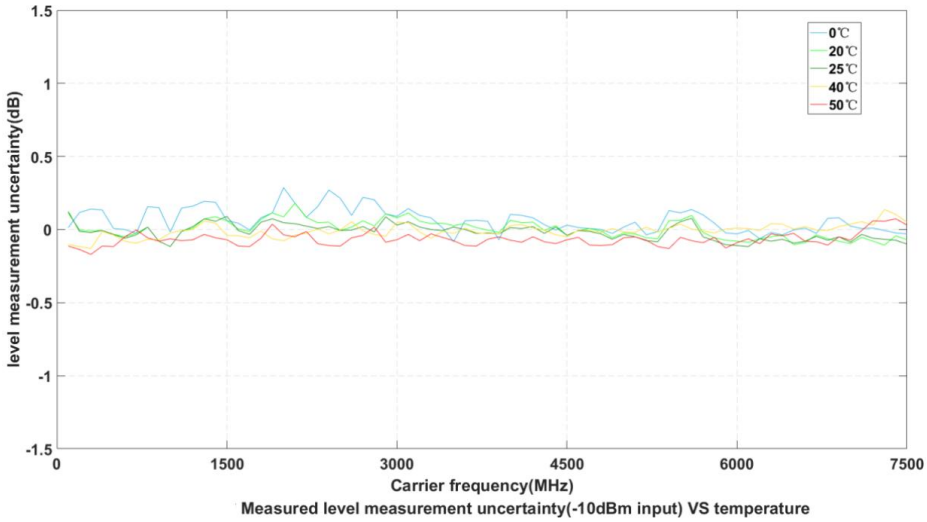
Level Display Range

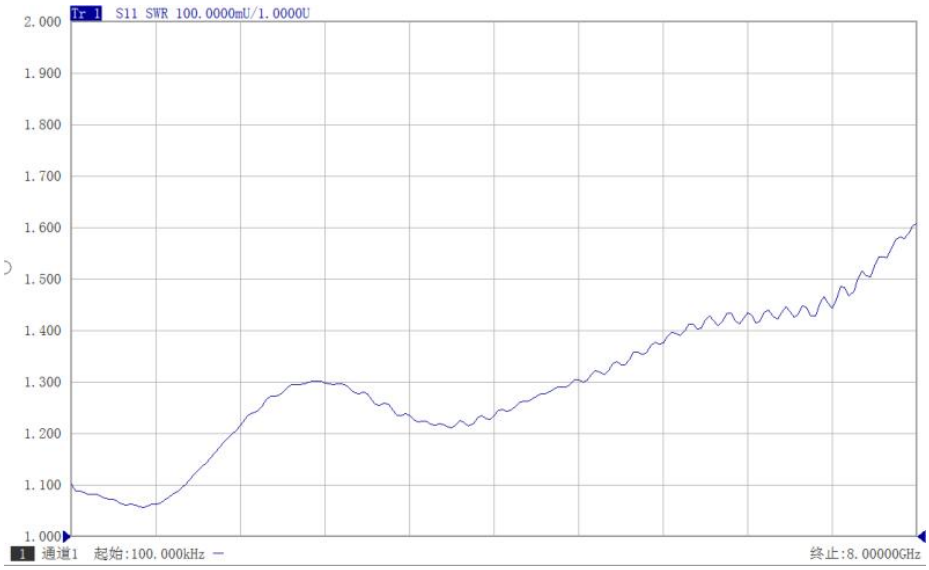
Display Log Scale	0.01 dB to 1000 dB			
Display Linear Scale	0% to 100% (Reference level)			
Level Coordinate Unit	dBm, dBmV, dBμV, dBμA, Volt, Watt, dBμW			
Screen Resolution	801			
Trace number	5			
Trace Detector Mode	Positive Peak, Negative Peak, Sample, Normal, Average, RMS, Quasi-Peak			
Trace Function	Clear Write, Max. Hold, Min. Hold, View, Close, Average			
Phase Noise				
Offset	20 °C to 30 °C, fc = 1 GHz, Normalized to 1 Hz			
10 kHz	-106 dBc/Hz (typ.)	-100 dBc/Hz (typ.)		
100 kHz	-104 dBc/Hz (typ.)	-100 dBc/Hz (typ.)		
1 MHz	-115 dBc/Hz (typ.)	-108 dBc/Hz (typ.)		
Displayed Average Noise Level (DANL) at 20℃～30℃, with 0 dB input attenuation, sample detection, trace averaging >50 times, normalized to 1 Hz, and tracking generator off.				
Preamplifier off				
100 kHz ~ 1 MHz	-95 dBm (typ.),<-88dBm			
1 MHz~ 500 MHz	-140 dBm (typ.), <-130dBm			
500MHz~ 3.6GHz	-138dBm (typ.), <-128dBm			
3.6 GHz~ 6.0 GHz		-134dBm (typ.), <-124dBm		
6 GHz~7.5 GHz		-129dBm (typ.), <-119dBm		
7.5GHz~14GHz			- 134 dBm (typ.), <-124 dBm	
14GHz~ 20GHz				-132 dBm (typ.), <-122 dBm
Preamplifier on				

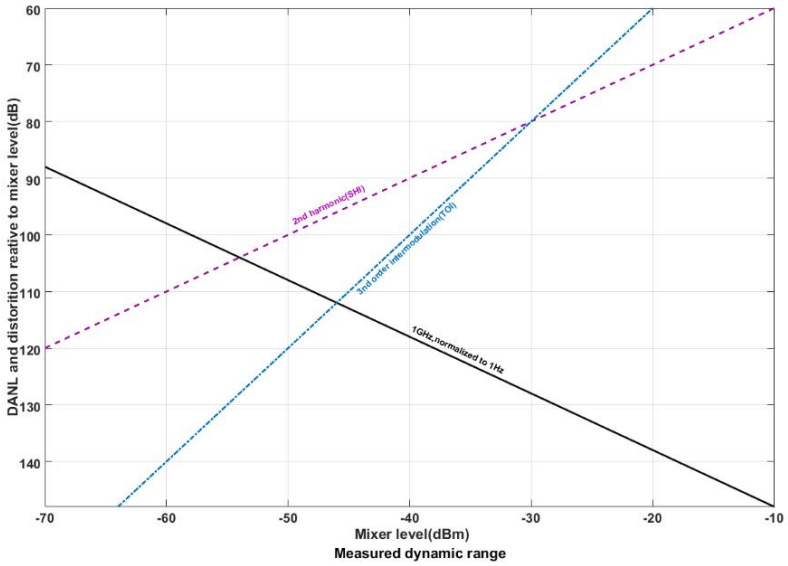
100 kHz ~ 1 MHz	-135 dBm (typ.),<-128dBm			
1 MHz~ 500 MHz	-160 dBm (typ.), <-150dBm			
500MHz~ 3.6GHz	-158dBm (typ.), <-148dBm			
3.6 GHz~ 6.0 GHz		-154dBm (typ.), <-144dBm		
6 GHz~7.5 GHz		-149dBm (typ.), <-139dBm		
7.5GHz~14G Hz			-154 dBm (typ.), <-144 dBm	
14GHz~ 20GHz				-152 dBm (typ.), <-142 dBm
Frequency response: 20℃～30℃, 30%～70% relative humidity, input attenuation 20 dB, reference frequency 50 MHz				
Preamplifier off	<0.7dB			
Preamplifier on	<1.0dB			



Error and Accuracy	
Resolution Bandwidth Switching Error	Logarithmic resolution, relative to 10 kHz RBW ±0.2 dB (nom.)
Input Attenuation Error	20℃~30℃, reference frequency 50 MHz, preamplifier off, relative to 20 dB attenuation, input attenuation 0~40 dB ±0.5 dB

<table>
<tr><td colspan="3">
</td></tr>
<tr><td>Absolute Magnitude Accuracy</td><td colspan="2">20℃~30℃, fc=50 MHz, RBW=1 kHz, VBW=1 kHz, peak detection, input attenuation 20 dB, 95% confidence level
±0.4 dB, input signal level -20dBm, preamplifier off
±0.5 dB, input signal level -40dBm, preamplifier on</td></tr>
<tr><td>Full Range Accuracy</td><td colspan="2">20℃~30℃, fc > 100 kHz, input signal level -50 dBm~0 dBm, RBW=1 kHz, VBW=1kHz, peak detection, input attenuation 20 dB, preamplifier off, 95% confidence level
±0.7 dB</td></tr>
<tr><td colspan="3">
</td></tr>
<tr><td>Voltage Standing Wave Ratio (VSWR)</td><td>Input attenuation ≥10 dB, fc ≥ 1 MHz
<1.8 (nom.)</td><td>Input attenuation ≥10 dB, fc ≥ 1 MHz
<2.0 (nom.)</td></tr>
</table>



Distortion and Spurious Response	
Second Harmonic Distortion (SHD)	20℃~30℃, fc≥50 MHz, Input mono level -20 dBm, input attenuation 0 dB, preamplifier off -65 dBc / +45 dBm, (nom.)
Third-Order Intercept Point (TOI)	20℃~30℃, fc≥50 MHz, Input Dual-tone Level -20 dBm, frequency interval 100 kHz, input attenuation 0 dB, preamplifier off +14 dBm, (typ.)
1 dB Gain Compression	20℃~30℃, fc≥50MHz, input attenuation 0 dB,preamplifier off >0 dBm (nom.)
	
Residual response	20℃~30℃, input port is terminated with a 50Ω load, input attenuation 0 dB <-90 dBm
Input-related clutter	20℃~30℃, mixer level -30 dBm <-65 dBc

Tracking Generator				
Frequency Indicator				
Frequency range	100 kHz ~ 3.6GHz	100 kHz ~ 7.5 GHz	--	--
Frequency resolution	1 Hz, Zero Span		--	--
RBW, only span mode	300 Hz ~ 5 MHz		--	--
Power Indicator				
Output power range	-40 dBm ~ 0 dBm		--	--
Output resolution	1 dB		--	--
Output Flatness	±3 dB (nom.)		--	--
Joint and Impedance	N-Type Female, 50Ω		--	--
Average Reverse Safe Power	Average power: 30 dBm(1 W)		--	--
Maximum Reverse Safe Voltage Level	±50 VDC		--	--
Advanced Measurement Kit				
Power Measurement				
Channel Power	Channel Power, Power Integral Density			
ACPR	Main Channel Power, Left Adjacent Channel Power/Power Ratio, Right Adjacent Channel Power/Power Ratio			
Bandwidth consumption	Power consumption			
Time-Domain Power	Zero Sweep Time Integrated Power			
Power Statistics	Statistical power probability			
Phase Noise	Auto Tune, Frequency Offset Fixed			
Spectrum Emission Mask	Built-in template, custom template, maximum 5 channels			
Transmit Power	Peak trigger, Threshold limit			

Spurious Emission Measurement	Amplitude limit, 5 Ranges, 10 Spurious signals
Nonlinear Measurement	
Third-Order Intermodulation Analysis	Based on dual-tone peak search
Harmonic Analysis	Maximum Harmonic 10

8.2 EMI Measurement Mode

Measurement Function	
Measurement View	Frequency scan, Meter, Signal List
Pre-compliance Sequence	Scan, Search, Meas
EMI Filter RBW (-6 dB)	200 Hz, 9 kHz, 120 kHz, 1 MHz
RBW Uncertainty	<5% (nom.)
Detector	Peak, RMS, Quasi-peak
Dwell time	1 ms ~ 1 s
RBW/Steps	0.1, 0.3, 0.5, 1, 2, 3
Limit and Trace	3
Limit Standards	EN550xx / CISPR, GB/T 9254.1, FCC Part 15B, IEC/EN 61000-6-3/6-4, as well as industry templates for railway, marine, electric vehicles, etc., and user-defined limit lines
Attenuator	0-40 dB
Frequency scale	Logarithmic

8.3 Real-Time Spectrum Analyzer Mode

Frequency and Time	
Real-Time Bandwidth	100 MHz
100% POI Minimum	Full Span, Kaiser Window, Frequency Mask Triggering at full amplitude accuracy

Signal Duration	6.25 μs
Measurement view	Density: 33 ms ~ 40 s 3D+Spectrogram: 33 ms ~ 40 s Spectrogram: 100 us ~ 40 s PvT+Spectrum: 100 us ~ 40 s
Points	800
Span min	5 kHz
Max Sample rate	128MHz
FFT Frequency/s	166666 (100 MHz analysis bandwidth)
Marker	8
Window	Kaiser(Default), Hanning, Flattop, Gaussian, Blackman-Harris, Rectangular
RBW	Any SPAN, six RBW for every window (only one for Rectangular), default min RBW. Typical RBW for Kaiser: Span RBW Min RBW Max 100MHz 251.076kHz 8.285484MHz 50MHz 125.538kHz 4.142742MHz 20MHz 50.215kHz 1.657096MHz 10MHz 25.107kHz 828.548kHz 1MHz 2.51kHz 82.85kHz 100kHz 251Hz 8.285kHz
Spectrogram /PvT Maximum stored	50 000 (Loop store)
Amplitude Accuracy and Range	
Trace	3
Detector	+Peak, -Peak, Sample, Average
Spectrum Density Display	0~100% (resolution 0.1%)
Dynamic range for Spectrogram	200 dB
Amplitude	Flatness: < 0.5dB Resolution: 0.01 dB Dynamic range: < 60 dB
Trigger	Free Run, PvT, External
Frequency Mask Trigger (FMT)	Source: Traces Type: Greater Than, Less Than, Outside Mask, Inside Mask, Frequency module trigger

Color Display	Warm (Default)						
Different RBW and span, 100% POI (μs)	Analysis	RBW1	RBW2	RBW3	RBW4	RBW5	RBW6
	100MHz	14	10	8	7	6.50	6.25
	40MHz	26	16	11	8.5	7.25	6.62
	20MHz	46	26	16	11	8.5	7.25
	10MHz	86	46	26	16	11	8.5
Different window length for RBW	Length/ Type	1024	512	256	128	64	32
	Kaiser (Beta= 12)	398.2849	198.9478	99.2793	49.4450	24.5279	12.0693
	Hanning	533.4785	266.4785	132.9785	66.2285	32.8535	16.1660
	Flattop	212.2447	106.0182	52.9050	26.3483	13.0700	6.4309
	Gaussian(alpha=3.5)	404.8707	202.2399	100.9244	50.2666	24.9376	12.2729
	Blackman-Harris	399.2401	199.4250	99.5174	49.5636	24.5868	12.0983
	Rectangular	801	--	--	--	--	--

8.4 Modulation Analyzer Mode

Characteristics	**Descriptions**			
Model	**HSA3036-R**	**HSA3075-R**	**HSA3140-R**	**HSA3200-R**
General Parameters				
Carrier Frequency	10kHz~3.6GHz	10 kHz ~7.5 GHz	10kHz ~ 14.0GHz	10 kHz ~ 20.0GHz
Carrier Power Accuracy	±2 dB (nom.)			
Carrier Power Range	-30 dBm ~ +20 dBm (nom.)			
Analog Modulation Analysis				
AM				
Modulation rate range	20 Hz ~ 100 kHz			

Accuracy	1 Hz (nom.), modulation rate < 1 kHz < 0.1% modulation rate (nom.), modulation rate ≥ 1 kHz
Modulation depth range	5% ~ 95%
Accuracy	±4% (nom.)
FM	
Modulation rate range	20 Hz ~ 100 kHz
Accuracy	1 Hz (nom.), modulation rate < 1 kHz < 0.1% modulation rate (nom.), modulation rate ≥ 1 kHz
Frequency deviation	1 kHz ~ 400 kHz
Accuracy	±4% (nom.)
PM	
Modulation rate range	50 Hz ~ 50 kHz
Accuracy	1 Hz (nom.), modulation rate < 1 kHz < 0.1% modulation rate (nom.), modulation rate ≥ 1 kHz
Phase deviation	0.2 ~ 100 rad
Accuracy	±4% (nom.)

8.5 Vector Network Analysis Mode

Characteristics	**Descriptions**	
Model	**HSA3036-R**	**HSA3075-R**
Stimulation and Measurement		
Frequency range	100 kHz ~ 3.6 GHz	100 kHz ~ 7.5 GHz
Measurement Parameter	S11, S21	
IF Bandwidth	300Hz, 500Hz, 1kHz, 3kHz, 5kHz, 10 kHz	
Port1 output power	-40~0 dBm (nom.)	
Display	Reflection/Transmission Coefficient, Return/Insertion Loss, Phase, Group Delay, Logarithmic Amplitude, Fault Location, Linear Amplitude, Real Part, Imaginary Part, Voltage Standing Wave Ratio (VSWR), Smith Chart (Linear/Phase, Log/Phase, Real/Imaginary, Resistance/Reactance, Conductance/Susceptance), Polar Plot	

		(Linear/Phase, Log/Phase, Real/Imaginary)		
Points		201~10001, 201(Default)		
Trace function		Maximum 32 traces, Trace average, Maximum hold, Minimum hold, Trace memory		
Marker		Maximum 16 markers per trace		
Directionality after S11 calibration		Logarithmic Amplitude Average Frequency 50, 10MHz > 50 dB		
S21 Dynamic range (IFBW= 10 kHz, Logarithmic,Amplitude Average Frequency 50)	100 kHz ~ 10 MHz	70 dB (typ.)		
	10 MHz ~ 3.6 GHz	80 dB (typ.)		
	3.6 GHz ~ 7.5 GHz		90 dB (typ.)	
Transmission Line Noise		10 kHz RBW, output power 0dB, Log mag, Average=20, >10MHz		
			Amplitude (dB)	Phase (deg)
		100kHz~3.05GHz	0.005	0.1
		3.05GHz~7.5GHz	0.005	0.3
Open-Loop Trace Noise		10 kHz RBW, output power 0dB, Log mag, Average=20, >10MHz		
			Amplitude (dB)	Phase (deg)
		100kHz~3.05GHz	0.04	0.3
		3.05GHz~7.5GHz	0.03	0.1
Calibration item		Full 1-Port Calibration Through Response Calibration		
Calibration Mechanisms		Built-in calibration parameters, user-defined calibration standards, adjustable phase/delay offset		
Socket Extension		1 Port Manual, 2 Ports Manual, 1 Port Automatic Open Circuit		
System Impedance		50Ω		
Velocity coefficient		0.01~1		

8.6 Cable and Antenna Measurement Mode

Characteristics	Descriptions	
Model	**HSA3036-R**	**HSA3075-R**
Measurement Function		
Frequency range	100 kHz ~ 3.6GHz	100 kHz ~ 7.5 GHz
Maximum Distance Resolution (meters)	1.5e12*Velocity Factor/Sweep Width	
Minimum Distance Resolution (meters)	1.5e8*Velocity Factor/Sweep Width	
Windowing Form	Rectangular, Hamming	
Calibration	Full 1-Port Calibration (OSL)	
Velocity coefficient	0.01~1	

8.7 Inputs and Outputs

Front Panel					
Model		**HSA3036-R**	**HSA3075-R**	**HSA3140-R**	**HSA3200-R**
RF input	Impedance	50Ω (nom.)		50Ω (nom.)	
	Connector	N-type female		2.92mm male	
Tracking Generator Output	Impedance	50Ω (nom.)		--	
	Connector	N-type female		--	
Internal / External Reference					
Internal Reference	Frequency	10 MHz			
	Output Level	+3 dBm to +10 dBm，+8 dBm (typ.)			
	Impedance	50Ω (nom.)			
	Connector	BNC female			
External Reference	Frequency	10 MHz ± 5 ppm			
	Output Level	0 dBm to + 10 dBm			
	Impedance	50Ω (nom.)			
	Connector	BNC female			
External Trigger Input					
External Trigger Input	Impedance	1 kΩ (nom.)			
	Connector	BNC female			
Audio Interface	Impedance	30Ω (nom.)			

	Connector	3.5 mm
Communication Interface		
USB Master Terminal		
USB Host	Connector	Type-C
	Protocol	USB 2.0
USB Device		
USB Devise	Connector	Micro USB
	Protocol	2.0 Version
LAN		10/100Base，RJ-45

8.8 General Specification

Structure	
Dimensions	270mm*190mm*60mm (W*H*D)
Weight	Net: 4.70 kg (10.0 lb); Shipping: 5.50 kg
Display	TFT LCD, 1024x600, 8 inch capacitive multi-touch screen
Storage	Internal (Flash) 3.3 GByte, External (U storage device) 32 GByte
Working Environment	
Power Supply	AC Voltage range: 100 V~240 V, 50/60Hz; 100~120V, 400Hz
Consumption	48 W
Temperature	Working temperature: 0℃~50℃ Storage temperature: -20℃~70℃
Humidity	0℃~30℃, ≤95% Relative humidity 30℃~50℃, ≤75% Relative humidity
Altitude	Operating: 3000 meters (10000 feet)
Electromagnetic Compatibility	
EN 61326-1: 2013 /EN 61000-3-2: 2014	Class A
EN61000-3-3: 2013	Plt : 0.65 Pst : 1.00, dmax : 4.00 %, dc : 3.00 %, dtLim: 3.30 % dt>Lim: 500ms
IEC61000-4-2: 2008	AD ±8.0kV, CD ±4.0kV

IEC61000-4-3: 2006 +A1: 2007 + A2: 2010	80MHz to 1000MHz: 10V/m；1.4GHz to 2.0GHz:3V/m；2.0GHz to 2.7GHz:1V/m
IEC61000-4-4: 2004 +A1: 2010	AC Line:±2.00kV
IEC61000-4-5: 2005	Line to Line: 1.0kV, Line to Earth: 2.0kV
IEC61000-4-6: 2008	0.15-80MHz: 3V 1KHz 80% AM
IEC61000-4-8: 2009	30A/m, 50/60Hz
IEC61000-4-11: 2004	Voltage Dips:0%/0.5P;40%/10P;70%/25P; Short Interruptions Test Level%UT:0%/250P
Safety	IEC 61010-1:2010/EN 61010-1:2010 CAN/CSA-C22.2 No.61010-1:2012 CAN/CSA-C22.2 No.61010-2-30:2012 UL 61010-1:2012 UL 61010-2-30:2012
RoHS	2011/65/EU

Adjustment interval: The recommended calibration interval is one year.

9. Warranty

9.1 Troubleshooting

Typical issues that may occur when using your spectrum analyzer:

- Power on malfunction
- No signal display
- Wrong measurement results or poor frequency or amplitude precision.

1. Power on malfunction

Power on malfunction can include a situation where the screen is still dark (no display) after switch on.
If the screen is still dark after power on, please check:

1) If the power supply has been connected correctly and it the power supply voltage range is within the specification.
2) If the power switch has been turned on.
3) If the fan is running, please contact us for service.

If the power indicator is not lit and the fan is not spinning, there might be a problem with the power supply of the spectrum analyzer. If the system cannot be accessed, it could be a CPU failure in the spectrum analyzer. If all the above checks are normal, then it's possible that the components related to graphic display are faulty.

2. No signal display

If there is no signal display at any wave band. Please try the following: set a signal generator at 30 MHz frequency and -20 dBm power and connect it to the spectrum analyzer RF input connector. If there is still no signal display, there may be a problem with the spectrum analyzer hardware circuit. Please contact us for service.

3. Poor signal frequency precision

If the display contents shakes a lot or the frequency readout exceeds the error range during measurements, check if the signal source is stable. If so, check if spectrum analyzer reference is precise. Select internal or external frequency reference according to measurement conditions: press **FREQ** →[Frequency reference Internal External]. If the frequency is still not precise, then the spectrum analyzer LO has lost its phase lock, please contact us for service.

4. Poor readout amplitude precision

If signal amplitude readout is not precise, perform a calibration. If amplitude readout is still not precise, then it may be a problem with internal circuit, please contact us for service.

9.2 Spectrum Analyzer Repair

When it is difficult to solve your spectrum analyzer's problem, you can contact us by phone or fax. When it's confirmed that the instrument is damaged and need return to repair, you need to wrap the spectrum with the original packaging material and the packing box, follow the steps below to package:

(1) Write a detailed description of the malfunction of the spectrum analyzer, put it in the box together with the spectrum analyzer.
(2) Put the instrument in a dustproof / antistatic plastic bag to reduce possible damage.
(3) Place pads in four corners of mother packaging carton, then put the instrument into the mother carton.
(4) Seal the carton with tape and tighten it with nylon tape.
(5) Mark the carton with words of "Fragile! Do not touch! Carefully".
(6) Ship by type of precise instruments.
(7) Keep all the copies of shipping sheets.

Caution: The use of other materials to package the spectrum analyzer may damage the instrument. Do not use polystyrene pellets as packaging materials, they can not adequately fit the instrument, and can be sucked into fan by the generated electrostatic, causing the spectrum analyzer damage.

10. Appendix

10.1 Appendix A: Accessories

(The accessories subject to final delivery.)

Standard Accessories



Power Cord



Quick Guide



USB Cable



N-BNC joint



Metal Case



Adapter



GPS Antenna

CD Rom

Optional Accessories



N-N Cable



N-SMA Cable



SMA-SMA Cable



SMA Adaptor



N-SMA Adaptor



Near Field Probe includes: Four near-field probes, N-SMA adapter, SMA-SMA cable (Frequency range: 30 MHz – 3 GHz)



Carrying Case

10.2 Appendix B: General Care and Cleaning

General Care

Please do not place the instrument in areas exposed to direct sunlight for prolonged periods.

Caution

To avoid any damage to the instrument or probes, do not exposed it to any sprays, liquids, or solvents.

Cleaning

Inspect the instrument and probes as often as operating conditions require.
To clean the instrument exterior, perform the following steps:
Wipe the dust from the instrument surface with a soft cloth. Take care not to scratch the transparent LCD protection screen when cleaning.

⚠ **Warning:** Before re-applying power, ensure that the instrument is completely dry, avoiding any electric shock or electrical short circuit resulting from moisture.

10.3 Appendix C: USB Disk Requirements

USB disk requirements:
Max capacity 4G, NTFS file system is not supported.
If the USB disk doesn't work properly, format your USB disk and then try again.

10.4 Appendix D: PC Software Requirements

The PC software does not support Windows XP.