Instruments.uni-trend.com

UTS3000T+ Series

Spectrum Analyzers

User's Manual

V1.1

September, 2026

Foreword

Thank you for choosing this UNI-T instrument. For safe and proper use this instrument, please read this manual carefully, especially the safety instructions session.

After reading this manual, it is recommended to keep the manual in a convenient location, preferably near the device, for future reference.

1. User Guide

This chapter is to introduce the safety instructions and basic information about the use of spectrum analyzer.

Inspect Product and Packing List

When you received the instrument, please inspect the packaging and packing list as follows,

- Inspect whether the packaging box is broken or scratched caused by external force, and further check whether the instrument appearance is damaged. If you have any questions about the product or other problems, please contact with distributor or the local office.
- Take out the goods carefully and check with the packing list.

Safety Instruction

This chapter contains information and warnings that must be observed. Ensure that the instrument is operated under the safe conditions. In addition to the safety precautions indicated in this chapter, you must also follow accepted safety procedures.

Safety Precautions	
Warning	**Please follow these guidelines to avoid possible electric shock and risk to personal safety.**
	Users must follow the following conventional safety precautions in operation, service, and maintenance of this device. UNI-T will not be liable for any personal safety and property loss caused by the user's' failure following the safety precautions. This device is designed for professional users and responsible organizations for measurement purposes. Do not use this device in any manner not specified by the manufacturer. This device is intended for indoor use only, unless otherwise stated in the product manual.
Safety Statements	
Warning	**"Warning" indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the "Warning" statement are not properly executed or observed.**

	Do not proceed to the next step until you fully understand and meet the conditions stated in the "Warning" statement.
Caution	**"Caution" indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the "Caution" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Caution" statement.**
Note	**"Note" indicates important information. It reminds users to pay attention to procedures, methods, and conditions, etc. The contents of "Note" should be highlighted if necessary.**

Safety Signs

	Danger	It indicates danger of electric shock, which may cause personal injury or death.
	Warning	It indicates that there are factors you should be cautious of to prevent personal injury or product damage.
	Caution	It indicates danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the "Caution" sign is present, all conditions must be met before you proceed to operation.
	Note	It indicates potential problems, which may cause failure of this device if you fail to follow a certain procedure or condition. If the "Note" sign is present, all conditions must be met before this device will function properly.
	AC	Alternating current of device. Please check the region's voltage range.
	DC	Direct current device. Please check the region's voltage range.
	Grounding	Frame and chassis grounding terminal
	Grounding	Protective grounding terminal
	Grounding	Measurement grounding terminal
	OFF	Main power off
	ON	Main power on
	Power	Standby power supply: When the power switch is turned off, this device is not completely disconnected from the AC power supply.
CAT I	Secondary electrical circuit connected to wall sockets through transformers or similar equipment, such as electronic instruments and	

		electronic equipment; electronic equipment with protective measures, and any high-voltage and low-voltage circuits, such as the copier in the office.
CAT II		Primary electrical circuit of the electrical equipment connected to the indoor socket via the power cord, such as mobile tools, home appliances, etc. Household appliances, portable tools (e.g., electric drill), household sockets, sockets more than 10 meters away from CAT III circuit or sockets more than 20 meters away from CAT IV circuit.
CAT III		Primary circuit of large equipment directly connected to the distribution board and circuit between the distribution board and the socket (three-phase distributor circuit includes a single commercial lighting circuit). Fixed equipment, such as multi-phase motor and multi-phase fuse box; lighting equipment and lines inside large buildings; machine tools and power distribution boards at industrial sites (workshops).
CAT IV		Three-phase public power unit and outdoor power supply line equipment. Equipment designed to "initial connection," such as power distribution system of power station, power instrument, front-end overload protection, and any outdoor transmission line.
CE	**Certification**	CE indicates a registered trademark of EU.
UK CA	**Certification**	UKCA indicates a registered trademark of United Kingdom.
Intertek 4007682	**Certification**	Conforms to UL STD 61010-1 and 61010-2-030. Certified to CSA STD C22.2 No.61010-1 and 61010-2-030.
	Waste	Do not place equipment and accessories in the trash. Items must be properly disposed of in accordance with local regulations.
40	**EEUP**	This environment-friendly use period (EFUP) mark indicates that dangerous or toxic substances will not leak or cause damage within this indicated time period. The environmentally friendly use period of this product is 40 years, during which it can be used safely. Upon expiration of this period, it should enter the recycling system.
Safety Requirements		
Warning		
Preparation before use		Please connect this device to AC power supply with the power cable provided. The AC input voltage of the line reaches the rated value of this device. See the product manual for specific rated value. The line voltage switch of this device matches the line voltage. The line voltage of the line fuse of this device is correct.

	This device is not intended for measuring the main circuit.
Check all terminal rated values	Please check all rated values and marking instructions on the product to avoid fire and the impact of excessive current. Please consult the product manual for detailed rated values before connection.
Use the power cord properly	You can only use the special power cord for the instrument approved by the local and state standards. Please check whether the insulation layer of the cord is damaged, or the cord is exposed, and test whether the cord is conductive. If the cord is damaged, please replace it before using the instrument.
Instrument Grounding	To avoid electric shock, the grounding conductor must be connected to the ground. This product is grounded through the grounding conductor of the power supply. Please be sure to ground this product before it is powered on.
AC power supply	Please use the AC power supply specified for this device. Please use the power cord approved by your country and confirm that the insulation layer is not damaged.
Electrostatic prevention	This device may be damaged by static electricity, so it should be tested in the anti-static area if possible. Before the power cable is connected to this device, the internal and external conductors should be grounded briefly to release static electricity. The protection grade of this device is 4 kV for contact discharge and 8 kV for air discharge.
Measurement accessories	Measurement accessories are of lower class, which are not applicable to main power supply measurement, CAT II, CAT III, or CAT IV circuit measurement. Probe subassemblies and accessories within the range of IEC 61010-031 and current sensors within the range of IEC 61010-2-032 can meet its requirements.
Use the input / output port of this device properly	Please use the input / output ports provided by this device in a proper manner. Do not load any input signal at the output port of this device. Do not load any signal that does not reach the rated value at the input port of this device. The probe or other connection accessories should be effectively grounded to avoid product damage or abnormal function. Please refer to the product manual for the rated value of the input / output port of this device.
Power fuse	Please use a power fuse of exact specification. If the fuse needs to be replaced, it must be replaced with another one that meets the specified specifications by the maintenance personnel authorized by UNI-T.
Disassembly and cleaning	There are no components available for operators inside. Do not remove the protective cover. Qualified personnel must conduct maintenance.

Service environment	This device should be used indoors in a clean and dry environment with ambient temperature from 0 °C to +40 °C. Do not use this device in explosive, dusty, or humid air.
Do not operate in humid environment	Do not use this device in a humid environment to avoid the risk of internal short circuit or electric shock.
Do not operate in flammable and explosive environment	Do not use this device in a flammable and explosive environment to avoid product damage or personal injury.
Caution	
Abnormality	If this device may be faulty, please contact the authorized maintenance personnel of UNI-T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI-T.
Cooling	Do not block the ventilation holes at the side and back of this device. Do not allow any external objects to enter this device via ventilation holes. Please ensure adequate ventilation and leave a gap of at least 15 cm on both sides, front and back of this device.
Safe transportation	Please transport this device safely to prevent it from sliding, which may damage the buttons, knobs, or interfaces on the instrument panel.
Proper ventilation	Poor ventilation will cause the device temperature to rise, thus causing damage to this device. Please keep proper ventilation during use, and regularly check the vents and fans.
Keep clean and dry	Please take actions to avoid dust or moisture in the air affecting the performance of this device. Please keep the product surface clean and dry.
Note	
Calibration	The recommended calibration period is one year. Calibration should only be conducted by qualified personnel.

Environmental Requirements

This instrument is suitable for the following environment:

- Indoor use.
- Pollution degree 2
- Overvoltage category: This product should be connected to a power supply that meets Overvoltage Category II. This is a typical requirement for connecting devices via power cords and plugs.

- In operating: altitude lower to 3000 meter; in non-operating: altitude lower to 15000 meter.
- Operating temperature 0°C to+40°C; Storage temperature -20°C to +70°C(unless otherwise specified).
- In operating, humidity temperature below to +35°C, ≤90% relative humidity;
  In non-operating, humidity temperature +35°C to +40°C, ≤60% relative humidity.

There are ventilation opening on the rear panel and side panel of the instrument. So please keep the air flowing through the vents of the instrument housing. To prevent excessive dust from blocking the vents, please clean the instrument housing regularly. The housing is not waterproof, please disconnect the power supply first and then wipe the housing with a dry cloth or a slightly moistened soft cloth.

Connecting Power Supply

The specification of AC power supply that can input

Voltage Range	Frequency
100 - 240VAC (Fluctuations±10%)	50/6 0Hz
100 - 120VAC (Fluctuations±10%)	400 Hz

Please use the attached power lead to connect to the power port.

Connecting to service cable

This instrument is a Class I safety product. The supplied power lead has good performance in terms of case ground. This spectrum analyzer is equipped with a three-prong power cable that meets international safety standards. It provides good case grounding performance for the specification of your country or region.

Please install AC power cable as follows:

- ensure the power cable is in a good condition.
- leave enough space for connecting the power cord.
- Plug the attached three-prong power cable into a well-grounded power socket.

Electrostatic Protection

Electrostatic discharge may cause damage to component. Components can be damaged invisibly by electrostatic discharge during transportation, storage and use.

The following measure can reduce the damage of electrostatic discharge,

- Testing in antistatic area as far as possible;
- Before connecting the power cable to the instrument, inner and outer conductors of the

instrument should be briefly grounded to discharge static electricity;

- Ensure all the instruments are properly grounded to prevent the accumulation of static.

Preparation Work

1. Connecting the power cable and insert the power plug into protective grounding outlet; use the tilt adjustment bracket as needed for your viewing angle.

Figure 1-1 Tilt adjustment

2. Press the switch on the rear panel , the spectrum analyzer will enter standby mode.
3. Press the switch on the front panel , indicator lights up green, and then the spectrum analyzer is powered on.

It takes about 30 seconds to initialize the boot, and then the spectrum analyzer enters the system default menu mode. In order to make this spectrum analyzer perform better, it is recommended that warm up the spectrum analyzer for 45 minutes after power on.

Usage Tip

Use External Reference Signal

If user want to use an external signal source 10 MHz as reference, please connect signal source to the 10MHz In port on the rear panel. The measuring bar on the top of the screen will indicate **Freq Ref: Ext.**

Activate the Option

If user want to activate the option, user need to input secret key of the option. Please contact UNI-T office to purchase it.

Refer to the following steps to activate the option you have purchased.

1. Save the secret key into USB and then insert it to spectrum analyzer;
2. Press **[System] key > System Information > add token;**

3. Select purchased secret key and then press **[ENTER]** to confirm.

Firmware Upgrade

After downloading the firmware upgrade package from the official website, perform the following steps to upgrade the firmware:

1. Decompress the upgrade package to the root directory of the USB flash drive. The package contains two files, xxxx.md5 and xxxx.upg, as shown in Figure 2-2;

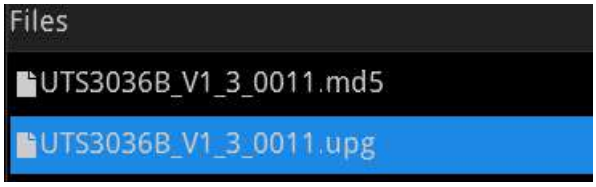

Figure 1-2 Upgrade Package

2. Insert the USB flash drive into the USB port on the front panel of the device, then press the File System key at the left bottom of the screen. Open the file system->USB flash drive>upgrade package->select xxxx.upg file, Click the menu on the right panel of the screen to load and confirm the upgrade;
3. The upgrade lasts for several minutes. After the upgrade is complete, the device will automatically restart;

Notes

Use USB with FAT32 format to copy the upgrade package. During the upgrade, the power supply and the USB flash drive should be reliable connect. Do not perform other operations, preventing the device failure from the upgrade failure.

Touch Operation

Spectrum analyzer has 10.1 inch multipoint touch screen for various gesture operating, which includes,

- Tap the top right on the screen to enter the main menu
- Slide up/down, left/right in grid area to change the center frequency of X axis or reference level of Y axis
- Zoom two points in grid area to change the span of X axis
- Tap parameter or menu on the screen to select and edit it
- Turn on and move the cursor
- Use auxiliary quick key to perform common operation

  Use **[Touch/Lock]** to turn on/off touch screen function.

Remote Control

The UTS3000T+ series spectrum analyzers support communication with computers via USB and LAN interfaces. Through these interfaces, users can combine the corresponding programming language or NI-VISA, using the SCPI (Standard Commands for Programmable Instruments) command to remotely program and control the instrument, as well as interoperate with other programmable instruments that support the SCPI command set.

For more information about the installation, remote control and programming, please refer to office site http:// www.uni-trend.com *Spectrum/Signal Analyzer Programming Manual*

Help Information

The spectrum analyzer's built-in help system provides help information for each function button and menu control key on the front panel.

- Touch the left of the screen "?", help dialog box will pop out on the center of the screen. Tap support function to get more detailed help description.
- After help information displayed on the center of the screen, tap "×" or other key to close the dialog box.

Operating Mode

Spectrum analyzer provides various operating mode, use Mode key to select it,

- Spectral analysis, refer to chapter 4
- Vector signal analysis
- EMI
- Analog demodulation
- Mode preset

Vector signal analysis, analog demodulation and EMI are the option, which should purchase to activate it.

The function of the front panel button may be different in different operating modes.

Mode preset: Different operating modes have their own independent reset modes.

2. Overview

This chapter is to introduce the main functions and features of UTS3000T+ spectrum analyzer, and brief introduce the front and rear panel keys and symbols.

Overview of UTS3000T+

UTS3000T+ is a swept spectrum analyzer with frequency range of 9kHz to 8.4GHz. It can be used as the main equipment to set up automatic control system. This instrument can also meet different test and application needs in the functional/terminal/QA test systems required in the electronics manufacturing industry.

Main Function and Feature

The main functions and features of UTS3000T+ spectrum analyzer as follows:

- High sensitivity measurement
- Frequency range 9kHz to 8.4GHz
- Display average noise level lower to -161dBm
- Phase noise lower to -98dBc/Hz (1 GHz, 10 kHz offset)
- Frequency range of tracking source 100 kHz to 6 GHz
- Accuracy of frequency meter reach to 1 Hz
- The minimum resolution bandwidth is 1 Hz
- Limiting value setup of Pass/fall, it can determine trace signal by pass/fall test
- Six trace lines display in the same time
- USB/LAN interface, remote control the instrument by SCPI command
- 10.1 inch 1280×800 high capacitance touch screen

Overview of Front Panel

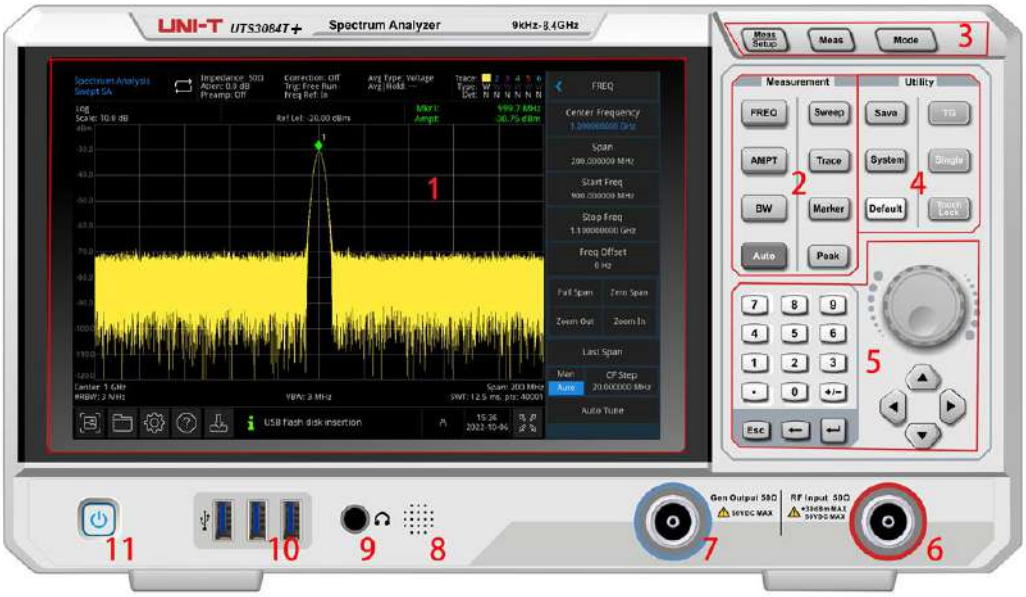

Figure 2-1 Front Panel

1. **Display Screen**: display area, touch screen.
2. **Measurement:** the main functions to active spectrum analyzer, including:
   - **FREQ:** press this key to enable center frequency function and enter the frequency setup menu
   - **AMPT:** press this key to enable reference level function and enter amplitude setup menu
   - **BW:** press this key to enable resolution bandwidth function and enter control bandwidth, visualize proportions menu
   - **Auto:** searching signal automatically and place the signal at the center of the screen
   - **Sweep:** set up sweep time, select sweep, trigger and demodulation type
   - **Trace:** set up trace line, demodulation mode and trace line operation
   - **Marker:** this maker key is to select marked number, type, attribute, tag function, and list and to control the display of these markers.
   - **Peak:** place a marker at the amplitude peak value of signal and control this marked point to perform its function
3. **Advanced Functional Key:** to active the advanced measurement of spectrum analyzer, these function includes:
   - **Meas Setup:** set average/hold time, average type, display line and limiting value
   - **Meas:** access to the menu of functions for measuring transmitter power, such as adjacent channel power, occupied bandwidth, and harmonic distortion
   - **Mode:** advanced measurement

4. **Utility Key:** the main functions to active spectrum analyzer, including:
   - **Save:** press this key to enter save interface, the types of files the instrument can save include state,
   - trace line + state, measurement data, limit, correction and export.
   - **System:** access to the system menu and set up the relevant parameters.
   - **Default:** press it to reset the setting to the default.
   - **TG:** the relevant setting of tracking source output terminal. Such as signal amplitude, amplitude
   - offset of tracking source. This key will light up when the trace source output is working.
   - **Single:** press this key to perform single sweep. press it again to change it to continuous sweep.
   - **Touch/Lock:** touch switch, press this key will indicate green light.
5. **Data Controller:** direction key, rotary knob and numeric key, to adjust the parameter, such as center frequency, start frequency, resolution bandwidth and make position.

Notes

Esc Key: If the instrument is in remote control mode, press this key to return to local mode.

6. **RF input 50Ω:** this port is used to connect the external input signal, the input impedance is 50 Ω（N-Female connector）.

Warning

It is forbidden to load the input port with a signal that does not meet the rated value, and ensure that the probe or other connected accessories are effectively grounded to avoid equipment damage or abnormal function. RF IN port can only withstand an input signal power of no more than +30dBm or a DC voltage input of 50V.

7. **Gen Output 50Ω（Tracking Source）：** This N- Female connector is used to as the source output of the built-in tracking generator. The input impedance is 50Ω.

Warning

It is forbidden to load input signals on the output port to avoid damage or abnormal function.

8. **Loudspeaker:** display analog demodulation signal and warning tone.
9. **Headphone Jack:** 3.5 mm.
10. **USB Interface:** to connect external USB, keyboard and mouse.

11. **ON/OFF Switch:** short press to active the spectrum analyzer. In on-state, short press ON/OFF switch will change the state to standby mode, all function will also be off.

User Interface

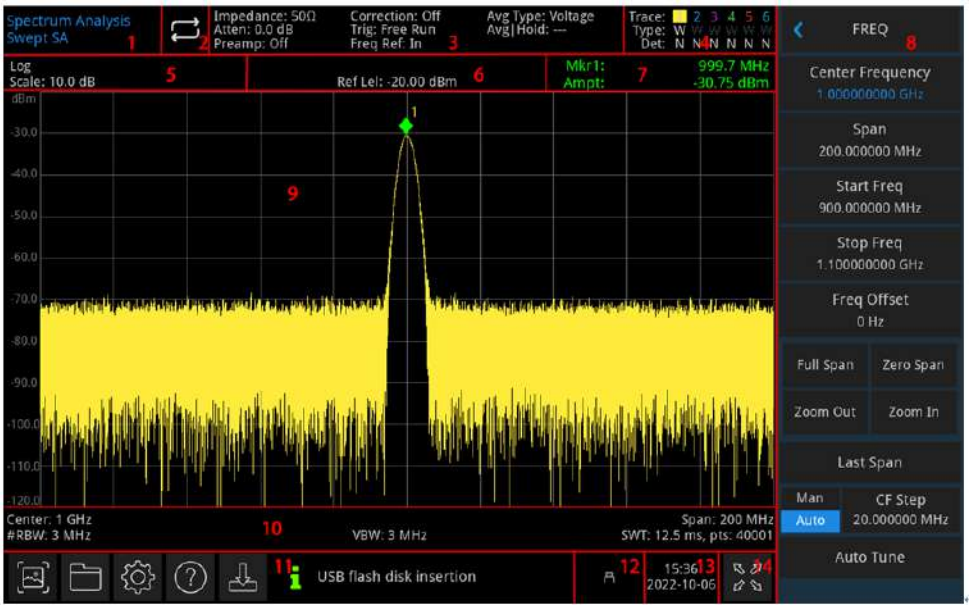

Figure 2-2 User Interface

1. **Working mode:** RF analysis, vector signal analysis, EMI, analog demodulation.
2. **Sweep/Measuring:** Single / continuous sweep, tap the screen symbol to quick step through the mode.
3. **Measuring bar**: Display the measurement information which includes input impedance, input attenuation, presetting, correction, trigger type, reference frequency, average type, and average/hold. Touch screen sign to quick switch these mode.
4. **Trace Indicator:** Display the trace line and detector message which includes number of trace line, trace type and detector type.

Notes

The first line is display the number of trace line, color of number and trace should be the same. The second line is display the corresponding trace type which includes W (Clear/Write), A (Average), M (Max Hold), m (Min Hold). The third line is display detector type which including S (sample), P (Peak), p (Negative), N (Normal), A (Average), and f (trace operation). Detection types are displayed in white letters.

Tap screen sign to quick switch different modes, different letter presents different mode:

- Letter in highlight white color, it presents the trace is being update;
- Letter in grey color, it presents the trace is not update;
- Letter in grey color with strikethrough, it presents the trace will not be update and display;
- Letter in white color with strikethrough, it presents the trace is being update but no display;

this case is useful for trace mathematical operation.

5. **Display Scale:** Scale value, scale type (logarithm, linear), scale value in linear mode cannot change.
6. **Reference Level:** Reference level value, reference level offset value.
7. **Result of Cursor Measurement:** Display the current result of cursor measurement which is frequency, amplitude. Display time in zero span mode.
8. **Panel Menu:** Menu and function of hard key, which includes frequency, amplitude, bandwidth, sweep, trigger, trace and marker.
9. **Lattice Display Area:** Trace display, marker point, video triggering level, display line, threshold line, cursor table, peak list.
10. **Data display:** Center Frequency value, span, start frequency, stop frequency, frequency offset, RBW, VBW, sweep time and points.
11. **Function Setting:** quick screenshot, file system, setup system, help system and file storage .
    - **Quick Screenshot** : screenshot will save in the default file; if there has an external storage, it is preferentially saved to external storage.
    - **File System** : user can use file system to save the correction, limiting value, measuring result, screenshot, trace, state or other file into internal or external storage, and it can be recall.
    - **System information** : view the basic information and option.
    - **Help System** : Help guides.
    - **File Storage** : Import or export state, trace + state, measuring data, limiting value and correction.
    - **System Log Dialog Box**: Click blank space on the right of file storage to enter system log to check the operation log, alarm and hint information.
12. **Connection Type:** Display connecting state of mouse, USB and screen lock.
13. **Date and Time:** Display the date and time.
14. **Full Screen Switch:** Open full screen display, the screen is stretched horizontally and the right button is automatically hidden.

Overview of Rear Panel

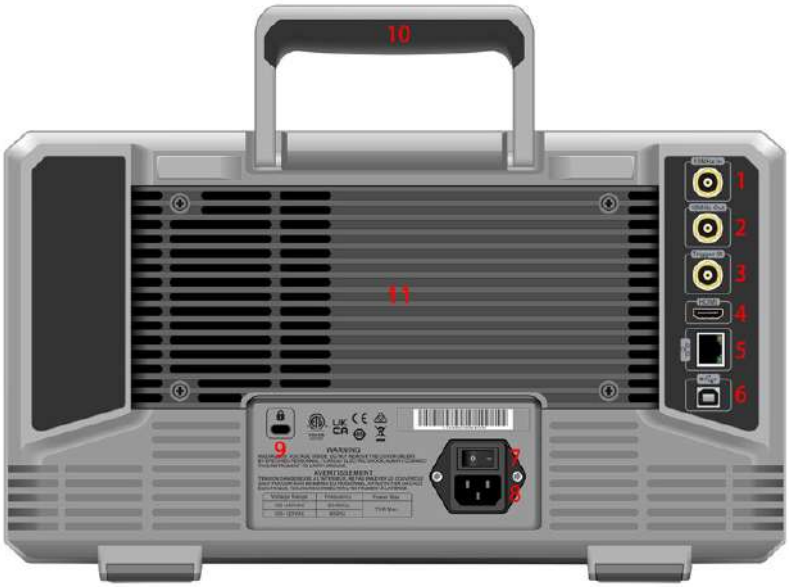

Figure 2-3 Rear Panel

1. **10MHz Reference Input:** Spectrum analyzer can use internal reference source or as an external reference source.
   - If the instrument detects that the [REF IN 10MHz] connector is receiving a 10MHz clock signal from an external source, the signal is automatically used as the external reference source. The user interface status displays "Freq Ref: Ext". When the external reference source is lost, exceeded or not connected, the instrument reference source is automatically switched to the internal reference and the measuring bar on the screen will show "Freq Ref: In".

   Warning

   It is forbidden to load the input port with a signal that does not meet the rated value, and ensure that the probe or other connected accessories are effectively grounded to avoid equipment damage or abnormal function.

2. **10MHz Reference Output:** Spectrum analyzer can use internal reference source or as an external reference source.
   - If the instrument uses an internal reference source, [REF OUT 10 MHz] connector can output 10MHz clock signal generated by the instrument's internal reference source, which can be used to synchronize other devices.

   Warning

   It is forbidden to load input signals on the output port to avoid damage or abnormal function.

3. **Trigger IN:** If spectrum analyzer uses an external trigger, the connector receives the rising of falling edge of an external trigger signal. The external trigger signal is feed in spectrum analyzer by BNC cable.

Warning

It is forbidden to load the input port with a signal that does not meet the rated value, and ensure that the probe or other connected accessories are effectively grounded to avoid equipment damage or abnormal function.

4. **HDMI Interface:** HDMI video signal output interface.
5. **LAN Interface:** TCP/IP port for remote control connecting.
6. **USB Device Interface:** Spectrum analyzer can use this interface to connect a PC, which can be remote control by the software on the computer.
7. **Power Switch:** AC power switch, when the switch is enabled, the spectrum analyzer enters standby mode and the indicator on the front panel lights up.
8. **Power Interface:** Power input power.
9. **Burglar-proof Lock:** Protect the instrument away from thief.
10. **Handle:** Easy to move the spectrum analyzer.
11. **Dustproof Cover:** Take off dustproof cover and then to clean the dust.

3. Function and Application

This chapter is to introduce the main function and basic measurement of spectrum analyzer. Refer to Overall of Front/Rear Panel for more information about the panel.

Basic Measurement

In this manual, key marked with **[ ]**, such as **[FREQ], [AMPT]** and **[Marker]** are physical keys on the front panel. In most cases, press one of this hard key to enter a function menu, this menu will display on the right of the screen, such as **center frequency** and **reference level**. And these are called panel menus.

Key on Front Panel

This section is to introduce how to use the basic function.

Input Data

There are common ways to input and edit data

Rotary Knob	Increase or decrease the current numerical value
Direction Key	Increase or decrease the current numerical value
Numeric Key	Input numerical value and confirm (select a virtual key unit or **[Enter]** key)
Virtual key	Touch panel menu to pop out dialog box, and then touch virtual key to input numerical value and confirm (select a virtual key "ENTER" or **[Enter]** key)
Enter Key	If input numerical value without unit or user want to use the default unit to be the unit for this numerical value, press **[Enter]** key as the termination key for this numerical value.

Use Panel Menu

Press panel menu (vertical permutation on the right of the screen) to enter the corresponding function item, the following are examples of panel menu

Switch	Press this panel menu to switch two modes of parameter
Sub-menu	Press this panel menu to enter sub-menu
Selection	Tap menu selection to change data, the selected menu will be highlight
Correction	Double click the parameter that need to change to pop out the modification menu, or select the data menu that need to change and then press Enter key to modify it

Rest Spectrum Analyzer

Reset is for recall preset, set the system setting return to the specified state, here are four reset types,

Press **[System]> Restore Defaults** to select reset type.

Select **Setup**, system setting of spectrum analyzer will return to the default.

Select **Data**, all the saved data will be deleted.

Select **All**,all the setting of spectrum analyzer will return to the default, delete all data.

Observe Signal

See the following steps to observe a simple signal.

1. Press **[Default]** to reset the spectrum analyzer to the factory setting.
2. Connect **10MHz OUT** port on the rear panel to **RF IN** port on the front panel.

Set Reference Level and Center Frequency

1. Press **[AMPT]>20dBm** to set the reference level to 20dBm.
2. Press **[FRQE]>Center Frequency>50MHz** to set the center frequency to 50MHz.

Set Span

Press **[FRQE]>Span>100MHz** to set span to 100MHz.

Notes

Changing the reference level will change the amplitude value of the top grid line. Changing the center frequency will change the horizontal position of the signal on the screen. Increasing the span will increase the range of frequency that can be displayed horizontally on the screen.

Read Frequency and Amplitude Value

1. Press **[Peak]** to place a marker at 10MHz peak (the default: marker 1).

   Notes

   Frequency and amplitude value of this mark will displayed on functional area on the top right of the screen.

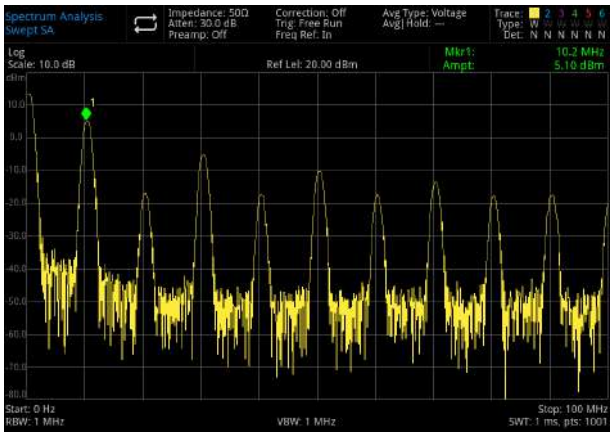

Figure 3-1 Read Frequency and Amplitude

Use rotary knob, direction key or **[Peak]** on the panel menu to move the marker

Change Reference Level

1. Press **[AMPT]**, please note that the reference level (Ref Level) is at the activation function area.
2. Press **[Marker]> Marker→> Ref Lvl**

Notice: Changing the reference level will change the amplitude value of the top grid line.

Measurement of Multiple Signal

This chapter will describe how to measure different kinds of multiple signal.

Use Difference Value△ marker on the Same Screen to Compare Signal

With this spectrum analyzer, user can easily compare the signal differences between frequency and amplitude. Difference value△ marker function allows user to compare two signals on the same screen.

In this example, the harmonic components of the 10 MHz reference signal provided on the rear panel of the spectrum analyzer are used to measure the difference in frequency and amplitude between the two signals on the same screen. Difference value△ marker is used to show the differences.

1. Reboot the spectrum analyzer;

   Press **[Default]>** to reset
2. Connect **10MHz OUT** port on the rear panel to **RF IN** port on the front panel
3. Set the center reference, span and reference level for check input signal and other harmonic wave of 10MHz;

   Press [FREQ]>Center Frequency>50MHz

   Press [FREQ]>Span>100MHz

   Press [AMPT]>Ref Level>20dBm
4. Place a marker at the maximum peak（10MHz）:

   Press [Peak] next peak on the left and next peak on the right to move marker from peak to peak. Marker should at 10MHz reference signal.
5. Lock a marker and activate the second marker:

   Press **[Marker]>Marker Mode>Delta△**

   The marker with a label "× "which presents this is a reference signal.
6. Use rotary knob or **[Peak]** key to move marker **1△2** to other signal peak:

   Press **[Peak]> Next PK** or

   Press **[Peak]>Next PK Left** or **Next PK Right**

Or press **[Marker]>Marker△ Frequency>Rotate the Rotary Knob to Next PK**

The difference of amplitude and frequency between the two markers are displayed on the screen.

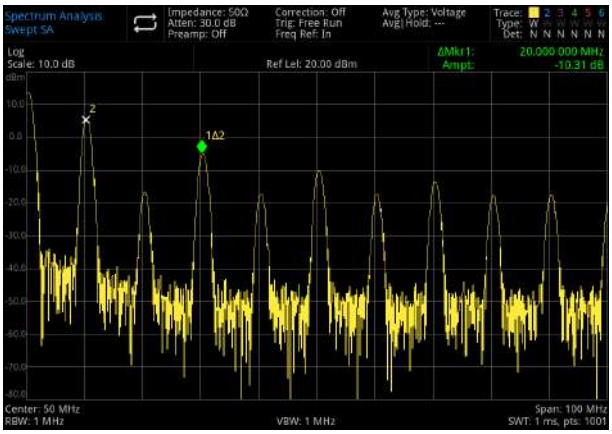

Figure 3-2 Marker Mode Difference Value△ on the Same Screen to Compare Signal

Notes

Turn on the frequency meter to increase the resolution of marker reading.

Use Difference Value△ Marker on the Different Screen to Compare Signal

With difference value marker function, user can easily measure the difference of amplitude and frequency between the two signals on the different screen. (This feature is suited for harmonic distortion measurement.)

In this example, use 10MHz signal to measure the difference in frequency and amplitude between the two signals, one of the signal is displayed on the screen, another signal is not on the screen. Difference value△ marker is used to show the differences.

1. Reset the spectrum analyzer:

   Press **[Default]> Reset**

2. Connect **10MHz OUT** port on the rear panel to **RF IN** port on the front panel
3. Set the center frequency, span and reference level for check input signal and other harmonic wave of 10MHz;

   Press [FREQ]>Center Frequency>50MHz

   Press [FREQ]>Span>100MHz

   Press [AMPT]>Ref Level>20dBm

4. Place a marker at 10MHz peak and set stepped center frequency as the frequency value (10MHz) of marker:

   Press [Peak]>Marker→> CF Step

5. Turn on difference value△ marker function:

Press [Marker]>Marker Mode>Delta △

6. Use center frequency to increase 10MHz:

   Press [FREQ]>Center Frequency,

   At this point, the first marker moves to the left side of the screen which is located at the first signal peak（10MHz）. Until the center frequency becomes 100MHz, frequency of △Mkr1 is 90MHz, which is marker 100MHz harmonic component. The annotation of △Mkr1 will show the amplitude and frequency difference of 10MHz signal peak and 100MHz signal peak.

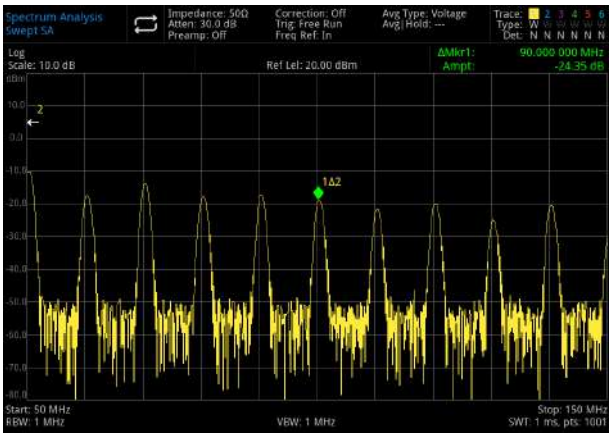

Figure 3-3 Difference Value Marker of Reference Signal Out of Screen

7. Turn off Marker: Press **[Marker]>All Markers Off** or **[Marker]>Marker Mode>Close**

Distinguish Signals of the Same Amplitude

This example shows that reduce the resolution bandwidth and video bandwidth to distinguish the two signals with the same amplitude, frequency space 100 kHz.

Please note that for resolution signal, the final selected resolution bandwidth value is equal to the frequency difference between the two input signals, while the video bandwidth is slightly narrower than the resolution bandwidth.

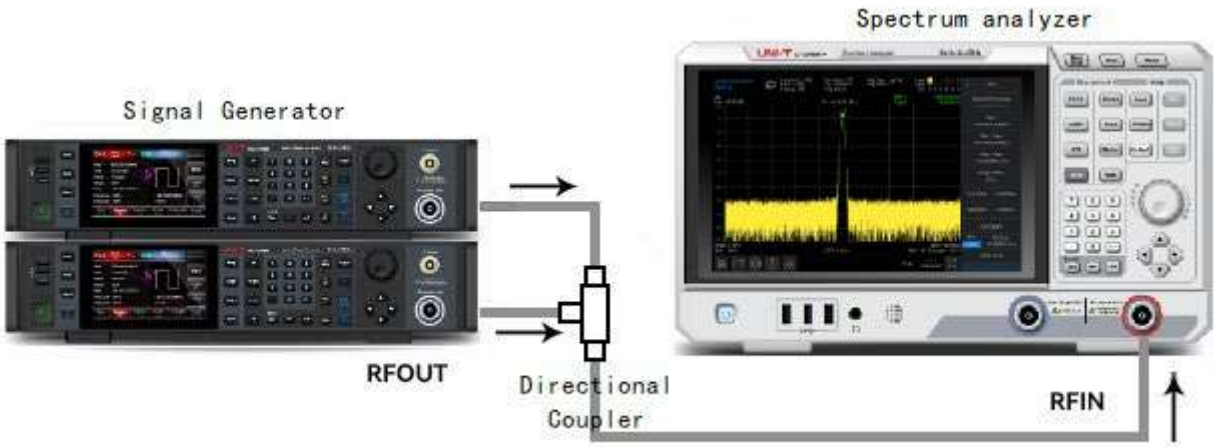

Figure 3-4: Instrument Setting for Acquire Two Channel's Signal

1. As shown in Figure 3-4, connect two signal sources to RF IN port via directional coupler.
2. Set the frequency of one of signal source to 300MHz and the frequency of another signal source to 300.1MHz, amplitude of the two signal sources to -20dBm, and turn on the signal output.
3. Set the spectrum analyzer to observe signal:

   Press **[Default]>Reset**

   Press **[FREQ]>Center Frequency>300MHz**, **Span>1MHz**

   Press **[BW]>100kHz**

   A single envelope signal can be seen at this point.

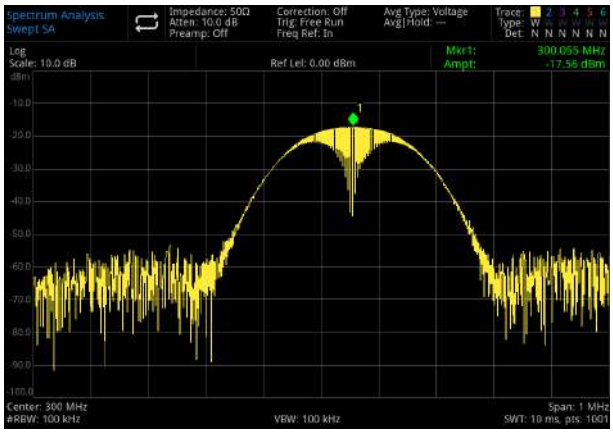

Figure 3-5 Undistinguished Two Equal-Amplitude Signals

4. Adjust the resolution bandwidth（RBW）to 30kHz to make its lower or equal to the frequency space of two input signal:

   Press **[BW]>RBW>300 kHz**

   Refer to Figure 3-6, two signal peaks can be seen at this point. Use rotary knob or direction key on the front panel to further decrease the resolution bandwidth, so that to better distinguish the two signals.

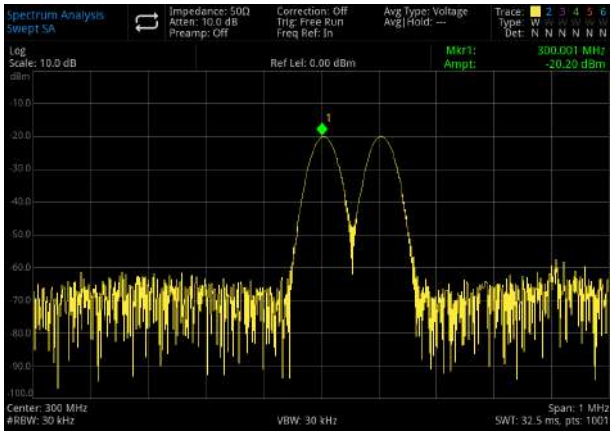

Figure 3-6 Distinguished Two Equal-Amplitude Signal（1）

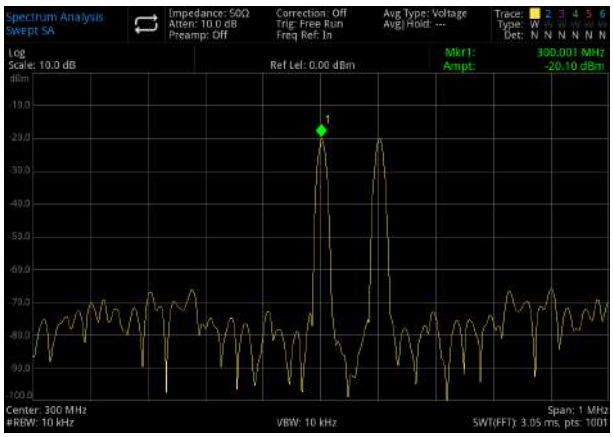

Figure 3-7 Distinguished Two Equal-Amplitude Signal（2）

When the resolution is decreased, the sweep time will increased and the displayed signal will be smoother at the same time. For the fastest measurement, use the maximum resolution bandwidth as much as possible. In factory setting, resolution bandwidth and sweep span is coupling.

Distinguish the Small Signal from the Big Signal

This example shows that use a narrow resolution bandwidth to distinguish two signal with frequency difference 10 kHz, amplitude difference 50dBm.

1. As shown in Figure 3-4, connect two signal sources to input port of the spectrum analyzer.
2. Set the frequency and amplitude of one signal source to 300Mz, -10dBm, another signal source is set to 300.01MHz，-60dBm and turn on signal output.
3. Follow the steps to set spectrum analyzer:

   Press **[Default]>Reset**

   Press **[FREQ]>Center Frequency>300>MHz**、**Span>200>kHz**

   Press **[BW]>30>kHz**
4. Set 300MHz signal as the reference level:

   Press **[Peak]>Marker→>Ref Lvl**

   Notes

   UTS3000T+'s filter has 4:8:1 shape factor. With a resolution bandwidth of 30 kHz, its 60dB bandwidth is 144 kHz. Half of this bandwidth (77 kHz) is greater than the frequency difference of two signals (10 kHz), so the two input signals cannot be distinguished.

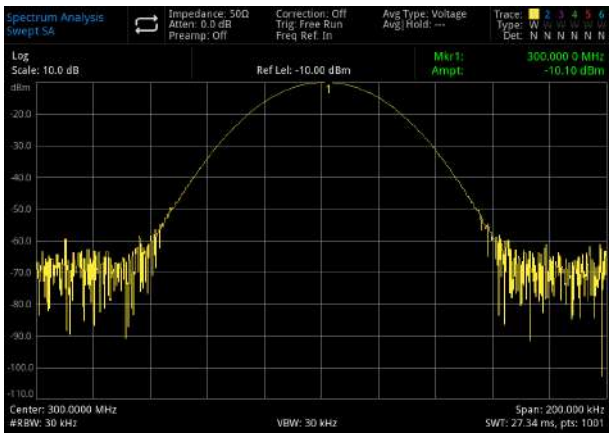

Figure 3-8: Fail to Distinguish Small Signal from Big Signal

5. Reduce the resolution bandwidth to check the hidden small signal:

   Press **[BW]>3 kHz**

   Press **[Peak]**

   Press **[Marker]>Marker Mode>Delta** △

   Press **[Marker]>Marker Frequency>10 kHz**

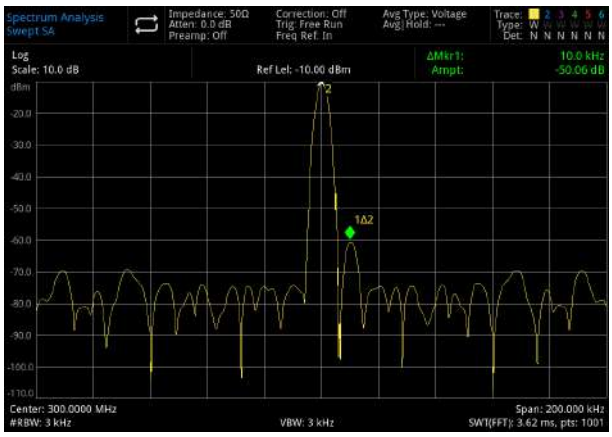

Figure 3-9: Distinguish Small Signal from Big Signal

Notes

UTS3000T+'s filter has 4:8:1 shape factor. With a resolution bandwidth of 3 kHz, its 60dB bandwidth is 14.4 kHz. Half of this bandwidth (7.2 kHz) is narrow than the frequency difference of two signals (10 kHz), so the two input signals can be distinguished.

Measurement of Low Level Signal

This chapter will describe how to measure the low level signal and how to distinguish it from noise in the same spectrum. The main method to measure the low signal as follows.

Reduce Input Loss

The spectrum analyzer's ability to measure low level signal is limited by the noise it generates internally.

Input attenuator will affect the level when it passes through a spectrum analyzer, if a signal is much closed to ground noise, reduce input loss to distinguish the signal from noise.

Caution

RF IN port on the front panel can only withstand an input signal power of no more than +30dBm or a DC voltage input of 50V. Otherwise, it may cause damage to interior circuit.

1. Press **[Default]>Reset** to reset spectrum analyzer.
2. Set the frequency and amplitude of signal source to 300MHz, -80dBm, connect RF OUT port of signal generator to RF IN port of spectrum analyzer and turn on signal output.

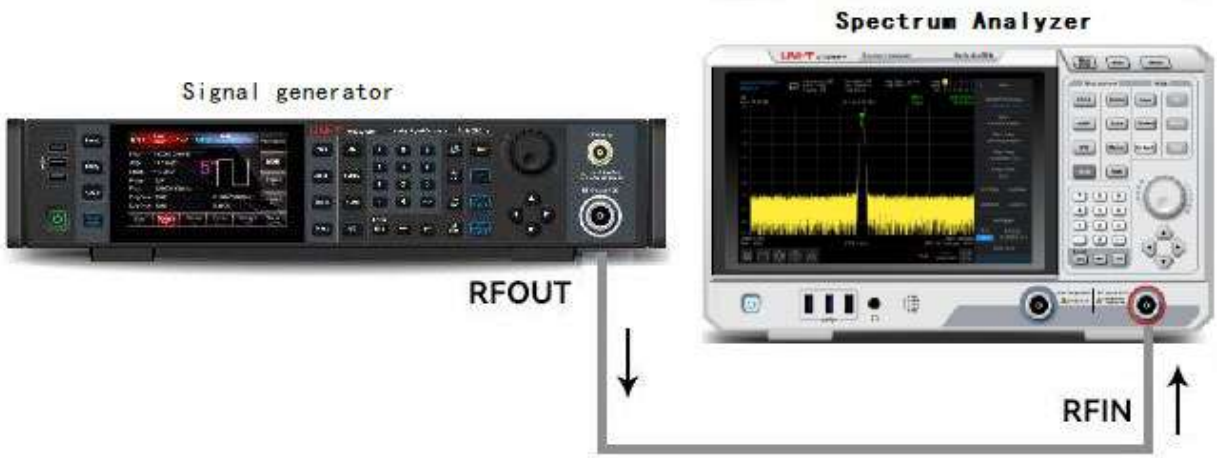

Figure 3-10 Instrument Setting for Acquire Single Signal

3. Set the center frequency, sweep span and reference level:

   Press **[FREQ]>Center Frequency>300MHz**, **Span>5MHz**

   Press **[AMPT]>Ref Level> -40dBm**
4. Move all the required peak (this example is 300MHz) to the center of the screen:

   Press **[Peak]>Marker→>CF**
5. Decrease the sweep span to 500kHz（as shown in Figure 3-11）;

   Press **[FREQ]>Span>500>kHz**
6. Set attenuation to 20dB:

   Press **[AMPT]>Attenuation>20>dB**

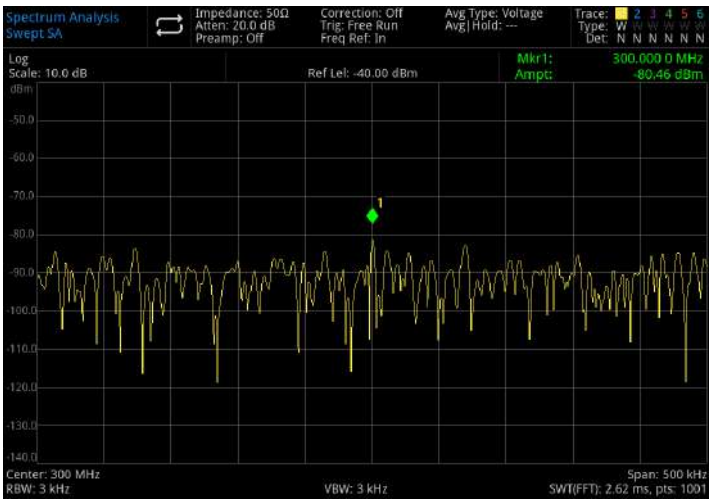

Figure 3-11 A Signal Close to Ground Noise

Notes

Increase attenuation value to make ground noise close to signal level.

7. Reduce attenuation to 0dB to observe signal more clearly:

   Press **[AMPT]>Attenuation>0>dB**

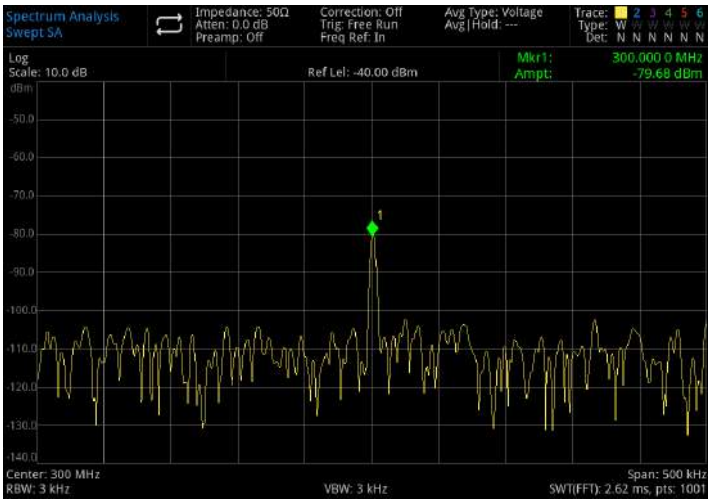

Figure 3-12 Measuring Small Signal with 0dB Attenuation

Reduce Resolution Bandwidth

Resolution bandwidth will affect internal noise level, however, waveform continuous signal will not affect by resolution bandwidth. Reduce resolution bandwidth to 10 times, ground noise will decrease 10dB accordingly.

1. Refer to "Reduce Input Loss" in this section and follow the steps to perform it.
2. Reduce the resolution bandwidth:

   Press **[BW]** to select the resolution bandwidth

   As the noise level is reduced, the low signal level will become clearer at this point.

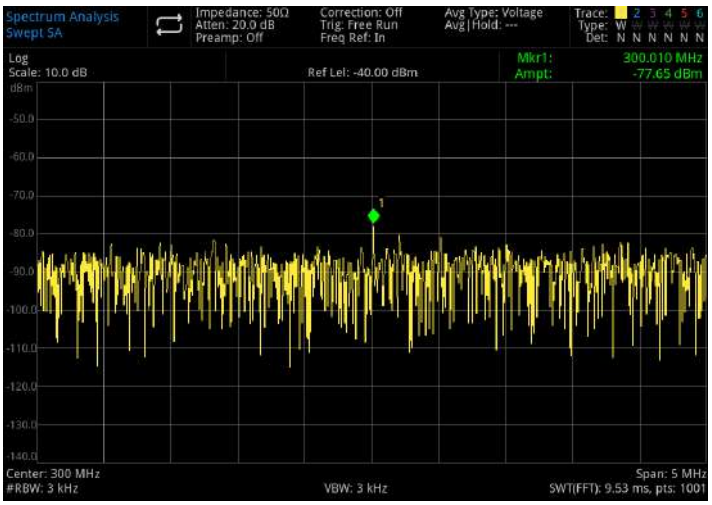

Figure 3-13 Reduce Resolution Bandwidth

Please note that there is a sign"#" at the bottom left of the screen, it presents resolution bandwidth has no coupling. It's manual adjustment.

Notes

User can use up/down direction key with 1-3-10 sequence to change the resolution bandwidth. RBW lower to 1 kHz is the resolution bandwidth of digital filter, the filter's rectangle coefficient (specific value of filter 60dB bandwidth and 3dB bandwidth) is 4.5:1. RBW greater or equal to 1 kHz, the filter's rectangle coefficient is 4.8:1. The maximum value of RBW is 3MHz, the minimum is 1Hz.

Trace Averaging

Trace averaging is a digital process that adds the current value of each trace point to the previous average and then took the average. Select the averaging, if the spectrum analyzer is automatic coupling, change the detection mode to sampling mode, it can make the displayed noise level be smooth.

1. Refer to "Reduce Input Loss" in this section and follow the steps to perform it.
2. Turn on average function:

   Press **[Trace]>Trace Type>Average**
3. Set the average count to 20:

   Press **[Meas/Setup]>Avg|Hold Number>20>** ↵

   As the averaging to make trace become smooth, so the low signal can be more clear (as shown in Figure 3-14).

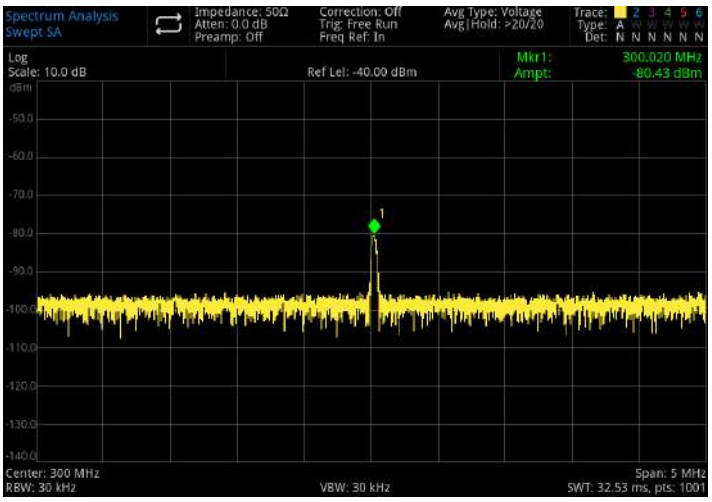

Figure 3-14 Trace Averaging

Track Signal Drift

This chapter will describe how to measure and track signal drift.

Measurement of Frequency Shift of Signal Source

This spectrum analyzer can measure the stability of a signal. Use the maximum hold function to display and keep the maximum amplitude level and frequency shift of an input signal trace.

1. Connect signal generator to RF IN port of the spectrum analyzer.
2. Set the frequency and amplitude of signal to 300MHz, -20dBm.
3. Set the center frequency, sweep span and reference level:

   Press **[Default]>Reset**

   Press **[FREQ]>Center Frequency>300MHz**, **Span>1MHz**

   Press **[AMPT]>Ref Level> -10dBm**
4. Place a marker at signal peak and turn on search continuous peak function:

   Press **[Peak]**
5. Use the maximum hold to measure signal drift:

   Press **[Trace]>Trace Type>Max Hold**

   When the signal is changing, the maximum hold function is to remain the maximum respond of input signal. Trace mode is displayed in the annotation on the right of the screen, which includes trace, trace type and detector.
6. Activate and update trace 2 and then select continuous sweep:

   Press [**Trace]>Select Trace>Trace 2**

   Press **Trace Type>Clear/Write**

   Trace 1 stay at the max hold mode to display signal drift.

7. Change the frequency of signal source slowly.

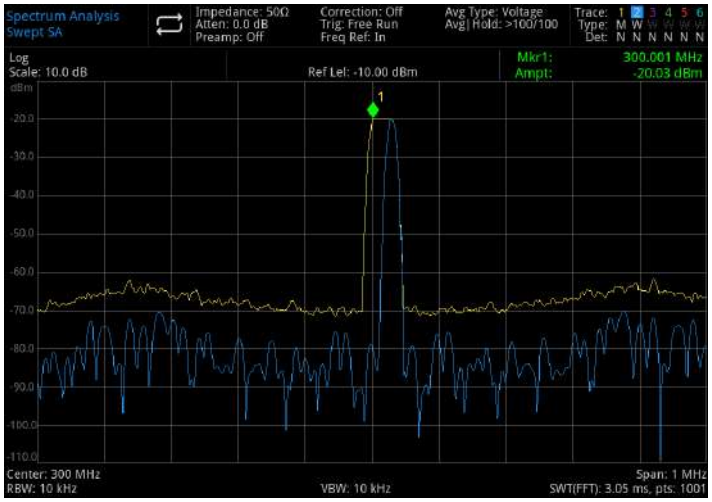

Figure 3-15 Maximum Hold and Update to Observe Signal Drift

Measurement of Signal Distortion

This chapter will describe how to recognize and measure signal distortion.

Recognize the Distortion Generated by Spectrum Analyzer

A high level input signal may cause the spectrum analyzer to generate a distortion signal, and this distortion signal will mask the true distortion to be measured on the input signal. User can trace and radio frequency attenuator to identify the signal. If it presents, that is generated by the instrument internally.

In this example, we use the output signal from a signal generator as a source to identify if the harmonic distortion component is generated by the spectrum analyzer.

1. Connect the signal source to RF IN port of spectrum analyzer.
2. Set the frequency and amplitude of signal source to: 200MHz, 0dBm
3. Set the center frequency and sweep span:

   Press **[Default]>Reset**

   Press **[FREQ]>Center Frequency>400MHz**, **Span>500MHz**

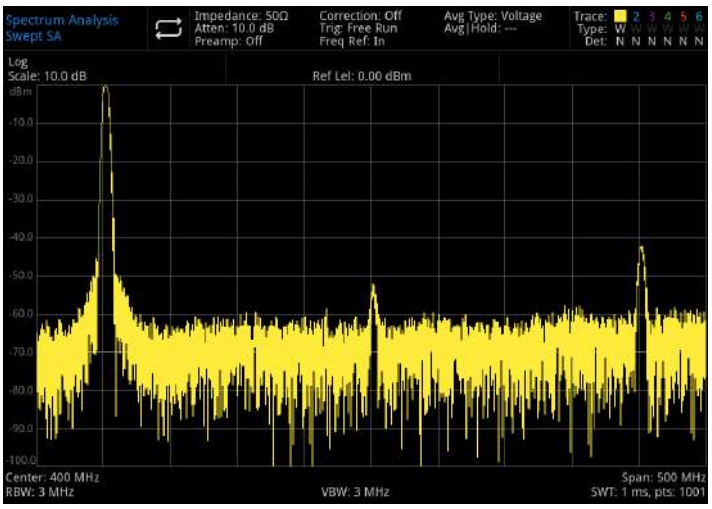

Figure 3-16 Harmonic Distortion

The harmonic distortion component is generated by this signal at the input mixer of the spectrum analyzer (lined up sequentially with the original 200MHz signal at 200MHz intervals).

4. Change the center frequency to the frequency value of first harmonic:

   Press **[Peak]>Next PK**

   Press **[Marker]>Marker→>CF**

5. Set sweep span to 50MHz, and redisplay the signal at the center of the screen:

   Press **[FREQ]>Span>50MHz**

   Press **[Peak]>Marker→>CF**

6. Set the attenuation to 0dB

   Press **[AMPT]>Attenuation>0dB**

7. To recognize whether the harmonic wave component is generated by spectrum analyzer, display input signal at trace 2 firstly:

   Press **[Trace]>Select Trace>Trace2**

   Press **[Trace]>Trace Type>Clear/Write**

   Press **[Trace]>Update>On**

   Press **[Trace]>Display>On**

8. Refresh trace 2 (sweep two times at least) and save the data of trace 2. After that, place a marker at harmonic component of trace 2:

   Press **[Trace]>Update>Off**

   Press **[Peak]**

   Press **[Marker]>Marker Mode>Delta △**

   The spectrum analyzer shows the stored waveform data of trace 2 and being measured data of trace 1. The reading of △Mkr1 is the amplitude difference between the reference marker and the activated marker.

9. Increase radio frequency attenuation to 10dB:

Press **[AMPT]>Attenuation>10dB**

Please note that the reading of △Mkr1, this reading is amplitude difference of the same harmonic distortion component at the input attenuation is set to 0dB and 10dB.

In the change of input attenuation, the absolute amplitude of △Mkr1 is about ≥1dB, it can be assumed that at least part of this harmonic distortion component is generated by the spectrum analyzer (as shown in Figure 3-17). The input attenuation should be adjusted up in this case.

Figure 3-17 Component of Harmonic Distortion

The reading of amplitude difference of △Mkr1 is affected by the following factors:

1. Increasing the input attenuation will deteriorate the signal-to-noise ratio, and that causes the reading of △Mkr1 to positive.
2. Losses in the internal circuitry of the spectrum analyzer for harmonics will cause △Mkr1 to read negative.

   A large reading of △Mkr1 indicates a significant test error. It can be minimized by input the attenuation.

Third-Order Intercept Distortion

Measurement of two-tone third-order intermodulation distortion is common in communication systems. When two signals are input to a nonlinear system, they may interact with each other to produce a third intermodulation component (TOI) adjacent to the original signal in the spectrum. These distortions are generated by system component such as the amplifier and mixer.

To quickly set up TOI measurement, see "Third-Order Intercept" for more details.

This example describes how to use a marker to measure the third-order intermodulation distortion of an instrument. The frequency of the two signal sources used are 299.95 MHz and 300.05MHz.

1. As shown in Figure 3-18 to connect an instrument. Connect the input port of the spectrum analyzer via low pass filter and directional coupler, the output of the directional coupler

is two-tone signal source with low intermodulation distortion.

Although the distortion performance with this connection is better than the spectrum analyzer, but the TOI for measuring the signal source/spectrum analyzer combination is still useful.

After the TOI performance of the signal source/spectrum analyzer combination has been calibrated, the instrument under test (DUT) (e.g., amplifier) is inserted between the output of the directional coupler and the input of the spectrum analyzer.

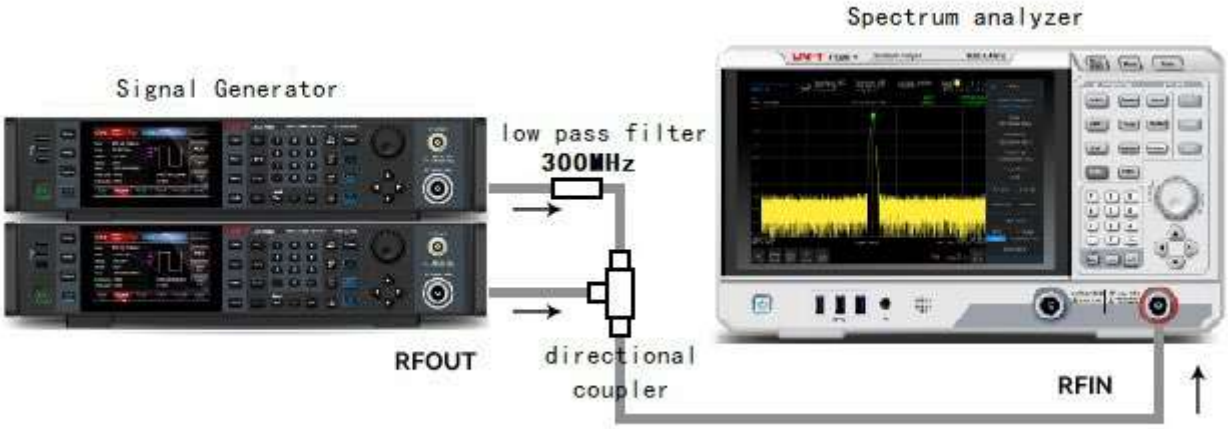

Figure 3-18 Instrument Setting of Third-Order Intercept Signal

Notes

Directional coupler must have high degree of isolation between the two inputs so that the two source signals will not cross modulate.

2. Set the frequency of a signal source (signal generator) to 299.95MHz, the frequency of the othersignal source to 300.05MHz, so the frequency spacing is 100kHz. The amplitudes of the two sourcesare set to the same value (in this case, -5dbm).
3. Set the center frequency and sweep span of the spectrum analyzer:

   Press **[Default]>Reset**

   Press **[FREQ]>Center Frequency>300>MHz**, **Span>500kHz**
4. Reduce the resolution bandwidth until the distortion product can be seen:

   Press **[BW]>Rotate the Rotary Knob**
5. Move signal to reference level:

   Press **[Peak]>Marker→>→Ref Level**
6. Decrease the resolution bandwidth until the distortion can be seen:

   Press **[BW]>Rotate the Rotary Knob**
7. Activate the second marker and use next peak to move it to the peak of distortion signal:

Press **[Marker]>Marker Mode>Delta△**

Press **[Peak]>Next PK**

8. Measure another distortion signal:

   Press **[Marker]>Marker Mode>Normal**

   Press **[Peak]>Next PK**

9. Measure the difference between the measured signal and the second distortion signal:

   Press **[Marker]>Marker Mode>Delta△**

   Press **[Peak]>Next PK**

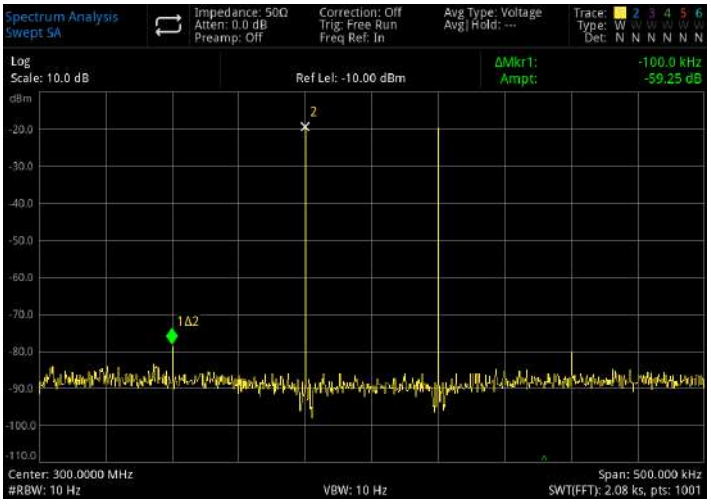

Figure 3-19 Measuring Distortion Product

Measurement of Phase Noise

Measuring the phase noise is to measure the stability in the frequency domain. Specify the phase noise as the sideband power with respect to the output frequency of fundamental RF, measured at each offset of the carrier frequency and normalized to 1 Hz in measurement bandwidth.

1. Press **[Default]** to restore the spectrum analyzer;
2. Use a cable to connect the output port of signal generator to RF IN port of the spectrum analyzer;
3. Press **[FREQ] >Center frequency >1 GHz, Sweep width >100 kHz;**
4. Press **[Trace] >Trace type>Trace average; Detection>Average;**
5. Press **[Peak]** to put a marker on the peak of signal;
6. Press **[Marker]>Marker mode >Difference△; Marker△Frequency>10kHz;**
7. Open **marker function >mark noise**, as shown in Figure 3-20:

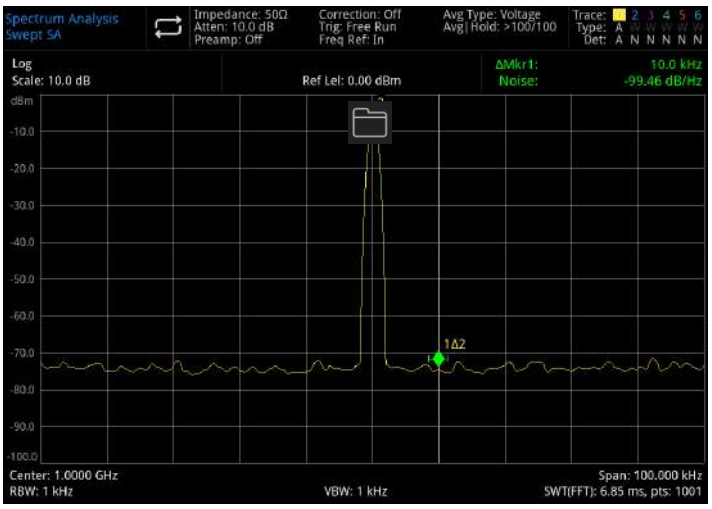

Figure 3-20 Phase Noise

Check Catalogue and Save File

The spectrum analyzer saves and acquires data in a similar way to a personal computer: both have internal memory and a USB drive. The spectrum analyzer allows you to view and save files on the internal memory or on a USB. This chapter will show you how to save files and find catalogue.

Find File in Catalogue

Tap the corresponding icon on the left of the screen to find file in the catalogue.

The spectrum analyzer contains six kinds of files:

- State file is to save the setting information of the spectrum analyzer. The file suffix is .state.
- Trace file is to save the trace information. The file suffix is .trace.
- Screenshot file is to save screen capture. The file suffix is .png.
- Limit value file is to ensure that trace whether is out of the preset range. The file suffix is .limit.
- Correction file is amplitude correction for compensating the gain and loss of the external device. The file suffix is .corr.
- Measuring data is to save the information of trace, peak list or marker list. The file suffix is .csv.

Create New File

Create a new file

1. Press >LocalDisk>UTS3000T+ to select a catalogue which need to create a file;
2. Tap "New folder" to create a new file.

Multiple Select (On/Off)

1. Press >LocalDisk>UTS3000T+ or select the catalogue in USB;

2. Turn on "Multi Select" menu;
3. Select the multiple file or tick √ box on the front of the file name to complete multiple selection.

Copy File

If you need to copy files from the internal memory to a USB flash drive, please refer to the following steps:

1. Press >LocalDisk>UTS3000T+ to select file or folder;
2. Connect U flash disk to USB interface on the instrument;
3. After select the file, tap "Copy" on the screen;
4. Select the catalogue which you want to copy and tap "paste" to complete copy and paste.

Move File

If you need to move file or folder from catalogue or move it from the internal memory to a USB flash drive, please refer to the following steps:

1. Press >LocalDisk>UTS3000T+ to select file or folder;
2. After select the file, tap "Move" on the screen, the system automatically pops up a dialog box;
3. If you want to move the file to USB, please plug USB at first, and then select the required USB from the LocalDisk drop-down menu in the dialog box.
4. Select the catalogue which you want to move and click √ in the dialog box to complete the move.

Notes

Please do not disconnect USB when moving and saving files to external storage (USB), to prevent data loss and file corruption.

Delete File

1. Press >LocalDisk>UTS3000T+ to select file or fold which need to be delete;
2. Tap "Delete" option to delete the selected file;
3. If you want to delete multiple files, tap "MultiSelect" to tick the box in front of the file name, and then tap "Delete" to remove multiple files.

Load File

1. Press >LocalDisk>UTS3000T+ to select file.
2. Tap "Load" to loading the data of the corresponding file which includes state, trace, screen and limit.

Rename File

Change the name of file or folder.

1. Press >LocalDisk>UTS3000T+ to select the file or folder which you want to rename;
2. Select "Rename" to change the name of file or folder.

Save/Recall File

Import and export the file by the state type (state, trace + state, measurement data, limit and correction)

If there has an external storage, it is preferentially saved to external storage.

See "File Storage（Save）" for more details

4. Key Function

- Frequency（FREQ）
- Amplitude（AMPT）
- Bandwidth（BW）
- Auto
- Sweep
- Trigger
- Trace
- Marker
- Peak
- Save
- System
- Default
- TG
- Single
- Touch/Lock
- Meas/Setup
- Meas
- Mode

Notes

Key function in this chapter is for sweep mode of the spectrum analyzer.

For different models of equipment, the parameter configurations and their ranges under each button menu are different. For specific parameter configurations, please refer to the data manuals corresponding to each model.

FREQ

Press **[FREQ]** key to activate the center frequency function and enter the frequency menu. The numerical value of center frequency, sweep span, start frequency and stop frequency are displayed at the bottom of the screen.

Center Frequency: This function can set a specific frequency value at the center of the screen and respectively display the center frequency and sweep span values at the left and right side on the bottom of the screen. Use numeric key, direction key or touch panel menu to change center frequency.

Notes

- Under the premise of constant sweep span to change the center frequency, it will automatically modify the start and stop frequency.
- Changing the center frequency is equivalent to shifting the current channel, the adjustable range is limited by the frequency range listed in the technical specifications of the spectrum analyzer.
- In zero span, start frequency, stop frequency and center frequency are the same.

Span: This function is to input range value of sweep span. Use numeric key, direction key or touch panel menu to change sweep span. The sweep span will be changed symmetrically according to the center frequency. The reading of sweep span is the total displayed frequency range. To determine the sweep span for each horizontal scale division, the above sweep span should be divided by 10.

Notes

- Under the premise of constant sweep span to change the width sweep, it will automatically modify the start and stop frequency.
- In zero span, the minimum sweep span can set to 100Hz. When the sweep span is set to the maximum, the spectrum analyzer enters full span mode.
- Changing sweep span to 0Hz by manual setting or press zero span menu to enter zero span mode.
- Changing the sweep span in non-zero span mode, if the stepped center frequency and RBW are automatic, it will be modified automatically. The modification of RBW will cause the change of VBW (in automatic).
- A change in one of three sweep span, RBW and VBW will cause a change of sweep time.

Start/Stop Freq: Start frequency is on the left side of the screen, the right side is stop frequency. After the frequency setting, it will display at the bottom of the screen, replacing the original

displayed center frequency and sweep span. Use numeric key, rotary knob, direction key or touch panel menu to change the start frequency.

Notes

- Changing the start/stop frequency will cause the change of sweep span and center frequency, and the change of sweep span will affect the parameter of other system.
- In zero span mode, if start frequency, center frequency and stop frequency are the same, it will be modified together.

Freq Offset: Set a frequency offset to explain the frequency conversion between the device under test and the import of spectrum analyzer. Use numeric key, rotary knob, direction key or touch panel menu to change the frequency offset.

Notes

- This parameter will not affect the hardware setting of spectrum analyzer, only change the display value of the center frequency, start and stop frequency.
- Set the frequency shift to 0Hz to eliminate the frequency offset.

Full Span: Change the sweep span to display full frequency range.

Zero Span: Set the sweep span to zero. This mode displays the envelope of the time domain signal (the X-axis is displayed in time unit). Like an oscilloscope.

Notes

In zero span, it displays the time-domain characteristic of fixed frequency component of the signal. There are many differences from the non-zero span mode.

The following function are not invalid in zero span mode:

Marker in **[Marker]** menu（except ->ref level）;

Sweep time and sweep mode in **[Sweep]**.

Zoom Out : Set the sweep span to double of the current sweep span, for observing more signals.

Zoom In: Set the sweep span to a half of the current sweep span, for observing the details of signal.

Last Span: Set the sweep span as the last modified sweep span.

CF Step: Set the stepped frequency will cause the change of center frequency, start and stop frequency. Use numeric key, rotary knob, direction key or touch panel menu to change the stepped frequency.

Auto Tune: Quick to find the signal that is most likely to be interest and place it optimally on the display.

AMPT

Press **[AMPT]** key to enable reference level and enter amplitude setting menu.

Ref Level: Set reference level, press **[AMPT]** key to enable this function. Reference level is the power or voltage value on the top grid of the screen (Unit is the selected amplitude unit). Use numeric key, rotary knob, direction key or touch panel menu to change the reference level.

Notes

- Reference level is the important parameter of spectrum analyzer, it presents the upper limit of dynamic range of the spectrum analyzer at the current. When the energy of the signal to be measured exceeds the reference level, it may cause non-linear distortion or even overload alarms. The nature of the signal to be measured should be understood and carefully select reference level, in order to perform the best measurement effect and protect the spectrum analyzer.

Attenuation（Auto/Man）: Set RF front-end attenuator so that signal can pass through the mixer with low distortion (small signals with low noise). Input attenuation can be switched between automatic and manual. When auto is selected, the input attenuation value is linked to the reference level. When manual is selected, the user can change the input attenuation value via the numeric key, rotary knobs, direction key or touch panel menu.

Notes

- When the maximum mixer level and reference level are determined, the minimum of input attenuation of the spectrum analyzer should meet the formula: Reference Level ≤ Input Attenuation- Pre-amplification -10dBm.

Preamplifier: The switch that controls the internal preamplifier of the instrument. Turn on to produce a gain to compensate for the preamplifier, so that the amplitude value read out is the actual value of the input signal. When the pre-preamplifier is turned on, the measurement bar area of the screen displays Preamp: on.

Scale/Div: Sets the logarithmic value corresponding to a grid in the vertical direction of the screen. The scale function is only available when the scale type is logarithmic. User can change the scale value by using the numeric key, rotary knobs, direction key or touch panel menu.

Scale: When the scale type is set to logarithmic, the logarithmic value corresponding to a grid in the vertical direction of the screen can be used. When linear is selected, the vertical grid becomes a linear scale with the default amplitude in volts V. The grid line at the top of the screen is the set

reference level, while the grid line at the bottom is the zero level. Each grid is a tenth of the reference level in volts V.

Y Axis Unit: Change the amplitude unit which can be both used in logarithmic and linear mode. Optional unit: dBm, dBmV, dBμV, V and W. The default is dBm.

Ref Level Offset: When there is gain or loss between the device under test and the import of spectrum analyzer, an offset value is added to the reference level to compensate for the resulting gain or loss. This value does not change the position of the trace and modifies the reference level and the amplitude reading of the cursor.

Impedance: Set the input impedance when converting voltage to power. The default input impedance is 50Ω. If the input impedance of the DUT to the spectrum analyzer is 75Ω, then need to use a 75Ω to 50Ω adapter to connect the DUT to the spectrum analyzer and set the input impedance to 75Ω.

Correction: Enter the amplitude correction to set the compensation of the gain or loss of external devices, such as antennas and cables. When the correction is turned on, the trace and the corresponding measurements will be corrected.

1. Select: Spectrum analyzer provides 10 correction factors and each factor can edit independent.
2. Correction (On/Off): The switch of correction, the default is off.
3. Close all: Close all the correction has been turned on.
4. Edit Correction:

Select	Provide 10 correction factors to save, the default: correction 1
Go To row	Select number of revised row
Insert row	Add revised point
Delete row	Delete select row at the current
Delete Correction	Delete Corrected data at the current

5. Delete All: Remove all the saved revised data.

Calibrate Signal: This function is used to verify that the device is finding the signal properly. In the absence of signal input, the calibration signal is turned on and the 100MHz square wave signal is automatically input, which can observe on the spectrum diagram.

BW

Press **[BW]** key to enable the resolution bandwidth function, enter panel menu to control the

resolution bandwidth and video bandwidth.

RBW（Auto/Man）: Set the resolution bandwidth to distinguish two signals with similar frequency. In manual mode, the user can change the resolution bandwidth value within the range 1Hz to 3MHz by using the numeric key, rotary knob, direction key or touch panel menu.
Below to 1kHz, the optional bandwidth value are 1Hz, 3Hz, 10Hz, 30Hz, 100Hz or 300Hz. If the input value is not one of these values, then select an available bandwidth value which closest to the input value. As the resolution bandwidth decreases, the system corrects the sweep time to maintain the calibration of the amplitude. The resolution bandwidth is also related to the sweep span, when the sweep span is reduced, the resolution bandwidth is also reduced.
In auto-coupling mode, the video bandwidth changes along with the resolution bandwidth, thus the ratio of the resolution bandwidth and the video bandwidth stay constant.
If the video bandwidth and resolution bandwidth are not coupled, a "#" mark will appear in the bottom left corner of the screen next to "RBW". Press auto key to re-couple.

VBW（Auto/Man）: Set the video bandwidth to filter out ambient noise. In manual mode, user can change the instrument's video bandwidth value from 1 Hz to 3 MHz by using the numeric key, rotary knob, direction key or touch panel menu. If the input value is not an available bandwidth value, then select an available bandwidth value which closest to the input value. As the video bandwidth decreases, the system increases the sweep time to maintain calibration of the amplitude.
When the video bandwidth and resolution bandwidth are not coupled, a "#" mark will appear at the bottom of the screen next to "VBW". Press auto key to re-couple.

VBW: 3dB RBW: Select the ratio of video bandwidth to resolution bandwidth. If the signal is similar to the noise level and the signal response displayed on the screen is blurred, the ratio can be set to less than 1 to reduce the noise. When reset with **[Default]**, the ratio is set to 1.000. User can change the ratio by using the numeric key, rotary knob, direction key or touch panel menu.

RBW Filter Type: The UTS3000T+ series supports two types of filters, Gaussian and flat top window.

- Gaussian window is a kind of exponential window. The main flap is wide, so the frequency resolution is low; no negative side flap, the first side flap attenuated to 55Db. Gaussian window is often used to truncate some non-periodic signals, such as exponential decay signal.
- The flat top window behaves in the frequency domain with very small passband fluctuations as its name suggests.

Auto

Press **[Auto]** key to enable auto tune function to check input signal, the steps as follows,

1. Performing peak search in full span
2. Operating Marker>Center Frequency
3. Operating Marker >Reference level
4. Other setting is for observing signals.

Notes

Valid frequency range of auto tune is 10MHz to 3GHz. It can automatically detect the minimum amplitude of the signal at -65dBm.

Sweep

Press **[Sweep]** key to enter the following panel menu to select the sweep mode.

Sweep Time（Auto/Man）: Select the sweep time of display sweep span (or the time used by the spectrum analyzer for the full screen scan when the sweep span is zero). Decreasing the sweep time will increase the sweep frequency. In manual mode, user can change the sweep time value by using the numeric key, rotary knob, direction key or touch panel menu.

1. **Sweep span is not zero:**

   When the sweep time is auto, the spectrum analyzer selects an optimal (minimum) sweep time for the current setting. This selection is influenced by the following factors.

   1. The maximum tuning frequency of the spectrum analyzer
   2. The selected video bandwidth filter and resolution
   3. The maximum sampling rate of the analog-digital converter
   4. Sweeping Points
   5. Scale of the amplitude (logarithmic or linear)
   6. Mode of the detector

   User can select a sweep time that is less than the auto-coupling value; however, this may cause some measurement errors. The minimum sweep time is 1ms.

2. **Sweep span is zero:**

   The minimum sweep time is determined by the maximum sampling rate of the analog-digital converter and the sweeping points.

   The minimum sweep time is 1us. The maximum scan time is 4000s.

   Sweeping Type Rule（Normal/Accuracy）: The sweep modes are divided into common sweeping and precise sweeping.

Common sweeping can get faster scanning speed, and precise sweeping is for high accuracy measurement.

Sweep(Single/Cont): Set the sweep mode to single and continuous, the default is continuous. The corresponding status at the top of the screen corresponding to the selected mode.

Cont: Set sweep mode to continuous sweep, the icon indicates continuous. The system automatically sends the trigger initialization signal and enters the trigger condition judgment directly after each sweep.

Single: Set sweep mode to single sweep, the icon indicates single window. Single backlight lights up after clicking "Single Window".

If the system is currently in single sweep mode and not in a measurement state, press "single" and perform the sweep when the trigger condition is met.
If the system is currently in single sweep mode and in the measurement state, press the "single" key and then perform the sweep and measurement when the trigger conditions are met.

Sweep Mode (Auto/Man) : Automatic, sweep frequency and FFT mode

1. Auto: The spectrum analyzer automatically selects the sweep mode or FFT mode according to the current resolution bandwidth, in order to achieve the fastest sweeping speed. When RBW is greater than to 10kHz, sweep mode is automatically selected; when RBW is less or equal than 10kHz, FFT mode is automatically selected.
2. Swept: Performed in a point-by-point sweep mode, it is suitable for large RBW.
3. FFT: Performed in parallel sweep mode, it is suitable for small RBW.

When TG is turned on, due to its frequency continuous output characteristics, it will be forced to switch to sweep mode.

Points: Set the count obtained for each scan, which is the number of points of the current trace. User can change the point value by using the numeric key or touch panel menu.

1. As the number of sweep points increases, the frequency resolution of the marker point increases, but the sweep speed decreases along with it.
2. Due to the limitation of interval time of minimum sweep point, the sweep time may become longer when sweep count increasing.
3. Changing the sweep count will affect several parameters of the system, so the system will be rescanned and measured.

Demod: Set the demodulation type to "AM" or "FM" or turn off the demodulation function. The default is "Off".

1. When AM (or FM) demodulation is turned on, the system will do AM(or FM) demodulation for that frequency point at the center frequency.
2. The machine is equipped with headphone jack, which can output the demodulation signal in audio mode through headphone. The audio frequency indicates the frequency of the modulating signal, and the audio strength indicates the amplitude of the modulating signal.

Trigger

Click the Trigger button under the panel menu to open the Trigger menu.

Trigger Type: Freedom trigger, external trigger and video trigger

1. **Free Run**: The trigger signal can be generated continuously at any time as long as the trigger conditions are met. No need to set trigger condition, after sweep each frame will sweep the next frame automatically.
2. **Video**: When the voltage of the detected video signal exceeds the setup video trigger level, a trigger signal is generated.

   Trigger Level: When the video trigger is selected, the trigger level line and the value of trigger level are displayed on the screen. User can change the trigger level by using the numeric key, rotary knob, direction key or touch panel menu.
3. **External**: Input an external signal via connector【TRIGGER IN】 on the rear panel, a trigger signal is generated when the signal meets the trigger edge conditions.

   Trigger Edge（Rising/Falling）: Set the trigger edge for external trigger to be the rising or falling edge of the pulse, a trigger signal is generated when the signal meets the trigger edge conditions.

   Trigger Delay: Set trigger delay time

Trace

Press **[Trace]** key to enter menu which can select and control trace information and detector. Each trace consists of a series of data points with amplitude information. With each sweeping, the spectrum analyzer will refresh information for every valid trace.

Select Trace: Select the required trace, there are 6 traces.

Trace Type: Set the type of the current selected trace. The system will display the scan data after taking the corresponding calculation method according to the selected trace type. The trace types

include refresh, trace averaging, maximum hold, and minimum hold. Each type has a corresponding parameter on the upper right side of the screen.

1. Clear/Write

   Take the real-time data after sweeping of each point of the trace.

2. Average

   Each point of the trace displays the result of averaging the data after multiple sweeps. As the time of average sweep increases, the waveform becomes smoother.

3. Max Hold

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

4. Min Hold

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

Detector: Set the detection mode of the current measurement and apply the detection mode to the current trace. Optional detector types includes sampling, peak, negative peak, normal detection, and average.

1. Sample

   For each point on the trace, the sampling shows the transient energy corresponding to a fixed time point (usually the first sampling point in this time period) in the corresponding time interval. Sampling applies to noisy or noise-like signals.

2. Peak

   For each point on the trace, peak detection shows the maximum value of the sampled data within the corresponding time interval.

3. Negative

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

4. Normal

   Normal detection selects the maximum and minimum values of the sampled data segment in turn to display, that is, for every odd number point on the trace line, the minimum value of the sampled data will be displayed. For every even number point on the trace line, the maximum value of the sampled data will be displayed.

   The range of amplitude variation can be observed intuitively by using normal detection.

5. Average

   For each data point, detector will take average value by sampling data in the time interval. The

average effect is different for different data types. The average type can set by **[Meas/Setup]** key.

Update（On/Off）：When the refresh is enabled, remove all the stored data in the selected trace and continuously displays any signals in sweep time. When the refresh is disabled, hold and display the amplitude data of the selected trace. The trace register will not refreshed with the sweep.

Display（On/Off）：Set the switch of the selected trace.

Math Function: Performs mathematical operations between traces or traces and a specified offset.

1. Off: Turn off the mathematical operation.
2. Power（A-B）：Calculating the power difference of operands A and B and stored it in the target trace. During the sweep, the following calculation is performed for each point:

   $$Trace=10\log\left(10^{A/10}-10^{B/10}\right).$$

   In the above formula, the parameter unit is the decibel value of logarithmic power. If the value of A point is the maximum trace value, then the difference result is also the maximum trace value; If the difference result is less than or equal to 0, the result is the minimum trace value.
3. Power（A+B）：Calculating the power sum of operands A and B and stored it the target trace. During the sweep, the following calculation is performed for each point:

   $$Trace=10\log\left(10^{A/10}+10^{B/10}\right).$$

   In the above formula, the parameter unit is the decibel value of logarithmic power. If the value of A or B point is the maximum trace value, then the sum result is also the maximum trace value.
4. Log（A-B+Offset）：With the logarithmic difference function, the operand A is subtracted the operand B and add the offset, and then store the result in the target trace. During the sweep, the following calculation is performed for each point:

   $$Trace=A-B+offset$$

   In the above formula, the unit of trace data is dBm.
5. Log（A+Offset）：calculating the sum of operand A and offset and store the result in the target trace. During the sweep, the following calculation is performed for each point:

   $$Trace=A+offset$$

   In the above formula, the unit of trace data is dBm.

Notes

Trace arithmetic functions are mutually exclusive, when an arithmetic function is applied to a trace, it will turn off the last selected arithmetic function.

Operand A: Set operation trace 1 in the operation function. Trace 1, trace 2, trace 3, trace 4, trace 5 and trace 6 are available for selection.

Operand B: Set operation trace 2 in the operation function. Trace 1, trace 2, trace 3, trace 4, trace 5 and trace 6 are available for selection.

Offset: Set logarithmic offset in the operation function, unit is dB. User can change the offset by using the numeric key, rotary knobs, direction key or touch panel menu.

Notes

For UTS3015T+ and UTS3032T+ ,only four traces are available.

For UTS3036T+ and UTS3084T+ ,six traces are available.

Marker

Press **[Marker]** key to access marker menu to select type and amount of marker. Marker is a rhombic icon, as shown in the Figure 4-1.

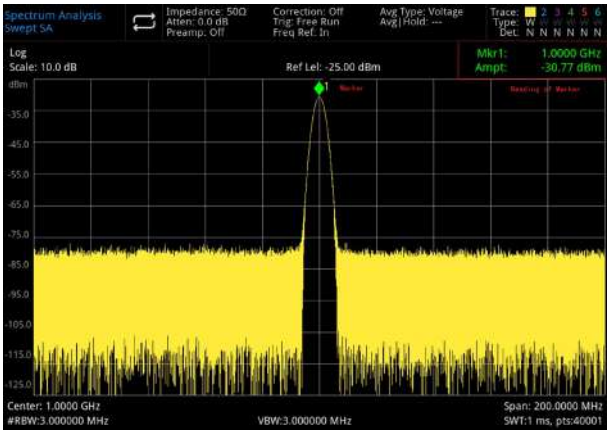

Figure 4-1 Reading of Marker Cursor

It can display 10 markers on the screen at the time, but each time can only control one or a pair of markers.

Select Marker: Select one of the ten cursors. The default is signed as marker 1. After selecting the cursor, it can set parameters such as the cursor type, the marked trace, and the reading mode. The currently open cursor will be marked on the trace selected by "Mark Trace", the current parameter area and upper right corner of the screen will display the current active cursor reading at the marker.

Marker Mode:

1. Normal: For measuring X (frequency or time) and Y (amplitude) values in a point of trace. After selecting normal, a cursor identified by the current cursor number will appear on the trace, such as "1", pay attention to the following points in using:

   If no activated cursor at the current, then activate a cursor at the center frequency of the

current trace.

The reading of the current cursor will display on the upper right of the screen.

The resolution of X-axis (time or frequency) reading is related to the sweep span, which can be reduced to achieve higher reading resolution.

2. Delta△:

   Used to measure the difference between "reference point" and a "point on the trace": X (frequency or time) and Y (amplitude) values.

   After selecting "Difference", a pair of cursors will appear on the trace: the reference cursor (marked with "×") and the difference cursor (marked with "△")

3. Fixed: After selecting "fixed" cursor, set the X and Y values of the cursor directly or indirectly, their positions remain unchanged. Y value does not change with the trace. The fixed cursor is generally used as the reference cursor of the difference cursor, and the fixed cursor is marked with "×".

4. Close: Turn off the selected cursor, the cursor information displayed on the screen and the related function will also be closed.

Mark Trace: Select the trace marked by the current cursor as Trace 1, Trace 2, Trace 3, Trace 4, Trace 5 or Trace 6.

Mark Frequency: Mark the frequency point on the trace. User can change the frequency value by using the numeric key, rotary knob, direction key or touch panel menu.

Relative To: For measuring the difference between two cursors and the two cursor can be marked on the different trace at the same time.

Properties: Scale selection, manual/automatic switch and mark line switch of X-axis.

1. X-Axis Scale: optional frequency, period, time, inverse time. The marker point reading changes the reading unit according to the X-axis scale.

   Frequency: When this type of reading is selected, "Normal" and "Fixed "cursor shows the absolute frequency.

   "Difference" cursor shows the frequency difference of difference cursor with respect to the reference cursor. In non-zero span mode, the default reading method is "Frequency".

   Period: When this type of reading is selected, "Normal" and "Fixed "cursor shows the reciprocal of the cursor frequency.

"Difference" cursor shows the reciprocal of the frequency difference. When the frequency difference is zero, then the reciprocal will be infinite and the reading show as "---".

Time: When this type of reading is selected, "Normal" and "Fixed "cursor shows the time difference between the cursor and sweep start.
"Difference" cursor shows the sweep time difference between the difference cursor and reference
cursor. In zero span mode, the default reading method is "Time".

Inverse Time: When this type of reading is selected, it shows the reciprocal of the sweep time difference between the difference cursor and reference cursor. When the time difference is zero, then the reciprocal will be infinite and the reading show as "---".

2. X-Axis Scale (Man/Auto): When X-axis scale is automatic, the sweep span is in zero span mode, and marker reading will change to "Time" automatically.

3. Lines (Off/On): turn on/off the mark line.
   When the mark line is turned on, the crossover line is displayed at the amplitude point indicated by the cursor, and the width of the horizontal line and the height of the vertical line are consistent with the length and height of the grid in the waveform display area.

If the cursor is not in the visible area, then extend the mark line to the display area. This function is useful for cursors outside the display area, the cursor extension line indicates the amplitude of the cursor, for observing the comparison.

Marker Function: Mark noise, power in-band and density in-band, N dB bandwidth point and frequency meter, frequency meter thresholds.

1. Mark Noise: Performing mark noise for the selected cursor, and then reads the normalized noise power density value at the cursor.
   If the current selected cursor is off in the Marker menu, press "Mark Noise" is automatically turned on to the "Normal" type. Then measuring the average noise level of frequency point at the cursor and normalized to the 1Hz bandwidth. Meanwhile, compensating for different detection methods and trace types. When using "RMS average" or "sampling" method, the noise cursor measurement is more accurate.
2. Band Power: In non-zero span mode, calculating the total power of the signal in a certain bandwidth. In zero span mode, calculating the average power in a certain time range.
3. Band Density: In non-zero span mode, the density in-band is the total power in the bandwidth to be measured divided by the measurement bandwidth. In zero span mode, the density in-band

is the measured power in-band divided by Bn (Bn refers to the noise bandwidth of the RBW filter).

4. N dB（on /off）: Turn on the N dB bandwidth measurement function, or set the value of N dB. N dB bandwidth refers to the frequency difference between two points where the current cursor frequency point is down (N<0) or up (N>0) of N dB amplitude to the left and right. User can change the value of N by using the numeric key, rotary knob, direction key or touch panel menu.
5. Counter（on/off）: Turn on the frequency counting function of the cursor. The cursor displays the precise frequency of the frequency point with the maximum energy. Enable the frequency meter will affect the scanning speed.
6. Counter Gate: Set the count time of the frequency meter.

All Markers Off: Close all the marker point.

Marker->: Use the value of the current cursor to set other system parameters of the spectrum analyzer (such as center frequency, reference level, etc.). If no cursor is available at the current, press Marker menu to activate a cursor automatically.

1. ->CF: Set the center frequency of the spectrum analyzer to the frequency of the current cursor.
   - When "Normal" cursor is selected, the center frequency is set to the frequency of the cursor.
   - When "Difference" cursor is selected, the center frequency is set to the frequency of the difference cursor.
   - In zero span mode, this function is not work.
2. ->CF Step: Set the stepped center frequency of the spectrum analyzer to the frequency of the current cursor.
   - When "Normal" cursor is selected, the stepped center frequency is set to the frequency of the cursor.
   - When "Difference" cursor is selected, the stepped center frequency is set to the frequency difference between the difference cursor and the reference cursor.
   - In zero span mode, this function is not work.
3. ->Start: Set the start frequency of the spectrum analyzer to the frequency of the current cursor.
   - When "Normal" cursor is selected, the start frequency is set to the frequency of the cursor.
   - When "Difference" cursor is selected, the start frequency is set to the frequency of the difference cursor.
   - In zero span mode, this function is not work.

4. ->Stop: Set the stop frequency of the spectrum analyzer to the frequency of the cursor.
   - When "Normal" cursor is selected, the stop frequency is set to the frequency of the current cursor.
   - When "Difference" cursor is selected, the stop frequency is set to the frequency of the difference cursor.
   - In zero span mode, this function is not work.
5. ->Ref Lvl: Set the reference level of the spectrum analyzer to the amplitude of the valid marker, and move the marker point to the reference level (top of the grid).
   - When "Normal" cursor is selected, set the marker amplitude of the spectrum analyzer to the amplitude of the current reference level.
   - When "Difference" cursor is selected, set reference level to the amplitude difference between markers.

Marker Table: Turn on/off marker Table

When the marker Table is opened, all open cursors are displayed as a Table in the window of the split screen. The display includes cursor number, marker mode, marked trace number, X-axis scale type, X-axis reading and amplitude. The cursor table can be used to view the measurement values of multiple measurement points.

Figure 4-2 Marker List

Peak

Press **[Peak]** key to access peak search menu and perform a peak search function.

Marker Frequency: The frequency point of the marker on the trace. User can change the frequency value by using the numeric key, rotary knob, direction key or touch panel menu.

Marker->: [Marker] key in the panel menu "Marker->".

PK Search: Use the normal cursor mode to search for the highest amplitude in the trace and display the frequency and amplitude value, then press peak search to perform it one time.

Next PK: Find the peak on the trace that is second only to the amplitude to the current peak and meets the search criteria, and mark it with the cursor. Without this peak, the marker will not move.

Next PK Left: Find the current peak on the left side and search the close peak that meet the search criteria on the trace, and mark it with the cursor.

Next PK Right: Find the current peak on the right side and search the close peak that meet the search criteria on the trace, and mark it with the cursor.

Min Pk: Find the minimum amplitude value on the trace and mark by the cursor.

Pk-Pk Search: Perform peak search and minimum search at the same time, the result of peak search marked with the reference cursor, the result of minimum search marked with the difference cursor.

Continue Peak Search（On/Off）: Turn on/off continuous peak search, the default setting is off. When continuous peak search is turned on, the spectrum analyzer automatically performs a peak search after each sweep, which is used to track the measuring signal.

Peak Table（On/Off）: Turn on/off peak Table, the default setting is off.
Turn on peak Table, a list of peaks that meet the search parameters (display frequency and amplitude) is displayed below the split screen window. Display 20 peaks at most that meet the criteria.

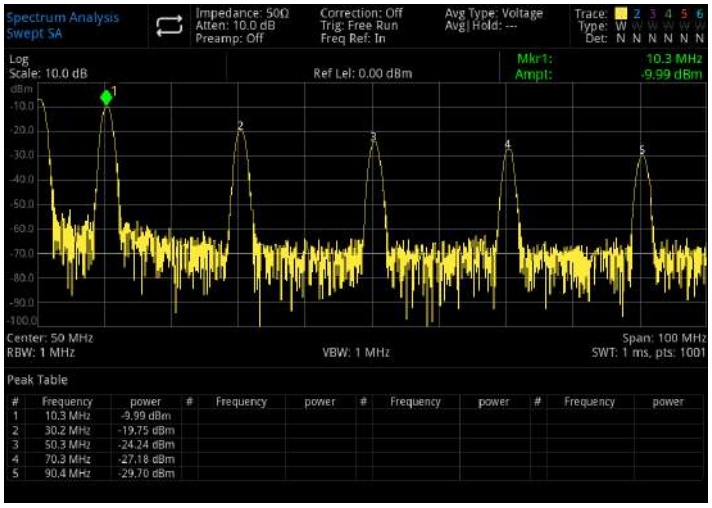

Figure 4-3 Peak List

Search Criteria: Threshold line, peak threshold and peak offset**.**

1. Threshold Line（On/Off）: Set whether to display the peak threshold and peak offset indicator line. The default setting is off.
2. Threshold（Man/Auto）: Specify the minimum of peak amplitude by manual or auto. Only peak greater than the peak threshold can be judged as the peak. User can change the threshold by using the number key, rotary knob, direction key or touch panel menu.
3. Excursion（Man/Auto）: Specify the difference between the peak and the minimum amplitude of the left and right side. The peak can be judged as the peak only the difference value is greater than the peak offset. User can change the threshold by using the number key, rotary knob, direction key or touch panel menu.

Save

Press **[Save]** key to access save menu, the types of files that can be saved in the instrument are state, trace + state, measurement data, limit, correction and Save. Long press this key to screenshot.

State: Press **State** panel menu to access state save menu. Save the state into the instrument.

1. Press **Save** key, the instrument will save the current state by the default file name or the input file name.
2. After the state file is selected, press **Recall** key to read the current state file.

Trace + State: Press **Trace + State** panel menu to access trace and state save menu. Save the instrument state and selected trace to a file.

Trace Selection: there are six traces for selection.

1. Press **Save** key, the instrument will save the current state and trace by the default file name or the input file name.
2. After the trace and state file is selected, press **Recall** key to read the current trace and state files.

Measurement Data: Press **Measurement Data** panel menu to access measurement data save menu. The selected measurement data type (such as trace, measurement result, peak list or cursor list) can be saved into the specified file. The instrument will save the corresponding data in csv (data separated by comma) format for data analysis by using Excel software.

Trace Selection: there are six traces for selection.

Data type: trace, peak list and marker list.

1. Press **Save** key, the instrument will save the current selected type of measurement data by the default file name or the input file name.
2. After the measurement data file is selected, press **Recall** key to read the current measurement data file.

Limit: Press **Limit panel** menu to access limit save menu. Save the limit line to a file.

Limit Selection: there are six limit data.

1. Press **Save** key, the instrument will save the current limit by the default file name or the input file name.
2. After the limit file is selected, press **Recall** key to read the current limit file.

Correction: Press **Correction** panel menu to access correction save menu. Save the selected correction data to a file.

Correction Selection: there are 10 correction data.

1. Press **Save** key, the instrument will save the current corrected data by the default file name or the input file name.
2. After the correction file is selected, press **Recall** key to read the current correction file.

Save: export he current selected file.

Recall: import the current selected file.（This key is hidden when no file is selected）.

System

Press **[System]** key to enter the setting menu, it can access the system information, basic setting and network setting of the spectrum analyzer.

Information: enter system information panel menu to check basic and option information.

1. Basic Information: manufacturer, product model, serial number, medium frequency hardware version number, radio frequency hardware version number, medium frequency logical version number, radio frequency logical version number, etc.
2. Option Information: check version number and state of the option.

Setting: enter the setting menu to set up the basic and network setting.

1. General

   Language: Chinese, English,German.

   Clock Format: 12-hour and 24-hour.

   Date/Time: touch this area to pop out the setting dialog box, swipe the numeric up and down to modify it. After the setting, touch "√" to confirm it and close the setting dialog box.

Picture Format: set the format of screenshot, it has bmp,jpeg and png for selection.

Power On: set the system parameter settings that are loaded after power on, it has default, last and preset for selection.

Backlight: swipe the scroll bar to change the backlight of the screen.

Volume: swipe the scroll bar to change the sound.

HDMI Output: HD multimedia interface, touch "□" to tick it, it indicates the interface is turned on.

Screenshot Inverse: Set the inverse color of screenshot.

User Preset: When the power-on parameter is set to preset, this configuration file will use to set the parameter when the instrument is turned on.

Shutdown Confirmation: after the shutdown confirmation box is selected, a confirmation dialog box will pop out.

2. Network

Adapter: that is LAN switch, touch "□"to tick it, it indicates the interface is enabled.

DHCP: touch "□" to tick it, it indicates automatic acquire the network configuration. If no tick it, it indicates manual setting.

IPv4 Address: the format of IP address is nnn.nnn.nnn.nnn, the first nnn range is 1 to 223, and the other three nnn range is 0 to 255. It is recommended to consult network administrator for an available IP address.

IP Mask: the format of subnet mask is nnn.nnn.nnn.nnn, nnn range is 0 to 255. It is recommended to consult network administrator for an available subnet mask address.

Gateway: the format of gateway is nnn.nnn.nnn.nnn, the first nnn range is 1 to 255, and the other three nnn range is 0 to 255. It is recommended to consult network administrator for an available gateway address.

MAC Address: physical address to confirm the location of a network device which is also called hardware address, the length is 48bits (6 bytes). It consists of hexadecimal digits, including the first 24 digits and the last 24 digits, in the format of XX-XX-XX-XX-XX-XX. The first 24 bits are called organization-unique identifiers, while the last 24 bits are assigned by the manufacturer and called extended identifiers.

3. Interface setup

Web Login User name: Set the user name for logging in to the browser. Web address, http://IP:9000, the IP for the network Settings of IPv4 addresses, such as: http://192.168.20.117:9000.

Web Login Password: Set the user name for logging in to the browser. After successful login, you can perform instrument control, SCPI command execution, network Settings and other operations on the browser.

4. Web Access

After Web user's name and password is set, user can use PC or mobile terminal Web browser to remote control the device. It mimics the clickable display function of the touchscreen/mouse, just like a physical instrument. The operation steps see as follow.

(1) Access Local Area Network

The computer and the oscilloscope should under the same LAN. Check the local IP address through the UTILITY menu of the spectrum analyzer, and then the browser accesses the spectrum analyzer by http://ip:9000 port.

Example:

Computer IP: 192.168.20.3

Spectrum Analyzer IP: 192.168.20.117

PC browser using 192.168.20.117:9000to access the spectrum analyzer, it can check the basic information and operate the instrument control, internet setting, password setting and SCPI control, as shown in Figure 4-4.

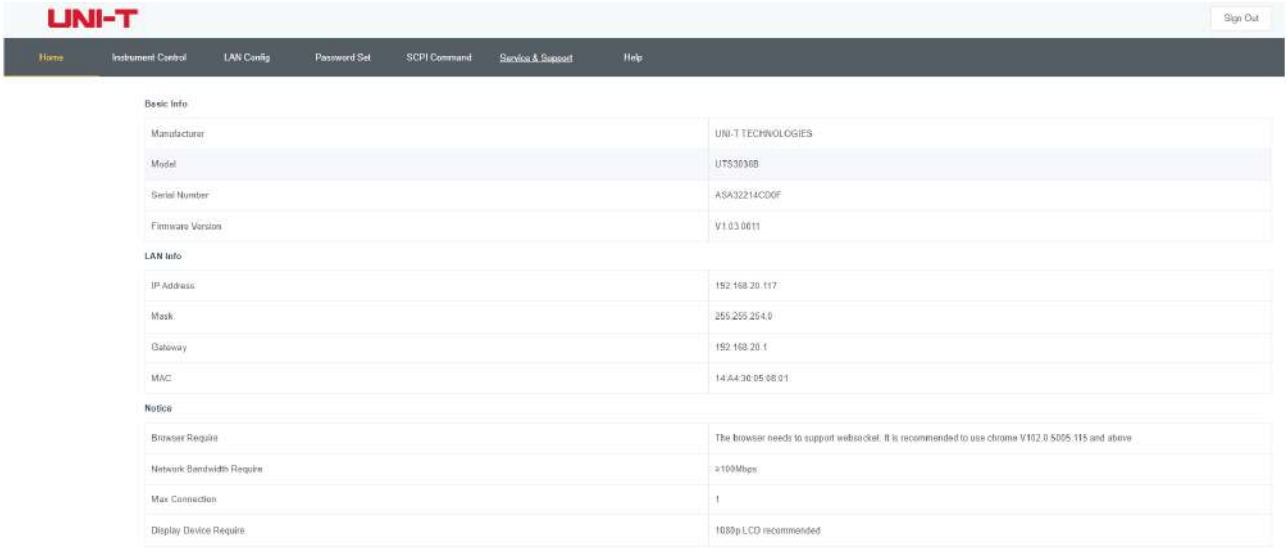

Figure 4-4 Web Basic Information

Log in to check the instrument setting, to operate the instrument control, internet setting, password setting and SCPI control. Web user name and password see Utility/System Information. After logging in, user can view and control the spectrum analyzer, as shown in Figure 4-5.

Figure 4-5 Web Instrument Control

The operation can be set in touch screen of a physical instrument, such as select the menu panel, click the function key, input number and character and drag the marker. And this Web page also can be operate and PrintScreen.

(2) Access Outer Network

a. The network cable should plug to the spectrum analyzer and the internet is available.

b. Turn on frp proxy service on the server.

c. Configure frp proxy service and IP port of the spectrum analyzer.

d. The browser can access the proxy port http://IP:web_port, and the access interface is consistent with the above.

Notes

This instrument uses frp intranet penetration way to access outer network. frp version is 0.34.0. This machine with frp-0.34.0 client port, it need use with the server, the server needs to open frp server, the client connects to the frp server port is 7000, so the server needs to configure bind_port = 7000.

(3) Network Setting

Modify the internet information and frp service of the spectrum analyzer as shown in Figure 4-6.

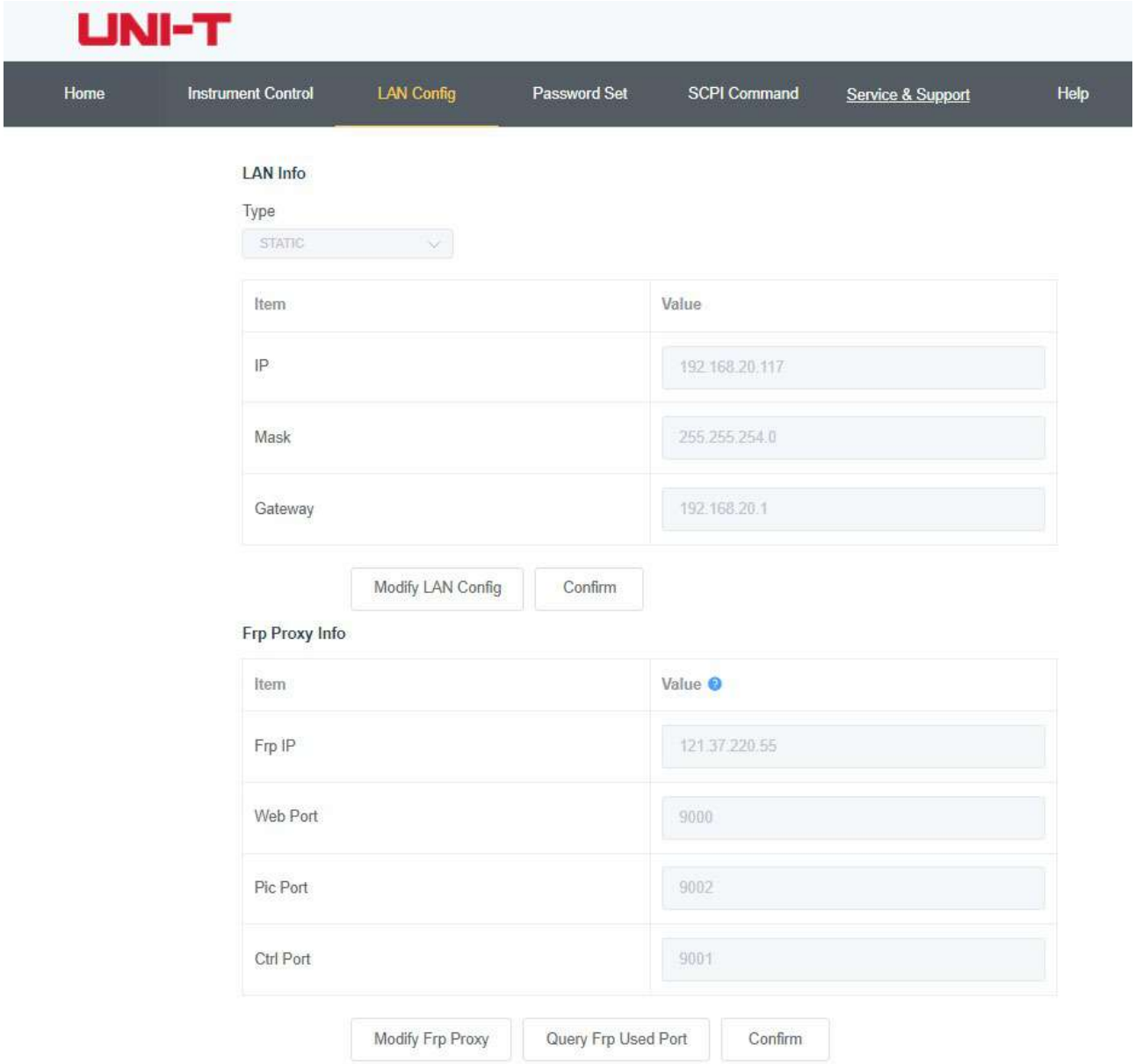

Figure 4-6 Web Setting

(4) Password Setting

Modify Web password of the spectrum analyzer as shown in Figure 4-7. The original password refers to physical instrument->System->Setting->Port Setting.

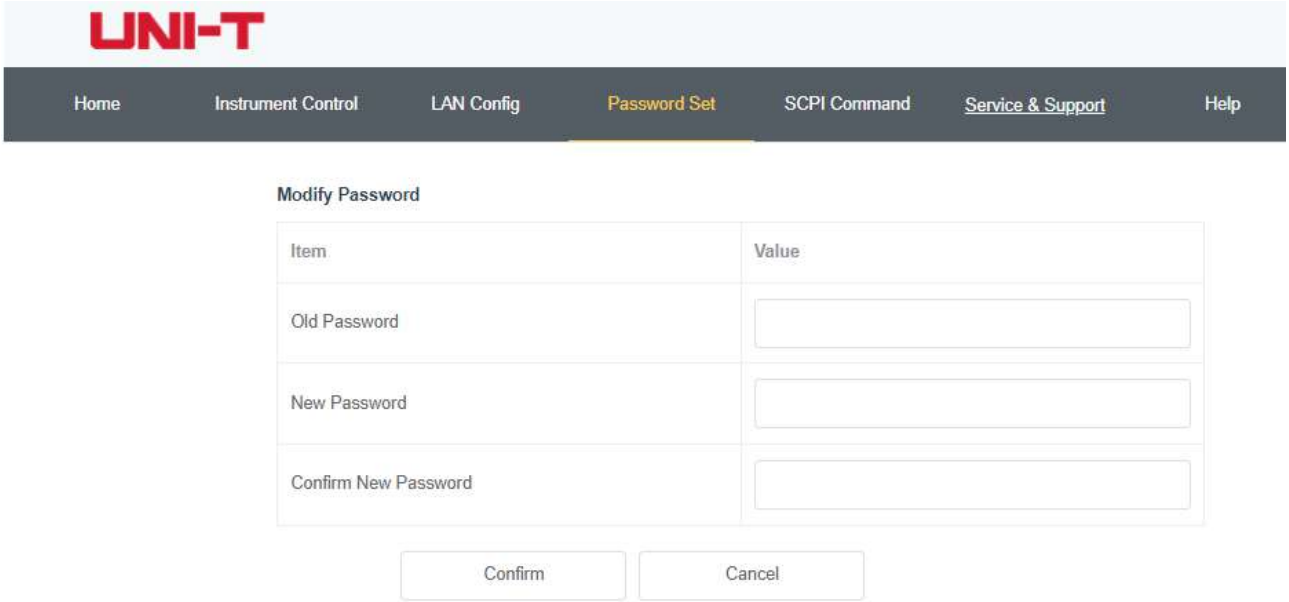

Figure 4-7 Web Password Setting

(5) SCPI

Executing SCPI as shown in Figure 4-8. Input the command in edit box and click Send key, the executed result will print to the following report frame.

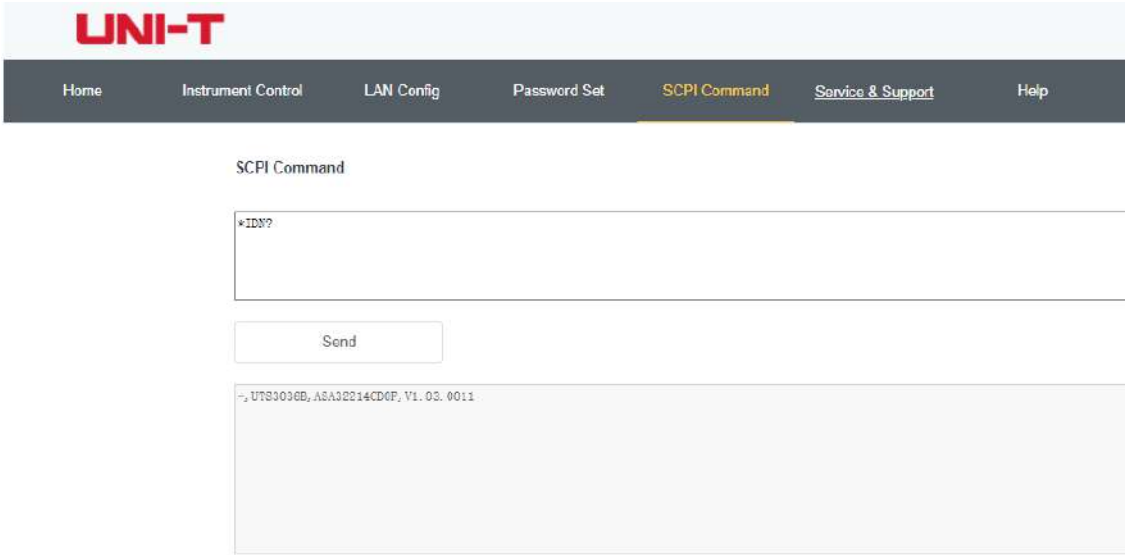

Figure 4-8 SCPI Control

Restore Defaults: enter restore default menu to perform this function.

1. Setup: Restore the system setting, the system setting of the spectrum analyzer will restore to the default state.
2. Data: Clear data, all the stored data of the spectrum analyzer will be delete.
3. All: Restore all the setting, all the setting of the spectrum analyzer will restore to the default state.

Default

Press **[Default]** key to provide a convenient start environment for measurement.

Press **[Default]**>restore to the factory setting,

1. Reset spectrum analyzer to Spectrum Analyzer (SA) mode.
2. Enter frequency menu.
3. Set the default parameter for some environment.
4. Perform processor test but not affect the correction data.
5. Delete the input and output caches and all trace data.
6. The amplitude values of traces 2, 3, 4, 5 and 6 are not displayed.
7. The amplitude correction factor is turned off but remains in the spectrum analyzer's memory.
8. The limit line test is turned off but the list of limit line remains in the spectrum analyzer's memory.
9. The state is directly set to 0.

The default values of key parameters after reset are as follows:

Belongs to the Menu	Parameter Name	Default Value
FREQ	Start Freq	10MHz
FREQ	Stop Freq	8.4GHz(biggest Freq)
FREQ	Freq Offset	0Hz
AMPT	Ref Level	0dBm
AMPT	Attenuation	Auto/10dB
AMPT	Preamplifier	Off
AMPT	Ref Level Offset	0dB
AMPT	Impedance	50Ω
BW	RBW	Auto/3MHz
BW	VBW	Auto/3MHz
Sweep	Sweep Time	Auto/2.6ms
Sweep	Sweep Mode	Auto/Swept
Sweep	Points	1001
Sweep	Trigger Type	Free Run
Trace	Select Trace	1
Trace	Trace Type	Clear/Write
Trace	Detector	Normal
Trace	Update	On
Trace	Display	On

Meas	Meas Type	Swept SA
Meas/Setup	Avg|Hold Number	100
Meas/Setup	Avg Type	Voltage

TG

Press **[TG]** key to enter tracking source panel menu.

Tracking source（on/off）: Turn on/off tracking source.

After the tracking source is turned on, **[TG]** key indicator on the front panel will light up, and the [Gen Output 50ω] connector on the front panel will output a signal with the same frequency as the current sweep signal. The power of the signal can be set through the menu.

Amplitude: Set the output power of the tracking source signal. User can change the amplitude value by using the number key, rotary knob, direction key or touch the panel menu.

Deviation: When there is a gain or loss between the output of the tracking source and an external device, this parameter is used to set the output power offset of the tracing source to display the actual power value of the system. User can change the offset by using the number key, rotary knob, direction key or touch the panel menu.

Normalization: turn on/off normalization. If the operation of saving the reference trace has not performed before turning on normalization, the spectrum will automatically save the reference trace when the current sweep frequency finished. When the normalization is enabled, the corresponding value of the reference trace is subtracted from the data after each sweep.

Reference level value: When the normalization is enabled, adjusting reference level value to change the vertical position of trace on the screen. The changing of this parameter will not affect the reference level value of the spectrum. User can change the reference level value by using numeric key, rotary knob, direction key or touch panel.

Reference trace: turn on/off the reference trace display.

Save reference trace: Open trace source, the reference trace can be saved when the first trace scanning is completed. After save the reference trace, it can execute the normalization. If the frequency is change when the normalization is executed, the reference trace should be save again.

Notes

This parameter does not change the actual output power of the tracking source, but only changes the power reading of the tracking source. The offset value can be positive or negative. A positive value corresponds to an external output gain, and a negative value corresponds to an external output loss.

Single

[Single] key which is the quick key of sweep mode. See Chapter 4 "Sweep" for more details.

Touch/Lock

[Touch/Lock] key, if indicator turns green, it presents the touch function is locked. If the indicator off, it presents the touch function is enabled. Press **[Esc]** to exit the lock screen.

Meas/Setup

Press **[Meas/Setup]** key to open the parameter setting panel menu corresponding to the measurement selected by the current **[Meas]** function key. It includes the following setting.

Avg|Hold Number: Set the average time of trace. User can change the average time by using the numeric key, rotary knob, direction key or touch the panel menu. Multiple averaging can reduce the influence of noise or other random signals, thus highlight the stable signal characteristics in the signal. The higher the average time, the smoother the trace.

Avg Type:

1. Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit; the average detection type will change to video detection.

   For random noise, logarithmic averaging = power averaging - 2.5 dB = voltage averaging - 1.45. Therefore, it reduces the displayed level of the noise (not the true level of the noise) and it is suitable for observing low-energy narrowband signals, especially those close to the noise.

2. Power averaging is to average the power of the signal (the square of the amplitude); the average detection type will change to RMS (power) detection. Power averaging is true power for noise. Power averaging is most suitable for measuring the real-time power of complex signals.

3. Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit; the average detection type will changed to voltage detection. The voltage averaging is still a linear display, which is suitable for observing the rise and fall of AM signals or pulse modulated signals (e.g., radar, TDMA transmitter).

Display Line（On/Off）: Set the display line level to change the display position. The display line is a reference horizontal line with an amplitude value equal to the set value, and the corresponding

amplitude unit is the same as the Y-axis unit. User can change the display line level by using the numeric key, rotary knob, direction key or touch the panel menu.

Notes

The display line is a reference horizontal line with an amplitude value equal to the set value, and the corresponding amplitude unit is the same as the Y-axis unit.

If the display line is outside the visible range, it is displayed at the top or bottom of the grid and indicated by direction.

Limits: Set the parameter of limit. Press **[Default]** key to turn off the limit value measurement function, but the limit value data is retained.

1. Select: select the current limit line, 6 limits can be selected, the default limit is 1.
2. Limit（On/Off）: Turn on/off the limit value line display. When the limit line is opened, the measurement interface displays the limit line, and the corresponding trace line will test according to the current limit line. Each limit line is shown in a different color.
3. Test Trace: set the trace for the current limit line test. The default trace is 1.
4. Margin（On/Off）: Turn on/off margin display. When the margin is opened, the margin line is displayed on the measurement interface. When it off, the margin is invalid.
5. Type（Upper/Lower）: Select the type of the current limit line as Upper or Lower. If the trace amplitude is greater than the upper limit amplitude or smaller than the lower limit amplitude, then the test is failed.
6. Edit limit: Press this key to enter the edit menu and open the limit line edit window. The current limit line is turned on, the peak table is turned off, and the trace corresponding to the limit line is turned on. This menu contains as follows,
   - Select: Select the limit line to be edit. The default limit value is 1.
   - Go To Row: Select the row of the limit value table.
   - Freq: Edit the frequency of the current point. User can change the display line level by using the numeric key, rotary knob, direction key or touch the panel menu.
   - Ampt: Edit the current amplitude of the current point. User can change the display line level by using the numeric key, rotary knob, direction key or touch the panel menu.
   - X Ofs: Set the frequency offset of the current limit value line.
   - Y Ofs: Set the amplitude offset of the current limit value line.
   - Apply Offsets: X offset and Y offset data to each point of the current limit line, and then reset the X offset and Y offset to 0.
   - Insert Row: Insert an editing point.
   - Delete Row: Delete the current selected.

- Delete Limit: Delete the current value line, the data of the current value line will be delete.

7. Test Limit（On/Off）: Turn on/off the current limit test.
8. Copy From Limit: Copy the limit line from the selected limit line.
9. Build From Trace: build the limit line from the selected trace.
10. Delete All Limits: after delete all limit lines, the data of all limit lines are cleared and restore to factory setting.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Meas

Press **[Meas]** key to perform the measurement of channel power, time domain power, occupied width, third-order intercept, adjacent channel power, spectrum monitor, carrier to noise ratio , harmonic component and Reflection Meas. See chapter 5 One-key Measurement for more details.

Mode

Mode includes spectrum analysis, vector signal analysis, EMI and analog demodulation; there are options that need to be activated separately. Please download the required instruction from the official website.

5. One-key Measurement

This chapter is to introduce how to use **[Meas]** key on the front panel (spectrum analysis mode).

Spectrum Sweeping

Press **[Meas] > Swept SA**

There are sweep analysis (frequency domain), FFT analysis (frequency domain), or zero span analysis (time domain) for measurement. After spectrum sweeping is selected, the advanced measurement function is disabled by default.

See "Chapter 4" for more details.

Press **[Meas/Setup]** key to set the parameter of spectrum analysis. This key can also set the measuring setting for other one-key measurement.

Channel Power

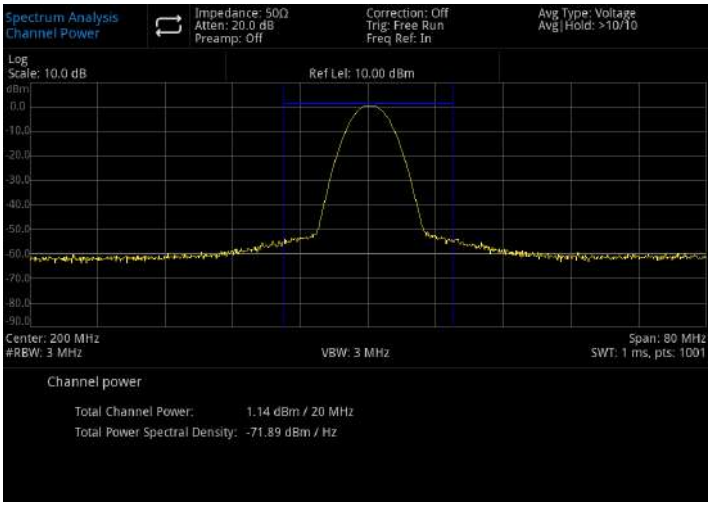

Figure 5-1 Channel Power

Power and power spectral density are measured in the channel bandwidth specified by the user. A pair of vertical lines on the display indicate the boundary of the channel bandwidth. The center frequency, reference level and channel bandwidth need to be set.

Press **[Meas] >Channel Power** to enter the following panel menu.

Meas/Setup

Avg|Hold Num (On/Off) : Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu.

Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.
When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Integ BW: Used to specify the range of integrals to calculating the power in a channel. For example, set the bandwidth of the main channel. Notice that the integral bandwidth is displayed in a blue box on the screen. In this case, the sweep span should be set between 1 and 10 times of the integral bandwidth. User can change the integral bandwidth by using the numeric key, rotary knob, direction key, or touch the panel menu.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Time Domain Power

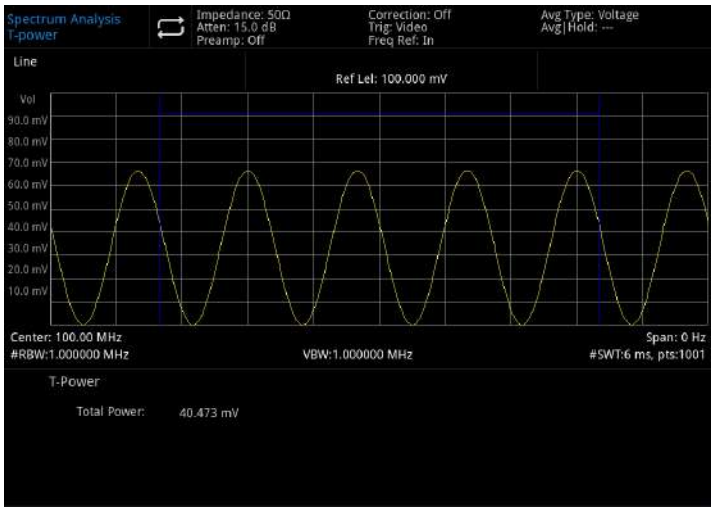

Figure 5-2 Time Domain Power

Press **[Meas] >T-power**, system will enter zero span mode and calculating the power in time domain. The setting menu as follows.

Meas/Setup:

AvglHold Num（On/Off）：Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

Start Time: Set the left boundary of the time domain power measurement in units of time. The time domain power measurement data are calculated from the start line to the end line. The default value is 0. User can change the left boundary by using the numeric key, rotary knob, direction key, or touch the panel menu.

Stop Time: Set the right boundary of the time domain power measurement in units of time. The time domain power measurement data are calculated from the start line to the end line. The default value is 0. User can change the left boundary by using the numeric key, rotary knob, direction key, or touch the panel menu.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Occupied Bandwidth

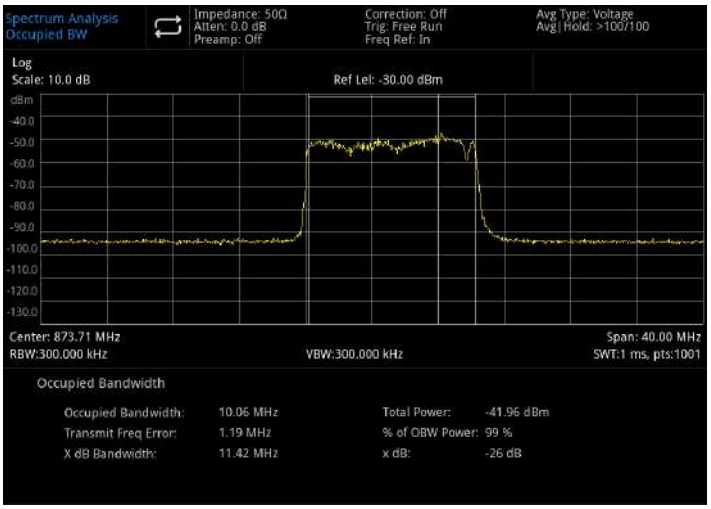

Figure 5-3 Occupied Bandwidth

The power of the spectrum shown on the screen will be calculated at first, and two marks are placed on the spectrum.

The percentage of the power between the two frequency indicated by the mark is specified by the user. The default percentage for testing is 99%. The power-bandwidth program calculates the power sum of all signals on the trace at first.

For 99% of the occupied power bandwidth, the markers are placed at the two frequency on the left and right, and the power between the two frequency accounts for 99% of the total spectrum power. The remaining 1% of the power is evenly distributed outside the marker. The frequency difference between the two markers are 99% power bandwidth and displayed on the screen.

The occupied bandwidth function can also be used to indicate the frequency difference between the center frequency of the spectrum analyzer and the center frequency of the channel. If the two boundary frequency of occupied bandwidth are expressed as F1 and F2 respectively, the transmitting frequency error is defined as the difference between (F1+F2) /2 and the center frequency of the spectrum analyzer.

Occupied bandwidth can be measured in single sweep mode or continuous sweep mode. User must set the center frequency, reference level and channel interval.

Press **[Meas] >Occupied BW** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num (On/Off) : Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring

average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

%of OBW Power: It can be used to change the percentage of signal power used in determining occupied bandwidth. User can change the percentage by using the numeric key, rotary knob, direction key, or touch the panel menu.

x dB: the number of dB that defines the highest point (P1) in the signal, for measuring the transmit bandwidth, the transmit bandwidth should within the span of OBW. This function is independent of the calculation of OBW.

The calculated result of XdB bandwidth is also called transmit bandwidth (EBW). A direction marker (F1 and F2) is placed at each of the two frequency of the left and right side of the highest point (P1). The amplitude of the two frequency is lower to dB number of the highest point（P1）, it should be the same with the dB value specified by the user. Calculating the total power between the two markers.

The frequency F1 and F2 are defined as the farthest frequency of xdB which higher and lower P1. The transmission bandwidth is the difference between F2-F1, the range is from -100.0 dB to -0.1dB. Users can change the xdB by using the numeric key, rotary knob, direction key, or touch the panel

menu.

Notes

The asterisk next to the xdB bandwidth value indicates that the result was not obtained under optimal setting of the spectrum analyzer. If your primary concern is transmit bandwidth, select maximum hold. Then Press **[Trace]**>Detector>Peak Detection. The obtained peak data will ensure the accuracy of the transmission bandwidth measurement.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Third-order Intercept

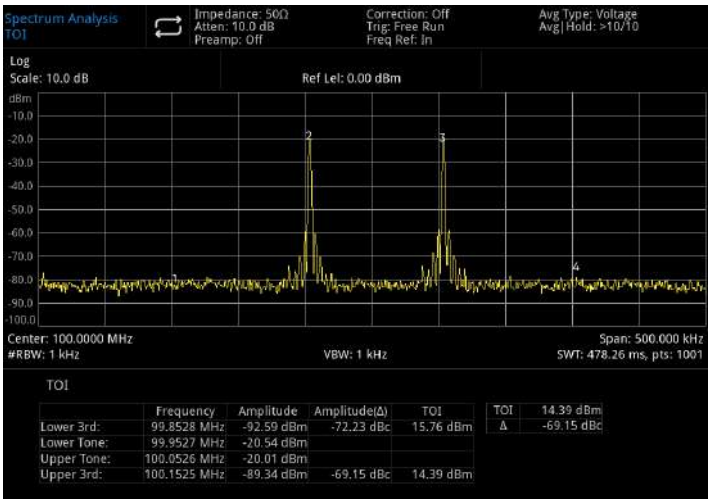

Figure 5-4 TOI

Third-order intermodulation (TOI) measurement is used to calculate and display the output cutoff (IP3), and placed direction marker on a trace to indicate the direction of the measured signal and third-order product.

Press **[Meas] > TOI** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num（On/Off）：Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the

average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Adjacent Channel Power

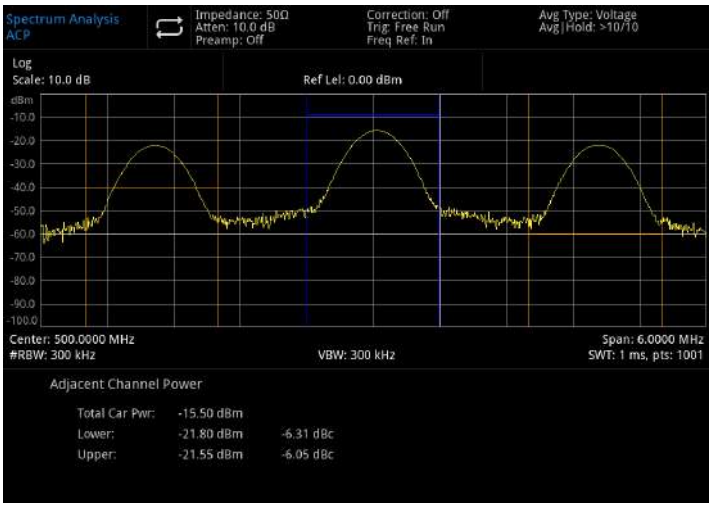

Figure 5-5 Measurement of Adjacent Channel Power

Measuring the main channel power, the power of previous channel and the last channel.
Set a main channel and adjacent channel on the left and right side, the main channel is centered on the central frequency point, and the left and right adjacent channels are symmetric with respect to the main channel.
Channel parameter can be changed by setting the bandwidth of the main channel and the adjacent channel, and the adjacent channel spacing (the distance between the adjacent channel and the main channel).

Press **[Meas] > ACP** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num (On/Off) : Press average time (on) to specify the average number of sweep to

calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

Noise BW: Set the bandwidth of the main channel. The power is integral within the bandwidth of the main channel (default value: 2MHz). User can change the carrier bandwidth by using the numeric key, rotary knob, direction key, or touch the panel menu.

Integ BW: Set the frequency bandwidth of the adjacent channel. The adjacent channel bandwidth is linked with the frequency bandwidth. Users can change the adjacent channel bandwidth by the numeric key, rotary knob, direction key, or touch the panel menu.

Offset Freq: The center frequency spacing between the main channel and the adjacent channel. Adjusting the channel spacing will adjust the distance among the previous channel, the next channel and the main channel at the same time. Users can change the adjacent channel spacing by the numeric key, rotary knob, direction key, or touch the panel menu.

Offset Side: Specifies which offset side to measure.NEG,Negative (lower) sideband only.POS,Positive (upper) sideband only.Both,Both of the negative (lower) and positive (upper) sidebands.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Spectrum Monitor

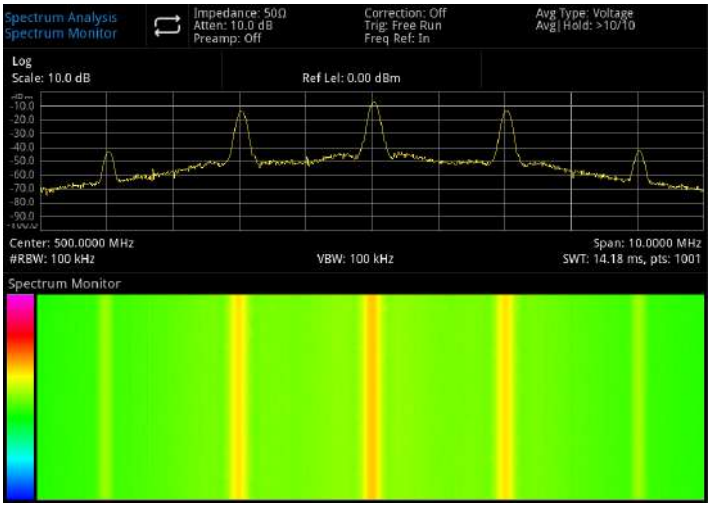

Figure 5-6 Spectrum Monitoring

Horizontal axis is frequency, vertical axis is time, and color presents the energy size of spectrum. It is used to detect the intermittent occurrence of the spectrum, and the spectrum monitoring can observe the change of the signal in a period of time.

Press **[Meas] >Spectrum Monitor** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num（On/Off）：Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old

data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Carrier to Noise Ratio

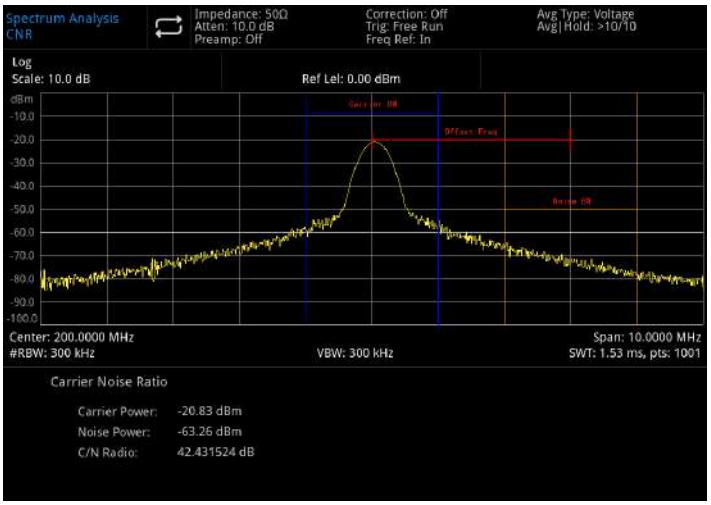

Figure 5-7 Measurement of Carrier-to-Noise Ratio

Measurement of Carrier-to-Noise Ratio: carrier power, noise power and carrier-to-noise-ratio. Search for the maximum positive peak f1 as the carrier within the screen range, calculating the power within the carrier bandwidth centered at f1, take it as the carrier power. Set frequency offset to make no carrier signal in the noise bandwidth.

Calculating the power within the noise bandwidth centered on f1 + frequency offset, take it as noise power. Divide the carrier power by the noise power, the result is the carrier-to-noise ratio.

Press **[Meas] >CNR** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num (On/Off) : Press average time (on) to specify the average number of sweep to

calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

Carrier BW: Set the bandwidth of the carrier to be measured. The carrier bandwidth is linked with sweep width, noise bandwidth and frequency offset. User can change the carrier bandwidth by using the numeric key, rotary knob, direction key, or touch the panel menu.

Noise BW: Set the bandwidth of the noise to be measured. The noise bandwidth is linked with sweep width, noise bandwidth and frequency offset. User can change the noise bandwidth by using the numeric key, rotary knob, direction key, or touch the panel menu.

Offset Freq: Set the difference between the center frequency of carrier and the noise. The frequency offset is linked with the sweep, carrier bandwidth and noise bandwidth. Users can change the frequency offset by using the numeric key, rotary knob, direction key, or touch the panel menu.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Harmonics

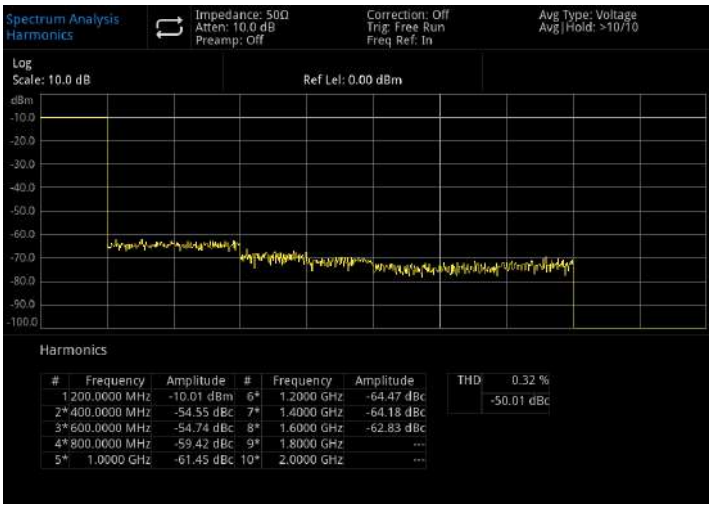

Figure 5-8 Harmonic Measurement

Harmonic Measurement: The amplitude of each sub-harmonic and the total harmonic distortion of the carrier signal, which can be measured up to 10 harmonics.

THD is the total harmonic distortion.

The harmonic analysis waveform is displayed as zero-sweep waveform of each harmonic, and all keys under the **[FREQ]** menu are blocked.

Press **[Meas] >Harmonics** to enter the following panel menu.

Meas/Setup:

Avg|Hold Num（On/Off）：Press average time (on) to specify the average number of sweep to calculating the measurement results. Sweep time range is from 1 to 999. User can change the average time by using the numeric key, rotary knob, direction key, or touch the panel menu. Measured average result will be displayed after the sweeping. Select (off) to turn off this measuring average function.

Avg Mode（Exponential/Repeat）：Switch between exponential and repetition average mode. When the specified average time of sweep is reached, this average mode is used to determine the average operation mode of the spectrum analyzer.

When the exponential average mode is selected, after a specified average time is reached, each channel trace data is weighted exponentially, added to the previous average value and then take the average. In the exponential average mode, the weight of the new data is larger than that of the old data, which is conducive to track signals that change slowly. Measured average result will be displayed after the sweeping.

When the repetition average mode is selected, after a specified average time is reached, all the

previous data will be delete and restart the sweeping.

Avg Type: Log-Pwr averaging is to average the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit, the average detection type will change to video detection. Power averaging is to average the power of the signal (the square of the amplitude),the average detection type will change to RMS (power) detection.Voltage averaging is to average the voltage values of the signal envelope measured in a signal collection unit, the average detection type will changed to voltage detection, The voltage averaging is still a linear display.

Fundamental: Set the frequency of the measured carrier signal.
User can change the frequency of basic harmonic by using the numeric key, rotary knob, direction key, or touch the panel menu. By default, other harmonic measurements will be test at multiples of the specified fundamental frequency.

Harmonics: Set the harmonic time of the measured carrier to calculate the total harmonic. User can change the harmonic time by using the numeric key, rotary knob, direction key, or touch the panel menu.

Dwell Time: Sets the dwell time for the specified harmonic. In zero-span, the auto mode strikes a balance between measurement speed and accuracy; increasing the dwell time will reduce measurement speed while increasing accuracy. User can change the dwell time by using the numeric key, rotary knob, direction key, or touch the panel menu.

Meas Preset: Reset Meas/Setup parameters of the current measuring mode to factory setting.

Reflection Meas

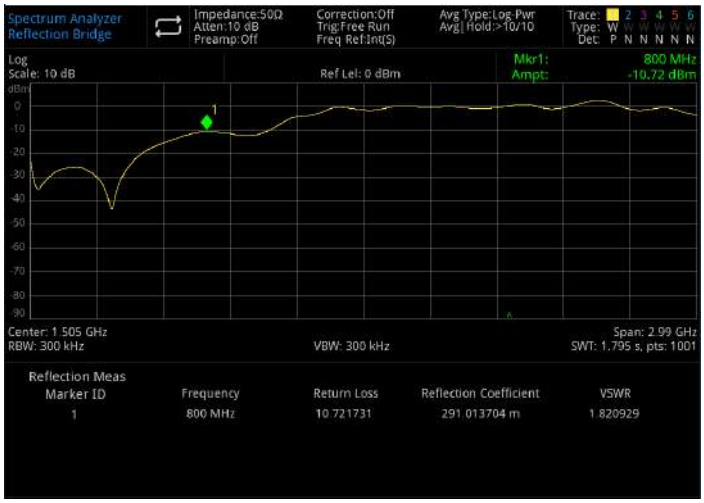

Figure 5-9: Reflection Meas

It is used to measure the S11 related indicators such as return loss, reflection coefficient and standing wave ratio of the tested equipment. After the measurement is completed, select a point on the trace and open the mark. The reflection measurement results will show the frequency of the mark, and the corresponding return loss, reflection coefficient, and voltage standing wave ratio measurement results.

This feature is optional for the UTS3000T+ series and requires the use of a VSWR bridge and a tracking source. This functionality is only available if the spectrum analyzer already has the VSWR measurement kit, VSWR bridge, and tracking source options installed. At the same time as turning on the reflection measurement, the tracking source is turned on and the TG backlight is lit.

Before the measuring device, two double N(positive) converters are used to connect the output end of the tracking source of the spectrum meter and the IN end of the bridge, and the RF input end of the spectrum meter and the OUT end of the bridge respectively. After the calibration is completed, the device under test is connected, the device under test is connected to the DUT end of the bridge, and then the measurement results are observed.

Press **[Meas] > Reflection Measurement** to enter the following panel menu.

Meas/Setup:

Reflection Meas (on/off) : Turns on or off the reflection measurement function.

Ref Value: Adjust the level reference value to adjust the vertical position of the trace on the screen. Changing this parameter does not affect the reference level value of the spectrometer. The user can change the level reference value by number keys, knobs, arrow keys, or touch panel menus.

Calibration: Open circuit calibration is required before accessing the device under test.

6. System Prompt and Troubleshooting

System Prompt

All the operating mode parameter setting are invalid, use the default value.

Name	Minimum	Maximum
Center Frequency	50Hz	8.409999950GHz
Span	Zero span	Full span
Start Freq	0Hz	8.409999900GHz
Stop Freq	100Hz	8.41GHz
Freq Offset	-100GHz	100GHz
CF Step	1Hz	8.41GHz
Ref Level	-100 dBm	30 dBm
Attenuation	0 dB	51 dB
Scale/Div	0.1dB	20dB
Ref Level Offset	-327.6dB	327.6dB
RBW	1Hz	3MHz
VBW	1Hz	3MHz
VBW:3dB RBW	0.000001	3000000
Sweep Time	1 ms	4 ks
Points	11	40001
Trace Operation Offset	-100dB	100dB
Band Span	0Hz	16.82GHz
N dB	-140dB	-0.01dB
Peak Threshold	-200dBm	30dBm
Peak Excursion	0dBm	100dBm
Avg|Hold Number	1	999
Display Line	-200dBm	30dBm
Integ BW	100Hz	8.4GHz
Start Time	0s	10ms
Stop Time	0s	10ms
%OBW Power	10%	99.99%
x dB	-100dB	-0.1dB
Noise BW (ACP)	100Hz	8.41GHz
Integral BW (ACP)	100Hz	8.41GHz

Offset Freq (ACP)	0Hz	4.204999950GHz
Carrier BW (CNR)	100Hz	8.409999800GHz
Noise BW (CNR)	100Hz	4.404999950GHz
Offset Freq (CNR)	100Hz	4.404999950GHz
Fundamental	100Hz	4.200000000GHz
Harmonics	2	10

Troubleshooting

This chapter lists the possible faults and troubleshooting methods of the spectrum analyzer. Please follow the corresponding steps to handle it, if these methods is not work, please contact UNI-T and provide your machine.

Device information (acquisition method: **[System] >Information**)

1. After press the power soft switch, the spectrum analyzer still display a blank screen, and nothing is displayed.
   a. Check whether the power connector is properly connected and the power switch is turned on.
   b. Check whether the power supply meets the requirements.
   c. Check whether the fuse of the machine is installed or blown.
2. Press the power switch, if the spectrum analyzer still display blank screen and nothing is displayed.
   a. Check the fan. If the fan rotates but the screen is off, the cable to the screen may be loose.
   b. Check the fan. If the fan does not rotate and the screen is off, it presents the instrument is not enabled.
   c. In case of the above faults, do not disassemble the instrument by yourself. Please contact UNI-T immediately.
3. Spectral line is not updated for a long time.
   a. Check whether the current trace is in update state or multiple averaging state.
   b. Check whether the current is meet the restriction conditions. Check the restriction settings and whether there are restriction signals.
   c. In case of the above faults, do not disassemble the instrument by yourself. Please contact UNI-T immediately.
   d. Check whether the current mode is in the single sweep state.
   e. Check whether the current sweep time is too long.
   f. Check whether the demodulation time of the demodulation listening function is too long.

g. Check whether the EMI measurement mode is not sweeping.

4. The measurement results are incorrect or not accurate enough.

Users can obtain detailed descriptions of technical index from the back of this manual to calculate system errors and check measurement results and accuracy problems. To achieve the performance listed in this manual, you need:

a. Check whether external device is properly connected and work.

b. Have a certain understanding of the measured signal and set appropriate parameters for the instrument.

c. Measurement should be performed under certain conditions, such as preheating for a period of time after starting up, specific working environment temperature, etc.

d. Calibrate the instrument regularly to compensate for measurement errors caused by instrument aging.

If you need calibrate the instrument after the guarantee calibration period. Please contact UNI-T company or obtain paid service from authorized measurement institutions.

7. Appendix

Maintenance and Cleaning

(1) General Maintenance

Keep the instrument away from the direct sunlight.

Caution

Keep sprays, liquids and solvents away from the instrument or probe to avoid damaging the instrument or probe.

(2) Cleaning

Check the instrument frequently according to the operating condition. Follow these steps to c clean the external surface of the instrument:

a. Please use a soft cloth to wipe the dust outside the instrument.

b. When cleaning the LCD screen, please pay attention and protect the transparent LCD screen.

c. When cleaning the dust screen, use a screwdriver to remove the screws of the dust cover and then remove the dust screen. After cleaning, install the dust screen in sequence.

d. Please disconnect the power supply, then wipe the instrument with a damp but not dripping soft cloth. Do not use any abrasive chemical cleaning agent on the instrument or probes.

Warning

Please confirm that the instrument is completely dry before use, to avoid electrical shorts or even personal injury caused by moisture.

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