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User's Manual

UTS3000A Series Signal Analyzer

This manual is for:
UTS3000A series

V1.0

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Foreword

Dear User,

Hello! Thank you for choosing this brand new UNI-T instrument. In order to use this instrument safely and correctly, please read this manual thoroughly, especially the Safety Requirements part. After reading this manual, it is recommended to keep the manual at an easily accessible place, preferably close to the device, for future reference.

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The "customer" refers to the individual or entity that is declared in the guarantee. In order to obtain the warranty service, "customer" must inform the defects within the applicable warranty period to UNI-T, and perform appropriate arrangements for the warranty service.

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This warranty shall not apply to any defects or damages caused by accidental, machine parts' wear and tear, improper use, and improper or lack of maintenance. UNI-T under the provisions of this warranty has no obligation to provide the following services:

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b) Any repair damage caused by improper use or connection to an incompatible device.

c) Any damage or malfunction caused by the use of a power source which does not conform to the requirements of this manual.

d) Any maintenance on altered or integrated products (if such alteration or integration leads to an increase in time or difficulty of product maintenance).

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1. Product Overview

- UTS3000A
- Front Panel
- User Interface
- Rear Panel

This chapter introduces the main functions and features of UTS3000A signal analyzer and provides a brief overview the keys and icons on the front panel and rear panels.

Overview of UTS3000A

UTS3000A is a swept signal analyzer with a frequency range of 9 kHz to 8.4 GHz. It serves as a primary instrument for setting up automatic control systems. This instrument is also suitable for various test and application needs within functional, terminal, and QA test systems required in the electronics manufacturing industry.

Main Function and Features

- Frequency range: 9 kHz to 8.4 GHz (Max.)
- Displayed average noise level (DANL): -165 dBm/Hz (Typ.)
- Phase noise < -100 dBc/Hz (Offset phase noise: 10 kHz, Typ.)
- Full amplitude accuracy < 0.7 dB
- Sweep Points Up to 40,001
- Minimum resolution bandwidth (RBW): 1 Hz
- Supports tracking generator output and vector network Analysis
- Real-time spectrum Analysis mode provides display methods for both probability density spectrum and spectrum, allowing real-time visualization of measured results
- Various trigger mode and trigger template
- 10.1-inch 1280 × 800 multi-touch HD screen
- Supports SCPI (Standard Commands for Programmable Instruments)

Front Panel

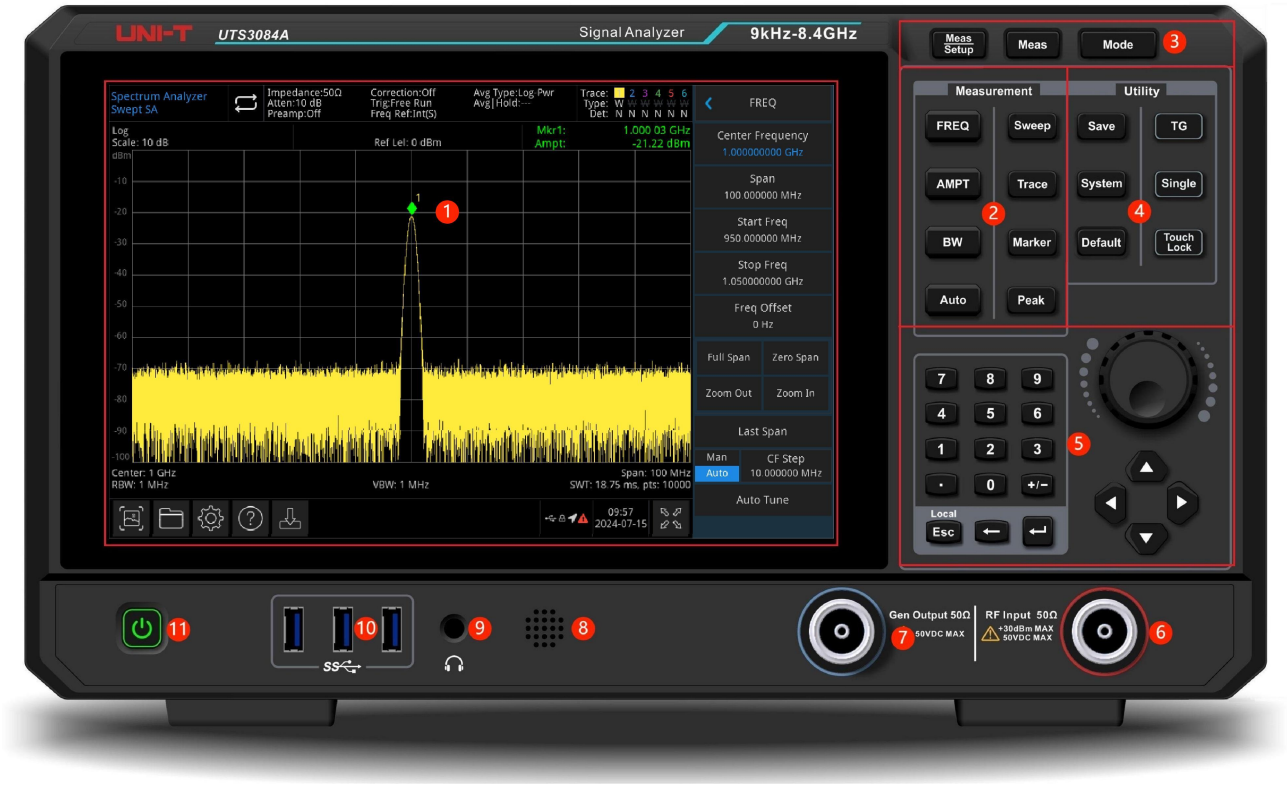


Figure 1-1 Front Panel

1. **Display Screen**: Display area supports touch control
2. **Measurement:** The main functions to active the signal analyzer, including:
   - **FREQ (Frequency):** Press this key to enable the center frequency function and enter the frequency setting menu.
   - **AMPT (Amplitude):** Press this key to enable the reference level function and enter the amplitude setting menu.
   - **BW (Bandwidth):** Press this key to enable the resolution bandwidth function and enter the resolution bandwidth (RBW) and video bandwidth (VBW) setting menus.
   - **Auto (Automatic Tuning):** Press this key to automatically search for the signal and place it at the center of the screen.
   - **Sweep (Sweep/Trigger):** Press this key to access the sweep time setting to select the sweep mode, trigger type, and demodulation type setting menus.
   - **Trace:** Press this key to access the trace, detection mode, and trace operation setting menus.
   - **Marker:** Press this key to select number, type, attribute, tag function, and list of the marker, as well as control the marker display.
   - **Peak:** Press this key to place a marker at the amplitude peak of the signal and control the marker to perform its functions.

3. **Advanced Functional Key:** Press this key to active the advanced measurement functions, including:
   - **Meas/Setup (Measurement Setup):** Press this key to set average/hold time, average type, display line, and limit value.
   - **Meas (Advanced Measurement):** Press this key to access the transmitter power function menu, which includes options such as adjacent channel, occupied bandwidth, and harmonic distortion.
   - **Mode:** Press this key to select the measurement mode for the signal analyzer.
4. **Utility (Functional Key):** The main functions to active the signal analyzer, including:
   - **Save (File store):** Press this key to access the save setting menu. The instrument can save these file types: state, trace line + state, measurement data, limit value, correction, and export.
   - **System (System Information):** Press this key to access the system menu and browse the settings.
   - **Default:** Press this key to reset the signal analyzer to its default settings.
   - **TG (Tracking Generator):** Press this key to access the tracking generator output terminal setting menus, including the amplitude and the amplitude offset for tracking generator signal. The key indicator will light up when this function is enabled.
   - **Single:** Press this key to perform a single sweep. Press this key again to cancel the single sweep, and return to continuous sweep mode.
   - **Touch/Lock:** Press this key to enable the touch screen function. The key indicator will light up in green when this function is enabled.
5. **Data Input Key:** Arrows key, rotary knob, and numeric keypad are used to adjust the numerical values such as center frequency, start frequency, resolution bandwidth, and marker position.

   Note

   Esc Key: If the instrument is in remote control mode, press this key to return to local mode.
6. **RF input 50 Ω:** This terminal is used to connect the external input signal, with an input resistance of 50 Ω (N-Female connector).

   WARNING

   Loading a signal that does not meet the rated value at the input port is prohibited. Ensure that the probe or any connected accessories are properly grounded to avoid equipment damage or abnormal function. The RF IN port can only tolerate an input signal power of up to +30 dBm or a DC voltage of 50 V.

7. **TG SOURCE (Gen Output 50 Ω):** This N-Female connector serves as the source output for the built-in tracking generator, with an input resistance of 50 Ω.

   WARNING

   Loading input signals on the output port is prohibited to prevent damage or abnormal function.

8. **Loudspeaker:** Used to play the analog demodulation signal and issue warning alerts.
9. **Headphone Jack:** 3.5 mm
10. **USB Interface:** Used to connect an external USB flash drive for storage or to connect a keyboard and mouse.
11. **ON/OFF Switch:** Short press this key to active the signal analyzer. In on-state, short press this key to enter standby mode, and all functions will be turned off.

User Interface

Figure 1-2 User's Interface

1. **Operating Mode**: Signal analysis, vector signal analysis, EMI, and analog demodulation.
2. **Sweep/Measurement**: Tap switch icon to quickly step through the sweep mode, either single or continuous.
3. **Measurement Bar**: Displays measurement settings (input impedance, input attenuation, preset, correction, trigger type, reference frequency, average type, and average/hold). Tap the icon to switch quickly.
4. **Trace Indicator**: Displays the trace line and detector information (trace number, trace type,

and detector type).

Note

The first line displays the number of the trace line; the color of the number and the trace should be the same. The second line displays the corresponding trace type, which includes W (Refresh), A (Trace Average), M (Max Hold), and m (Min Hold). The third line displays the detector type, including S (Sample Detection), P (Peak), p (Negative Peak), N (Normal Detection), A (Average), and f (Trace Operation). Detection types are displayed in white letters.

Tap screen's icon to switch quickly. The definitions of different letters are as follows:

- Letter in highlighted white: Indicates the trace is being update.
- Letter in grey: Indicates the trace is not being update.
- Letter in grey with strikethrough: Indicates the trace will not be updated and displayed.
- Letter in highlighted white with strikethrough: Indicates the trace is being updated but not displayed; this is useful for trace mathematical operations.

5. **Scale**: Scale value and scale type (logarithm, linear). The scale value in linear mode cannot be changed.
6. **Reference Level**: Reference level value and reference level offset value.
7. **Cursor Measurement Result**: Displays the cursor measurement results (frequency, amplitude). In zero span mode, it displays time.
8. **Panel Menu**: Displays menu and functions for the functional keys: frequency, amplitude, bandwidth, trace, and marker.
9. **Grid**: Displays trace, marker point, video trigger level line, display line, threshold line, cursor line, and peak list.
10. **Data**: Displays center frequency value, span, start frequency, stop frequency, frequency offset, RBW, VBW, sweep time, and sweep points.
11. **Function Setting**: Quick screenshot, file management system, system information, help system, and file storage.
    - Quick Screenshot : Screenshots will be saved in the default file. If there is external storage, it will be preferentially saved to the external storage.
    - File Management System : Save corrections, limit values, measurement results, screenshots, traces, states, or other files into internal or external storage, and these settings can be recalled.
    - System Information : Browse the basic information and optional information.
    - Help System : Help navigation.
    - File Storage : Import or export state, trace + state, measurement data, limit values, and

corrections.

12. **System Log Dialog Box**: Click the blank area on the right of the file storage to view the instrument's operation log, alerts, and prompts.
13. **Connection**: Displays the connection state of mouse, USB and screen lock.
14. **Date and Time**: Displays the current date and time.
15. **Full Screen Switch**: Toggle full screen on or off. ON: the screen is stretched horizontally, and the key on the right side will be hidden automatically.

Rear Panel

Figure 1-3 Rear Panel

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

WARNING

Loading a signal that does not meet the rated value at the input port is prohibited. Ensure that the probe or any connected accessories are properly grounded to avoid

equipment damage or abnormal function.

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

   WARNING

   Loading input signals on the output port is prohibited to prevent damage or abnormal function.

3. **Trigger IN:** If the signal analyzer uses an external trigger, the connector receives the rising or falling edge of an external trigger signal. The external trigger signal is fed into the signal analyzer via a BNC cable.

   WARNING

   Loading a signal that does not meet the rated value at the input port is prohibited. Ensure that the probe or any connected accessories are properly 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 and connection of the instrument.
6. **USB Device Interface:** The signal analyzer can use this interface to connect to a PC, allowing remote control via software on the computer.
7. **Power Switch ON/OFF:** When the switch is enabled, the signal analyzer enters standby mode, and the indicator on the front panel lights up.
8. **Power Input Socket:** For connecting the signal analyzer to a power source.
9. **Burglar-Proof Lock Slot:** Protects the instrument from theft. Lock not included.
10. **Handle:** Easy to move the signal analyzer.
11. **Dustproof Cover:** Remove the dustproof cover to clean off any dust.

2. User Guide

- Inspect Packing List
- Safety Instruction
- Environmental Requirements
- Connecting Power Supply
- Electrostatic Protection
- Preparation Work
- Usage Tip
- Touch Operation
- Remote Control
- Help Information
- Operation Mode

This chapter introduces the safety instructions and basic information about using the signal analyzer.

Inspect Packing List

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

- Inspect the packaging box for any damage or scratches caused by external forces, and check the instrument's appearance for any damage. If you have any questions or issues with the product, please contact the distributor or local office.
- Carefully take out the goods and check them against the packing list.

Safety Instruction

This chapter contains information and warnings that must be observed. To ensure that the instrument is operating under the safety conditions. In addition to the safety precautions indicated

in this chapter, you must also follow accepted safety procedures.

Safety Precautions

Warning	**Please follow the following 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 to follow the following safety precautions. This device is designed for professional users and responsible organizations for measurement purposes.
	Do not use this device in any way not specified by the manufacturer. This device is only for indoor use unless otherwise specified in the product manual.

Safety Statements

Warning	"Warning" indicates the presence of a hazard. It reminds 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 reminds 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 the "Note" should be highlighted if necessary.

Safety Sign

	**Danger**	It indicates possible danger of electric shock, which may cause personal injury or death.
	**Warning**	It indicates that you should be careful to avoid personal injury or product damage.
	**Caution**	It indicates possible 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 of device. Please check the region's voltage range.
	**Grounding**	Frame and chassis grounding terminal.
	**Grounding**	Protective grounding terminal.
	**Grounding**	Measuring grounding terminal.
	**OFF**	Main power off.
	**ON**	Main power on.
	**Power Supply**	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.

	Certification	UKCA indicates a registered trademark of United Kingdom.
	Certification	Conforms to UL STD 61010-1, 61010-2-030, Certified to CSA STD C22.2 No. 61010-1, 61010-2-030.
	Waste	Do not place equipment and accessories in the trash. Items must be properly disposed of in accordance with local regulations.
	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. Do not used to measure mains circuit.
Check all terminal rated values	Please check all rated values and marking instructions on the product to avoid fire and 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 4KV for contact discharge and 8KV for air discharge.
Measurement	Measurement accessories are of lower class, which are definitely not

accessories	applicable to main power supply measurement, CAT II, CAT III, or CAT IV circuit measurement. Probe assemblies and accessories within the scope of IEC 61010-031, and current sensors within the scope of IEC 61010-2-032 shall meet the requirements thereof.
Use the input / output port of this device properly	Please use the input / output ports provided by this device in a properly 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 power fuse of specified 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 to operators inside. Do not remove the protective cover. Maintenance must be carried out by qualified personnel.
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	
Abnormity	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 carried out by qualified personnel.

Environmental Requirements

This instrument is suitable for the following environment:

- Indoor
- Pollution degree: Class 2
- For overvoltage: This product should be powered from a mains supply that complies with Overvoltage Category II, which is a typical requirement for connecting equipment via power cords and plugs.
- Operating: Altitude below 3,000 meters; non-operating: Altitude below 15,000 meters
- Unless otherwise specified, the operating temperature is 0 to +40°C; storage temperature is -20 to +70 °C.
- Operating: Humidity at temperatures below +35°C, ≤ 90% RH.; non-operating: Humidity at temperatures from +35 °C to 40 °C, ≤ 60% RH.

Note

There are ventilation openings on the rear and side panels of the instrument. Please ensure that air can flow through these vents. To prevent excessive dust from blocking the vents, 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 the AC power supply is as shown in the following table.

Voltage Range	Frequency
100-240 VAC (Fluctuations±10%)	50/60 Hz
100-120 VAC (Fluctuations±10%)	400 Hz

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

Connecting to the service cable:

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

Please install the AC power cable as follows:

- Ensure the power cable is in 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 components. Components can be invisibly damaged by electrostatic discharge during transportation, storage, and use.

The following measures can reduce the damage caused by electrostatic discharge:

- Test in an antistatic area as far as possible.
- Before connecting the power cable to the instrument, briefly ground the inner and outer conductors of the instrument to discharge static electricity.
- Ensure all instruments are properly grounded to prevent the accumulation of static.

Preparation Work

1. Connect the power cable and insert the power plug into a protective grounding outlet. Adjust the tilt bracket as needed for your viewing angle.

Figure 2-1 Tilt Adjustment

2. Press the switch  on the rear panel to enter standby mode.
3. Press the soft switch  on the front panel; the indicator lights up green, and the signal analyzer powers on.

   It takes about 30 seconds to initialize the boot, and then the signal analyzer enters the system default menu mode. To ensure optimal performance, it is recommended to warm up the signal analyzer for 45 minutes after powering on.

Usage Tip

Use an External Reference Signal

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

Activate the Option

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

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

1. Copy the attached license file to the root directory of the USB flash drive.
2. Insert the U disk into the USB port of the front panel of the instrument device.
3. In the front panel, press the **System** key to open the system Settings window, select the **Information**, click **Add License** below the option information table, and the "Add License" dialog box will pop up. Find the license file in the U disk in the dialog box, select the license file, and check it. Upon completion, the status of the option in the option information table is updated to active.

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 a USB flash drive. The package contains two files, "xxxx.md5" and "xxxx.upg," as shown in Figure 2-2.

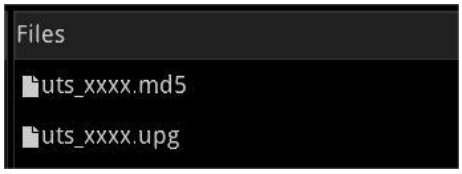


Figure 2-2 Upgrade Package

2. Insert the USB flash drive into the USB port on the front panel of the device, then press the file management system key at the bottom left of the screen. Open the **File Management System** -> **USB Flash Drive** -> **Upgrade Package** -> **Select "xxxx.upg**." 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.

Note

Use a USB flash drive formatted with FAT32 to copy the upgrade package. During the upgrade, ensure the power supply and the USB flash drive are reliably connected. Do not perform other

operations to prevent device failure due to an upgrade failure.

Touch Operation

The signal analyzer has a 10.1-inch multipoint touch screen for various gesture operations, which include:

- Tap the top right of the screen to enter the main menu.
- Slide up/down or left/right in the waveform area to change the center frequency on the X-axis or the reference level on the Y-axis.
- Zoom with two points in the waveform area to change the span on the X-axis.
- Tap parameters or menus on the screen to select and edit them.
- Turn on and move the cursor.
- Use auxiliary quick keys to perform common operations.
- Use **[Touch/Lock]** key to turn on/off the touch screen function.

Remote Control

UTS3000A series signal analyzers support communication with computers via USB and LAN interfaces. Through these interfaces, users can use the corresponding programming language or NI-VISA, and employ SCPI (Standard Commands for Programmable Instruments) commands to remotely program and control the instrument. Additionally, they can interoperate with other programmable instruments that support the SCPI command set.

For more information about installation, remote control, and programming, please refer to the ***UTS3000A Series Programming Manual*** available on the official website: http://www.uni-trend.com.

Help Information

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

- Touch the left bottom of the screen “  “, and a help dialog box will pop out in the center of the screen. Tap the support function to get a more detailed help description.
- After the help information is displayed in the center of the screen, tap “×” or any other key to close the dialog box.

Operation Modes

The signal analyzer offers various operating mode, press the **Mode** key to select it.

- Spectrum Analysis (refer to Chapter 4 for more details)
- IQ analysis
- EMI
- Analog Demodulation
- Vector Signal Analysis
- Real-time Spectrum Analysis
- Vector Network Analysis
- Phase Analysis
- Mode Presetting

Mode Presetting: Each operation mode has its own preset mode. The options include IQ analysis, EMI, analog demodulation, vector signal analysis, and phase analysis, which require purchase to activate.

In different operation modes, the functional keys on the front panel may differ. This manual uses the spectrum analysis mode as an example to introduce the user interface and functional keys.

3. Function and Application

- Basic Measurement
- Multiple Signal Measurement
- Low-level Signal Measurement
- Frequency Shift of Signal Source Measurement
- Signal Distortion Measurement
- Phase Noise Measurement
- View Catalogue and File Management System

This chapter introduces the main functions and basic measurements of the signal analyzer. For more information about the panel, refer to the *Front and Rear Panel* in the section Overview of UTS3000A.

Basic Measurement

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

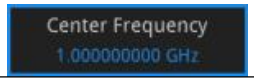
Using Front Panel

This section introduces how to use the basic function of the signal analyzer.

Input Data

When inputting parameter values, there are several common methods for editing as shown below.

Rotary Knob	Increase or decrease the current numerical value.
Arrow Keys 	Increase or decrease the current numerical value.
Numeric Keypad	Input a numerical value and confirm it. To confirm, either select the virtual **[Enter]** key or press the

	[Enter] key.
Virtual Key	Touch the panel menu to pop out the dialog box, and touch the virtual numeric keypad to input a value and then confirm. To confirm, either select the virtual **[Enter]** key or press the **[Enter]** key.
Enter Key 	If inputting a numerical value without a unit, or if the user wants to use the default unit for the numerical value, press the **[Enter]** key as the termination key for this numerical value.
Using Panel Menu Press the panel menu (vertically arranged on the right side of the screen) to enter the corresponding function item. The following are examples of panel menus.	
Switch Auto/Manual 	Press this option to switch between **Auto** and **Manual** modes.
Submenu 	Press this option to enter the submenu of a function.
Selection 	Tap this option to change the item, and the selected menu will be highlighted.
Correction	Double-click the parameter item to be changed to pop out its menu, or select the data menu to be changed and then click **[Enter]** key to modify it.

Reset Signal Analyzer

Reset is used to recall presets, to reset the system setting back to a specified state. There are three reset types:

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

1. Select **Setup** to return the system settings of the signal analyzer to the default.
2. Select **Data** to delete all saved data.
3. Select **All** to return all settings of the signal analyzer to the default and delete all user's data.

Observe Signal

Follow these steps to observe a simple signal:

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

Set Reference Level and Center Frequency

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

Set Sweep Bandwidth

Press **[FRQE] > Sweep Bandwidth > 100 MHz** to set the sweep bandwidth to 100 MHz.

Note

- Changing the reference level alters the amplitude value of the top grid line.
- Adjusting the center frequency shifts the horizontal position of the signal on the screen.
- Increasing the span expands the range of frequencies that can be displayed horizontally on the screen.

Read Frequency and Amplitude Value

1. Press the **[Peak]** key to place a marker at the 10 MHz peak (Default: Marker 1). Use the rotary knob, arrow keys, or [Peak] on the panel menu to move the marker.

Note

- The frequency and amplitude values of this marker will be displayed in the functional area at the top right of the screen.

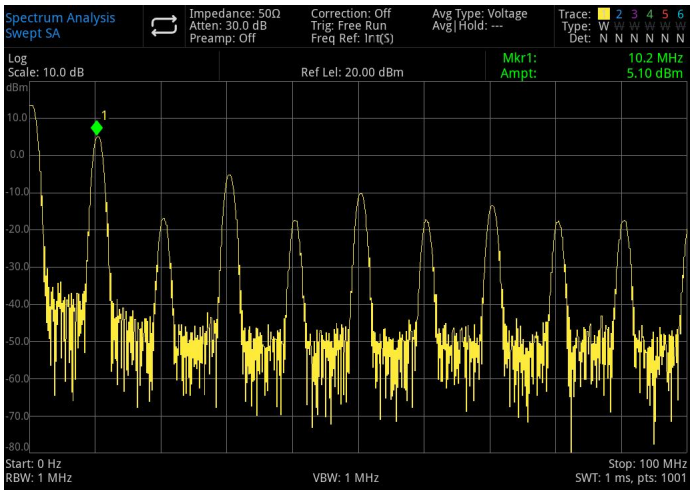


Figure 3-1 Read Frequency and Amplitude

- Use the rotary knob, arrow keys, or **[Peak]** key on the panel menu to move the marker.

Change Reference Level

1. Press **[AMPT]**. Note that the reference level (Ref Level) is now in the activation function area.
2. Press **[Marker] > Marker → > Reference Level**

Note

- Changing the reference level will alter the amplitude value of the top grid line.

Multiple Signal Measurement

This chapter describes how to measure different kinds of multiple signals.

Use Difference Value Marker△ to Compare Signals on the Same Screen

With this signal analyzer, users can easily compare signal differences in frequency and amplitude. The difference value△ marker function allows users 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 signal analyzer are used to measure the difference in frequency and amplitude between the two signals on the same screen. The difference value marker (Delta△) is used to show the differences.

1. Reboot the signal analyzer:

   Press **[Default] > Reset**

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

   Press **[FREQ] > Center Frequency > 50 MHz**

   Press **[FREQ] > Sweep Width > 100 MHz**

   Press **[AMPT] > Reference Level > 20 dBm**

4. Place a marker at the maximum peak (10 MHz):

   Press **[Peak]**, then use the **next peak on the left** and **next peak on the right** options to move the marker from peak to peak.

   The marker should be at the 10 MHz reference signal.

5. Lock a marker and activate the second marker at the same time:

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

   The marker labeled "×" represents the reference signal.

6. Use the rotary knob or **[Peak]** key to move marker **1△2** to another signal peak:

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

   Press **[Peak] > Next Peak on the Left** or **Next Peak on the Right** or

   Press **[Marker] > Marker △ Frequency > Rotate the Rotary Knob to Next Peak**

   The difference in amplitude and frequency between the two markers will be displayed on the screen.

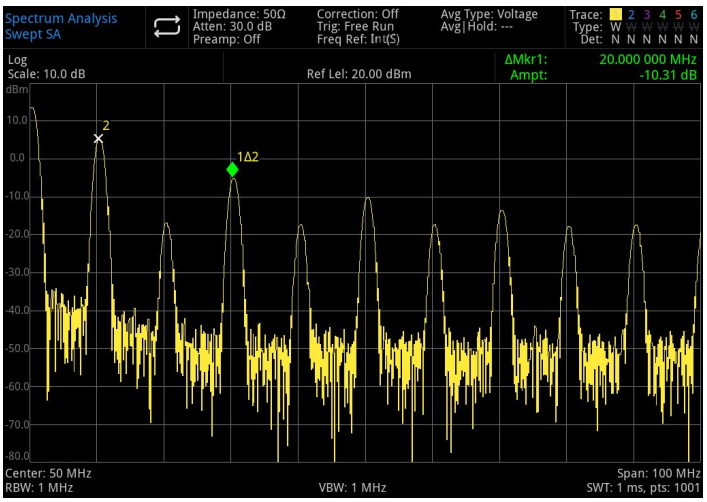


Figure 3-2 Compare Signals on the Same Screen with Difference Value Marker△

Note

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

Use Delta△ to Compare Signals on Different Screens

With the difference value marker function, users can easily measure the difference in amplitude and frequency between two signals on different screens. This feature is well-suited for harmonic distortion measurement.

In this example, use a 10 MHz signal to measure the difference in frequency and amplitude between two signals: one signal is displayed on the screen, while the other signal is not. The difference value marker (Delta△) is used to show the differences.

1. Reset the signal analyzer:

   Press **[Default] > Reset**

2. Connect the **10 MHz OUT** port on the rear panel to the **RF IN** port on the front panel

3. Sets the center reference, span, and reference level to check the input signal and other harmonic waves of 10 MHz:

   Press **[FREQ] > Center Frequency > 50 MHz**

   Press **[FREQ] > Sweep Width > 100 MHz**

   Press **[AMPT] > Reference Level > 20 dBm**

4. Place a marker at 10 MHz peak and set stepped center frequency to the marker's frequency value (10 MHz):

   Press **[Peak] > Marker > Stepped Center Frequency**

5. Enable Delta△ function:

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

6. Use the center frequency to increase ▲ by 10 MHz:

   Press **[FREQ] > Center Frequency**

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

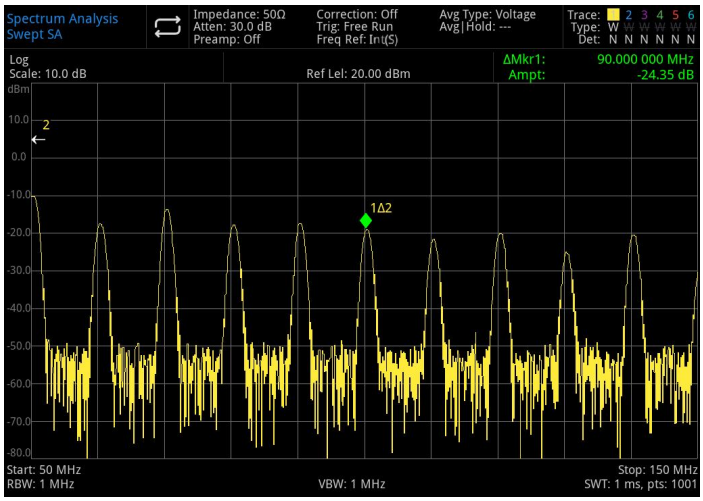


Figure 3-3 Delta Marker for the Reference Signal Out of the Screen

7. Disable marker: Press **[Marker] > All OFF** or **[Marker] > Marker Mode > OFF**.

Distinguish Signals with Same Amplitude

This example shows how to reduce the resolution bandwidth and video bandwidth to distinguish between two signals with the same amplitude, spaced 100 kHz apart.

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

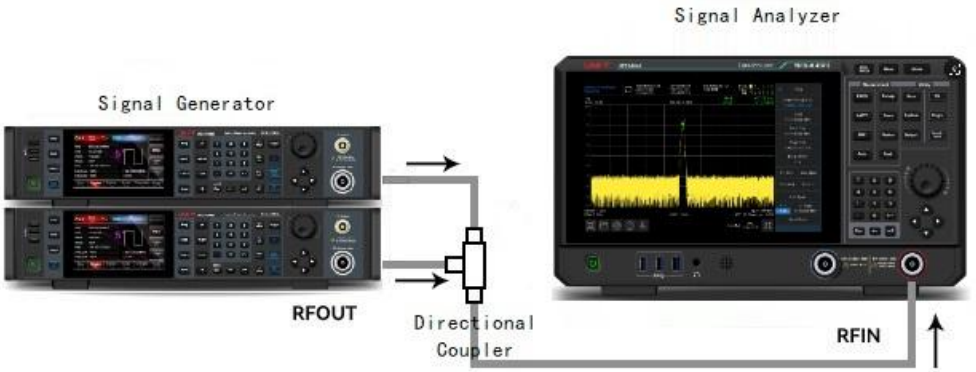


Figure 3-4 Instrument Setting for Acquire Signal from Two Channel

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

   Press **[Default] > Reset**

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

   Press **[BW] > 100 kHz**

   At this point, a single envelope signal can be seen.

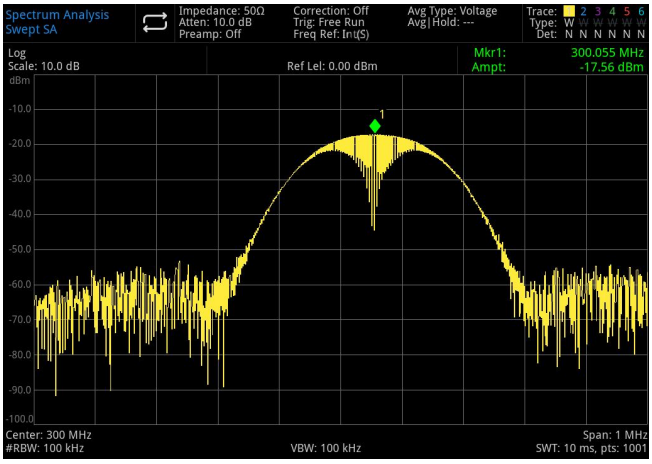


Figure 3-5 Undistinguished Two Equal-Amplitude Signals

4. Adjust the resolution bandwidth (RBW) to 30 kHz to make it equal to or lower than the frequency spacing of the two input signals.

   Press **[BW] > Resolution Bandwidth > 30 kHz**

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

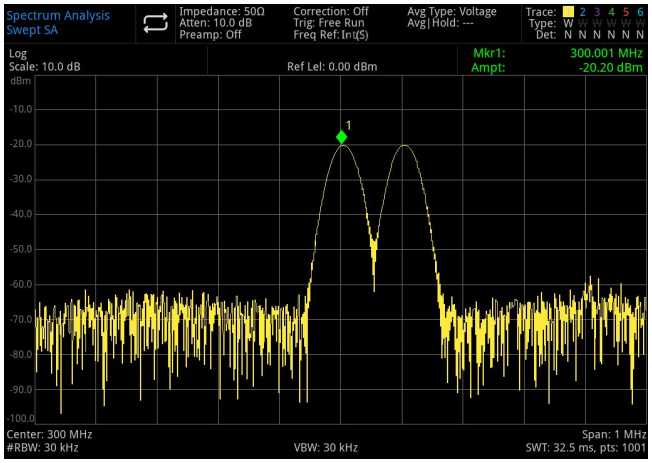


Figure 3-6 Distinguish Two Equal-Amplitude Signal (1)

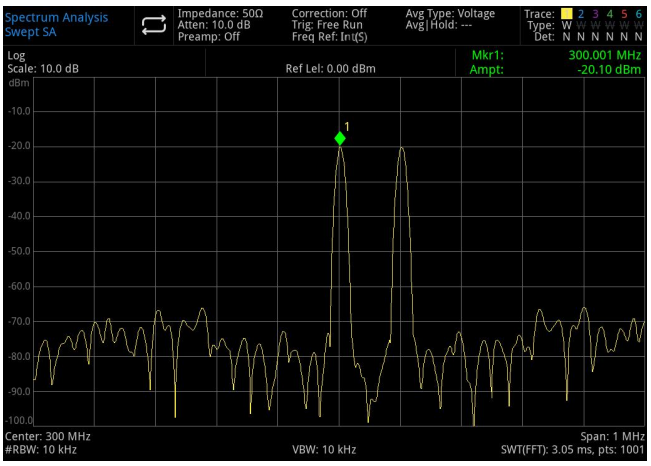


Figure 3-7 Distinguish Two Equal-Amplitude Signal (2)

When the resolution is decreased, the sweep time will increase, and the displayed signal will become smoother. For the fastest measurement, use the maximum resolution bandwidth as much as possible. In the factory setting, the resolution bandwidth and span are coupled.

Distinguish the Small Signal from the Big Signal

This example shows how to use a narrow resolution bandwidth to distinguish between two signals with a frequency difference of 10 kHz and an amplitude difference of 50 dBm.

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

   Press **[Default] > Reset**

   Press **[FREQ] > Center Frequency > 300 MHz, Sweep Width > 200 MHz**

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

   Press **[Peak] > Marker →> Reference Level**

   Note

   UTS3000A filter has a 4.8:1 shape factor. With a resolution bandwidth of 30 kHz, its 60 dB bandwidth is 144 kHz. Half of this bandwidth (72 kHz) is greater than the frequency difference between the two signals (10 kHz), so the two input signals cannot be distinguished.

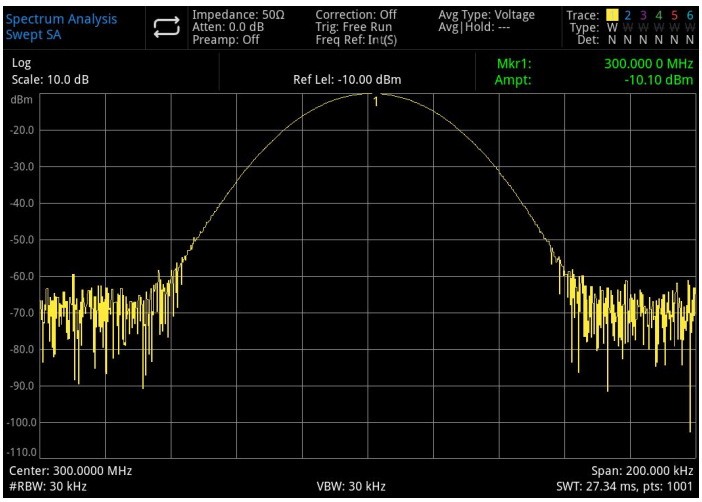


Figure 3-8 Failure to Distinguish Small Signal from Big Signal

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

   Press **[BW] > 3 kHz**

   Press **[Peak]**

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

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

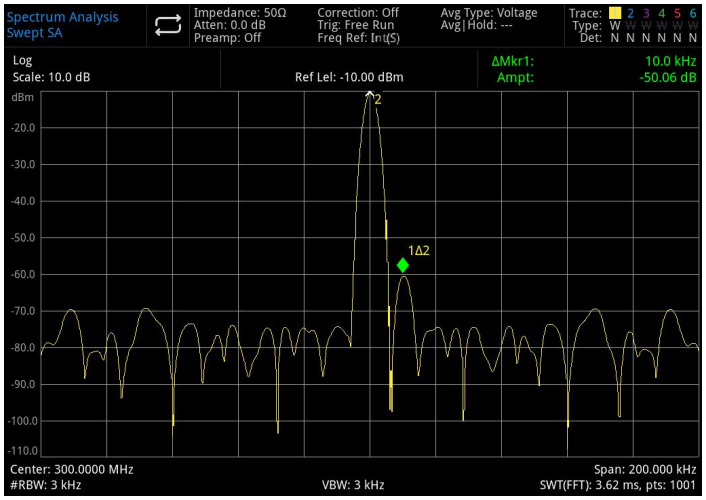


Figure 3-9 Distinguish Small Signal from Big Signal

Note

UTS3000A filter has a 4.8:1 shape factor. With a resolution bandwidth of 3 kHz, its 60 dB bandwidth is 14.4 kHz. Half of this bandwidth (7.2 kHz) is greater than the frequency difference between the two signals (10 kHz), so the two input signals cannot be distinguished.

Low-level Signal Measurement

This chapter will describe how to measure low-level signals and distinguish them from noise in the same spectrum. The main methods for measuring low-level signals are as follows.

Reduce Input Loss

The signal analyzer's ability to measure low-level signals is limited by the noise it generates internally. The input attenuator will affect the signal level when it passes through the signal analyzer. If a signal is very close to the ground noise, reduce the input attenuation to distinguish the signal from the noise.

Caution

The RF IN port on the front panel can only withstand an input signal power of no more than +30 dBm or a DC voltage input of 50 V. Exceeding these limits may cause damage to the internal circuitry.

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

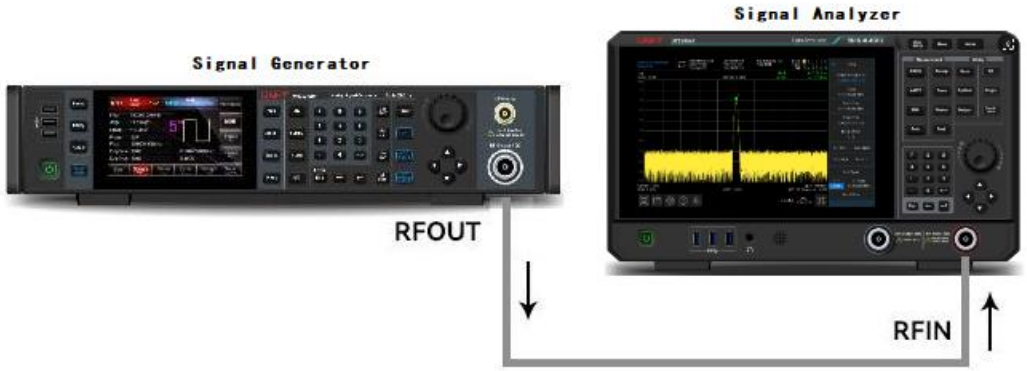


Figure 3-10 Instrument Setting for Acquire Single Signal

3. Sets the center frequency, span, and reference level.
   Press **[FREQ] > Center Frequency > 300 MHz**, **Sweep Width > 5 MHz**
   Press **[AMPT] > Reference Level > -40 dBm**
4. Move the required peak (in this example, 300 MHz) to the center of the screen.
   Press **[Peak] > Marker→> Center Frequency**
5. Decrease the span to 500 kHz (as shown in Figure 3-11).
   Press **[FREQ] > Sweep Width > 500 kHz**
6. Sets the input attenuation to 20 dB.
   Press **[AMPT] > Input Attenuation > 20 dB**

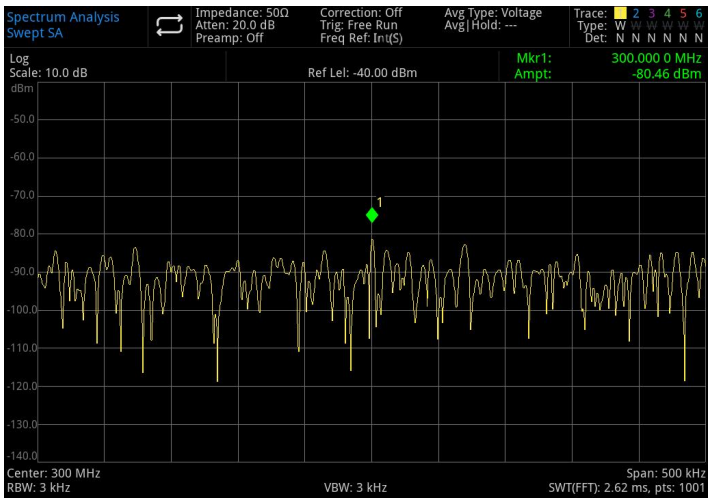


Figure 3-11 A Signal Close to Ground Noise

Note

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

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

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

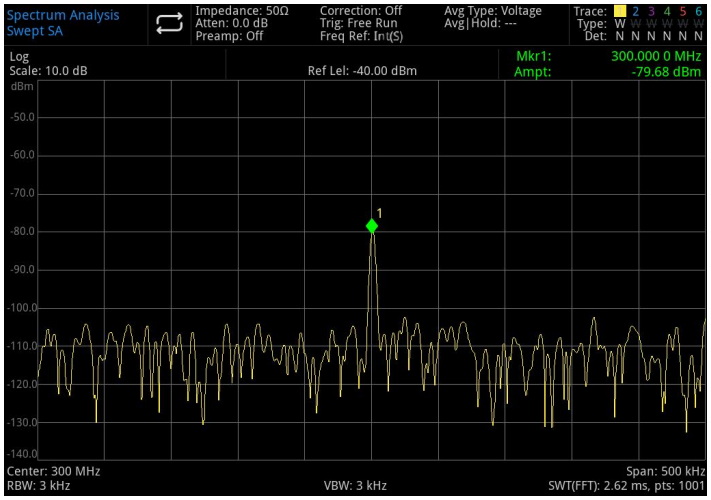


Figure 3-12 Measuring Small Signal with 0 dB Attenuation

Reduce Resolution Bandwidth

Resolution bandwidth will affect the internal noise level; however, continuous waveform signals will not be affected by resolution bandwidth. By reducing the resolution bandwidth by a factor of 10, the ground noise will decrease by 10 dB accordingly.

1. Refer to Reduce Input Loss in this section, and follow the steps to perform it again.
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.

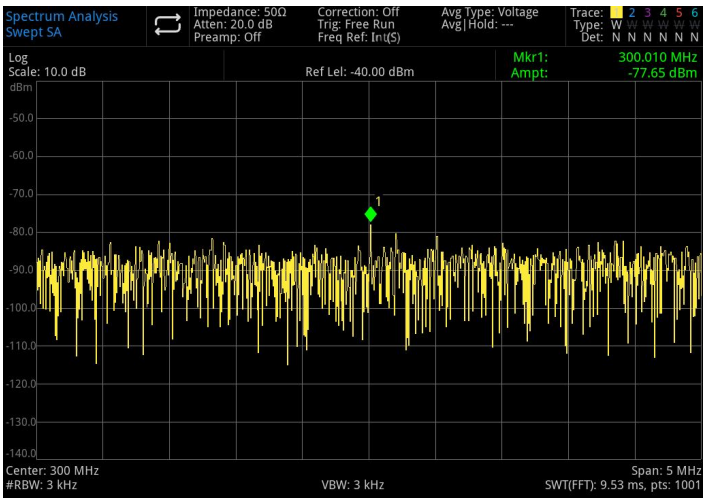


Figure 3-13 Reduce Resolution Bandwidth

Please note that a "#" symbol at the bottom left of the screen indicates that the resolution bandwidth (RBW) is not coupled and is set to manual adjustment.

Note

Users can adjust the resolution bandwidth using the up/down arrow keys with a 1-3-10 sequence. The resolution bandwidth has a rectangularity factor (the ratio of the 60 dB bandwidth of the filter to the 3 dB bandwidth) of 4.8:1, with a maximum value of 3 MHz and a minimum value of 1 Hz.

Trace Average

Trace averaging is a digital process that adds the current value of each trace point to the previous average and then calculates the new average. Select the averaging mode, and if the signal analyzer is in automatic coupling, change the detection mode to sampling mode to make the displayed noise level smoother.

1. Refer to Reduce Input Loss in this section, and follow the steps to perform it again.
2. Enable the average function.

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

   Press **[Meas/Setup] > Average/Hold Count > 20 >** ↵

   Averaging smooths the trace, making low signals clearer (as shown in Figure 3-14).

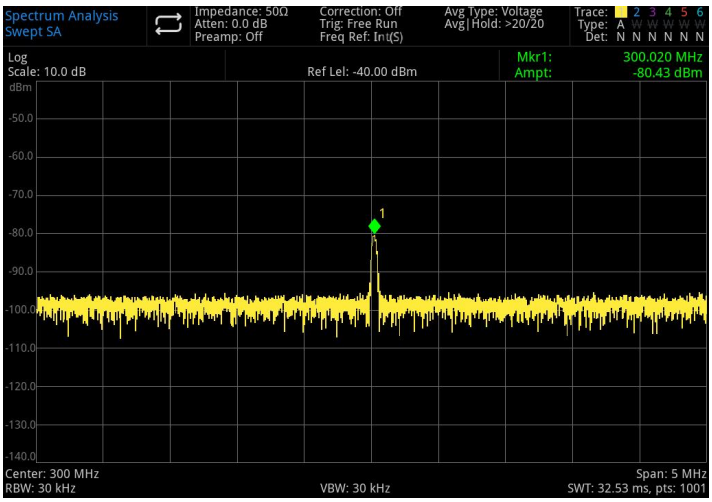


Figure 3-14 Trace Average

Track Shifted Signal

This chapter describes how to measure and track the shifted signal.

Frequency Shift of Signal Source Measurement

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

1. Connect the signal generator to the RF IN port of the signal analyzer.
2. Sets the frequency and amplitude of the output signal to 300 MHz, -20 dBm.
3. Sets the center frequency, span, and reference level for the signal analyzer.
   Press **[Default] > Reset**
   Press **[FREQ] > Center Frequency > 300 MHz**, **Sweep Width > 1 MHz**
   Press **[AMPT] > Reference Level > -10 dBm**
4. Place a marker at the signal peak and turn on the continuous peak search function.
   Press **[Peak]**
5. Use the maximum hold to measure the shifted signal.
   Press **[Trace] > Trace Type > Maximum Hold**
   When the signal is changing, the maximum hold function retains the maximum response of the input signal. The trace mode is displayed in the annotation on the right side of the screen, which includes the trace, trace type, and detector.
6. Activate and update trace 2, and set it to continuous sweep.
   Press **[Trace] > Select Trace > Trace 2**
   Press **[Trace] > Trace Type > Refresh**
   Set Trace 1 to stay in maximum hold mode to display the shifted signal.
7. Change the frequency of the signal source slowly.

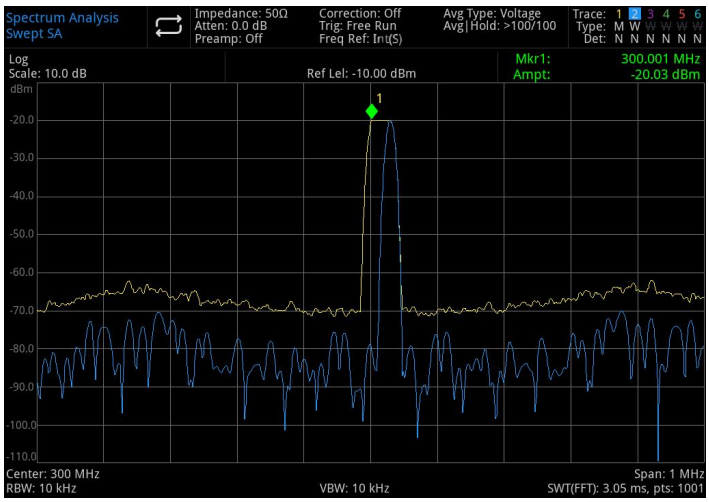


Figure 3-15 Use Maximum Hold and Refresh to Observe Shifted Signal

Signal Distortion Measurement

This chapter describes how to recognize and track the shifted signal.

Recognize the Distortion Generated by Signal Analyzer

A high-level input signal may cause the signal analyzer to generate a distortion signal, which can mask the true distortion present in the input signal. Users can adjust the trace and radio frequency attenuator to identify the source of the signal. If the distortion signal is present after adjustment, it is likely generated internally by the instrument.

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

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

   Press **[Default] > Reset**

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

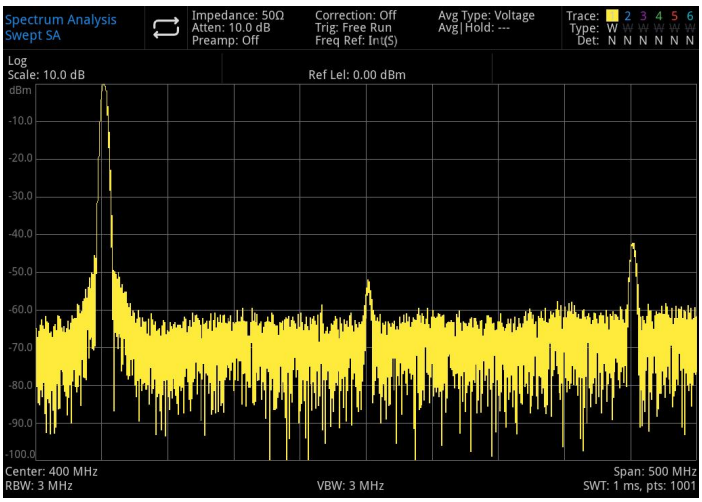


Figure 3-16 Harmonic Distortion

The harmonic distortion component is generated by the signal at the input mixer of the signal analyzer, appearing sequentially with the original 200 MHz signal at 200 MHz intervals.

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

   Press **[Peak] > Next Peak**

   Press **[Marker] > Marker→> Center Frequency**

5. Sets the span to 50 MHz, and redisplay the signal at the center of the screen.

   Press **[FREQ] > Sweep Width > 50 MHz**

   Press **[Peak] > Marker→> Center Frequency**

6. Sets the attenuation to 0 dB.

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

7. To determine whether the harmonic wave component is generated by the signal analyzer, first display the input signal on Trace 2.

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

   Press **[Trace] > Trace Type > Refresh**

   Press **[Trace] > Refresh > ON**

   Press **[Trace] > Display > ON**

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

   Press **[Trace] > Refresh > OFF**

   Press **[Peak]**

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

   The signal analyzer displays the stored waveform data of Trace 2 along with the current measurement data of Trace 1. The reading of △Mkr1 indicates the amplitude difference between the reference marker and the active marker.

9. Increase the radio frequency attenuation to 10 dB.

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

   Note

   The reading of △Mkr1 indicates the amplitude difference of the same harmonic distortion component when the input attenuation is set to 0 dB and 10 dB. If the absolute amplitude of △Mkr1 changes by ≥1 dB, it can be assumed that at least part of this harmonic distortion component is generated by the signal analyzer (as shown in Figure 3-17). In this case, the input attenuation should be increased.

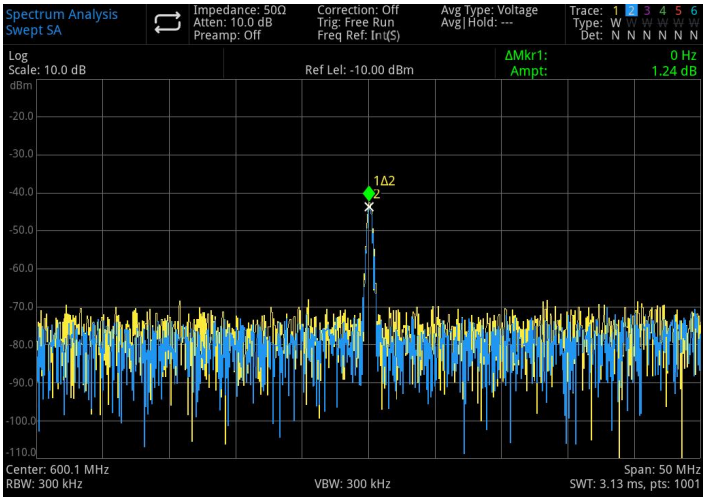


Figure 3-17 Component of Harmonic Distortion

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

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

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

Third-order Intercept Distortion

The measurement of two-tone third-order intermodulation distortion (TOI) is common in communication systems. When two signals are input into a nonlinear system, they may interact to produce a third intermodulation component adjacent to the original signal in the spectrum. These distortions are generated by system components such as amplifiers and mixers.

For a quick setup of TOI measurement, see the section Third-order Intermodulation Distortion for more details.

This example describes how to use a marker to measure the third-order intermodulation

distortion of an instrument. The frequencies of the two signal sources used are 299.95 MHz and 300.05 MHz.

1. As shown in Figure 3-18, connect the input port of the signal analyzer via a low pass filter and a directional coupler. The output of the directional coupler provides a two-tone signal source with low intermodulation distortion.

   Although the distortion performance of this connection is better than that of the signal analyzer, the TOI measurement for the signal source/signal analyzer combination is still useful.

   After calibrating the TOI performance of the signal source/signal analyzer combination, insert the device under test (DUT), such as an amplifier, between the output of the directional coupler and the input of the signal analyzer.

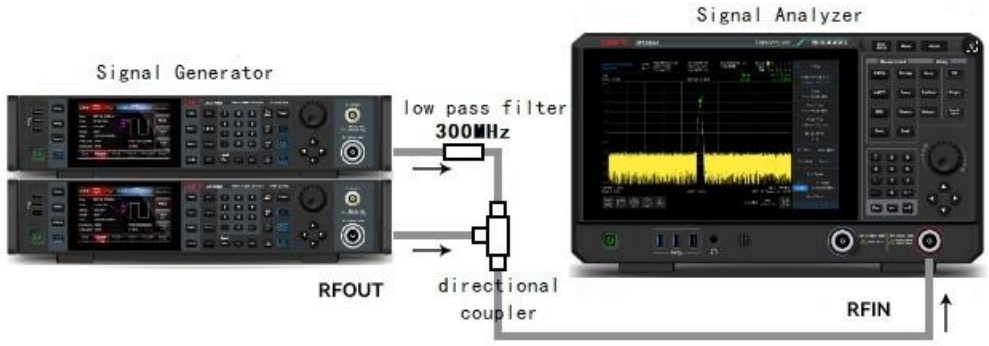


Figure 3-18 Instrument Setting for Third-order Intercept Signal

Note

The directional coupler must have a high degree of isolation between the two inputs to prevent cross modulation of the two source signals.

2. Sets the frequency of one signal source (signal generator) to 299.95 MHz and the frequency of the other signal source to 300.05 MHz, creating a frequency spacing of 100 kHz. Sets the amplitudes of the two sources to the same value (in this case, -5 dBm).
3. Sets the center frequency and span for the signal analyzer.

   Press **[Default] > Reset**

   Press **[FREQ] > Center Frequency > 300 MHz**, **Sweep Width > 500 kHz**
4. Reduce the resolution bandwidth until the distortion product becomes visible.

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

   Press **[Peak] > Marker →>→Reference Level**
6. Decrease the resolution bandwidth until the distortion becomes visible.

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 Peak**

8. Measure another distortion signal.

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

   Press **[Peak] > Next Peak**

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

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

   Press **[Peak] > Next Peak**

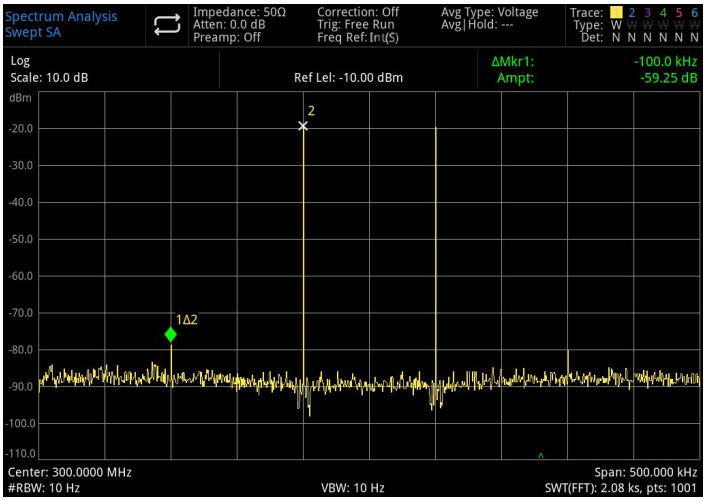


Figure 3-19 Distortion Product Measurement

Phase Noise Measurement

Measuring phase noise involves assessing stability in the frequency domain. Phase noise is specified as the sideband power relative to the fundamental RF output frequency, measured at each offset from the carrier frequency and normalized to a 1 Hz measurement bandwidth.

1. Press **[Default] > Reset** to restore the signal analyzer.
2. Use a cable to connect the output port of the signal generator to the RF IN port of the signal analyzer.

   Press **[FREQ] > Center frequency > 1 GHz, Sweep Width > 100 kHz**

   Press **[Trace] Trace Type >Trace Average; Detector > Average**

   Press **[Peak]** to put a marker on the peak of the signal

   Press **[Marker] > Marker Mode > Difference△; Marker△Frequency > 10 kHz**

3. Enable **Marker Function > Mark Noise**, as shown in Figure 3-20.

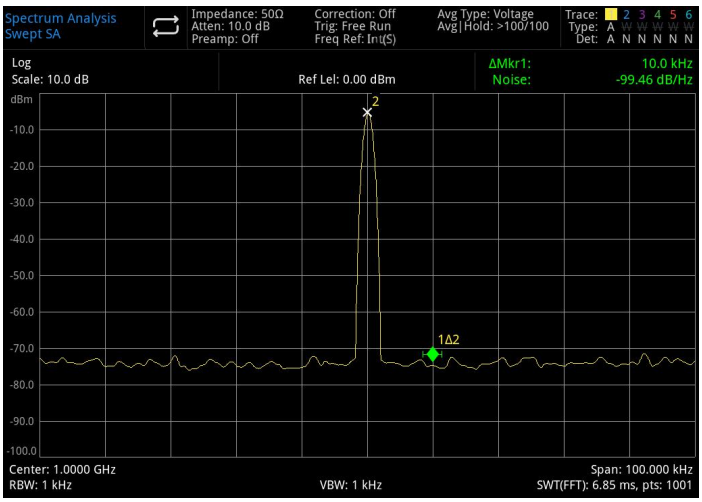


Figure 3-20 Phase Noise

Check Catalogue and File Management

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

Locate File in Catalogue

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

The signal analyzer contains six kinds of files:

- **State file**: Saves the setting information of the signal analyzer. The file suffix is ".state."
- **Trace file**: Saves the trace information. The file suffix is ".trace."
- **Screenshot file**: Saves screen captures. The file suffix is ".png."
- **Limit value file**: Ensures whether the trace is within the preset range. The file suffix is ".limit."
- **Correction file**: Provides amplitude correction for compensating the gain and loss of external devices. The file suffix is ".corr."
- **Measured data**: Saves the information of trace, peak list, or marker list. The file suffix is ".csv."

Create New File Folder

Create a new file folder.

1. Press  > LocalDisk > UTS3084A to select the catalogue where you want to create a file folder.
2. Tap "New folder" to create a new file folder.

Multiple Selection (ON/OFF)

1. Press  > LocalDisk > UTS3084A to select the catalogue or select the catalogue in a USB flash drive.
2. Turn on "Multiple Selection" menu.
3. Select multiple files or tick the √ box in 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 > UTS3084A to select the file or folder.
2. Connect the USB flash drive to the USB interface on the instrument.
3. After selecting the file, tap "Copy" on the screen.
4. Select the catalogue where you want to copy the file, then tap "Paste" to complete the copy and paste process.

Move File

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

1. Press  > LocalDisk > UTS3084A to select the file or folder.
2. After selecting the file, tap "Move" on the screen. The system will automatically pop up a dialog box.
3. If you want to move the file to a USB flash drive, plug in the USB drive first, then select the required USB flash drive from the LocalDisk drop-down menu in the dialog box.
4. Select the catalogue where you want to move the file, then tick the √ in the dialog box to complete the move.

Note

Please do not disconnect the USB flash drive while moving and saving files to external storage (USB) to prevent data loss and file corruption.

Delete File

1. Press  > LocalDisk > UTS3084A to select the file or folder that needs to be deleted.
2. Tap the "Delete" option to delete the selected file.
3. If you want to delete multiple files, tap "MultiSelect," tick the boxes in front of the file names, and then tap "Delete" to remove multiple files.

Load File

1. Press  > LocalDisk > UTS3084A to select the file.
2. Tap "Load" to load the data of the corresponding file, which includes state, trace, screen, and limit.

Rename File

Change the name of a file or folder.

1. Press  > LocalDisk > UTS3084A to select the file or folder you want to rename.
2. Select "Rename" to change the name of the file or folder.

Import/Export File

Import and export files according to the state type (state, trace + state, measurement data, limit, and correction).

If there is external storage connected, the files are preferentially saved to the external storage.

For more details, see "File Storage (Save)."

4. Key Description (Spectrum Analysis Mode)

- FREFQ (Frequency)
- AMPT (Amplitude)
- BW (Bandwith)
- Auto (Automatic Tuning)
- Sweep
- Trace
- Marker
- Peak
- Save (File Storage)
- System Setup
- Default Setup
- TG (Tracking Generator)
- Single (Single Sweep)
- Touch/Lock
- Meas/Setup (Measurement/Setup)
- Meas (Measurement)
- Mode

Note

- The key description is for the spectrum analysis mode.
- For different devices, the parameter configuration and functions may differ. Refer to the data sheet of each device for specific parameter configurations.

FREQ (Frequency)

Press the **[FREQ]** key to activate the center frequency function and enter the frequency setting menus. The numerical values of center frequency, 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 displays the center frequency and span values on the left and right side on the bottom of the screen. Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to change the center frequency.

Note

- Under the premise of a constant span, changing the center frequency will automatically modify the start and stop frequencies.
- Changing the center frequency is equivalent to horizontally moving the current channel, which is limited by the frequency range listed in the technical specifications of the signal analyzer.
- In zero span, the start frequency, stop frequency, and center frequency are the same.

Sweep Width: To input the span range value by using the numeric keypad, rotary knob, arrow keys, or touch panel menu to adjust the value. The span will be changed symmetrically according to the center frequency. The reading of span is the total displayed frequency range. To determine the span for each horizontal scale division, the above span should be divided by 10.

Note

- Under the premise of a constant span, changing the center frequency will automatically modify the start and stop frequencies.
- In non-zero span mode, the minimum span can be set to 100 Hz. When the span is set to the maximum, the signal analyzer enters full span mode.
- To enter zero span mode, either manually set the span to 0 Hz or press the zero span menu option.
- When changing the span in non-zero span mode, if the center frequency and RBW are set to automatic, they will be adjusted automatically. Changes to the RBW will also affect the VBW (if set to automatic).
- Any change to the span, RBW, or VBW will result in a change in sweep time.

Start Frequency: The start frequency is displayed on the left end of the screen, while the stop frequency is shown on the right end of the screen. After setting the frequencies, they will be displayed at the bottom of the screen, replacing the previously displayed center frequency and span. Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to adjust the start frequency.

Note

- Changing the start frequency will affect the span and center frequency. Additionally, changes

in span will impact other system parameters.

- In zero span mode, if the start frequency, center frequency, and stop frequency are the same, they will be modified simultaneously.

Stop Frequency: The stop frequency is displayed on the right end of the screen, while the start frequency is shown on the left end of the screen. After setting the frequencies, they will be displayed at the bottom of the screen, replacing the previously displayed center frequency and span. Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to adjust the stop frequency.

Note

- Changing the stop frequency will affect the span and center frequency. Additionally, changes in span will impact other system parameters.
- In zero span mode, if the start frequency, center frequency, and stop frequency are the same, they will be modified simultaneously.

Frequency Offset: Set a frequency offset to account for the frequency conversion between the DUT (device under test) and the input of the signal analyzer. Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to adjust the frequency offset.

Note

- This parameter does not affect the hardware settings of the signal analyzer; it only changes the displayed values of the center frequency, start frequency, and stop frequency.
- Sets the frequency offset to 0 Hz to eliminate the frequency shift.

Full Sweep Width: Changes the span to display the full frequency range.

Zero Sweep Width: Sets the span to zero. This mode displays the envelope of the time-domain signal (the X-axis is displayed in time units), similar to an oscilloscope.

Note

In zero span mode, the time-domain characteristics of the fixed frequency component of the signal are displayed. This mode differs significantly from non-zero span mode.

The following functions are not available in zero span mode:

Marker functions in the **[Marker]** menu (except for -> Reference Level).

Sweep time and sweep mode settings in the **[Sweep]** menu.

Zoom out Sweep Width: Sets the span to double of the current span to observe more of the signal.

Zoom in Sweep Width: Sets the span to half of the current span to examine the signal in more detail.

Last Sweep Width: Restore the span to the last modified value.

Center Frequency Step: Adjust the stepped frequency, which will change the center frequency, start frequency, and stop frequency. Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to modify the stepped frequency.

Auto Tune: Quickly find the signal of interest and optimally position it on the display.

AMPT (Amplitude)

Press the **[AMPT]** key to activate the reference level function and enter the amplitude setting menus.

Reference Level: Sets the reference level by pressing the **[AMPT]** key to enable this function. The reference level is the power or voltage value displayed on the top of the screen (unit is the selected amplitude unit). Use the numeric keypad, rotary knob, arrow keys, or touch panel menu to adjust the reference level.

Note

- The reference level is an important parameter of the signal analyzer, representing the upper limit of the dynamic range at the current setting. If the energy of the signal being measured exceeds the reference level, it may cause non-linear distortion or even overload alarms. Understanding the nature of the signal to be measured and carefully selecting the reference level is essential to achieve optimal measurement results and protect the signal analyzer.

Input Attenuation (Auto/Manual): Sets the RF front-end attenuator to allow the signal to pass through the mixer with low distortion (small signals with low noise). Input attenuation can be switched between automatic and manual modes. 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 using the numeric keypad, rotary knobs, arrow keys, or by touching the panel menu.

Note

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

Preamplifier: This switch controls the instrument's internal preamplifier. Turning it on produces a gain to compensate for the preamplifier, ensuring that the amplitude value read is the actual value of the input signal. When the preamplifier is turned on, the measurement bar area of the screen displays "**Preamp: on**."

Scale/Division: Sets the logarithmic value corresponding to one grid division in the vertical direction of the screen. The scale function is only available when the scale type is logarithmic. The user can change the scale value using the numeric keypad, rotary knobs, arrow keys, or by touching the panel menu.

Scale: When the scale type is set to logarithmic, the logarithmic value corresponding to one grid division in the vertical direction of the screen can be set, with a value range of 0.1 to 20 dB per grid. When set to linear, the vertical grid becomes a linear scale with the default amplitude in volts (V). The grid line at the top of the screen represents the set reference level, while the grid line at the bottom represents the zero level. Each grid division represents a tenth of the reference level in volts (V).

Y Axis Unit: Changes the amplitude unit, applicable in both logarithmic and linear modes. Optional units: dBm, dBmV, dBμV, V, and W. The default is dBm.

Ref Level Offset: When there is gain or loss between the DUT and the input of the signal 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 but modifies the reference level and the amplitude reading of the cursor.

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

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

1. Select correction factor: The signal analyzer provides 10 correction factors, each of which can be edited independently.
2. Correction (ON/OFF): The switch for correction; the default setting is OFF.
3. All close: Closes all the corrections that have been turned on.
4. Edit correction: Refer to the following table.

Selection	Provides 10 data for saving, default: Correction 1
Select row	Choose the row number for correction

Insert row	Add a new correction point
Delete row	Remove the currently selected row
Delete correction data	Remove the currently revised correction data

5. Delete all: Clear all the saved revised data.

Calibration Signal: This function is used to verify that the device is detecting the signal properly. In the absence of a signal input, the calibration signal is activated, and a 100 MHz square wave signal is automatically input. This can be observed on the spectrum display.

BW (Bandwith)

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

RBW (Auto/Manual): Sets the resolution bandwidth to distinguish two signals with similar frequency.

In manual mode, the user can change the resolution bandwidth value within the range 1 Hz to 10 MHz by using the numeric key, rotary knob, arrow keys or touch panel menu.

Below to 1 kHz, the optional bandwidth value are 1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, or 300 Hz. 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 span, when the 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 at the bottom left corner of the screen next to "RBW." Press auto key to re-couple.

VBW (Auto/Manual): Sets the video bandwidth to filter out ambient noise.

In manual mode, the user can adjust the instrument's video bandwidth from 1 Hz to 10 MHz using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. If the input value is not an available bandwidth option, 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 amplitude calibration.

When the video bandwidth and resolution bandwidth are not coupled, a "#" mark will appear at the

bottom of the screen next to "VBW." Press the auto key to re-couple.

VBW: 3 dB RBW (Auto/Manual): 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 appears blurred, the user can set the ratio to less than 1 to reduce the noise. When resetting with **[Default]**, the ratio is set to 1.000. In automatic mode, the user can change the ratio using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.
In manual mode, if the trace detector is set to average, the default ratio is 0.1. If the trace detector is set to any other mode, the default ratio is 1.

RBW Filter Type: UTS3000A series supports two types of filters: Gaussian and Flat Top Window.

- Gaussian Window: This is an exponential window with a wide main lobe, resulting in lower frequency resolution. It has no negative side lobes, and the first side lobe is attenuated by 55 dB. The Gaussian window is often used to analyze non-periodic signals, such as exponential decay signals.
- Flat Top Window: As its name suggests, the flat top window exhibits very small passband fluctuations in the frequency domain.

Auto (Automatic Tuning)

Press the **[Auto]** key to enable the automatic tuning function to check the input signal.
Follow these steps:

1. Perform a peak search across the full span.
2. Select Marker > Center Frequency.
3. Select Marker > Reference Level.
4. Set all other settings to Auto to observe the signal.

Note

The valid frequency range for automatic tuning is 10 MHz to 8.4 GHz. It can automatically detect signals with a minimum amplitude of -65 dBm.

Sweep

Press the **[Sweep]** key to enter the panel menu to select the sweep and trigger modes.

Sweep Time (Auto/Manual): Select the sweep time for the displayed span (or the time used by the signal analyzer for a full-screen scan when the span is set to zero). Decreasing the sweep time

will increase the sweep frequency.

In manual mode, the user can change the sweep time value using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

1. **Span is not zero:**

   When the sweep time is set to auto, the signal analyzer selects an optimal (minimum) sweep time based on the current settings. This selection is influenced by the following factors:

   - The maximum tuning frequency of the signal analyzer
   - The selected video bandwidth filter and resolution
   - The maximum sampling rate of the analog-to-digital converter
   - Sweeping points
   - Amplitude scale (logarithmic or linear)
   - Detector mode

   The user can manually select a sweep time shorter than the auto-coupling value, but this may introduce measurement errors. The minimum sweep time is 1 ms.

2. **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 1 μs.
   - The maximum scan time is 4000s.

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

- Common sweeping provides faster scanning speeds.
- Precise sweeping is for high-accuracy measurements.

Sweep (Single/Continuous): Sets the sweep mode to single and continuous. The default is continuous. The corresponding status is displayed at the top of the screen according to the selected mode.

- **Continuous**: Sets the sweep mode to continuous sweep. The icon  indicates continuous mode. The system automatically sends the trigger initialization signal and enters the trigger condition judgment directly after each sweep.
- **Single**: Sets the sweep mode to single sweep. The icon  indicates single mode. The single backlight lights up after selecting "Single."

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

If the system is currently in single sweep mode and in the measurement state, press the "Single" key to perform the sweep and measurement when the trigger conditions are met.

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

- Auto: The signal analyzer automatically selects either sweep mode or FFT mode based on the current resolution bandwidth (RBW) to achieve the fastest sweeping speed. When RBW is greater than or equal to 1 kHz, sweep mode is automatically selected. When RBW is less than 1 kHz, FFT mode is automatically selected.
- Sweep Frequency: This mode performs a point-by-point sweep and is suitable for larger RBW settings.
- FFT: This mode performs a parallel sweep and is suitable for smaller RBW settings.
  When the Tracking Generator (TG) is turned on, due to its frequency continuous output characteristics, the system will be forced to switch to sweep mode.

Points: Sets 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.

Demodulation: Sets the demodulation type to "AM" or "FM," or turn off the demodulation function. The default setting is "OFF."

1. **AM or FM Demodulation**: When AM (or FM) demodulation is enabled, the system will automatically perform AM (or FM) demodulation for that frequency point.
2. **Audio Output**: The machine is equipped with a headphone jack, which can output the demodulated signal in audio mode through headphones. The audio frequency corresponds to the frequency of the modulating signal, and the audio strength indicates the amplitude of the modulating signal.

Trigger Type: Free trigger, external trigger, and video trigger

1. **Free Trigger**: The trigger signal can be generated continuously at any time as long as the

trigger conditions are met. No need to set trigger conditions; after sweeping each frame, the next frame will sweep automatically.

2. **Video Trigger**: When the voltage of the detected video signal exceeds the set video trigger level, a trigger signal is generated.

   Trigger Level: When the video trigger is selected, the trigger level line and the value of the trigger level are displayed on the screen. The user can change the trigger level using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

3. **External Trigger**: Input an external signal (TTL) via the connector **[TRIGGER IN]** on the rear panel. A trigger signal is generated when the signal meets the trigger edge conditions.

   Trigger Edge (Rising/Falling): Sets the trigger edge for the 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: Sets the trigger delay time.

Trace

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

Select Trace: Select the required trace. There are 6 traces available.

Trace Type: Sets the type of the currently selected trace. The system will display the scan data after performing the corresponding calculation method according to the selected trace type. The trace types include refresh, trace average, maximum hold, and minimum hold. Each type has a corresponding parameter displayed on the upper right side of the screen.

1. **Refresh**: Takes the real-time data after sweeping each point of the trace.
2. **Trace Average**: Each point of the trace displays the result of averaging the data after multiple sweeps. As the number of average sweeps increases, the waveform becomes smoother.
3. **Max Hold**: Each point of the trace keeps displaying the maximum value over multiple sweeps, updating the data display when a new maximum value is generated.
4. **Min Hold**: Each point of the trace keeps displaying the minimum value over multiple sweeps, updating the data display when a new minimum value is generated.

Detector: Sets the detection mode of the current measurement and apply the detection mode to the current trace. Optional detector types include sample, peak, negative peak, normal detection,

and average.

1. **Sample**: For each point on the trace, 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 is applicable 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 Peak:** For each point on the trace, negative peak detection shows the minimum value of the sampled data within the corresponding time interval.
4. **Normal Detection:** Normal detection alternately selects the maximum and minimum values of the sampled data segment. For every odd-numbered point on the trace line, the minimum value of the sampled data will be displayed. For every even-numbered point on the trace line, the maximum value of the sampled data will be displayed. This allows the range of amplitude variation to be observed intuitively.
5. **Average:** For each data point, the detector will take the average value by sampling data within the time interval. The averaging effect varies for different data types. The average type can be set using the **[Meas/Setup]** key. When the detector is set to average, the default value of VBW: 3 dB RBW is 0.1.

Auto Detector: Enable/disable the automatic detector selection function for trace. By default, the instrument turns on the automatic detector mode for trace. If the detector is set to manual, the automatic detector function for trace will be disabled.

Refresh (ON/OFF): When refresh is enabled, all stored data in the selected trace are removed, and any signals during sweep time are continuously displayed. When refresh is disabled, the amplitude data of the selected trace are held and displayed. The trace register will not be refreshed with the sweep.

Display (ON/OFF): Turn on/off the selected trace.

Trace Operation: Performs mathematical operations between traces or traces and a specified offset.

1. **OFF**: Disable the mathematical operations.
2. **Power (A-B)**: Calculate the power difference between operands A and B and store it in the target trace. During the sweep, the following calculation is performed for each point:
   Trace=10log ($10^{A/10}$-$10^{B/10}$)
   In this formula, the parameter unit is the decibel value of logarithmic power. If the value at point

A 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)**: Calculate the power sum of operands A and B and store it in the target trace. During the sweep, the following calculation is performed for each point:

   Trace=10log ($10^{A/10}$+$10^{B/10}$)

   In this formula, the parameter unit is the decibel value of logarithmic power. If the value at point A or B 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, operand A is subtracted from operand B and the offset is added, then the result is stored in the target trace. During the sweep, the following calculation is performed for each point:

   Trace=A-B+offset

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

5. **Log (A+Offset)**: Calculate the sum of operand A and the offset and store the result in the target trace. During the sweep, the following calculation is performed for each point:

   Trace=A+offset

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

Note

Trace arithmetic functions are mutually exclusive. When an arithmetic function is applied to a trace, it will turn off the previously 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. The unit is dB. The user can change the offset using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Marker

Press the **[Marker]** key to access the marker function panel menu, to select the marker type and quantity. The marker point is a rhombic icon, as shown in Figure 4-1.

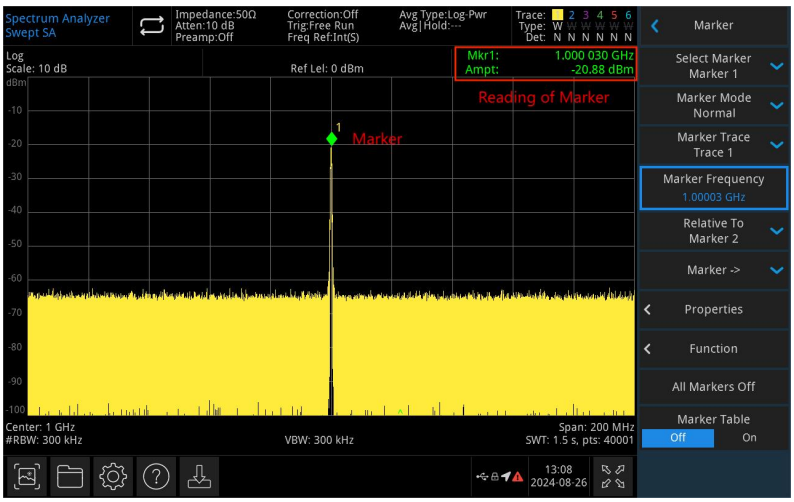


Figure 4-1 Reading of Marker Cursor

10 markers can be displayed on the screen simultaneously. However, only one marker or a pair of markers can be controlled at any given time.

Select Marker: Choose one of the ten available markers. By default, marker 1 is selected. After selecting a marker, the user can set parameters such as marker type, the trace to mark, and the reading mode. The active marker will be displayed on the selected trace, and the current parameter area and the upper right corner of the screen will show the marker's readings.

Marker Mode:

1. **Normal:** This mode is used for measuring X (frequency or time) and Y (amplitude) values at a specific point on the trace. After selecting Normal mode, a marker identified by its number (e.g., "1:) will appear on the trace. Note the following points when using this mode:
   - If no marker is currently activated, a marker will be activated at the center frequency of the current trace.
   - The reading of the current marker will be displayed in the upper right corner of the screen.
   - The resolution of the X-axis (time or frequency) reading is related to the span; reducing the span can achieve higher reading resolution.
2. **Delta** △: Used to measure the difference between the "reference point" and a "point on the trace" in terms of 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 the "Fixed" cursor, set the X and Y values of the cursor directly or indirectly; their positions remain unchanged. The Y value does not change with the trace. The fixed cursor is generally used as the reference cursor for the difference cursor and is marked with "×."

4. **OFF**: 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. The user can change the frequency value using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Relative To: Used for measuring the difference between two cursors. The two cursors can be marked on different traces at the same time.

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

1. **X-axis Scale:** Frequency, period, time, and inverse time can be set. The marker point reading changes according to the X-axis scale.
   - **Frequency:** When this type of reading is selected, the "Normal" and "Fixed" cursors show the absolute frequency. The "Difference" cursor shows the frequency difference relative to the reference cursor. In non-zero span mode, the default reading method is "Frequency."
   - **Period:** When this type of reading is selected, the "Normal" and "Fixed" cursors show the reciprocal of the cursor frequency. The "Difference" cursor shows the reciprocal of the frequency difference. When the frequency difference is zero, the reciprocal will be infinite, and the reading will show as "---."
   - **Time:** When this type of reading is selected, it shows the reciprocal of the sweep time difference between the difference cursor and the reference cursor. The "Difference" cursor shows the sweep time difference between the difference cursor and the reference cursor. In zero span, the default reading type 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 the reference cursor. When the time difference is zero, the reciprocal will be infinite, and the reading will show as "---."
2. **X-axis Scale (Man/Auto):** Manual and automatic X-axis scale can be set. When X-axis scale is automatic, and the span is in zero span mode, the marker reading will change to "Time" automatically.
3. **Marker Line (ON/OFF):** Turn on/off the marker line.
   - When the marker 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, and frequency meter threshold.

1. **Mark Noise:** Performs mark noise for the selected cursor and reads the normalized noise power density value at the cursor.
   If the current selected cursor is off in the **Marker** menu, pressing "Mark Noise" will automatically turn it on to the "Normal" type. This measures the average noise level of the frequency point at the cursor and normalizes it to the 1 Hz bandwidth, compensating for different detection methods and trace types. The noise cursor measurement can be more accurate by using "RMS Average" or "Sampling" methods.
2. **Power in-band:** In non-zero span mode, this calculates the total power of the signal within a certain bandwidth. In zero span mode, it calculates the average power within a specific time range.
3. **Density in-band:** In non-zero span mode, the density in-band is the total power within the measured bandwidth 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):** Enables the N dB bandwidth measurement function or sets 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) by N dB amplitude to the left and right. The user can change the value of N using the numeric key, rotary knob, arrow keys, or by touching the panel menu.
5. **Frequency Meter (ON/OFF):** Enables the frequency counting function of the cursor. The cursor displays the precise frequency of the frequency point with the maximum energy. Enabling the frequency meter will affect the scanning speed.
6. **Frequency Meter Threshold:** Sets the count time for the frequency meter.

All Markers OFF: Closes all marker points.

Marker->: Uses the value of the current cursor to set other system parameters of the signal analyzer (such as center frequency, reference level, etc.). If no cursor is available currently, pressing the **Marker** menu will activate a cursor automatically.

1. **->Center Frequency**: Sets the center frequency of the signal analyzer to the frequency of the current cursor.

- When the "Normal" cursor is selected, the center frequency is set to the frequency of the cursor.
- When the "Difference" cursor is selected, the center frequency is set to the frequency of the difference cursor.
- In zero span mode, this function does not work.

2. **->Center Frequency Step**: Sets the stepped center frequency of the signal analyzer to the frequency of the current cursor.
   - When the "Normal" cursor is selected, the stepped center frequency is set to the frequency of the cursor.
   - When the "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 does not work.
3. **->Start Frequency**: Sets the start frequency of the signal analyzer to the frequency of the current cursor.
   - When the "Normal" cursor is selected, the start frequency is set to the frequency of the cursor.
   - When the "Difference" cursor is selected, the start frequency is set to the frequency of the difference cursor.
   - In zero span mode, this function does not work.
4. ->**Stop Frequency**: Sets the stop frequency of the signal analyzer to the frequency of the current cursor.
   - When the "Normal" cursor is selected, the stop frequency is set to the frequency of the cursor.
   - When the "Difference" cursor is selected, the stop frequency is set to the frequency of the difference cursor.
   - In zero span mode, this function does not work.
5. **->Reference Level**: Sets the reference level of the signal analyzer to the amplitude of the valid marker and move the marker point to the reference level (on the top of the grid).
   - When the "Normal" cursor is selected, set the marker amplitude of the signal analyzer to the amplitude of the current reference level.
   - When the "Difference" cursor is selected, set the reference level to the amplitude difference between markers.

Marker List: Turn on/off the marker list.

When the marker table is opened, all open cursors are displayed as a table in the window of the split screen. The display includes the cursor number, marker mode, marked trace number, X-axis scale

type, X-axis reading, and amplitude. The marker table can be used to view the measurement values of multiple measurement points.

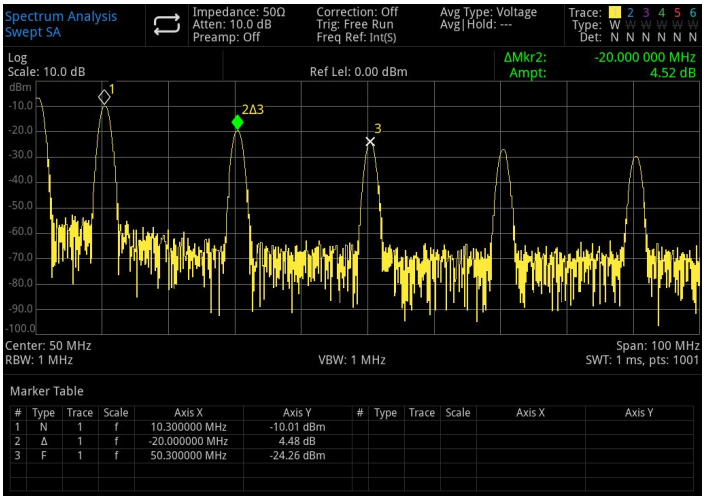


Figure 4-2 Marker List

Peak

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

Marker Frequency: Mark the frequency point on the trace. The user can change the frequency value by using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Marker ->: Refer to "Marker->" in the panel menu.

Peak Search: Use the normal cursor mode to search for the highest amplitude in the trace and display the frequency and amplitude value. Press the peak search to perform it once.

Next Peak: Search the peak on the trace that has the second highest amplitude after the current peak and meets the search criteria. Mark it with the cursor. If this peak does not exist, the marker will not move.

Next Peak on the Left: Search the current peak on the left side and search for the closest peak that meets the search criteria on the trace. Mark it with the cursor.

Next Peak on the Right: Search the current peak on the right side and search for the closest peak that meets the search criteria on the trace. Mark it with the cursor.

Minimum Peak: Search the minimum amplitude value on the trace and mark it with the cursor.

Peak-to-Peak Search: Perform peak search and minimum search simultaneously. The result of the peak search is marked with the "Difference" cursor, and the result of the minimum search is marked with the "Reference" cursor.

Continuous Peak Search (ON/OFF): Turn on/off continuous peak search. The default setting is OFF. When continuous peak search is turned on, the signal analyzer automatically performs a peak search after each sweep to track the measuring signal.

Peak List (ON/OFF): Turn on/off the peak list. The default setting is OFF.

When the peak table is turned on, a list of peaks that meet the search parameters (displaying frequency and amplitude) is displayed below the split screen window. A maximum of 20 peaks that meet the criteria can be displayed.

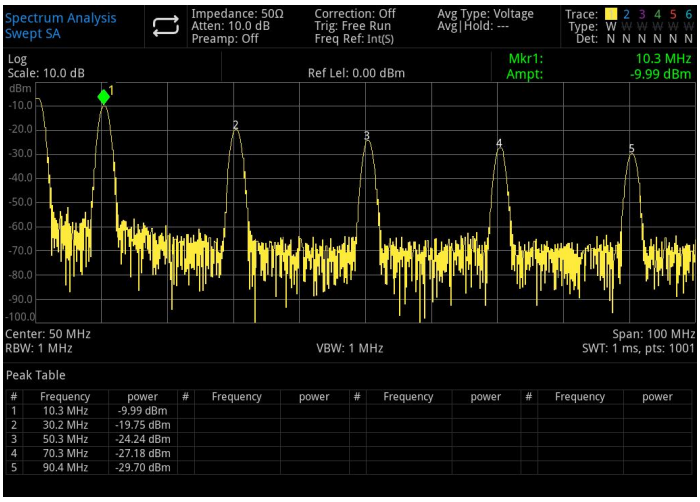


Figure 4-3 Peak List

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

Threshold Line (ON/OFF): Set whether to display the peak threshold and peak offset indicator line. The default setting is OFF.

Threshold (Man/Auto): Specify the minimum peak amplitude manually or automatically. Only peaks greater than the peak threshold can be considered peaks. The user can change the threshold by using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Threshold Offset (Man/Auto): Specify the difference between the peak and the minimum amplitude on the left and right sides. The peak can be considered a peak only if this difference is greater than the peak offset. The user can change the offset using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Save (File Storage)

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

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

1. Press the **Export** key. The instrument will save the current state using the default file name or a user-defined file name.

2. After the state file is selected, press the **Import** key to read the current state file.

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

Trace Selection: There are six traces available for selection.

1. Press the **Export** key. The instrument will save the current state and trace using the default file name or a user-defined file name.
2. After the state file is selected, press the **Import** key to read the current state and trace files.

Measurement Data: Press the Measurement Data panel menu to access the 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 (comma-separated values) format for data analysis using Excel software.

Trace Selection: There are six traces available for selection.

Data Type: Trace, peak list, and marker list.

1. Press the **Export** key. The instrument will save the current selected type of measurement data using the default file name or a user-defined file name.
2. After the measurement data file is selected, press the **Import** key to read the current measurement data file.

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

1. Press the **Export** key. The instrument will save the current limit using the default file name or a user-defined file name.
2. After the limit file is selected, press the **Import** key to read the current limit file.

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

Correction Selection: There are 10 correction data.

1. Press the **Export** key. The instrument will save the current correction data using the default file name or a user-defined file name.
2. After the correction file is selected, press the **Import** key to read the current correction file.

Export: Export the current selected file.

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

System Setting

Press the **[System]** key to enter the settings menu. This menu allows access to the system information, general settings, and network settings of the signal analyzer.

Information: Enter the System Information panel menu to check general and option information.

1. **Basic Information:** Displays the 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 the version number and state of the option.

Setting: Enter the settings menu to configure the basic and network settings.

1. **General Settings**
   - **Language:** Simplified Chinese, English, and German
   - **Time 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 them. After setting, touch "√" to confirm and close the setting dialog box.
   - **Picture Format:** Sets the format of screenshots, with "bmp," "jpeg," and "png" available for selection.
   - **Power On:** Sets the system parameter settings that are loaded after power on, with options for default, last, and preset.
   - **Backlight:** Swipe the scroll bar to adjust the screen backlight.
   - **Volume:** Swipe the scroll bar to adjust the sound volume.
   - **HDMI Output:** HD multimedia interface, touch "□" to tick it, indicating the interface is turned on.
   - **Screenshot Inverse:** Sets the inverse color of screenshot.
   - **User Preset:** When the power-on parameter is set to preset, this configuration file will be used to set the parameters when the instrument is turned on.
   - **Shutdown Confirmation:** When selected, a confirmation dialog box will pop up before shutting down.
2. **Network Settings**
   - **Adapter:** This is the LAN switch. Touch "□" to tick it, indicating that the interface is enabled.
   - **DHCP:** Touch "□" to tick it, indicating that the network configuration is automatically acquired. If it is not ticked, it indicates a manual setting.

- **IPv4 Address:** The format of the IP address is "nnn.nnn.nnn.nnn." The first "nnn" range is 1 to 223, and the other three "nnn" ranges are 0 to 255. It is recommended to consult a network administrator for an available IP address.
- **IP Mask:** The format of the subnet mask is "nnn.nnn.nnn.nnn," where "nnn" ranges from 0 to 255. It is recommended to consult a network administrator for an available subnet mask address.
- **Gateway:** The format of the gateway is "nnn.nnn.nnn.nnn." The first "nnn" range is 1 to 255, and the other three "nnn" ranges are 0 to 255. It is recommended to consult a network administrator for an available gateway address.
- **MAC Address:** The physical address that confirms the location of a network device, also called the hardware address. The length is 48 bits (6 bytes) and 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 are called extended identifiers.

3. **IO Config**
   - **Web User name:** Sets the username for logging into the browser. The web address format is http://IP , where IP is the network setting of the IPv4 address. For example, http://192.168.20.117.
   - **Web Password:** Sets the password for logging into the browser. After a successful login, the user can perform instrument control, SCPI command execution, network settings, and other operations on the browser.
4. **Web Access**

   After the web username and password are set, users can use a PC or mobile web browser to remotely control the device. It mimics the clickable display function of the touchscreen/mouse, just like a physical instrument. The operation steps are as follows:

   (1) Access Local Area Network

   The computer and the signal analyzer should be on the same LAN. Check the local IP address through the UTILITY menu of the signal analyzer, and then the browser accesses the signal analyzer using http://ip port.

   Example:

   - Computer IP: 192.168.20.3
   - signal analyzer IP: 192.168.20.117
   - PC browser using 192.168.20.117 to access the signal analyzer can check the basic information and operate the instrument control, internet settings, password settings, and SCPI control, as shown in Figure 4-4.

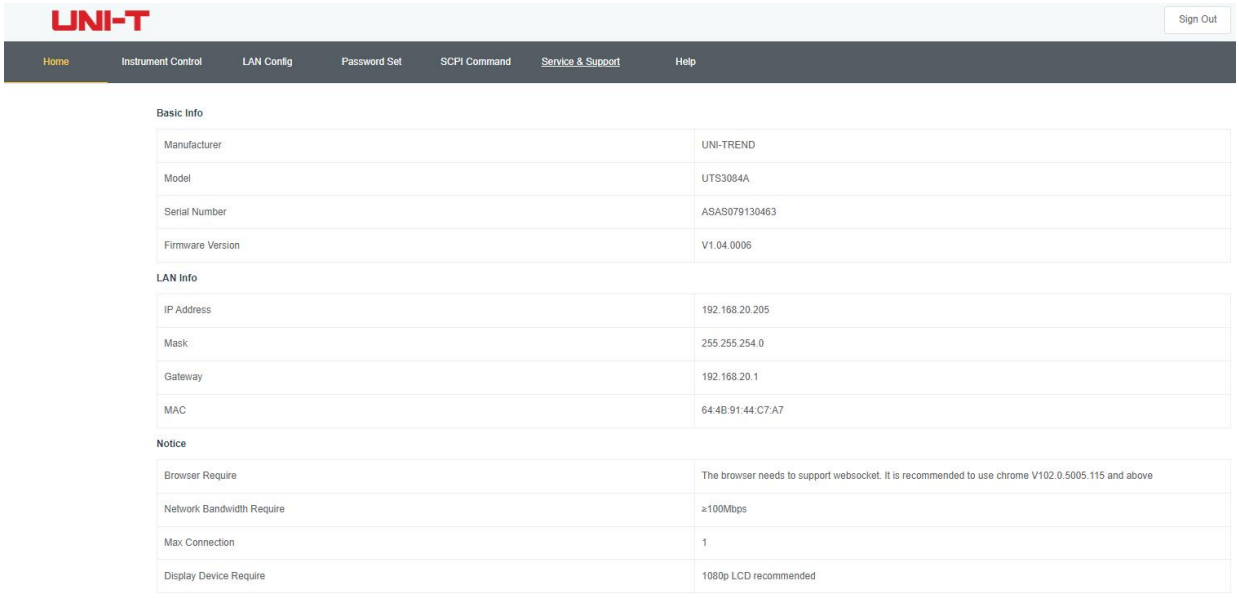


Figure 4-4 Web Basic Information

Log in to check the instrument settings, operate the instrument control, configure internet settings, set passwords, and control SCPI. The web username and password can be found in Utility/System Information. After logging in, users can view and control the signal analyzer, as shown in Figure 4-5.

Figure 4-5 Web Control for Instrument

The operations can be performed on the touchscreen of a physical instrument, such as selecting the menu panel, clicking the function key, inputting numbers and characters, and dragging the marker. This web page can also be operated and PrintScreen can be used.

(2) Access Outer Network

a. Ensure the network cable is plugged into the signal analyzer and that internet access is available.

b. Turn on the frp proxy service on the server.

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

d. The browser can access the proxy port via http://IP:web_port, and the access interface will be consistent with the local network interface described above.

Note

This instrument uses frp (Fast Reverse Proxy) for intranet penetration to access the outer network. The frp version is 0.34.0. The instrument includes the FRP-0.34.0 client port, which requires a server running the FRP server. The client connects to the FRP server port 7000, so the server configuration must include "bind_port = 7000."

(3) Network Settings

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

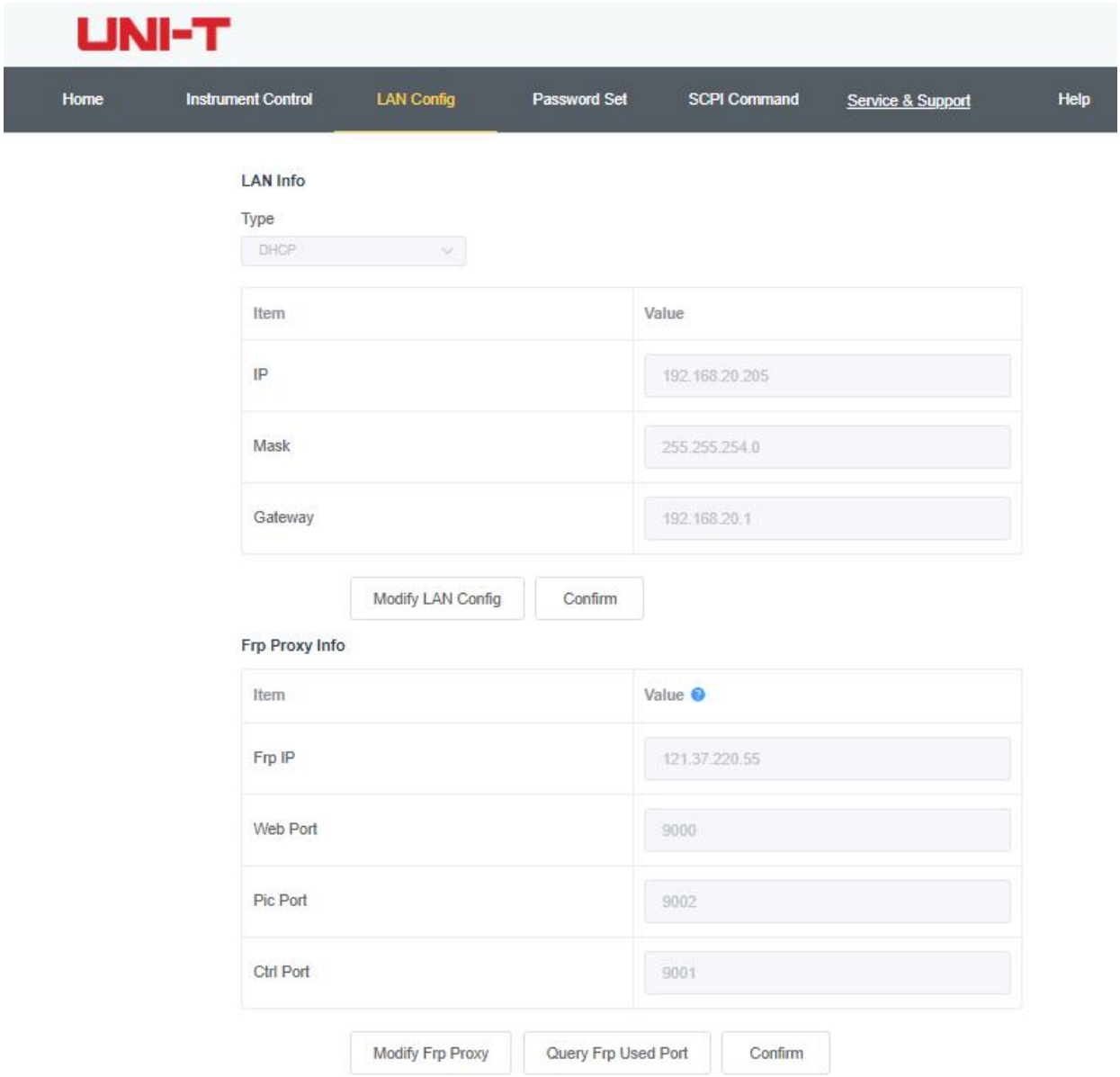


Figure 4-6 Web Network Settings

(4) Password Settings

Modify the web password of the signal analyzer as shown in Figure 4-7. The original password can be found by navigating to Physical Instrument -> System -> Setting -> Port Setting.

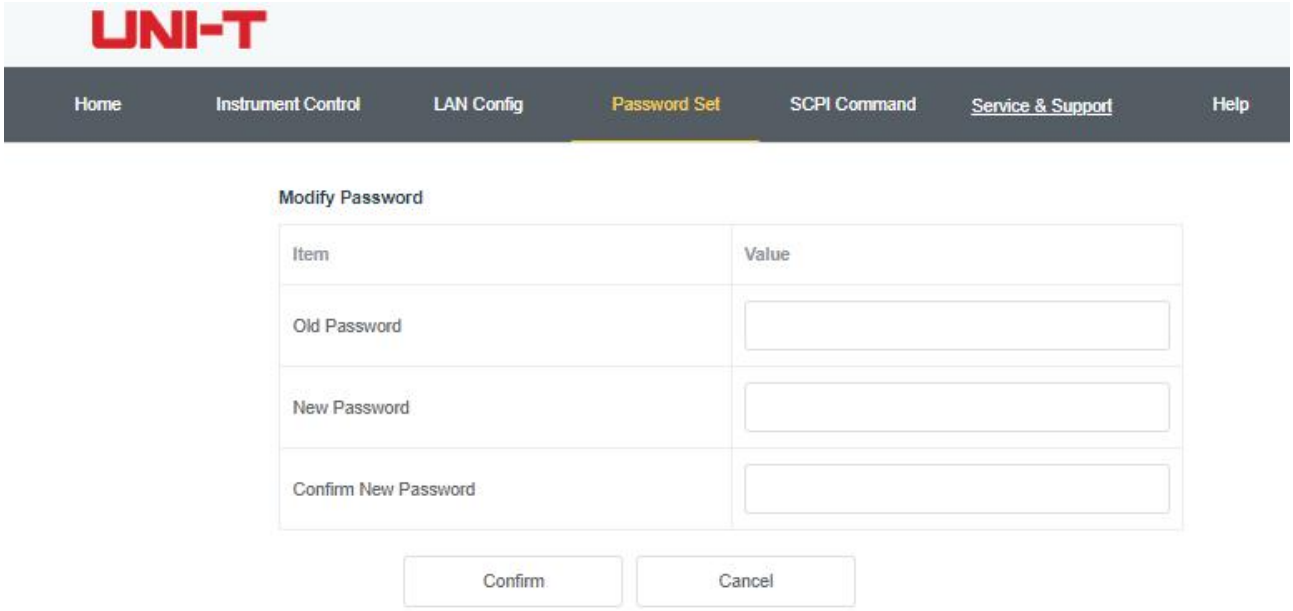


Figure 4-7 Web Password Settings

(5) SCPI

Execute SCPI commands as shown in Figure 4-8. Input the command in the edit box and click the **Send** key. The executed result will be displayed in the report frame below.

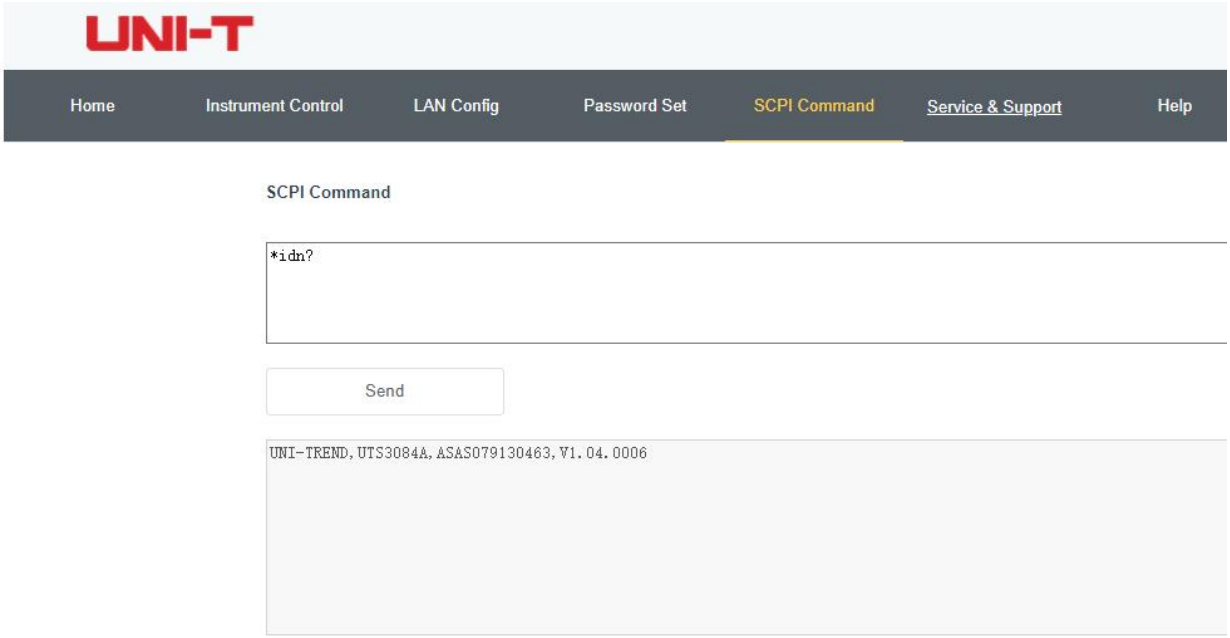


Figure 4-8 SCPI Control

Restore Defaults: Enter the restore default menu to perform this function.

1. Restore the system settings: The system settings of the signal analyzer will be restored to the

default state.

2. Clear data: All the stored data of the signal analyzer will be deleted.
3. Restore all settings: All settings of the signal analyzer will be restored to the default state, and clear the user's data.

Default Setting

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

Press [Default] > Reset to restore to the factory settings:

1. Reset the signal analyzer to signal analyzer (SA) mode.
2. Enter the frequency menu.
3. Sets the default parameter for some environment.
4. Perform a processor test without affecting 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 signal analyzer's memory.
8. The limit line test is turned off, but the list of limit lines remains in the signal analyzer's memory.
9. The state is directly set to 0.

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

Menu	Parameter Name	Default Value
FREQ (Frequency)	Start Frequency	10 MHz
FREQ (Frequency)	Stop Frequency	8.4 GHz (Max frequency)
FREQ (Frequency)	Frequency Offset	0 Hz
AMPT (Amplitude)	Reference Level	0 dBm
AMPT (Amplitude)	Input Attenuation	Auto/ 10 dB
AMPT (Amplitude)	Preamplifier	OFF
AMPT (Amplitude)	Reference Level Offset	0 dB
AMPT (Amplitude)	Impedance	50 Ω
BW (Bandwidth)	RBW (Resolution Bandwidth)	Auto / 10 MHz
BW (Bandwidth)	VBW (Video Bandwidth)	Auto / 10 MHz
Sweep	Sweep Time	Auto / 2.6 ms

Sweep	Sweep Mode	Auto / Sweep
Sweep	Sweep Points	1001
Sweep	Trigger Type	Free trigger
Trace	Select Trace	1
Trace	Trace Type	Refresh
Trace	Trace Detector	Normal
Trace	Trace Update	ON
Trace	Trace Display	ON
Meas (Measurement)	Measurement Type	Frequency Sweep
Meas/Setup	Average/Hold Count	100
Meas/Setup	Average Type	Voltage

Tracking Generator (TG)

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

Tracking source (ON/OFF): Turn on/off the tracking source.

When the tracking source is enabled, the **[TG]** key indicator on the front panel will light up, and the [Gen Output 50 Ω] connector 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: Sets the output power of the tracking source signal. The user can change the amplitude value by using the number key, rotary knob, arrow keys, or touch the panel menu.

Offset: Adjust the output power offset of the tracking source to account for any gain or loss between the output and an external device. This ensures that the displayed power value reflects the actual system power. You can change the offset using the numeric keypad, rotary knob, arrow keys, or the touch panel menu.

Normalization: Turn on/off normalization. If normalization is turned on without saving the reference trace first, the signal analyzer will automatically save the reference trace once the current sweep is complete. A prompt message will display during this process. When normalization is enabled, the reference trace values are subtracted from the data after each sweep.

Reference Level Value: When normalization is enabled, adjust the reference level value to change the vertical position of the trace on the screen. This adjustment does not affect the spectrum's reference level value. You can change the reference level value using the numeric keypad, rotary knob, arrow keys, or the touch panel menu.

Reference Trace: Turn on/off the reference trace display.

Save Reference Trace: When the trace source is enabled, the reference trace can be saved once

the first trace scan is complete. After saving the reference trace, normalization can be executed. If the frequency changes during normalization, the reference trace should be saved again.

Note

This parameter does not affect the actual output power of the tracking source; it only adjusts the power reading. The offset value can be positive or negative. A positive offset indicates an external output gain, while a negative offset indicates an external output loss.

Single

The **[Single]** key is a quick key for activating the sweep mode. For more details, refer to "Sweep."

Touch/Lock

The **[Touch/Lock]** key indicates the status of the touch function: a red indicator means the touch function is locked, while an off indicator means the touch function is enabled. Press the **[Esc]** key to exit the lock screen.

Meas/Setup

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

Average/Hold Count: Sets the average time for the trace. The user can change the average time using the numeric key, rotary knob, arrow keys, or by touching the panel menu. Multiple averages can reduce the influence of noise or other random signals, thereby highlighting the stable characteristics of the signal. A higher average time results in a smoother trace.

Average Type:

1. **Log-Power Averaging:** This averages 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 dB. Therefore, it reduces the displayed level of the noise (not the true noise level) and is suitable for observing low-energy narrowband signals, especially those close to the noise.
2. **Power Averaging:** This averages the power of the signal (the square of the amplitude). The average detection type will change to RMS (power) detection. Power averaging provides the

true power for noise and is most suitable for measuring the real-time power of complex signals.

3. **Voltage Averaging:** This averages the voltage values of the signal envelope measured in a signal collection unit. The average detection type will change to voltage detection. Voltage averaging still provides a linear display, making it suitable for observing the rise and fall of AM signals or pulse-modulated signals (e.g., radar, TDMA transmitters).

Display Line (ON/OFF): Sets the display line level to adjust its position. The display line is a reference horizontal line with an amplitude value equal to the set value, and the amplitude unit corresponds to the Y-axis unit. The user can change the display line level using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Note

- The display line serves as a reference horizontal line with an amplitude value equal to the set value, and its unit matches the Y-axis unit.
- If the display line is outside the visible range, it will be displayed at the top or bottom of the grid and indicated by an arrow.

Limits: Sets the parameters for the limit. Press the **[Default]** key to disable the limit value measurement function while retaining the limit value data.

1. **Select:** Choose the current limit line. Up to 6 limit lines can be selected; the default is Limit 1.
2. **Limit (ON/OFF):** Turn on/off the limit line display. When the limit line is enabled, the measurement interface will display the limit line, and the corresponding trace will be tested according to the current limit line. Each limit line is displayed in a different color.
3. **Test Trace:** Sets the trace used for testing the current limit line. The default trace is Trace 1.
4. **Margin (ON/OFF):** Enable or disable margin display. When the margin is enabled, the margin line is shown on the measurement interface. When the margin is disabled, the margin is not displayed.
5. **Type (Upper/Lower):** Select the type of the current limit line as either “Upper” or “Lower”. The test fails if the trace amplitude exceeds the upper limit or falls below the lower limit.
6. **Edit Limit:** Press this key to access the edit menu and open the limit line editing window. When the limit line is enabled, the peak list will be turned on. When the peak list is disabled, the corresponding trace corresponding to the limit line will be turned on. The menu includes the following options.
   - **Select:** Choose the limit line to edit. The default limit value is 1.
   - **Select Line:** Select the row in the limit value table.
   - **Frequency:** Edit the frequency of the current point. The user can change the display line

level by using the numeric key, rotary knob, arrow keys or touch the panel menu.

- **Amplitude:** Edit the frequency of the current point. The user can change the frequency using the numeric key, rotary knob, arrow keys, or by touching the panel menu.
- **X Offset:** Sets the frequency offset for the current limit value line.
- **Y Offset:** Sets the amplitude offset for the current limit value line.
- **Apply Offsets:** Apply the X and Y offsets to each point of the current limit line, then reset the X and Y offsets to 0.
- **Insert Row:** Add a new editing point.
- **Delete Row:** Remove the currently selected row.
- **Delete Limit:** Delete the current limit line and its associated data.

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:** Create a limit line based on the selected trace.
10. **Delete All Limits:** Delete all limit lines. This action clears the data of all limit lines and restores them to the factory settings.

Measurement Preset: Reset all parameters of the current measurement mode to the factory settings.

Measurement (Meas)

Press the **[Meas]** key to perform measurements including channel power, time domain power, occupied bandwidth, third-order intermodulation, adjacent channel power, spectrum monitor, carrier-to-noise ratio, and harmonic components. For more details, see Chapter 5 "One-key Measurement."

Mode

Press the **[Mode]** key to select IQ analysis, EMI, analog demodulation, vector signal analysis, real-time sweep frequency analysis, vector network analysis, and phase noise (some options may require additional activation). Please download the required instructions from the official website.

5. One-key Measurement

- Frequency Sweep
- Channel Power
- Time Domain Power
- Occupied Bandwidth
- Third-order Intercept
- Adjacent Channel Power
- Spectrum Monitor
- Carrier-to-noise
- Harmonic

This chapter introduces how to use the **[Meas]** key on the front panel (take the spectrum analysis mode as an example).

Frequency Sweep

Press **[Meas] > Frequency Sweep**

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 the **[Meas/Setup]** key to set the parameters for spectrum analysis. This key can also be used to set the measuring settings for other one-key measurements.

Channel Power

Figure 5-1 Channel Power

Power and power spectral density are measured within the user-specified channel bandwidth, with a pair of vertical lines on the display indicating the boundaries of the channel bandwidth. The center frequency, reference level, and channel bandwidth need to be configured.

Press **[Meas] > Channel Power** to access the panel menu. The settings menu includes the following options.

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
- **Repetition Average Mode:** Once the specified sweep count is reached, all previous data is deleted, and the sweep process restarts.

Average Type:

- **Logarithmic Power Averaging:** Averages the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit. When this type of averaging is selected, the detection type changes to video detection.
- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Integral BW: Specify the range of integration to calculate the power within a channel, such as setting the bandwidth of the main channel. The integral bandwidth is displayed in a blue box on the screen. The span should be set between 1 and 10 times the integral bandwidth. The integral bandwidth can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Time Domain Power

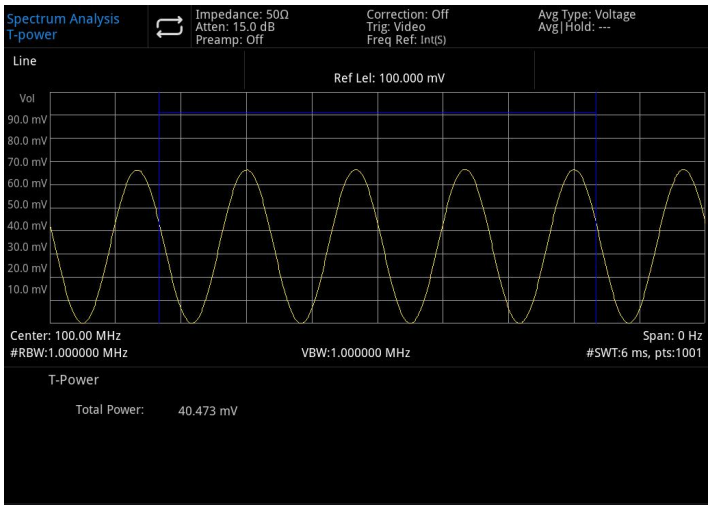


Figure 5-2 Time Domain Power

Press **[Meas] > Time Domain Power** to enter zero span mode, where the system calculates power in the time domain. The settings menu includes the following options.

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel

menu. The measured average result will be displayed after the sweep. When the average count is disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
- **Repetition Average Mode:** Once the specified sweep count is reached, all previous data is deleted, and the sweep process restarts.

Average Type:

- **Logarithmic Power Averaging:** Averages the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit. When this type of averaging is selected, the detection type changes to video detection.
- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Start Time: Sets 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. The user can change the left boundary using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Stop Time: Sets 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. The user can change the right boundary using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Occupied Bandwidth

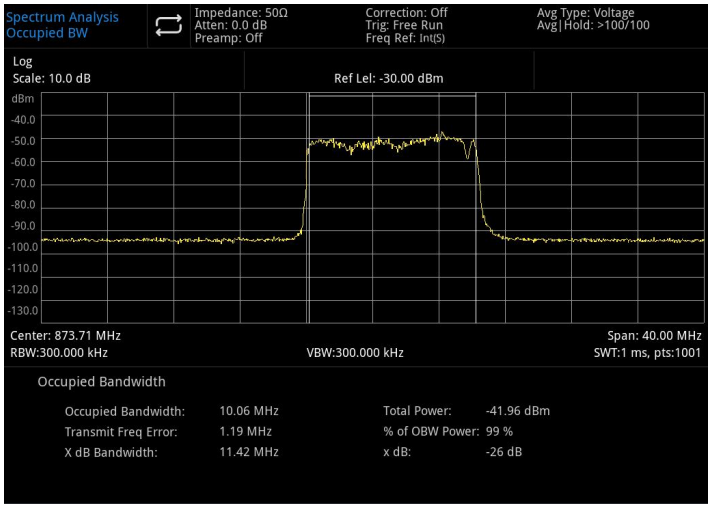


Figure 5-3 Occupied Bandwidt

The power of the spectrum shown on the screen will first be calculated, and two markers will be placed on the spectrum. The percentage of power between the two frequencies indicated by the markers is specified by the user, with a default testing percentage of 99%.

The power-bandwidth program calculates the total power of all signals on the trace. For the 99% occupied power bandwidth, the markers are placed at frequencies on the left and right such that the power between these two frequencies accounts for 99% of the total spectrum power. The remaining 1% of the power is evenly distributed outside the markers. The frequency difference between the two markers represents the 99% power bandwidth and is displayed on the screen.

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

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

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

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is

disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
- **Repetition Average Mode:** Once the specified sweep count is reached, all previous data is deleted, and the sweep process restarts.

Average Type:

- **Logarithmic Power Averaging:** Averages the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit. When this type of averaging is selected, the detection type changes to video detection.
- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

% of OBW Power: This parameter allows the user to change the percentage of signal power used in determining the occupied bandwidth (OBW). The percentage can be adjusted using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

X dB: This parameter defines the number of dB below the highest point (P1) in the signal for measuring the transmission bandwidth. The transmission bandwidth should be within the span of the OBW. This function operates independently of the OBW calculation. The calculated result of the x dB bandwidth is also referred to as the emission bandwidth (EBW).

A directional marker (F1 and F2) is placed at each of the two frequencies on the left and right sides of the highest point (P1). The amplitude at these two frequencies is lower by the specified dB value from the highest point (P1), corresponding to the dB value set by the user. The total power between the two markers is then calculated.

The frequencies F1 and F2 are defined as the furthest frequencies from P1 where the signal is higher or lower by the specified x dB. The transmission bandwidth is calculated as the difference between F2 and F1, with a range from -100.0 dB to -0.1 dB. The user can change the x dB value using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Note

The asterisk next to the x dB bandwidth value indicates that the result was not obtained under optimal signal analyzer settings. If your primary concern is transmission bandwidth, select Maximum Hold, then press **[Trace] > Detector > Peak Detection**. The peak data obtained will ensure the accuracy of the transmission bandwidth measurement.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Third-order Intermodulation

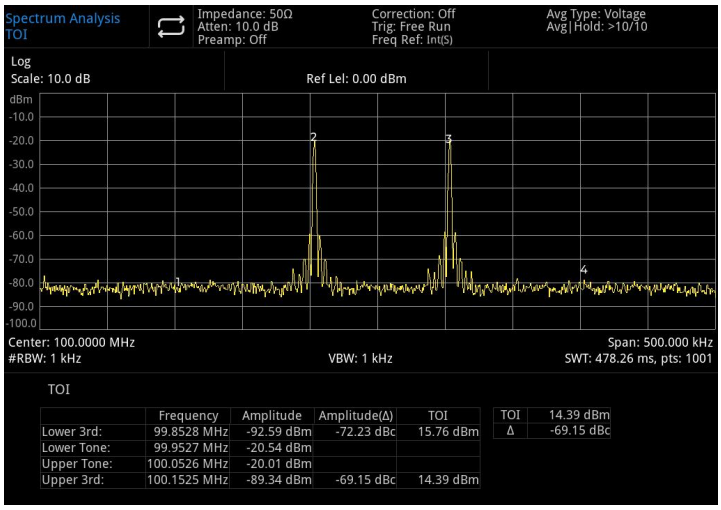


Figure 5-4 Third-order Intermodulation

Third-order intermodulation (TOI) measurement is used to calculate and display the output intercept point (IP3). Direction markers are placed on the trace to indicate the positions of the measured signal and the third-order intermodulation product.

Press **[Meas] > Third-order Intercept** to enter the following panel menu.

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
- **Repetition Average Mode:** Once the specified sweep count is reached, all previous data is deleted, and the sweep process restarts.

Average Type:

- **Logarithmic Power Averaging:** Averages the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit. When this type of averaging is selected, the detection type changes to video detection.
- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Adjacent Channel Power

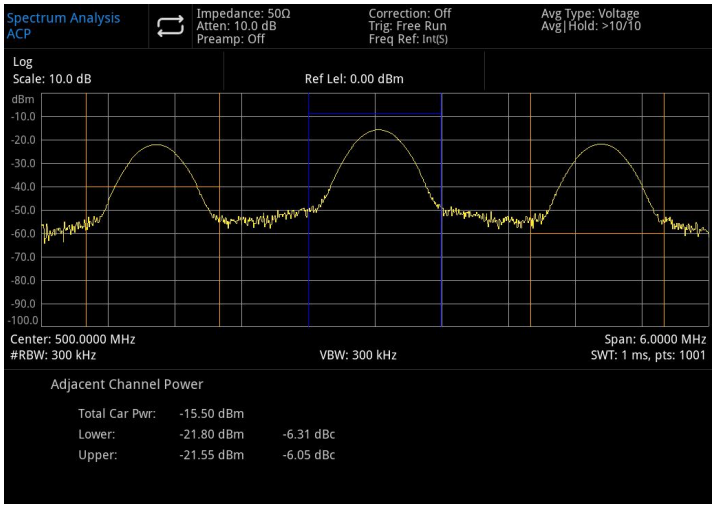


Figure 5-5 Adjacent Channel Power Measurement

Measure the power of the main channel, as well as the power of the adjacent channels on both sides. Given the main channel and the left and right adjacent channels, with the main channel centered on the center frequency point and the adjacent channels symmetrically positioned on either side. The channel parameters can be adjusted by varying the main channel bandwidth, adjacent channel bandwidth, and adjacent channel spacing (the distance between the adjacent channels and the

center of the main channel). This method calculates the power of each channel, similar to the channel power algorithm. The ratio of the adjacent channel power to the power of the main channel is known as the adjacent channel power ratio (ACPR).

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

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
- **Repetition Average Mode:** Once the specified sweep count is reached, all previous data is deleted, and the sweep process restarts.

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- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Noise BW: Sets the bandwidth of the main channel. The power is integrated within the main channel's bandwidth (default value: 2 MHz). The user can change the carrier bandwidth using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Integral BW: Sets the frequency bandwidth of the adjacent channel. The adjacent channel bandwidth is linked to the frequency bandwidth. The user can adjust the adjacent channel

bandwidth using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Frequency Offset: Refers to the center frequency spacing between the main channel and the adjacent channels. Adjusting the channel spacing will simultaneously adjust the distances among the previous channel, the next channel, and the main channel. The user can change the adjacent channel spacing using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Offset Side: Specifies which offset side to measure.

- NEG: Negative (lower) sideband only.
- POS: Positive (upper) sideband only.
- Both: Both the negative (lower) and positive (upper) sidebands.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Spectrum Monitor

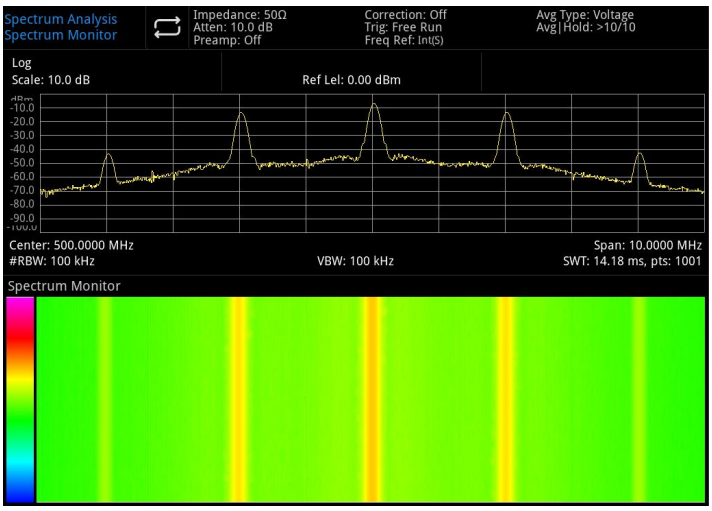

Figure 5-6 Spectrum Monitor

The horizontal axis represents frequency, the vertical axis represents time, and color indicates the energy level of the spectrum. This setup is used to detect intermittent occurrences within the spectrum. Spectrum monitoring allows for observing changes in the signal over a period of time.

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

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is

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- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Carrier to Noise Ratio

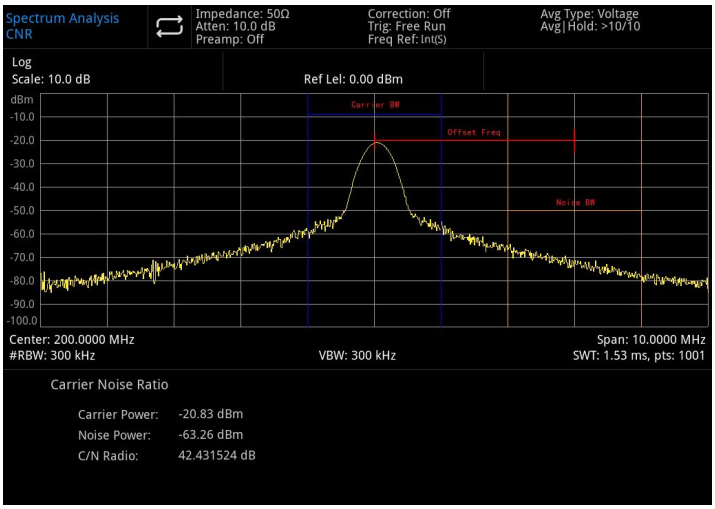

Figure 5-7 Carrier to Noise Ratio Measurement

Carrier to Noise Ratio Measurement: Carrier power, noise power, and carrier-to-noise-ratio.

- **Carrier Power:** Search for the maximum positive peak, $f1$ within the screen range. Calculate the power within the carrier bandwidth centered at $f1$; this is the carrier power.
- **Noise Power:** Set the frequency offset to ensure no carrier signal is present in the noise bandwidth. Calculate the power within the noise bandwidth centered on $f1$ +frequency offset; this is the noise power.
- **Carrier to Noise Ratio:** Divide the carrier power by the noise power to obtain the carrier-to-noise ratio.

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

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
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- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Carrier BW: Sets the bandwidth of the carrier to be measured. The carrier bandwidth is linked with

the span, noise bandwidth, and frequency offset. The user can adjust the carrier bandwidth using the numeric key, rotary knob, arrow keys, or by touching the panel menu.

Noise BW: Sets the bandwidth of the noise to be measured. The noise bandwidth is linked with the span, carrier bandwidth, and frequency offset. The user can adjust the noise bandwidth using the numeric key, rotary knob, arrow keys, or touch the panel menu.

Frequency Offset: Sets the frequency difference between the center frequency of the carrier and the noise. The frequency offset is linked with the span, carrier bandwidth, and noise bandwidth. The user can adjust the frequency offset using the numeric key, rotary knob, arrow keys, or touch the panel menu.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

Harmonic Measurement

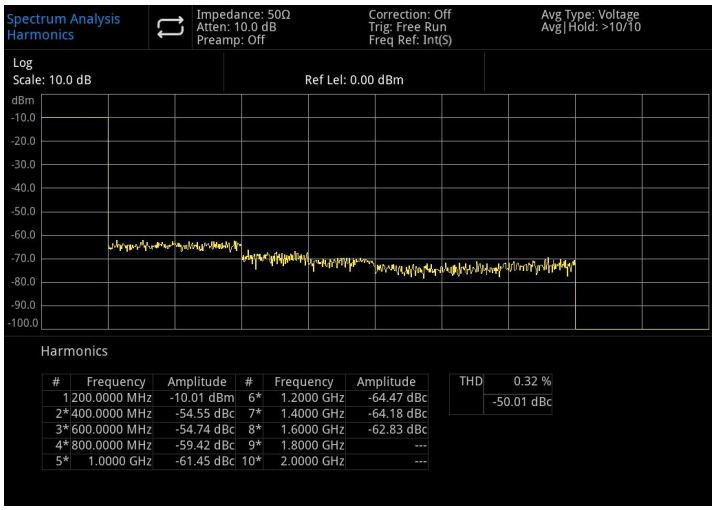

Figure 5-8 Harmonic Measurement

Harmonic Measurement: Measures the amplitude of each harmonic and the total harmonic distortion (THD) of the carrier signal, up to 10 harmonics.

The harmonic analysis waveform is displayed as a zero-sweep waveform for each harmonic, and all keys under the **[FREQ]** menu are disabled during this measurement.

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

Measurement Setup

Average/Hold Count (ON/OFF): When the average count is enabled (ON), specify the number of sweeps to average the measurement results. The sweep count can range from 1 to 999. The average time can be adjusted using the numeric keys, rotary knob, arrow keys, or by touching the panel menu. The measured average result will be displayed after the sweep. When the average count is

disabled (OFF), the averaging function is turned off.

Average Mode (Exponential/Repeat): Switch between exponential and repetition averaging modes. This averaging mode is used to determine the average mode for the signal analyzer when the specified number of averaging scans has been reached.

- **Exponential Average Mode:** After the specified number of sweeps is reached, the data is weighted exponentially and added to the previous average value. In this mode, the weight of new data is greater than that of older data, allowing the signal analyzer to track slowly changing signals more effectively. The average result is displayed after sweeping.
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Average Type:

- **Logarithmic Power Averaging:** Averages the logarithmic amplitude values (in dB) of the signal envelope measured within a signal collection unit. When this type of averaging is selected, the detection type changes to video detection.
- **Power Averaging:** Averages the power of the signal, which is the square of the amplitude. When this type is selected, the detection type changes to RMS (power) detection.
- **Voltage Averaging:** Averages the voltage values of the signal envelope measured within a signal collection unit. When this type is selected, the detection type changes to voltage detection.

Fundamental Harmonic: Sets the frequency of the measured carrier signal. By default, other harmonics are measured at multiples of the specified fundamental frequency. The user can adjust the fundamental frequency using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Harmonic: Sets the number of harmonic to measure for calculating total harmonic distortion. The user can adjust the harmonic count using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Dwell Time: Sets the dwell time for the specified harmonic measurement. In zero-sweep mode, the auto setting balances measurement speed and accuracy; increasing the dwell time will enhance accuracy but slow down the measurement process. The user can adjust the dwell time using the numeric keys, rotary knob, arrow keys, or by touching the panel menu.

Measurement Preset: Reset all parameters of the current measuring mode to factory setting.

6. System Prompt and Troubl

- System Prompt
- Troubleshooting

System Prompt

When the default value is used, all operating mode parameters will be invalid.

Name	Minimum	Maximum
Center Frequency	50 Hz	8.409999950 GHz
Sweep Width	Zero span	Full span
Start Frequency	0 Hz	8.409999900 GHz
Stop Frequency	100 Hz	8.41 GHz
Frequency Offset	-100 GHz	100 GHz
Center Frequency Step	1 Hz	8.41 GHz
Reference Level	-100 dBm	30 dBm
Input Attenuation	0 dB	51 dB
Scale	0.1 dB	20 dB
Reference Level Offset	-327.6 dB	327.6 dB
RBW	1 Hz	10 MHz
VVBW	1 Hz	10 MHz
VBW:3dB RBW	0.000001	3000000
Sweep Time	1 ms	4 ks
Sweep Points	11	40001
Trace Operation Offset	-100 dB	100 dB
Width in-band	0 Hz	16.82 GHz
N dB	-140 dB	-0.01 dB
Peak Threshold	-200 dBm	30 dBm
Peak Offset	0 dBm	100 dBm
Average/Hold Count	1	10000
Display Line	-300 dBm	30 dBm
Integral BW	100 Hz	8.4 GHz
Start Time	0s	10 ms
Stop Time	0s	10 ms

%OBW Power	10%	99.99%
x dB	-100 dB	-0.1 dB
Noise BW (ACPR)	100 Hz	8.41 GHz
Integral BW (ACPR)	100 Hz	8.41 GHz
Frequency Offset (ACPR)	0 Hz	4.204999950 GHz
Carrier BW (CNR)	100 Hz	8.409999800 GHz
Noise BW (CNR)	100 Hz	4.404999950 GHz
Frequency Offset (CNR)	100 Hz	4.404999950 GHz
Fundamental Harmonic	100 Hz	4.200000000 GHz
Harmonic	2	10

Troubleshooting

This chapter lists potential faults and their corresponding troubleshooting methods for the signal analyzer. Follow these steps to resolve issues. If the methods do not work, please contact UNI-T and provide your machine's information (acquisition method: **[System] > Information**).

1. After pressing the power soft switch, the signal analyzer displays a blank screen, and nothing appears.
   a. Check if the power connector is properly connected and the power switch is turned on.
   b. Check that the power supply meets the required specifications.
   c. Check whether the fuse of the machine is properly installed or blown.
2. Pressing the power switch still results in a blank screen with no display.
   a. Check the fan. If the fan rotates but the screen remains 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 may indicate that the instrument is not powered on.
   c. If the above steps do not resolve the issue, do not disassemble the instrument yourself. Please contact UNI-T immediately for further assistance.
3. Spectral line is not updated for a long time.
   a. Check if the current trace is in the update state or if multiple averaging is enabled.
   b. Check whether the current settings meet the restriction conditions. Review the restriction settings and check for any restriction signals.
   c. If the above steps do not resolve the issue, do not disassemble the instrument yourself. Please contact UNI-T immediately for further assistance.

d. Check whether the current mode is in the single sweep state.
e. Check whether the current sweep time is excessively long.
f. Check if the demodulation time in the demodulation listening function is excessively long.
g. Confirm that the EMI measurement mode is sweeping.

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

   Users can refer to the detailed technical index descriptions at the back of this manual to calculate system errors and address issues with measurement results and accuracy. To ensure performance as specified in this manual, the following steps should be taken:

   a. Ensure that external devices are properly connected and functioning.
   b. Have a good understanding of the signal being measured and set appropriate parameters for the instrument.
   c. Perform measurements under specific conditions, such as allowing the instrument to warm up for a certain period after startup and maintaining an appropriate working environment temperature.
   d. Calibrate the instrument regularly to compensate for any measurement errors caused by instrument aging.

If calibration is required after the warranty calibration period, please contact UNI-T or obtain paid services from authorized measurement institutions.

7. Appendix

- Maintenance and Cleaning
- Contact Us

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 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.

Contact Us

If the use of this product has caused any inconvenience, and you are in mainland China, you can contact UNI-T directly.

Service support: 8 a.m. to 5.30 p.m. (UTC+8), Monday to Friday or via email at infosh@uni-trend.com.cn

For product support outside mainland China, please contact your local UNI-T distributor or sales center.

Many UNI-T products offer options to extend the warranty and calibration period. Please contact your local UNI-T dealer or sales center for more information.

To obtain the address list of our service centers, please visit our website at http://www.uni-trend.com.