Instruments.uni-trend.com

# UTS7000A Series Signal Analyzer

## User Manual

This manual applies to:

UTS7000A Series

V1.2

December , 2025

# Foreword

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

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

# Safety Information

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

## Safety Precautions

| Safety Precautions | |
|---|---|
| **Warning** | **Please follow these guidelines to avoid possible electric shock and risk to personal safety.** |
| | Users must adhere to standard safety precautions during the operation, servicing, 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 safety precautions. This device is designed for professional users and responsible organizations for measurement purposes.<br>Do not use this device in any manner not specified by the manufacturer. This device is intended for indoor use only, unless otherwise stated in the product manual. |
| **Safety Statements** | |
| **Warning** | **"Warning" indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Personal injury or death may occur if the rules in the "Warning" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Warning" statement.** |
| **Caution** | **"Caution" indicates the presence of a hazard. It warns users to pay attention to a certain operation process, operation method or similar. Product damage or loss of important data may occur if the rules in the "Caution" statement are not properly executed or observed. Do not proceed to the next step until you fully understand and meet the conditions stated in the "Caution" statement.** |
| **Note** | **"Note" indicates important information. It reminds users to pay attention to procedures, methods, and conditions, etc. The contents of "Note" should be highlighted if necessary.** |
| **Safety Signs** | |

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| | **Danger** | It indicates danger of electric shock, which may cause personal injury or death. |
| | **Warning** | It indicates that there are factors you should be cautious of to prevent personal injury or product damage. |
| | **Caution** | It indicates danger, which may cause damage to this device or other equipment if you fail to follow a certain procedure or condition. If the "Caution" sign is present, all conditions must be met before you proceed with the 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 device. Please check the region's voltage range. |
| | **DC** | Direct current device. Please check the region's voltage range. |
| | **Grounding** | Frame and chassis grounding terminal |
| | **Grounding** | Protective grounding terminal |
| | **Grounding** | Measurement grounding terminal |
| | **OFF** | Main power off |
| | **ON** | Main power on |
| | **Power** | Standby power supply: When the power switch is turned off, this device is not completely disconnected from the AC power supply. |
| **CAT I** | Secondary electrical circuit connected to wall sockets through transformers or similar equipment, such as electronic instruments and electronic equipment; electronic equipment with protective measures, and any high-voltage and low-voltage circuits, such as the copier in the office. | |
| **CAT II** | Primary electrical circuit of the electrical equipment connected to the indoor socket via the power cord, such as mobile tools, home appliances, etc. Household appliances, portable tools (e.g., electric drill), household sockets, sockets more than 10 meters away from CAT III circuit or sockets more than 20 meters away from CAT IV circuit. | |
| **CAT III** | Primary circuit of large equipment directly connected to the distribution board and circuit between the distribution board and the | |

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| | | socket (three-phase distributor circuit includes a single commercial lighting circuit). Fixed equipment, such as multi-phase motor and multi-phase fuse box; lighting equipment and lines inside large buildings; machine tools and power distribution boards at industrial sites (workshops). |
| **CAT IV** | | Three-phase public power unit and outdoor power supply line equipment. Equipment designed to "initial connection," such as power distribution system of power station, power instrument, front-end overload protection, and any outdoor transmission line. |
| CE | **Certification** | CE indicates a registered trademark of EU. |
| UK CA | **Certification** | UKCA indicates a registered trademark of the United Kingdom. |
| Intertek 4007682 | **Certification** | Conforms to UL STD 61010-1 and 61010-2-030. Certified to CSA STD C22.2 No.61010-1 and 61010-2-030. |
| | **Waste** | Do not place equipment and accessories in the trash. Items must be properly disposed of in accordance with local regulations. |
| 40 | **EUP** | 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.<br>The AC input voltage of the line reaches the rated value of this device. See the product manual for specific rated value.<br>The line voltage switch of this device matches the line voltage.<br>The line voltage of the line fuse of this device is correct.<br>This device is not intended for measuring the main circuit. |
| **Check all terminal rated values** | | Please check all rated values and marking instructions on the product to avoid fire and the impact of excessive current. Please consult the product manual for detailed rated values before connection. |
| **Use the power cord properly** | | Users 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 |

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| | conductor of the power supply. Please be sure to ground this product before it is powered on. |
| **AC power supply** | Please use the AC power supply specified for this device. Please use the power cord approved by your country and confirm that the insulation layer is not damaged. |
| **Electrostatic prevention** | This device may be damaged by static electricity, so it should be tested in the anti-static area if possible. Before the power cable is connected to this device, the internal and external conductors should be grounded briefly to release static electricity. The protection grade of this device is 4 kV for contact discharge and 8 kV for air discharge. |
| **Measurement accessories** | Measurement accessories designated as lower-grade, which are not applicable to main power supply measurement, CAT II, CAT III, or CAT IV circuit measurement. Probe subassemblies and accessories within the range of IEC 61010-031 and current sensors within the range of IEC 61010-2-032 can meet its requirements. |
| **Use the input / output port of this device properly** | Please use the input / output ports provided by this device in a proper manner. Do not load any input signal at the output port of this device. Do not load any signal that does not reach the rated value at the input port of this device. The probe or other connection accessories should be effectively grounded to avoid product damage or abnormal function. Please refer to the product manual for the rated value of the input/output port of this device. |
| **Power fuse** | Please use a power fuse of exact specification. If the fuse needs to be replaced, it must be replaced with another one that meets the specified specifications by the maintenance personnel authorized by UNI-T. |
| **Disassembly and cleaning** | There are no components available for operators inside. Do not remove the protective cover.<br>Qualified personnel must conduct maintenance. |
| **Service environment** | This device should be used indoors in a clean and dry environment with ambient temperature from 0 °C to +40 °C.<br>Do not use this device in explosive, dusty, or high humidity conditions. |
| **Do not operate in humid environment** | Do not use this device in a humid environment to avoid the risk of internal short circuit or electric shock. |
| **Do not operate in flammable and explosive environment** | Do not use this device in a flammable and explosive environment to avoid product damage or personal injury. |
| **Caution** | |

| | |
|---|---|
| **Abnormality** | If this device may be faulty, please contact the authorized maintenance personnel of UNI-T for testing. Any maintenance, adjustment or parts replacement must be done by the relevant personnel of UNI-T. |
| **Cooling** | Do not block the ventilation holes at the side and back of this device. Do not allow any external objects to enter this device via ventilation holes.<br>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** | Insufficient 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 precautions to prevent dust or moisture in the air affecting the performance of this device. Please keep the product surface clean and dry. |
| **Note** | |
| **Calibration** | The recommended calibration period is one year. Calibration should only be conducted by qualified personnel. |

# Environmental Requirements

This instrument is suitable for the following environment:

- Indoor use
- Pollution degree: 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, operating temperature is 0 to +40°C; storage temperature is -20 to +60°C.

  Operating: Humidity at temperature below +35°C, ≤90% RH.; non-operating: Humidity at temperature from +35°C to +40°C, ≤60% RH.

There are ventilation openings on the rear panel and side panel of the instrument. So please keep the air flowing through the vents of the instrument housing. To prevent excessive dust from

blocking the vents, please clean the instrument housing regularly. The housing is not waterproof, please disconnect the power supply first and then wipe the housing with a dry cloth or a slightly moistened soft cloth.

# Connecting Power Supply

The specification of AC power supply that can input as the following table.

| Voltage Range | Frequency | Power |
|---|---|---|
| 100-240 VAC (Fluctuations ± 10%) | 50/60 Hz | ≤250W |
| 100-120 VAC (Fluctuations ± 10%) | 400 Hz | |

Please use the attached power cord to connect to the power outlet.

**Connecting to service cable**

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

Please install the AC power cable as follows.

- Ensure the power cable is in good condition.
- Leave enough space to connect 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 damaged invisibly by electrostatic discharge during transportation, storage and use.

The following measure can reduce the damage of electrostatic discharge.

- Testing in anti-static areas as far as possible.
- Before connecting the power cable to the instrument, the inner and outer conductors of the instrument should be briefly grounded to discharge static electricity.
- Ensure all the instruments are properly grounded to prevent the accumulation of static electricity

# 1. Overview

- UTS7000A Series
- Front Panel
- User Interface
- Rear Panel

This chapter describes the main functions and features of the UTS7000A series signal analyzer and gives a brief introduction to keys and icons on the front and rear panel.

## UTS7000A Series

The UTS7000A series is a signal analyzer with a frequency range from 2 Hz to 40 GHz. It can serve as the core instrument in an automatic control system and is well-suited for various testing and application needs in corporate R&D, factory production, and educational research environments.

## Front Panel

Figure 1-1 Front Panel

1. **Display screen:** Display area, touch screen.
2. **Measurement:** Used to activate the main functions of the signal analyzer, including:
   - **Frequency (FREQ):** Press this key to enable the center frequency function and enter the frequency setup menu.

- **Amplitude (AMPT):** Press this key to enable the reference level function and enter amplitude setup menu.
- **Bandwidth (BW):** Enables the resolution bandwidth (RBW) function and opens the menu for configuring parameters such as bandwidth and aspect ratio.
- **Sweep:** Opens the sweep menu to configure sweep time, mode, and number of points.
- **Trigger:** Opens the trigger menu to configure trigger type and trigger parameters.
- **Trace:** Opens the trace control menu to configure trace, detection mode, and trace operation.
- **Marker:** Used to select marked number, type, attributes, tagging options, and list view; also controls the display of these marks.
- **Peak:** Places a marker at the peak amplitude of the signal and enables control over its associated functions.
- **Measurement setting (Meas Setup):** Configures average/hold time, average type, display line, and limit values.
- **Input/Output (I/O:** Opens the I/O menu to configure parameters, including calibration, reference frequency input, and input coupling.
- **Single:** Press this key to perform a single sweep; press again to return to continuous sweep mode.
- **Auto-Tuning (Auto):** Automatically searches for active signals and centers them on the screen.

3. **Advanced function key:** Used to activate advanced measurement functions of the signal analyzer, including:
   - **Mode/Meas:** Opens the measurement mode selection menu, where users can choose the operating mode of the signal analyzer and configure measurement functions specific to each mode—such as Adjacent Channel Power (ACP), Occupied Bandwidth (OBW), and Harmonic Distortion in Spectrum Analysis mode.
   - **Reset (Default):** Restores the signal analyzer to its default factory settings.
4. **System (function key)**: Used to activate the main functions of signal analyzer, including:
   - **File System (File):** Opens the file manager where users can view, create, modify, or delete files. Files such as corrections, limits, measurement results, screenshots, traces, and status logs can be stored in internal or external memory and recalled when needed.
   - **File storage (Save/Recall):** Press this key to enter the save menu, the types of files include state, trace line + state, measurement data, limit, correction, and export data.
   - **System information (System):** Access the system menu to configure system parameters.

- **Touch/Lock:** Toggles the touchscreen function. The key illuminates green when activated.

5. **Data control key:** Direction key, rotary knob and numerical key are used to adjust the numerical value of the activated function, such as center frequency, start frequency, resolution bandwidth and maker position.

   **Note**

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

6. **Headphone jack:** 3.5 mm. The load resistance value of the interface adaptation is ≤32Ω, greater than 32Ω does not guarantee the audio effect.
7. **Radio Frequency input terminal (RF input 50 Ω):** Used to connect the external input signal, the input impedance is 50 Ω (type-N female).

   **Warning**

   Do not apply signals that exceed the rated specifications to the input ports. Ensure that probes and other connection accessories are properly grounded to prevent equipment damage or functional failures. The RF IN port can tolerate a maximum input power of +30 dBm or a DC voltage of up to 50 V.

8. **USB port:** Used to connect external USB, keyboard, and mouse.
9. **ON/OFF switch:** Short press power on the signal analyzer. When the instrument is already on, a short press will place it into standby mode, during which all functions are disabled.

# User Interface

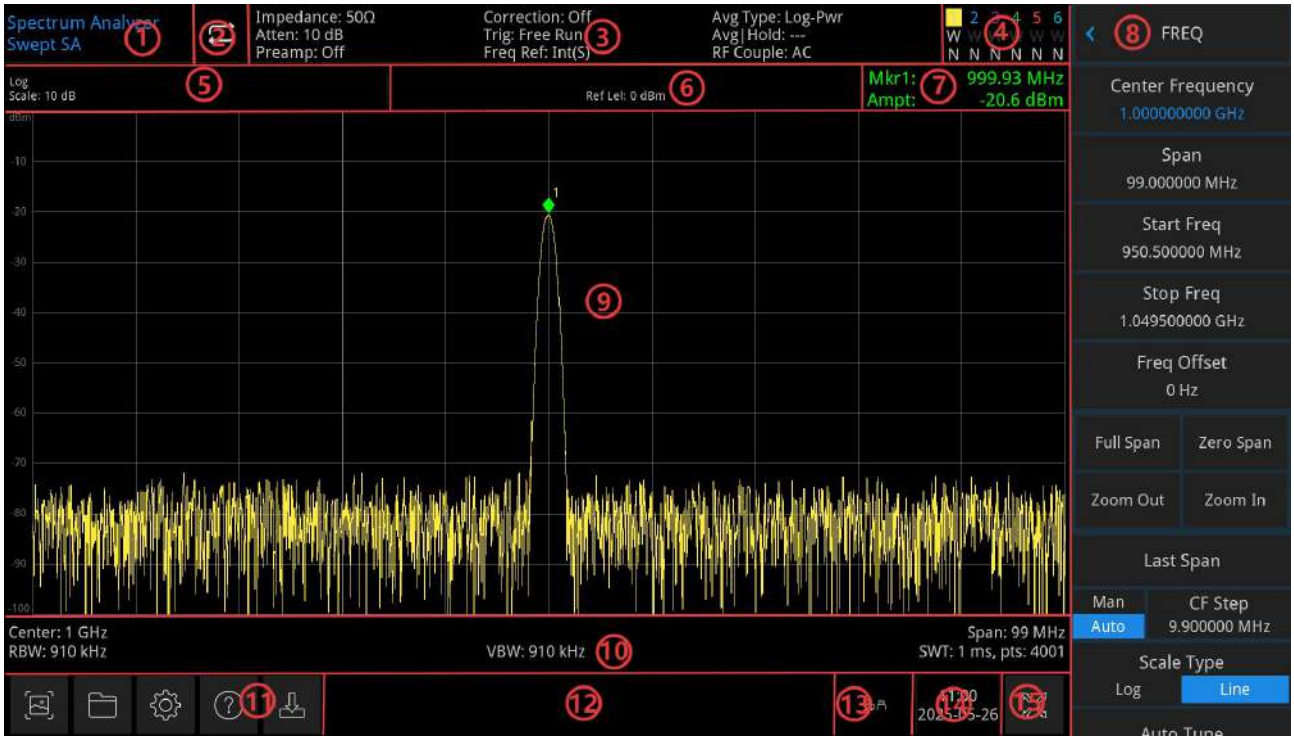


Figure 1-2 User Interface

1. **Operation modes:** Spectrum analysis, IQ analysis, EMI (Electromagnetic Interference) testing, analog demodulation, vector signal analysis, real-time spectrum analysis, phase noise analysis, LTE FDD (Long-Term Evolution Frequency Division Duplex), LTE TDD (Long-Term Evolution Time Division Duplex), and NR (New Radio).
2. **Sweep/Measuring:** Single/continuous mode. Tap the screen icon to quickly toggle between the two modes.
3. **Measurement menu:** Displays the measurement information, including input impedance, input attenuation, preset, correction, trigger type, reference frequency, average type, and average/hold. Tap the screen icon to quickly access and switch on these functions.
4. **Trace indicator:** Displays the information of trace and detector, including trace serial number, trace type, and detector type.

**Note**

The first line displays the trace number, with its color matching the corresponding trace on the screen for easy identification.

The second line indicates the trace type, such as **W** (refresh), A (average), **M** (maximum hold), and **m** (minimum hold).

The third line shows the detector type, including **S** (sample detection), **P** (peak detection), **p** (negative peak), **N** (normal detection), **A** (average), and **f** (trace math operation).

All detector types are displayed in white text.

Tap the screen icon to quickly switch between different modes. Each letter represents a specific mode.

- **Highlighted white letter:** The trace is currently being updated and displayed.
- **Gray letter:** The trace is not being updated.
- **Gray letter with strikethrough:** The trace is neither updated nor displayed.
- **White letter with strikethrough:** The trace is being updated but not displayed — useful for trace math operations.

5. **Display scale:** Displays the scale value and scale type (logarithm, linear). In linear mode, the scale value cannot be changed.
6. **Reference level:** Displays the reference level value and reference level offset value.
7. **Result of cursor measurement:** Displays the cursor measurement results, including frequency and amplitude. In zero span mode, the time is displayed instead of frequency.
8. **Panel menu:** Menu and function, including frequency, amplitude, bandwidth, trace, and marker.
9. **Grid display area:** Displays trace display, marker, video triggering level, display line, threshold line, cursor table, and peak list.
10. **Data display:** Displays center frequency value, sweep width, start frequency, cut-off frequency, frequency offset, RBW, VBW, sweep time, and sweep count.
11. Function setting: Quick screenshot, file system, setup system, help system, and file storage.
    - **Quick screenshot** : Saves a screenshot to the default file. If an external storage device is connected, the screenshot is saved there by default.
    - **File system** : Allows saving of corrections, limits, measurement results, screenshots, traces, status, and other data to internal or external storage. Saved files can be recalled for later use.
    - **System information** : Displays the basic and optional information.
    - **Help system** : Opens user guidance and help documentation.
    - **File storage** : Import or export state, trace + state, measurement data, limit value, and correction files.
12. **System log dialog box:** Click the blank space on the right of file storage to enter system log to check the operation log. This dialog provides access to operation logs, alarm messages, prompt, and hint information.
13. **Connection type:** Displays the connection status of mouse, USB, and screen lock.
14. **Date and time:** Displays the date and time.

15. **Full screen switch:** Toggles full screen mode. The display is horizontally stretched. The right-side control panel is automatically hidden for maximum viewing area.

# Rear Panel

Figure 1-3 Rear Panel

1. **Trigger 1 IN:** When the signal analyzer is set to External Trigger 1 (Ext 1) mode, this connector receives either the rising or falling edge of an external trigger signal, input via a BNC cable.
2. **Trigger 2 IN:** When the signal analyzer is set to External Trigger 2 (Ext 2) mode, this connector receives either the rising or falling edge of an external trigger signal, input via a BNC cable.

   **Warning**

   Trigger 1 IN,Trigger 2 IN, The rated voltage is 5Vpp. Do not apply signals that exceed the rated specifications to the input ports. Ensure that probes and other connection accessories are properly grounded to prevent equipment damage or functional anomalies.
3. **Trigger 1 Out:** When output trigger is enabled, this connector outputs a TTL-compatible trigger signal (square wave).
4. **Trigger 2 Out:** When trigger output trigger is enabled, this connector outputs a TTL-compatible trigger signal (square wave).

   **Warning**

   The rated voltage of Trigger 1 Out and Trigger 2 Out is 5Vpp. When output to other devices, please pay attention to the receiving port specification to avoid damage or abnormal function of the device.
5. **10MHz reference input:** The signal analyzer can operate using either an internal or external reference source.

- If the instrument detects a valid 10 MHz external clock signal at the **[REF IN 10 MHz]** connector, it will automatically switch to this signal as the external frequency reference. The user interface will then display **Reference Frequency: External**. If the external reference signal is lost, out of range, or disconnected, the instrument will automatically revert to the internal reference, and the display will update to **Frequency Reference: Internal**.

**Warning**

The input power rating of 10MHz In is -5dBm to +10dBm. Do not apply signals that exceed the rated specifications to the input ports. Ensure that probes and other connection accessories are properly grounded to prevent equipment damage or functional anomalies.

6. **10MHz reference output:** The signal analyzer can operate using either an internal or external reference source.
   - When using the internal reference, the **[10 MHz OUT]** connector outputs a 10 MHz clock signal generated by the analyzer's internal reference source. This signal can be used to synchronize external devices, ensuring consistent timing across instruments.

**Warning**

Do not apply input signals to the output ports, as this may cause equipment damage or functional failures. The rated output power of 10MHz Out is 10dBm ±2dB. When output to other devices, please pay attention to the receiving port specifications to avoid equipment damage or abnormal function.

7. **HDMI interface:** Outputs HDMI video signals for external display.
8. **LAN interface:** A TCP/IP communication port used for remote control of the instrument over a network.
9. **USB Device interface:** Connects the signal analyzer to a PC, enabling remote control via PC-based software.
10. **USB 3.0 interface:** Used to connect external USB storage devices. Supports reading and importing waveform data files from a USB drive. This port also allows system firmware upgrades, ensuring the RF analog signal generator runs until the latest version is released by the manufacturer.
11. **GPIB interface:** Enables connection to a PC for remote control of the signal generator via PC-side software using the GPIB (IEEE-488) protocol.
12. **Power switch:** Turns the signal analyzer on or off.
13. **Power switch:** Used to turn on/off the AC power supply. When the switch is turned on, the signal analyzer enters standby mode while the indicator on the front panel lights up.
14. **Burglar-proof lock:** Provides physical security to help prevent theft of the instrument.

15. **Ground connector:** Provides an electrical ground connection point for connecting an antistatic wrist strap. This helps prevent electrostatic discharge (ESD) damage when handling or connecting the Device Under Test (DUT).

# 2. User Guide

- Inspecting Package and Packing List
- Preparatory Work
- Instructions
- Touch Operation
- Remote Control
- Help Information
- Operation Mode

## Inspecting Package and Packing List

When you receive the instrument, please check the packaging and list in the following steps.

1. Check whether the packing box and padding material have been compressed or damaged by external forces and inspect the appearance of the instrument. If you have any questions about the product or need consulting services, please contact the distributor or local office.
   If you have any questions about the product or other problems, please contact the distributor or the local office.
2. Carefully take out the article and check it with the packing instructions.

## Preparatory Work

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

Figure 2-1 Tilt Adjustment

2. Press the switch on the rear panel, the signal analyzer will enter standby mode.
3. Press the soft switch on the front panel, the indicator illuminates green, which means the signal analyzer is powered on.

   The signal analyzer requires approximately 30 seconds to complete initialization before entering the system's default menu mode. For optimal performance, it is recommended to allow the instrument to warm up for at least 45 minutes after it is powered on.

# Instructions

### Use External Reference Signal

If the instrument uses an external 10 MHz signal source as the reference, please connect the signal source to the 10 MHz IN port on the rear panel. The measurement menu at the top of the screen will display **Reference Frequency: External**.

### Activate the Option

To activate an option, you must enter its license key. You can purchase the required license by contacting your nearest UNI-T office. Follow the steps below to activate a purchased option:

1. Copy the license file (provided in the accessories) to the root directory of a USB flash drive.
2. Insert the USB flash drive into the USB port located on the front panel of the instrument.
3. Press the **System** key on the front panel to open the system settings window.
4. Select **System Information**. In the **Option Information** table, click **Add License** to open the Add License dialog box.
5. Locate and select the license file on the USB drive, then check the box to confirm.
6. Upon successful activation, the status of the corresponding option in the Option Information table will be updated to **Activated**.

### Firmware Upgrade

After downloading the firmware upgrade package from the official UNI-T website, please follow the steps below to complete the upgrade:

1. Unzip the upgrade package and copy its contents to the root directory of a USB flash drive. The package should contain a file named xxxx.deb (as shown in the figure below).

Figure 2-2 Upgrade Package

2. Insert the USB flash drive into the USB port on the device's front panel.

3. Open the USB drive and copy the .deb file to the device's Home directory.
4. In the Home directory, double-click to open the upgrade dialog box, click Install Package in the dialog box, enter the password: admin, click Authenticate, the upgrade will begin.
5. The upgrade process may take several minutes. Once completed, double-click Signal Analyzer application on the desktop to launch the updated program.

**Note**

Use a USB flash drive formatted as FAT32 to copy the upgrade package. During the upgrade process, ensure that the instrument remains powered on, the USB drive stays securely connected, and no other operations are performed. Interruptions may cause the upgrade to fail, potentially resulting in device malfunction.

# Touch Operation

Press the **[Touch Lock]** key to enable or disable touchscreen input.

The signal analyzer features an 11.6-inch multi-touch screen that supports a variety of gesture-based operations, including:

- Tap the top-right corner of the screen to open the main menu.
- Swipe up/down or left/right in the grid area to adjust the X-axis center frequency or Y-axis reference level.
- Pinch or spread two fingers in the grid area to zoom in or out on the X-axis sweep span.
- Tap on-screen parameters or menus to select and edit them.
- Enable and reposition cursors as needed for measurement.
- Use auxiliary shortcut keys to perform common operations efficiently.

# Remote Control

UTS7000A series signal analyzer supports communication with computers via USB and LAN interfaces. Through these interfaces, users can utilize standard programming languages or NI-VISA, together with SCPI (Standard Commands for Programmable Instruments), to remotely program and control the instrument. The analyzers are also compatible with other programmable devices that support the SCPI command set, enabling system integration and interoperability.

For detailed information on installation, remote control, and programming, please refer to the ***Spectrum/Signal Analyzer Programming Manual***, available on the official website: http://www.uni-trend.com.

# Help Information

The signal analyzer includes a built-in help system that provides contextual assistance for each function button and menu control key on the front panel.

1. Touch the question icon on the bottom left of the screen to open the Help dialog box in the center of the display. Tap any supported function to view detailed help related to that feature.
2. To close the Help dialog box, tap the ✖ icon or press any other key.

# Operation Mode

The signal analyzer supports multiple operating modes, which can be accessed by pressing the **Mode** key:

- Spectrum Analysis (see Chapter 4 for details)
- IQ Analysis
- EMI (Electromagnetic Interference) Testing
- Analog Demodulation
- VSA (Vector Signal Analysis)
- Real-time Spectrum Analysis
- Phase Noise Analysis
- LTE FDD (Long-Term Evolution Frequency Division Duplex)
- LTE TDD (Long-Term Evolution Time Division Duplex)
- NR (New Radio)
- Reset Mode

**Reset Mode:** Each operating mode has its own independent reset configuration.

Notes: The advanced measurement part of spectrum analysis, IQ analysis, EMI, analog modulation, vector signal analysis, phase noise analysis, LTE FDD, LTE TDD, and NR are optional features. These functions require activation through the purchase of a corresponding license.

Note that the key functions on the front panel may vary depending on the selected operating mode. The available front panel keys and menu options may vary depending on the selected operating mode. This manual primarily introduces the user interface and key functions in Spectrum Analysis mode.

# 3. Function and Application


- Basic Measurement
- Measuring Multiple Signals
- Measuring Low Level Signal
- Measuring Frequency Shift of Signal Source
- Measuring Signal Distortion
- Measuring Phase Noise
- Checking Catalogue and Storage File


This chapter introduces the main functions of the signal analyzer and provides guidance on performing basic measurements. It assumes that you are already familiar with the layout of the instrument's front and rear panels, as well as the screen display indicators. If not, please refer to the Front Panel section for an overview before proceeding.

## Basic Measurement

In this manual, keys are labeled with **[ ]**, such as **[FREQ]**, **[AMPT]**, and **[Marker]**, these are physical keys on the front panel. In most cases, pressing such a key will access a menu of functions that are displayed on the right side of the screen, such as center frequency and reference level, and these are referred to as panel menu.

### Using Front Panel

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

#### Input Data

There are several common ways to edit data input when you need to input parameter value.

| | |
|---|---|
| **Rotary Knob** | Increase or decrease the current value. |
| **Arrow Key** | Increase or decrease the current value. |

| | |
|---|---|
| **Numeric Key** | Input the numerical value and confirm (select a virtual key ENTER or press the physical button **[Enter]** to confirm). |
| **Virtual Key** | Tap the panel menu to pop out the dialog box and touch to input the numerical value and confirm (select a virtual key ENTER or press the physical button **[Enter]** to confirm). |
| **Enter Key** | If the input value does not include a unit, or if you want to set a default unit for input values, press the **[Enter]** key to setup. |
| **Using Front Panel** | Press the panel menu (arranged vertically on the right side of the screen) to enter the corresponding function item. The following are examples of panel menu. |
| **Switching** | Press this panel menu to switch manual/auto modes. |
| **Submenu** | Press this panel menu to enter the submenu. |
| **Select** | Tap this option to change the data, the selected menu will be highlighted. |
| **Edit** | Double click to pop out the edit menu or users can select the data menu and press the **[Enter]** key to edit. |

## Reset Signal Analyzer

The signal analyzer offers three reset options to restore system settings.

Press **[System]**, and then select **Reset** mode.

Reset options:

- Setting: Restores all system settings to their default values without affecting user data.
- Data: Deletes all user-saved data without changing system settings.
- All: Restores all system settings to default values and deletes all user data.

### Observing Signal

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

### Set the 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 the sweep width

Press **[FRQE]>Sweep Width >100 MHz** to set the sweep width to 100 MHz.

**Note**

Changing the reference level adjusts the amplitude value displayed at the top grid line. Modifying the center frequency shifts the horizontal position of the signal on the screen. Increasing the sweep width expands the frequency range displayed across the horizontal axis.

### Read frequency and amplitude value

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

**Note**

The frequency and amplitude value of this marker will be displayed in the function area on the right top of the screen.

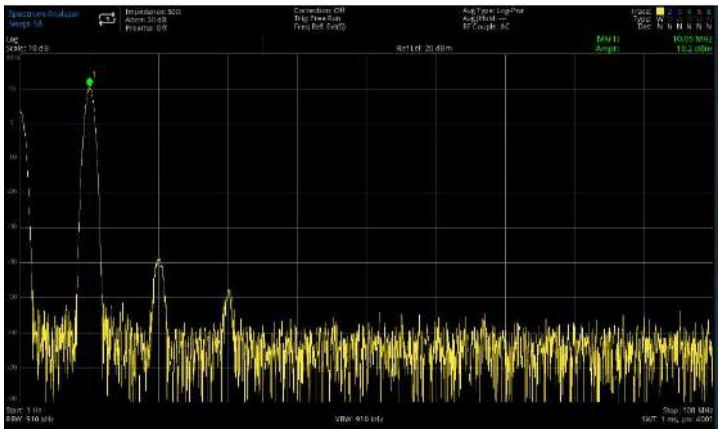

Figure 3-1 Read Frequency and Amplitude

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

### Change the reference level

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

**Note**

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

## Measuring Multiple Signal

This section introduces how to measure multiple signals of different types.

### Using Difference Value Marker Δ to Compare Signals on the Same Screen

With this signal analyzer, users can easily compare frequency and amplitude differences between signals, and the signal analyzer's difference value **Δ** marker feature allows you to compare two signals on the same screen.

In this example, the harmonic component of the 10 MHz reference signal provided on the rear panel of the signal analyzer is used to measure the frequency and amplitude difference between the two signals on the same screen, and the Delta markers are used to show this difference.

### Setting Steps

1. Reset the signal analyzer.

   Press **[Default]> Reset** to restore the instrument to its default settings.
2. Connect the signal source.

   Use a cable to connect the **10 MHz OUT** connector on the rear panel to the RF IN connector on the front panel.
3. Set the center frequency, sweep bandwidth, and reference level of the signal analyzer for checking the 10 MHz input signal and its harmonics.

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

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

   Press **[FREQ]> Reference Level > 20 dBm**
4. Place a marker at the maximum peak (10 MHz).

   Press **[Peak] Next Peak on the Left** and **Next Peak on the Right** on the panel menu to move the marker between peaks.

   The marker should be at the reference signal of 10 MHz.
5. Lock a marker and activate the second marker.

   Press **[Marker]> Mark Mode > Difference Value**

   A marker labeled with **x** indicates the reference signal.
6. Use the rotary knob or the **[Peak]** key to move the marker **1Δ2** to the peak of the other signal.

   Press **[Peak] Next Peak** or **[Peak] Next Peak on the Left** or **Next Peak on the Right**, or press **[Marker]> Marker Δ Frequency>** Rotating the rotary knob to **Next Peak**

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

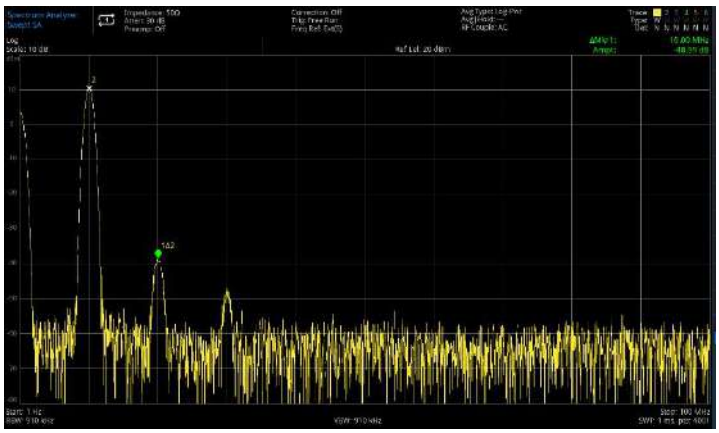

Figure 3-2 Difference Value Δ (Marker Mode) Signal Comparison on the Same Screen

**Note**

Enabling the frequency counter improves the resolution of marker readouts.

### Using Delta Marker to Compare Signals on Different Screen

Using the Delta mark function to measure the difference in frequency and amplitude between two signals that are not on the same screen (this function is suitable for measuring harmonic distortion).

In this example, the amplitude and frequency difference between a signal displayed on the screen and a signal not displayed on the screen is measured by using a 10 MHz signal of the signal analyzer, and Delta markers are used to show this difference.

### Setting Steps

1. Reset the signal analyzer.

   Press **[Default]> Reset** to restore the instrument to its default settings.

2. Connect the signal source.

   Use a cable to connect the **10 MHz OUT** connector on the rear panel to the RF IN connector on the front panel.

3. Set the center frequency, sweep bandwidth, and reference level of the signal analyzer for checking the 10 MHz input signal and its harmonics.

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

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

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

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

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

5. Turn on the difference value Δ function.

Press **[Marker]> Mark Mode> Difference Value Δ**

6. Use the center frequency to increase 10 MHz.

   Press **[FREQ]> Center Frequency>** ▲

   At this point, the first marker moves to the left side of the screen at the peak of the first signal (10 MHz) until the center frequency is 100 MHz. The frequency of ΔMkr1 is 90 MHz, which is a marker at the harmonic component of 100 MHz. The annotation of ΔMkr1 displays the amplitude and frequency difference between the 10 MHz signal peak and the 100 MHz signal peak.

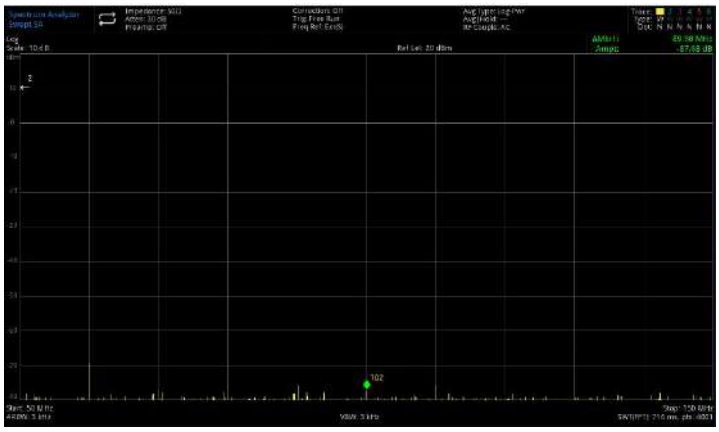

Figure 3-3 Δ Marker of Reference Signal Outside the Screen

7. Turn off the marker

   Press **[Marker]> Close All** or press **[Marker]> Mark Mode> OFF**.

### Identifying Signals with Identical Amplitudes

This example distinguishes two signals of the same amplitude and 100 kHz apart in frequency by reducing the resolution bandwidth and video bandwidth.

Note: The resolution bandwidth value ultimately chosen for resolving signals is equal to the frequency difference between the two input signals, while the video bandwidth is slightly narrower than the resolution bandwidth.

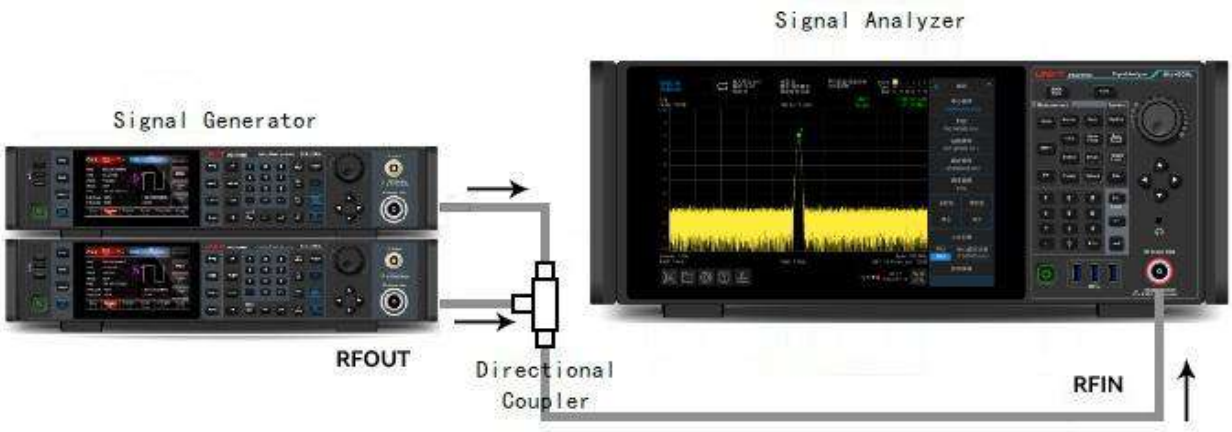


Figure 3-4 Instrument Setting for Acquiring Two-channel Signal

## Setting Steps

1. As shown in Figure 3-4, connecting **two signal sources** to the **RF IN** connector of the signal analyzer via a directional coupler.
2. Set the frequency of one source to **300 MHz** and the frequency of the other signal source to **300.1 MHz**, set the amplitude of the two signal sources to **-20 dBm** and turn on the signal output.
3. Set the signal analyzer to observe the signal.

   Press **[Default]> Reset** to restore the instrument to its default settings.

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

   Press **[BW]> 100 kHz**

   At this point, a single envelope signal should appear on the display.

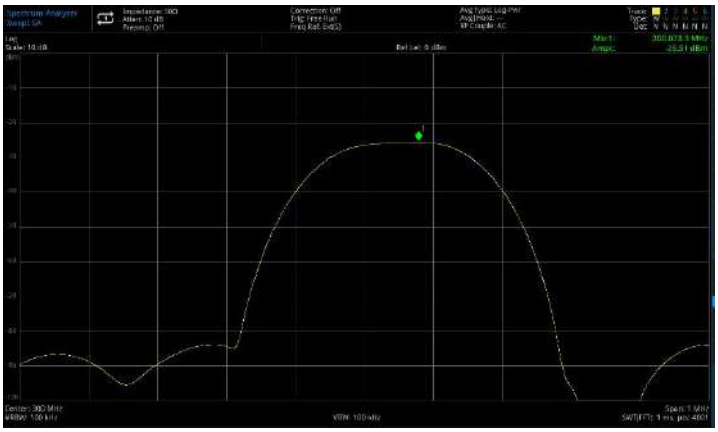

Figure 3-5 Two Unresolved Signals of Equal Amplitude

4. Set resolution bandwidth (RBW) to **30 kHz**, adjust it to lower than or equal to the frequency interval of the two input signals.

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

   As shown in Figure 3-6, the peak of the two signals can be seen at the same time, and the resolution bandwidth can be further reduced by using the knobs or arrow keys on the front

panel to better distinguish between the two signals.

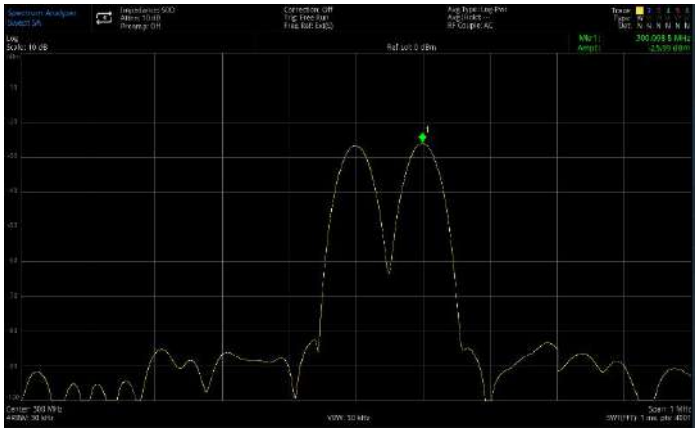

Figure 3-6 Two Resolved Signals of Equal Amplitude (1)

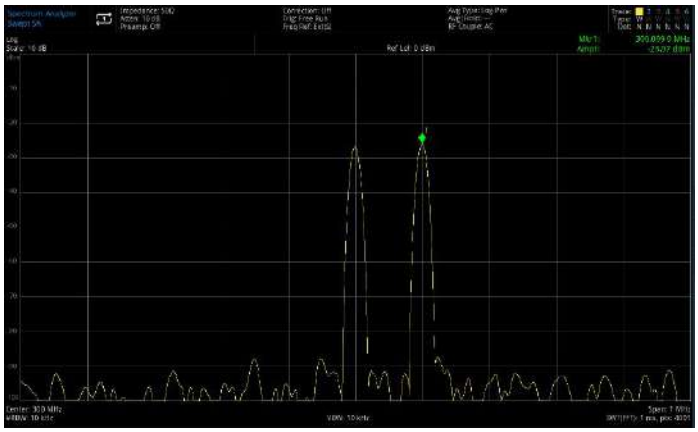

Figure 3-7 Two Resolved Signals of Equal Amplitude (2)

As the resolution decreases, the sweep time increases, and the displayed signal becomes smoother. For the fastest measurement, use the largest resolution bandwidth as far as possible, which is the resolution coupled to the sweep width at the factory setting.

## Identifying A Small Signal Hidden within A Larger Signal

In this example, a narrow resolution bandwidth is used to distinguish between two signals that differ by 10 kHz in frequency and 50 dB in amplitude.

### Setting Steps

1. As shown in Figure 3-4, connect **two signal sources** to the **input connector** of the signal analyzer.
2. Set one signal source to a frequency of **100 MHz** with an amplitude of **-10 dBm**, and the other to **100.01 MHz** with an amplitude of **-60 dBm**. Enable the output of both signal sources.
3. Set the signal analyzer to observe the signal.

   Press **[Default]> Reset** to restore the instrument to its default settings.

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

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

4. Set 300 MHz signal as the reference level.

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

**Note**

The UTS7000A filter has a shape factor of 4.1:1. When the resolution bandwidth (RBW) is set to 30 kHz, the corresponding 60 dB bandwidth is 144 kHz. Since half of this bandwidth (72 kHz) exceeds the 10 kHz frequency difference between the two input signals, the analyzer cannot resolve the two signals—they appear as a single combined signal.

Figure 3-8 Small Signal Cannot Be Distinguished from Large Signal

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

   Press **[BW]> 3 kHz**

   Press **[Peak]**

   Press **[Marker]>Mark Mode> Difference Value Δ**

   Press **[Marker]> Mark frequency> 10 kHz**

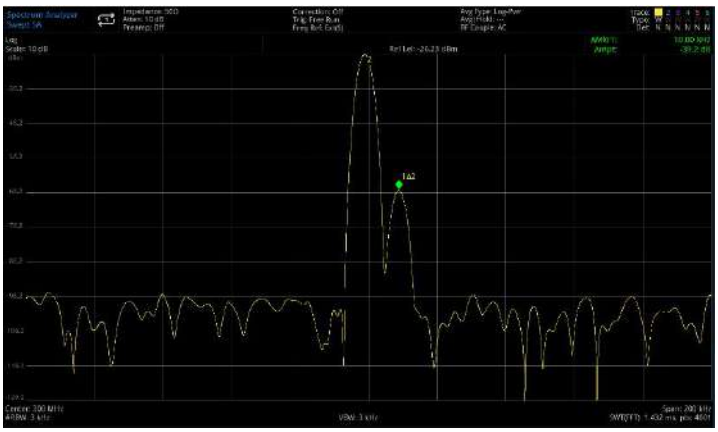

Figure 3-9 Identifying Small Signal Hidden in Large Signal

**Note**

The UTS7000A filter has a shape factor of 4.1:1. When the resolution bandwidth is set to 3 kHz, the corresponding 60 dB bandwidth is 14.4 kHz. Half of this bandwidth (7.2 kHz) is less than the

frequency difference between the two signals (10 kHz), allowing the two input signals to be distinguished.

# Measuring Low Level Signal

This section introduces how to measure a low-level signal and how to distinguish it from spectral noise. The main methods used to measure low level signals are given below.

## Decreasing Input Loss

A signal analyzer's ability to measure low-level signals is limited by its internally generated noise. As a signal passes through the analyzer, its level is influenced by the input attenuator. If the signal is close to the noise floor, reducing the input attenuation can help distinguish the signal from the noise.

**Caution**

The RF IN port on the front panel can only withstand an input signal power of up to **+30 dBm** or a **DC voltage of 50 V**. Exceeding these limits may damage the internal circuitry and cause the instrument to malfunction.

### Setting Steps

1. Reset the signal analyzer.

   Press **[Default]> Reset** to restore the instrument to its default settings.

2. Set the frequency and amplitude of the signal to **300 MHz, -80 dBm**, connect the **RF OUT** connector of the signal source to the **RF IN** connector of the signal analyzer and turn on the signal output.

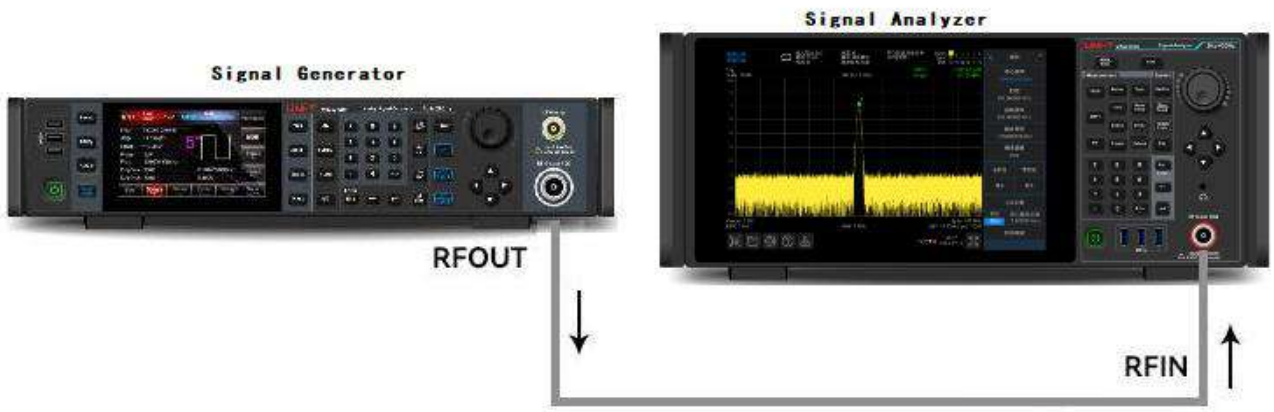


Figure 3-10 Instrument's Setting for Acquiring Single Signal

3. Set the center frequency, sweep bandwidth, and reference level.

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

Press **[AMPT]> Reference Level> -40 dBm**

4. Move the selected peak (300 MHz in this example) to the center of the screen.

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

5. Decrease the sweep bandwidth to 500 kHz (as shown in Figure 3-11).

   Press **[FREQ]> Sweep Bandwidth> 500> kHz**

6. Set the attenuation to 20 dB.

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

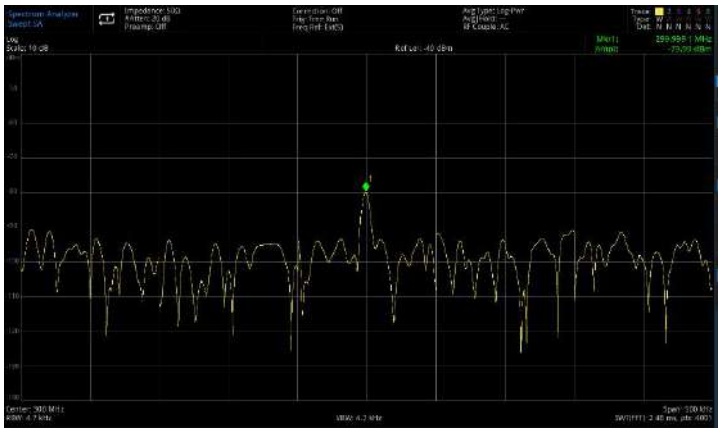

Figure 3-11 Signal Close to Noise Floor

**Note**

When the attenuation value is increased, it will make the ground noise close to the signal level.

7. To see the signal more clearly, set the attenuation to 0 dB.

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

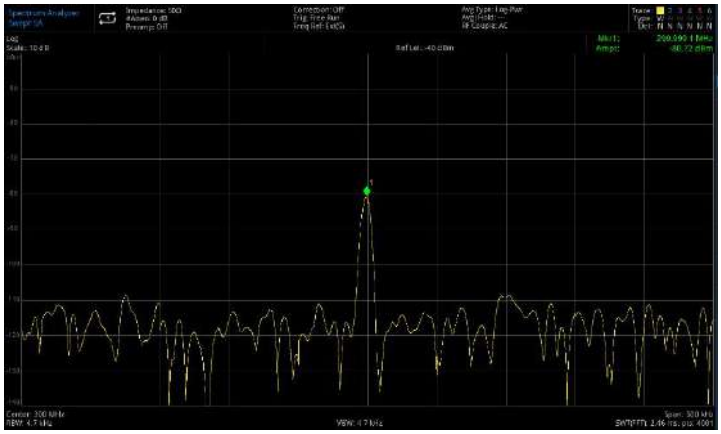

Figure 3-12 Measuring Small Signal in 0 dB Attenuation

## Decreasing Resolution Bandwidth

The internal noise level is influenced by the resolution bandwidth (RBW), whereas a continuous waveform signal is not. Reducing the RBW by a factor of 10 lowers the noise floor by approximately 10 dB.

### Setting Steps

1. Refer to Decreasing Input Loss section and repeat steps 1–3.
2. Decrease the resolution bandwidth.

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

   As the noise floor is reduced, the low-level signal becomes more visible and easier to identify.

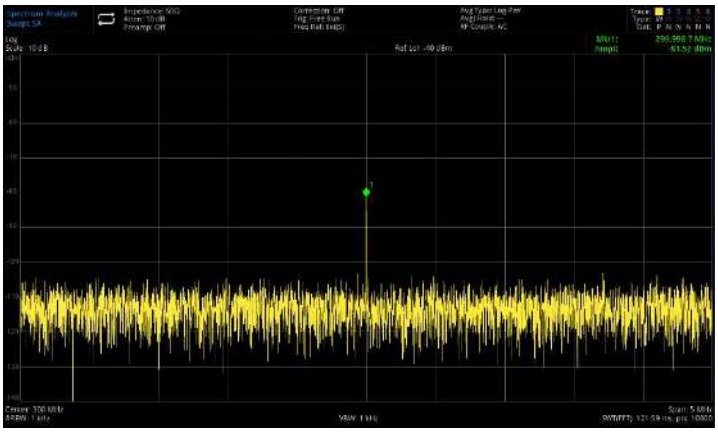

Figure 3-13 Decrease Resolution Bandwidth

**Note**

- A **#** symbol displayed next to the RBW value at the bottom-left corner of the screen indicates that the resolution bandwidth is uncoupled and has been manually adjusted.
- Users can adjust the resolution bandwidth (RBW) of the signal analyzer using the up and down arrow keys, following a 1-3-10 step sequence. The filter has a rectangularity factor (the ratio of 60 dB bandwidth to 3 dB bandwidth) of 4.1:1. The RBW can be set within a range of 1 Hz (minimum) to 3 MHz (maximum).

### Trace Average

Trace averaging is a digital processing method. When enabled, it calculates the average of each trace point by combining the current trace data with the previously averaged values. When the signal analyzer is set to automatic coupling, it is recommended to use sampling detection mode to smooth the displayed noise level.

Note that this trace averaging process is different from the average detection mode, which averages the detected signal level over time before displaying.

### Setting Steps

1. Refer to Decreasing Input Loss section and repeat steps 1–5.
2. Turn on the average function.

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

Press **[MeasSetup]> Average/Hold Number >20 >**

Since the averaging operation smooths the trace, low-level signals become more clearly visible (as shown in Figure 3-14).

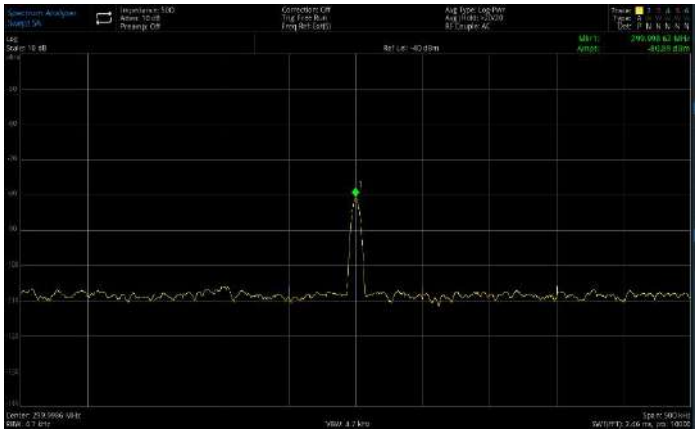

Figure 3-14 Trace Average

# Measuring Frequency Drifting of Signal Source

This section introduces how to measure and trace drifting signals.

## Tracing Signal Drift

This signal analyzer measures the stability of a signal source and using the maximum hold function, displays and holds the maximum amplitude level and its frequency drift of an input signal trace.

### Setting Steps

1. Connect the **signal generator** to the **RF IN** connector of the signal analyzer.
2. Set the frequency and amplitude of the output signal to **300 MHz**, **-20 dBm**.
3. Set the center frequency of the signal analyzer, sweep width, and reference level.

   Press **[Default]> Reset** to restore the instrument to its default settings.

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

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

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

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

   The maximum Hold function captures and retains the peak value of a changing input signal. The trace mode, displayed in the annotation at the top right of the screen, includes the trace, trace type, and detector.
6. Activate refresh trace 2 and set it to continuous sweep.

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

Press **[Trace Type] > Refresh**

Trace 1 remains in maximum Hold mode to display signal drift.

7. Slowly change the frequency of the signal generator.

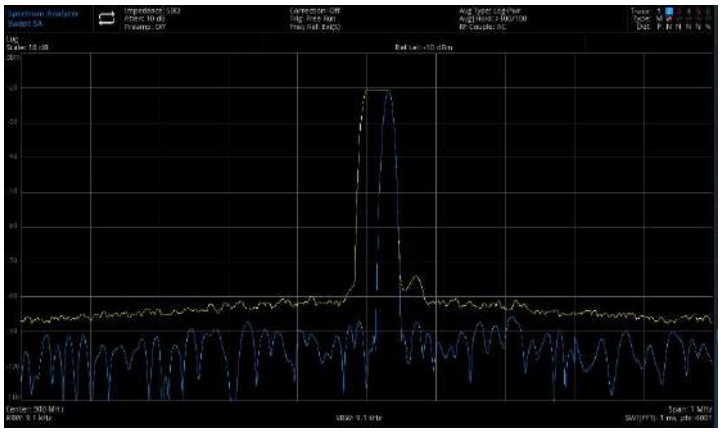

Figure 3-15 Observing Signal Drift Using Maximum Hold and Refresh

# Measuring Signal Distortion

This section introduces how to recognize and measure signal distortion.

## Recognizing Distortion Generated by the Signal Analyzer

A high-level input signal may cause the signal analyzer to introduce distortion, which can mask the actual distortion present in the input signal. If distortion is observed, it may be internally generated by the instrument itself. To identify such distortion, users can adjust the trace display and RF attenuator.

In this example, a signal generator's output is used to verify whether the harmonic distortion component originates from the signal analyzer.

### Setting Steps

1. Connect the **signal generator** to the **RF IN** connector of the signal analyzer.
2. Set the frequency and amplitude of the output signal to **200 MHz**, **0 dBm**.
3. Set the center frequency and sweep bandwidth of signal analyzer.

   Press **[Default]> Reset** to restore the instrument to its default settings.

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

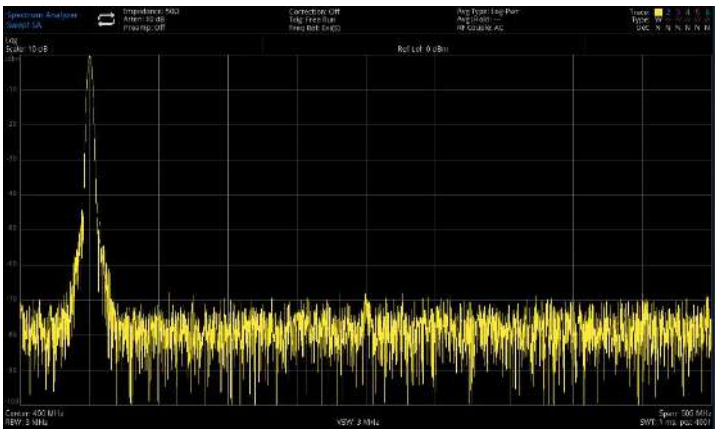

Figure 3-16 Harmonic Distortion

The harmonic distortion components generated by the input signal appear at the input mixer of the signal analyzer, spaced at 200 MHz intervals relative to the original 200 MHz signal.

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

   Press **[Peak]> Next Peak**

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

5. Set the sweep bandwidth to 50 MHz and redisplay the signal in the center of the screen.

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

   Press **[Peak]> Maker> Center Frequency**

6. Set the attenuation to 0 dB.

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

7. To determine whether the harmonic distortion component is generated by the signal analyzer, the signal analyzer. 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 two times at least) and save the data of trace 2, and then place a marker at the harmonic component of trace 2.

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

   Press **[Peak]**

   Press **[Marker]> Mark Mode > Difference Value Δ**

   Currently, the signal analyzer displays the waveform data stored in Trace 2 and the live measurement data in Trace 1. ΔMkr1 indicates the amplitude difference between the reference marker and the currently active marker.

9. Increase the RF attenuation to 10 dB.

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

Note: ΔMkr1 shows the amplitude difference of the harmonic distortion component measured with the input attenuation set to 0 dB and 10 dB, respectively.

If the absolute value of ΔMkr1 changes by approximately 1 dB or more when adjusting the input attenuation, it indicates that at least part of the harmonic distortion originates from the signal analyzer (see Figure 3-17). In this case, increasing input attenuation is recommended.

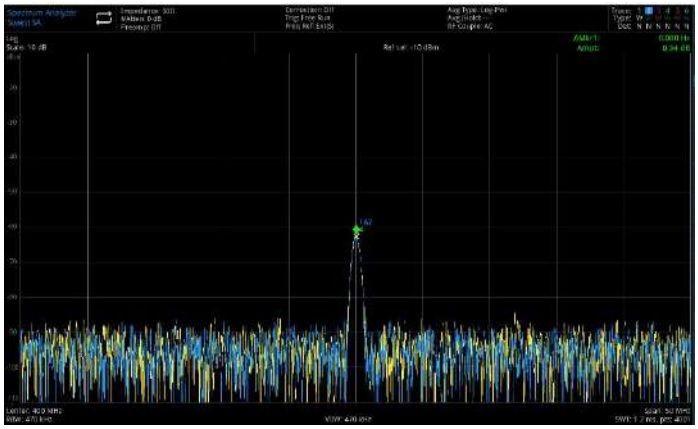

Figure 3-17 Harmonic Distortion Component

The amplitude difference readings of **ΔMkr1** are influenced by the following factors.

1. Increasing the input attenuation degrades the signal-to-noise ratio, causing a positive ΔMkr1 reading.
2. Harmonic losses within the signal analyzer's internal circuitry cause a negative ΔMkr1 reading.

A large ΔMkr1 value indicates a significant measurement error, which can be minimized by adjusting the input attenuation.

# Third-Order Intercept Point Distortion

Measurements of two-tone third-order intercept point (TOI) distortion are common in communication systems. When two signals are input into a nonlinear system, third-order intercept point components appear near the original signal frequencies due to intermodulation. These distortions are generated by system components such as amplifiers and mixers.

To quickly set up a TOI measurement, refer to the Third-Order Intercept Point section under one-key measurements.

This example demonstrates how to measure third-order intercept point distortion using a single instrument. The frequencies of the two signal sources used are 299.95 MHz and 300.05 MHz.

### Setting Steps

1. Connect the instrument as shown in Figure 3-18. The two signal generators are connected to

the input of a directional coupler through low-pass filters, and the output of the coupler provides a two-tone signal source with very low intermodulation distortion. Although this configuration offers better distortion performance than the signal analyzer alone, it remains useful to measure the TOI of the combined source and signal analyzer.

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

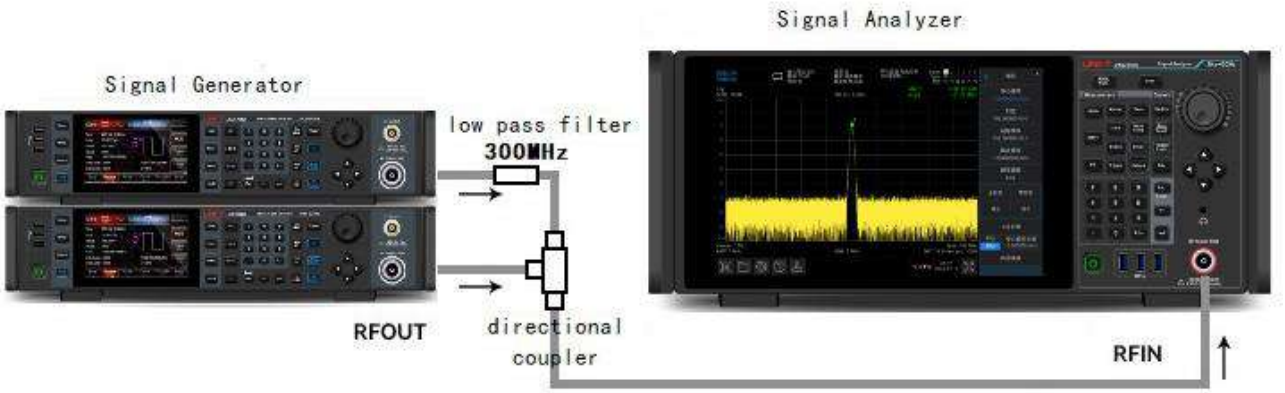


Figure 3-18 Instrument's Setting of Third-order Intercept Point Signal

**Note**

Directional couplers must have a high degree of isolation between the two inputs so that the two source signals are not intermodulation.

2. Set the frequency of one signal generator to **299.95 MHz** and the other to **300.05 MHz**, establishing a frequency spacing of **100 kHz**. Set the amplitudes of both sources to the same level; in this example, the amplitude is set to **-5 dBm**.
3. Set the center frequency and sweep bandwidth of the signal analyzer.
   Press **[Default]> Reset** to restore the instrument to its default settings.
   Press **[FREQ]> Center Frequency > 300> MHz, Sweep Bandwidth > 500 kHz**
4. Decrease the resolution bandwidth to see the distortion product.
   Press **[BW]> Rotating Rotary Knob**
5. Move the signal to the reference level.
   Press **[Peak]> Marker> Reference Level**
6. Decrease the resolution bandwidth to see the distortion.
   Press **[BW]> Rotating Rotary Knob**
7. Activate the second marker and move it to the next distortion signal peak.
   Press **[Marker]> Mark Mode > Difference Value Δ**
   Press **[Peak]> Next Peak**

8. Measure another distortion signal.

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

   Press **[Peak]> Next Peak**

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

   Press **[Marker]> Mark Mode > Difference Value Δ**

   Press **[Peak]> Next Peak**

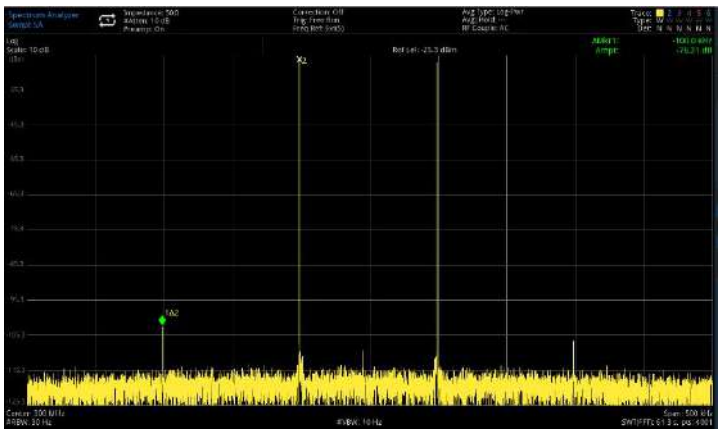

Figure 3-19 Measure Distortion Product

# Measuring Phase Noise

Phase noise measurement evaluates signal stability in the frequency domain. Phase noise is defined as the single-sideband (SSB) noise power relative to the carrier frequency, measured at specific frequency offsets and normalized to a 1 Hz bandwidth.

### Setting Steps

1. Press **[Default]> Reset** to restore the instrument to its default settings.
2. Connect the output of the signal generator to the RF IN connector of the signal analyzer via a cable.
3. Press **[FREQ] > Center Frequency > 1 GHz**, **Sweep Bandwidth > 100 kHz**
4. Press **[Trace] > Trace Type > Trace Average**; **Detector > Average**
5. Press **[Peak]** to place a marker at the peak of signal
6. Press **[Marker]> Mark Mode > Difference Value Δ**; **Mark Δ Frequency > 10 kHz**
7. Open **Mark Function > Mark Noise**, as shown in Figure 3-20.

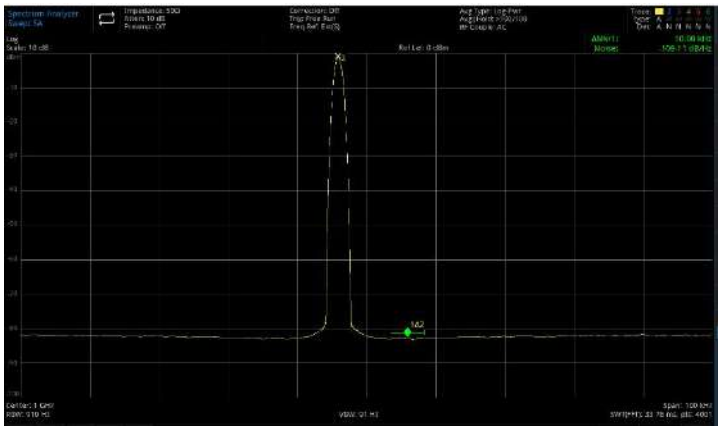

Figure 3-20 Phase Noise

# Checking Directory and Saved Files

This signal analyzer stores and retrieves data similarly to a personal computer, supporting both internal memory and USB flash drives. Users can view and save files in either internal memory or on the USB flash drive. This section explains how to save files and navigate directories.

## Finding Files in the Directory

Tap the icon at the bottom-left corner of the screen to open the file directory and locate saved files.

This signal analyzer supports six types of files:

**State (.state)**: Saves the current instrument settings.

**Trace + State (.trace):** Saves trace data along with corresponding instrument settings.

**Limits (.limit):** Saves limit test configurations used to determine whether a trace exceeds predefined thresholds.

**Correction (.corr):** Saves amplitude correction settings used to compensate for gain or loss introduced by external devices.

**Measurement Data (.csv)**: Contains exported data such as trace values, peak lists, or marker lists.

### New File Folder

To create a new file folder.

1. Press > LocalDisk> UTS7026A to navigate to the desired directory.
2. Tap **New** to create a new folder in the selected directory.

### Multiple Selection (ON/OFF)

1. Press > LocalDisk> UTS7026A, or select a directory on the USB flash driver.
2. Open the Multiple Selection menu.

3. Select multiple files or folders by ticking the checkbox (✓) in front of each item in the dialog box.

### Copying Files

To copy files from internal memory to a USB flash drive, follow these steps:

1. Press > LocalDisk> UTS7026A to locate and select the desired file or folder.
2. Insert a USB flash drive into the instrument's USB port.
3. Select the file or folder, then tap **Copy** on the screen.
4. Navigate to the target directory (e.g., on the USB drive), then tap **Paste** to complete the copy operation.

### Moving Files

To move files or folders—either within internal memory or to a USB flash drive, follow these steps:

1. Press > LocalDisk> UTS7026A to locate and select the desired file or folder.
2. Tap **Move** on the screen. A dialog box will appear automatically.
3. To move the file or folder to a USB flash drive, insert the USB drive into the instrument's USB port. Then, pull down the LocalDisk menu and select the USB drive as the destination path.
4. Navigate to the target directory, tick the checkbox (✓) to confirm the destination, and tap **Paste** to complete the move operation.

**Note**

When moving files to external memory (USB), do not disconnect the USB device during the saving process to prevent unnecessary data loss and file corruption.

### Deleting Files

1. Press > LocalDisk> UTS7026A to locate and select the desired file or folder.
2. Tap **Delete** on the panel menu to remove the selected item.
3. To delete multiple files, open the Multiple Selection menu and tick the checkboxes (✓) in front of the desired file names.
4. Tap **Delete** on the panel menu to delete all selected files.

### Loading Files

1. Press > LocalDisk> UTS7026A to the desired file.
2. Tap **Load** to retrieve file data, including instrument state, trace, screen display, and limit settings.

### Renaming Files or Folders

To rename a file or folder.

1. Press > LocalDisk> UTS7026A to locate the file or folder you want to rename.
2. Tap **Rename** and enter the new name for the selected item.

### Importing and Exporting Files

Set the file type for import/export operations based on the current export status. Available file types include state, trace + state, measurement data, limits, and correction files.

If an external storage device (e.g., USB flash drive) is connected, it will be prioritized as the save location.

For detailed procedures, refer to the File Storage (Save/Recall) section in the Key Function chapter.

# 4. Function Key (Spectrum Analysis Mode)


- Frequency (FREQ)
- Amplitude (AMPT)
- Bandwidth (BW)
- Sweep
- Trigger
- Trace
- Marker
- Peak
- Measurement Setting (MeasSetup)
- Single
- Input/Output
- Default Setting
- File Storage (Save/Recall)
- System Setting
- Screen Lock (Touch/Lock)
- File Management (File)
- Measurement Mode (Mode/Meas)
- Automatic Tuning (Auto)


**Note**

1. This button activates the spectrum analysis mode of the signal analyzer.
2. Parameter settings and their available ranges may vary depending on the equipment model. For detailed specifications, please refer to the data manual corresponding to your specific model.

## Frequency (FREQ)

Press the **[FREQ]** key to activate the center frequency function and enter the frequency menu. The numerical values of center frequency, sweep bandwidth start frequency, and cut-off frequency are displayed at the bottom of the screen.

**Center frequency:** Activating the center frequency sets a specific frequency at the center of the screen's horizontal axis. The center frequency and sweep bandwidth are displayed on the left and right sides of the bottom grid, respectively. The center frequency can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- Modifying the center frequency automatically adjusts the start and cut-off frequencies while keeping the sweep bandwidth unchanged.
- Changing the center frequency is equivalent to panning the current frequency channel; the adjustable range is limited by the frequency range specified in the signal analyzer's specifications.
- When the sweep bandwidth is set to zero, the start frequency, cut-off frequency, and center frequency values are identical.

**Sweep bandwidth:** Specifies the frequency range of the sweep. The sweep bandwidth value can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The sweep bandwidth changes symmetrically around the center frequency. The displayed sweep bandwidth represents the total frequency range shown on the screen. To calculate the frequency range per horizontal division, divide the total sweep bandwidth by 10.

**Note**

- Modifying the sweep bandwidth automatically adjusts the start and cut-off frequencies while keeping the center frequency unchanged.
- In non-zero sweep bandwidth mode, the minimum sweep bandwidth can be set to 100 Hz. When the sweep bandwidth is set to the maximum, the signal analyzer enters full sweep bandwidth mode.
- Users can manually set the sweep bandwidth to 0 Hz or activate zero sweep bandwidth mode via the corresponding menu option.
- When the sweep bandwidth is changed in non-zero sweep bandwidth mode, and both the stepped center frequency and resolution bandwidth (RBW) are set to automatic, they adjust automatically. If the video bandwidth (VBW) is also set to automatic, it will track changes in RBW.
- Sweep time changes automatically when any of the following parameters are modified: sweep bandwidth, RBW, or VBW.

**Start frequency:** The start frequency defines the left boundary of the sweep. The start and cut-off frequencies are displayed on the left and right sides of the grid, respectively. When these values are

set, they replace the previously displayed center frequency and sweep bandwidth at the bottom of the screen. The start frequency can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- The sweep bandwidth and center frequency change when the start frequency is adjusted, and other system parameters will be affected by changes in sweep bandwidth.
- In zero sweep bandwidth mode, the start frequency, center frequency, and cut-off frequency are identical and change simultaneously.

**Cut-off frequency:** The start frequency defines the right boundary of the sweep. The start and cut-off frequencies are displayed on the left and right sides of the grid, respectively. When these values are set, they replace the previously displayed center frequency and sweep bandwidth at the bottom of the screen. The cut-off frequency can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- The sweep bandwidth and center frequency change when the cut-off frequency is adjusted, and other system parameters will be affected by changes in sweep bandwidth.
- In zero sweep bandwidth mode, the start frequency, center frequency, and cut-off frequency are identical and change simultaneously.

**Frequency offset:** A frequency offset value is applied to compensate for the frequency conversion between the device under test (DUT) and the signal analyzer input. The frequency offset can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- This parameter does not affect any hardware settings of the signal analyzer; it only modifies the displayed values of the center frequency, start frequency, and cut-off frequency.
- To eliminate the frequency offset, set the frequency offset to 0 Hz.

**Full sweep bandwidth:** Sets the signal analyzer to sweep across its entire available frequency range.

**Zero sweep bandwidth:** Sets the sweep bandwidth to 0 Hz. In this mode, the signal analyzer displays the envelope of the time-domain signal, functioning similarly to an oscilloscope.

**Note**

In zero sweep bandwidth mode, the signal analyzer displays the time-domain characteristics of fixed-frequency components. This mode operates fundamentally differently from non-zero sweep

bandwidth mode.

The following functions are not available in zero sweep bandwidth mode:

- Most options are under the **[Marker]** menu, except **Reference Level**.
- Sweep Time and Sweep Mode settings under the **[Sweep]** menu.

**Zoom-in sweep bandwidth:** Doubles the current sweep bandwidth to expand the frequency range, making it easier to observe more signal components.

**Zoom-out sweep bandwidth**: Halves the current sweep bandwidth to narrow the frequency range, making it easier to observe finer signal details.

**Previous sweep bandwidth:** Restores the sweep bandwidth to its previous value.

**Stepped center frequency:** Setting the frequency step size determines the increment by which the center frequency, start frequency, and stop frequency change when using the arrow keys. The stepped center frequency can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Scale type:** Sets the horizontal display scale to either linear or logarithmic.

**Note**

The horizontal axis scale type affects only how data is displayed and does not influence scanning or trace data.

**Automatic tuning:** Automatically locate signals of interest and optimally center them on the display for easier observation.

## Amplitude (AMPT)

Press the **[AMPT]** key to activate the reference level and enter the amplitude setup menu.

**Reference level:** Press the **[AMPT]** key to activate the reference level setting. The reference level represents the power or voltage value displayed at the top of the screen, based on the currently selected amplitude unit. The reference level can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- The reference level is a key parameter of a signal analyzer, representing the upper limit of its dynamic range under current settings. If the power of the input signal exceeds the reference level, it may cause nonlinear distortion or even trigger an overload alarm. To ensure optimal

measurement performance and protect the instrument, users should understand the characteristics of the signal under test and select the reference level carefully.

**Input Attenuation (Auto/Manual):** This setting controls the RF front-end attenuator to optimize signal fidelity. High-power signals require sufficient attenuation to pass through the mixer with minimal distortion, while low-power signals require minimal attenuation to maintain a low noise floor. The input attenuation mode can be set to either Automatic or Manual.

Automatic: Input attenuation is dynamically adjusted in relation to the reference level.

Manual: The input attenuation can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

- When the maximum mixer level and reference level are determined, the instrument's minimum input attenuation should satisfy the following condition: Reference level ≤ Input attenuation - Preamplifier -10 dBm

**Preamplifier:** Controls the internal preamplifier switch of the instrument. When turned on, it applies gain compensation so that the displayed amplitude accurately reflects the actual input signal level. While the preamplifier is active, the measurement bar on the screen shows **Preamp: on**.

**Scale:** Sets the value represented by each vertical division on the display grid. This function is available only when the scale type is set to logarithmic. The scale value can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Display scale:** When the logarithmic scale is selected, the vertical axis uses a dB scale. Each grid division can be set from 0.1 dB to 20 dB per division. When the linear scale is selected, the vertical axis switches to a linear voltage scale (default unit: V). The top grid line represents the reference level, while the bottom grid line corresponds to the zero level. Each grid division equals one-tenth of the reference level in volts.

**Y-axis unit:** Allows changing the amplitude unit and can be used in both logarithmic and linear modes. Available units include dBm, dBmV, dBμV, V, and W. The default unit is dBm.

**Reference level offset:** When there is gain or loss between the DUT and the signal analyzer input, an offset value is added to the reference level to compensate for this gain or loss. This offset does not change the position of the trace but modifies the reference level and the amplitude readings of the cursor.

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

**Correction:** Enter the amplitude correction menu to configure compensation for the gain or loss introduced by external devices such as antennas, cables, or amplifiers. When the correction is enabled, the trace and the corresponding measurement results will all be corrected.

1. Select correction: The signal analyzer provides 10 correction factors, and each factor can be edited independently.
2. Correction (ON/OFF): Toggle to enable or disable the correction function. The default setting is OFF.
3. Close All: Disables all currently active corrections.
4. Edit Correction: Opens the correction editor, as shown in the following table.

| | |
|---|---|
| Selection | Provides 10 data to save, default: Correction 1 |
| Select row | Selects the serial number of the correction row. |
| Insert row | Adds a new correction point. |
| Delete row | Deletes the currently selected correction row. |
| Delete correction data | Delete the current correction data. |

5. Delete all correction data: Deletes all saved correction data.

# Bandwidth (BW)

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

**Resolution Bandwidth (Auto/Manual):** Sets the resolution bandwidth (RBW), which determines the instrument's ability to distinguish between two closely spaced signals in frequency.

In manual mode, users can adjust the RBW from 1 Hz to 10 MHz using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. For values below 1 kHz, the available RBW options are: 1 Hz, 3 Hz, 10 Hz, 30 Hz, 100 Hz, and 300 Hz. If an unsupported value is entered, the nearest valid bandwidth will be selected automatically.

As the resolution bandwidth decreases, the system automatically increases the sweep time to maintain amplitude accuracy. RBW is also dependent on sweep bandwidth—reducing the sweep bandwidth may cause the RBW to decrease accordingly.

In auto coupling mode, the video bandwidth (VBW) tracks changes in RBW to maintain a constant

VBW-to-RBW ratio. If RBW and VBW are decoupled, a **#** icon appears next to RBW at the bottom left of the screen. To re-enable coupling, press the Manual/Auto key again and select Auto.

**Video Bandwidth (Auto/Manual):** Sets the video bandwidth (VBW), which filters out noise components outside the selected video bandwidth, helping to smooth the displayed trace.
In manual mode, users can adjust the VBW from 1 Hz to 10 MHz using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. If an unsupported value is entered, the nearest valid bandwidth will be selected automatically. As the resolution bandwidth decreases, the system automatically increases the sweep time to maintain amplitude accuracy.
If RBW and VBW are decoupled, a **#** icon appears next to VBW at the bottom left of the screen. To re-enable coupling, press the Manual/Auto key again and select Auto.

**VBW: 3dB RBW (Auto/Manual):** Sets the ratio between video bandwidth (VBW) and resolution bandwidth (RBW). When the signal is close to the noise floor and appears fuzzy on the display, reducing the ratio (i.e., setting it to less than 1) can help suppress noise and improve trace clarity. Pressing the **[Default]** key resets the ratio to 1.000. The ratio can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.
In auto mode, when the trace detector is set to average, the default ratio is 0.1. For all other trace detector types, the default ratio is 1.

**RBW filter type:** Selects the filter shape used for resolution bandwidth. The UTS7000A series supports two RBW filter types: Gaussian Window and Flat Window.

- Gaussian window: An exponential window characterized by a wide main lobe, resulting in lower frequency resolution. It has no negative side lobes, and the first side lobe attenuation reaches up to −55 dB. This window is often used for truncating non-periodic signals, such as exponentially decaying signals.
- Flat window: As the name suggests, this window provides a flat passband response, minimizing amplitude fluctuations in the frequency domain. It is ideal for precise amplitude measurements.

**RBW filter bandwidth:** Sets the bandwidth reference point of the Gaussian RBW filter, with selectable options of −3 dB and −6 dB bandwidth. The -6 dB bandwidth is the same as that at -3 dB. For example, when the RBW is set to 1.0 kHz with the filter bandwidth at −3 dB, switching to −6 dB will display the RBW as approximately 1.41 kHz. Note that this change affects only the annotation and displayed value in the RBW active function area; the actual filter shape and bandwidth remain unchanged.

# Sweep

Press the **[Sweep]** key to enter the following panel menu to select the sweep mode and trigger mode of the signal analyzer.

**Sweep time (Auto/Manual):** Sets the duration for the signal analyzer to complete a sweep across the selected bandwidth. When the sweep bandwidth is zero, this defines the time to scan the entire screen. Reducing the sweep time increases the sweep rate. In manual mode, sweep time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

1. **Non-zero Sweep Bandwidth**

   When the sweep time is set to automatic, the signal analyzer selects the optimal (shortest) sweep time based on the current settings. The sweep time depends on the following factors:

   a) Maximum tuning frequency of the signal analyzer
   b) Selected video bandwidth (VBW) filter and resolution bandwidth (RBW)
   c) Maximum sampling rate of the analog-to-digital converter (ADC)
   d) Number of sweep points
   e) Amplitude scale (logarithmic or linear)
   f) Detector mode

   Users may manually select a sweep time shorter than the automatic value; however, this can cause measurement errors. The minimum allowable sweep time is 1 ms.

2. **Zero Sweep Bandwidth**

   a) In zero sweep bandwidth mode, the minimum sweep time is determined by the maximum sampling rate of the analog-to-digital converter (ADC) and the number of sweep points.
   b) The minimum sweep time is 1 μs, and the maximum sweep time is 4000 s.

**Sweep time mode (Common/Precise):** The sweep mode can be set to either common sweep or precise sweep.

Common sweep prioritizes faster sweep speeds for quicker measurements.

Precise sweep emphasizes higher measurement accuracy at the expense of longer sweep times.

**Sweep/Measurement mode (Single/Continuous):** Sets the sweep mode to either single or continuous. The default mode is continuous Sweep. The current mode and status are displayed at the top of the screen.

**Continuous**: Sets the sweep mode to continuous sweep. An icon indicates the continuous mode. After each sweep, the system automatically sends a trigger initialization signal and immediately begins evaluating the trigger conditions.

**Single**: Sets the sweep mode to single sweep. An icon indicates the single sweep mode, which will illuminate after pressing the Single key.

If the system is in single sweep mode but **not currently measuring**, pressing the Single key initiates a scan when the trigger condition is met.

If the system is in single sweep mode and **currently measuring**, pressing the Single key initiates a scan and measurement when the trigger condition is met.

**Sweep mode (Auto/Manual):** Includes three options: Automatic, sweep frequency, and FFT.

a) Automatic: The signal analyzer automatically selects either sweeping frequency mode or FFT mode based on the current resolution bandwidth (RBW) to achieve the fastest possible sweep speed. When RBW is greater than 10 kHz, sweep frequency mode is selected. When RBW is less than or equal to 10 kHz, FFT mode is selected.

b) Sweep frequency: Performs point-by-point scanning, suitable for larger RBW settings.

c) FFT: Performs parallel scanning, suitable for smaller RBW settings.

When the tracking generator (TG) is enabled, due to its continuous frequency output characteristic, the system will force a switch to sweep frequency mode.

**Point:** Sets the number of data points acquired during each sweep, i.e., the number of points used to generate the current trace. The value can be adjusted using the numeric keypad or by tapping the panel menu.

a) Increasing the number of sweep points improves the frequency resolution of markers but reduces sweep speed.

b) Higher point counts may result in longer sweep times due to the minimum interval time between points.

c) Changing the number of sweep points affects multiple system parameters and will trigger a re-sweep and re-measurement.

# Trigger

Press the **[Trigger]** key to enter the trigger menu and to set the trigger parameter.

**Trigger type:** The signal analyzer supports three trigger types: Arbitrary trigger, external trigger, video trigger and periodic trigger.

1. **Arbitrary trigger:** Triggers continuously whenever the trigger conditions are met, without the need to set specific trigger conditions. After each sweep is completed, the next sweep starts automatically.
2. **Video trigger:** Generates a trigger signal when the detected video signal voltage exceeds the configured video trigger level.

   **Trigger level:** When video trigger mode is active, a trigger level line and corresponding value are displayed on the screen. The trigger level can be adjusted using the numeric keypad, rotary knob, arrow keys, or tapping the panel menu.
3. **External trigger:** A trigger signal is generated when an external TTL signal, applied through the [TRIGGER IN] connector on the rear panel, meets the specified edge condition.

   **Trigger edge (Rising/falling):** When using external trigger mode, the trigger edge is either rising or falling. A trigger signal is generated when the input pulse meets the selected edge condition.

   **Trigger delay:** Set the trigger delay time.
4. **External trigger2:** A trigger signal is generated when an external TTL2 signal, applied through the [TRIGGER IN] connector on the rear panel, meets the specified edge condition. The trigger parameters are consistent with the external trigger.
5. **Periodic Trigger:** When the periodic trigger is selected, the analyzer will use the built-in periodic timer signal as a trigger. The trigger event is set by the periodic timer signal, and the periodic timer signal is set by the offset and synchronous source. When a period signal is available but no reliable signal, use this trigger to synchronize the periodic signal with an external event (using a periodic synchronization source) to more closely approximate a reliable trigger signal. If the synchronous source is not selected (it is "OFF"), then the internal timer will not be synchronized with any external timing events.

   **Period:** Set the period for the internal periodic timer. For digital communication signal, this is usually set to the frame period of the current input signal.

   If the synchronization source is not set to OFF and the rate of external synchronization source is changed for some reason, the periodic timer is synchronized by resetting the timer circuit's internal state, the periodic timer is synchronized at each external synchronization pulse.

   **Offset:** Adjust the accumulated offset between the periodic timer events and trigger events.

**Synchronous source:** Use this drop-down list to select the synchronous source of the periodic timer. Select a source to synchronize the periodic timer trigger, otherwise, the trigger could be generated anywhere in the frame. Synchronization reduces the accuracy required for period settings.

**Trigger delay:** Set the trigger delay time.

6. **RF Burst Trigger:** When the RF burst trigger is selected, the analyzer starts the scan based on whether the power level of the input signal itself exceeds (or falls below) the user-defined trigger threshold; the analyzer continuously monitors the total power (or peak power) of the input signal within the current center frequency and sweep width range (or within a specific "trigger band"). When the monitored power value exceeds (or falls below) the user-defined threshold, the spectrum analyzer triggers a scan. Applications: Capturing instantaneous signals, such as short-duration, randomly occurring signals, such as burst interference, radar pulses, switch transients, and sporadic signals.

   **Trigger Level:** a trigger level line and corresponding value are displayed on the screen. The trigger level can be adjusted using the numeric keypad, rotary knob, arrow keys, or tapping the panel menu.

   **Trigger edge (Rising/falling):** When using external trigger mode, the trigger edge is either rising or falling. A trigger signal is generated when the input pulse meets the selected edge condition.

   **Trigger delay:** Set the trigger delay time.

# Trace

Press the **[Trace]** key to access and control the trace and detection settings. Each trace consists of a sequence of data points representing amplitude information. With each sweep, the signal analyzer updates the data for all active traces.

**Select trace:** Choose from up to 6 available traces.

**Trace type:** Select the type for the currently active trace. The system displays the acquired data based on the selected trace type, applying the corresponding calculation method. Available trace types include refresh, trace average, maximum hold, and minimum hold. The relevant parameter for each type is shown in the upper-right corner of the screen.

1. **Refresh:** Displays real-time data for each sweep of the trace.

2. **Trace average:** Each trace point represents the average value over multiple sweeps. Increasing the number of sweeps results in a smoother waveform.
3. **Maximum hold:** Each trace point retains the highest value recorded over multiple sweeps. The trace updates when a new maximum is detected.
4. **Minimum hold:** Each trace point retains the lowest value recorded over multiple sweeps. The trace updates when a new minimum is detected.

**Detector:** Select the detection mode for the current measurement. The selected mode is applied to the active trace. Available detector types include sampling, peak, negative peak, normal detection, and average.

1. **Sampling:** Each trace point reflects the instantaneous amplitude at a fixed sampling moment (typically the first sample within each time interval). This mode is suitable for measuring noise or noise-like signals.
2. **Peak:** Each trace point displays the maximum value of the sampled data within the corresponding time interval.
3. **Negative peak:** Each trace point displays the minimum value of the sampled data within the corresponding time interval.
4. **Normal detection:** In this mode, trace points alternate between the minimum and maximum values of the sampled data segments. Specifically, odd-numbered points display the minimum value, and even-numbered points display the maximum. This mode is useful for visualizing the upper and lower bounds of signal amplitude fluctuations.
5. **Average:** Each trace point represents the average value of the sampled data within the corresponding time interval. The effect of averaging varies depending on the signal type. The averaging method can be set using the **[Meas/Setup]** key. When the detector is set to average, the default ratio of VBW: 3dB is 0.1.
6. **Quasi Peak:** Quasi-peak detector implemented in accordance with CISPR standards.
7. **EMI Average:** EMI Average detector implemented in accordance with CISPR standards.

**Auto detector:** Enables or disables automatic detector selection for trace lines. By default, the instrument operates in automatic detection mode. If the detection type is manually selected, the auto detector function is disabled for the corresponding trace.

**Refresh (ON/OFF):** When set to ON, the selected trace is cleared of any previously stored data and continuously updated with incoming signals during the signal analyzer's sweep.
When set to OFF, the trace holds and displays the last captured amplitude data. The trace register is no longer updated during subsequent scans.

**Display (ON/OFF):** Toggles the visibility of the selected trace on the screen.

**Trace operation:** The trace operation function performs mathematical calculations between two traces or between a trace and a specified offset value.

1. **OFF:** Disables the trace operation function.
2. **Power difference (A-B):** Calculates the power difference between Operand A and Operand B and saves the result to the target trace. During the sweep, the following calculation is performed for each point: Trace=10log ($10^{A/10}$-$10^{B/10}$)

   Here, A and B are values in logarithmic power units (decibels).

   If the value of Operand A at a point equals the maximum trace value, the resulting difference is also set to the maximum trace value.

   If the result is less than or equal to zero, it is set to the minimum trace value.
3. **Power sum (A+B):** Calculates the power sum of Operand A and Operand B and saves the result to the target trace. During the sweep, the following calculation is performed for each point: Trace=10log (10A/10+10B/10)

   Here, A and B are values in logarithmic power units (decibels).

   If either Operand A or Operand B at a point equals the maximum trace value, the sum result is also set to the maximum trace value.
4. **Logarithmic difference (A-B+offset):** Computes the logarithmic difference between Operand A and Operand B, adds a specified offset, and stores the result in the target trace. During the sweep, the following calculation is performed for each point: Trace=A-B+offset

   The trace data is expressed in dBm.
5. **A + offset:** Adds a specified offset to Operand A and stores the result in the target trace. During the sweep, the following calculation is performed for each point: Trace=A+offset

   The trace data is expressed in dBm.

**Note**

The trace operation functions are mutually exclusive, applying a new operation to a trace will automatically disable any previously selected operation.

**Operand A:** Specifies the first operand trace used in the operation. Available options include Trace 1, Trace 2, Trace 3, Trace 4, Trace 5, and Trace 6.

**Operand B:** Specifies the second operand trace used in the operation. Available options include Trace 1, Trace 2, Trace 3, Trace 4, Trace 5, and Trace 6.

**Offset:** Specifies the logarithmic offset applied in the operation, expressed in dB. The offset can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

# Marker

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

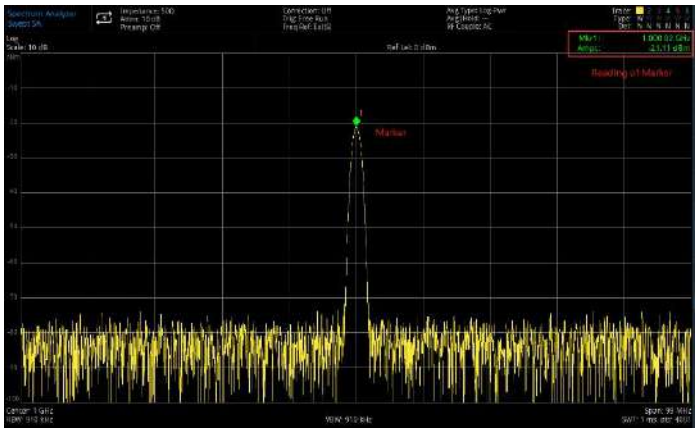

Figure 4-1 Mark Cursor Reading

Up to ten markers can be displayed on the screen simultaneously, but only one marker or a pair of markers can be controlled at a time.

**Select marker:** Choose one of the ten available markers. The default marker is Marker 1. After selecting a marker, users can configure parameters such as cursor type, the trace it references, and the reading mode. The active marker is displayed on the trace specified by the Mark Trace setting. The current reading of the active marker appears both in the parameter area and at the upper-right corner of the screen.

### Marker Mode

1. **Normal:** Used to measure the X-axis (frequency or time) and Y-axis (amplitude) values at a specific point on the trace. When the normal mode is selected, a cursor marked with its number (e.g., "1") appears on the trace.

   Note:

   - If no cursor is currently active, one will be automatically placed at the center frequency of the trace.
   - The current reading of the active cursor is displayed in the upper-right corner of the screen.
   - The resolution of the X-axis (time or frequency) depends on the sweep bandwidth. Reducing the sweep bandwidth improves reading resolution.

2. **Difference value△:** Used to measure the difference in X (frequency or time) and Y (amplitude) values between a reference point and another point on the trace. When Delta mode is selected, a pair of cursors appears:
   - The reference cursor, marked with "×".
   - The delta cursor, marked with "△".
3. **Fixed:** When the fixed mode is selected, the cursor's X and Y values can be changed directly or indirectly, but its position on the trace remains unchanged. The Y value does not follow the trace data. This mode is commonly used to define a reference point for Delta measurements. The Fixed cursor is marked with "×".
4. **OFF:** Disables the selected cursor. All on-screen cursor information and related functions will be hidden.

**Mark trace:** Selects the trace associated with the active cursor. Available options include Trace 1, Trace 2, Trace 3, Trace 4, Trace 5, and Trace 6.

**Mark frequency:** Marks a specific frequency point on the selected trace. The frequency can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Relative to:** Used to measure the difference between two cursors. The cursors can be placed on different traces simultaneously, allowing for comparative measurements across traces.

**Attribute:** Includes X-axis scale, X-axis scale (Auto/Manual), and marker line display.

1. **X-axis scale:** Selects the unit used for the X-axis cursor readings. Available options include frequency, period, time, inverse time, and marker. The reading mode adapts according to the selected scale.

   **Frequency:** When this reading type is selected, normal and fixed cursors display absolute frequency. Delta cursors display the frequency difference between the delta and reference cursors. In non-zero sweep width, frequency is the default reading unit.

   **Period:** When this reading type is selected, normal and fixed cursors display the reciprocal of the cursor frequency. Delta cursors display the reciprocal frequency difference. If the frequency difference is zero, its reciprocal is infinite, and the reading is shown as "---".

   Time: When this reading type is selected, normal and fixed cursors display the time difference between the sweep start to the cursor position. Delta cursors display the time difference between the delta and reference cursors. In zero sweep bandwidth mode, time is the default reading unit.

   **Inverse time:** When this reading type is selected, normal and fixed cursors display the reciprocal of the time difference between the delta and reference cursors. If the time difference

is zero, its reciprocal is infinite, and the reading is shown as "---".

2. **X-axis scale (Auto/Manual):** Selects between automatic and manual control of the X-axis scale.
   When set to Auto, and the sweep bandwidth is zero, the marker reading automatically switches to time mode.

3. **Marker line (ON/OFF):** Toggles the visibility of the marker line.
   When enabled, a crosshair appears at the amplitude point indicated by the cursor. The horizontal and vertical line dimensions match the grid width and height of the waveform display area.
   If the cursor is outside the visible display area, the marker line is extended into the viewing area. This allows users to visualize the amplitude position of off-screen cursors for reference or comparison.

**Marker function:** Includes mark noise, in-band power, in-band power density, N dB bandwidth point, and frequency meter threshold.

1. **Mark noise:** Performs noise marking at the selected cursor and displays the normalized noise power density at that point.
   If the currently selected cursor is disabled in the Marker menu, pressing Mark Noise will automatically enable it in Normal mode. The system measures the average noise level at the cursor's frequency and normalizes it to a 1 Hz bandwidth. Compensation is applied based on the selected detection method and trace type. For higher accuracy, it is recommended to use RMS Average or Sampling mode during noise measurements.
2. **In-band power:** Calculates the total power within a user-defined bandwidth.
   In non-zero sweep bandwidth mode, the total signal power within the specified bandwidth is calculated.
   In zero sweep bandwidth mode, the average power within the defined bandwidth is calculated instead.
3. **In-band density:** Determines the power spectral density within a specified bandwidth.
   In non-zero sweep bandwidth mode, in-band density is calculated as total in-band power divided by the bandwidth.
   In zero sweep bandwidth mode, in-band density is calculated as the measured in-band power divided by Bn, where Bn is the equivalent noise bandwidth of the RBW filter.
4. **N dB point (ON/OFF):** Enables the N dB bandwidth measurement function or sets the N dB value.

The N dB bandwidth is defined as the frequency difference between two points where the amplitude decreases (N < 0) or increases (N > 0) by N dB on either side of the current cursor frequency.

N dB point can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

5. **Frequency meter (ON/OFF):** Enables frequency counting at the cursor position. The frequency meter displays the precise frequency of the point with the highest signal energy near the cursor.

   Note: Enabling this function may reduce sweep speed.

6. **Frequency meter threshold:** Sets the measurement time for the frequency meter.

**Marker demodulation:** Sets the demodulation type for the marker to Amplitude Modulation (AM), Frequency Modulation (FM), or OFF (default).

- When AM or FM demodulation is enabled, the system performs demodulation at the marker's center frequency.
- The instrument includes a headphone jack for audio output of the demodulated signal. The audio frequency corresponds to the frequency of the modulating signal, while the audio volume reflects its amplitude.

**Close All:** Disables all active markers.

**Marker**: Uses the current marker value to set system parameters on the signal analyzer (e.g., center frequency, reference level).

If no marker is currently active, opening the **Marker** menu will automatically activate one.

1. **-> Center frequency:** Sets the signal analyzer's center frequency to the frequency at the current marker.
   - If a normal marker is selected, the center frequency is set to its frequency.
   - If a Delta marker is selected, the center frequency is set to the frequency of the delta cursor.
   - This function is unavailable in zero sweep bandwidth mode.

2. **-> Stepped center frequency:** Sets the stepped center frequency to the frequency at the current marker.
   - If a normal marker is selected, the stepped center frequency is set to its frequency.
   - If a Delta marker is selected, the stepped center frequency is set to the frequency difference between the delta and reference cursors.
   - This function is unavailable in zero sweep bandwidth mode.

3. **-> Start frequency:** Sets the start frequency of the signal analyzer to the frequency at the current marker.
   - If a normal marker is selected, the start frequency is set to its frequency.
   - If a Delta marker is selected, the start frequency is set to the frequency of the delta cursor.
   - This function is unavailable in zero sweep bandwidth mode.

4. **-> Cut-off frequency:** Sets the cut-off frequency of the signal analyzer to the frequency at the current marker.
   - If a normal marker is selected, the cut-off frequency is set to its frequency.
   - If a Delta marker is selected, the cut-off frequency is set to the frequency of the delta cursor.
   - This function is unavailable in zero sweep bandwidth mode.

5. **-> Reference level:** Sets the signal analyzer's reference level to the amplitude of the active marker and moves the marker to the reference level position (the top of the display grid).
   - If a normal marker is selected, the signal analyzer sets the marker amplitude to match the current reference level.
   - If a Delta marker is selected, the reference level is set to the amplitude difference between the two markers.

**Marker list:** Enables or disables the marker list display.

When enabled, all active markers are displayed in a list in the lower pane of the split screen. The list includes the marker number, marker mode, associated trace number, X-axis scale type, X-axis value, and amplitude.

The marker list provides a convenient way to view measurement values for multiple points simultaneously.

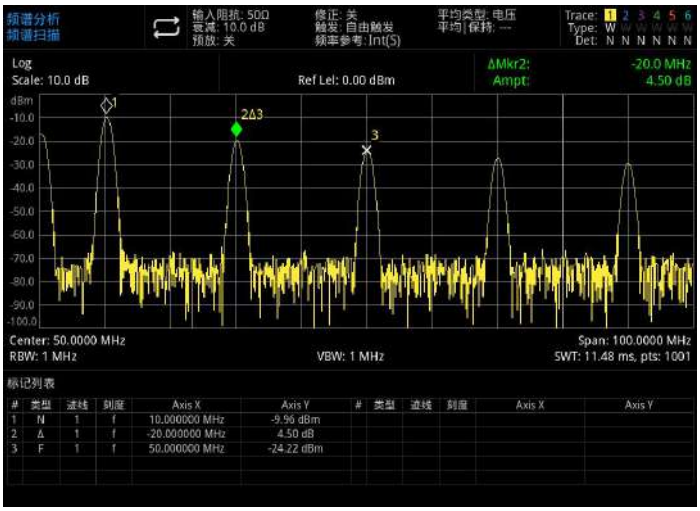

Figure 4-2 Marker List

# Peak

Press the **[Peak]** key to turn on the peak search menu and execute a peak search.

**Mark frequency:** Marks a specific frequency point on the trace. The frequency value can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Marker:** See the **[Marker]** key under the panel menu **Marker->** for additional marker functions.

**Peak search:** Uses the normal marker mode to locate the highest amplitude on the trace and display its frequency and amplitude values. Pressing Peak Search executes this operation once.

**Next peak:** Finds the peak with the second-highest amplitude that meets the search criteria and marks it with the marker. If no such peak exists, the marker remains at its current position.

**Next peak on the left:** Finds the closest qualifying peak to the left of the current peak and marks it with the marker.

**Next peak on the right:** Finds the closest qualifying peak to the right of the current peak and marks it with the marker.

**Minimum peak:** Finds the minimum amplitude on the trace and marks it with the cursor marker.

**Peak-to-Peak search:** Performs peak and minimum searches simultaneously. The peak result is marked with the reference marker, and the minimum result is marked with the difference marker.

**Continuous peak search (ON/OFF):** Enables or disables continuous peak search. The default setting is OFF.

When enabled, the signal analyzer automatically performs peak detection during each trace update to track the measurement signal.

**Peak List (ON/OFF):** Enables or disables the peak list display. The default setting is OFF.

When enabled, a list of peaks (frequency and amplitude) that meet the search criteria is displayed in a split-screen window. Up to 20 valid peaks can be seen.

Figure 4-3 Peak List

**Search standard:** Includes threshold line display, peak threshold, and peak offset.

**Threshold line (ON/OFF):** Enables or disables the display of the threshold line used for peak detection.

The line indicates the peak offset value. The default setting is OFF.

**Peak threshold (Auto/Manual):** The minimum peak amplitude can be set automatically or manually. Only peaks with amplitudes greater than the specified threshold are identified as valid peaks. The threshold can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Peak offset (Auto/Manual):** The difference between the peak value and the minimum amplitude on either side can be set automatically or manually. Only peaks with a peak-to-valley difference greater than the specified offset are identified as valid peaks. The peak offset can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

# Measurement Setting (Meas Setup)

Press the **[Meas/Setup]** key to open the parameter panel menu, including the settings of average/hold time, average type, display line, limits, EMC standard, CISPR preset, phase noise optimization, and measurement preset.

**Average/Hold time:** Sets the averaging time for the trace. The average time can be adjusted by using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

Increasing the averaging time reduces the influence of noise and other random signals, helping to highlight stable signal characteristics. A greater number of averages results in a smoother, more consistent trace.

**Average type**

1. **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelope within a signal acquisition unit. In this mode, the detection type switches to video detection. For stochastic noise, the following relationship applies: Logarithmic average = power average - 2.5 dB = voltage average -1.45.

   This method reduces the displayed noise level (not the actual noise power), making it suitable for observing low-energy narrowband signals, particularly those near the noise floor.
2. **Power average:** Calculates the average power of the signal. The detection mode switches to RMS (power) detection. The power average reflects the actual power of noise, making it suitable for measuring the real-time power of complex signals.

3. **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelope within a signal acquisition unit. The detection mode switches to voltage detection, and results are displayed on a linear scale.
   This method is ideal for observing AM signals or analyzing the rise and fall behavior of pulsed or modulated signals (e.g., radar or TDMA bursts).

**Display line (ON/OFF):** Enables or disables the display line. This line is a horizontal reference at a user-defined amplitude level, using the same unit as the Y-axis.
The display line level can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

The display line appears as a horizontal reference at the specified amplitude level, with units consistent with the Y-axis.
If the set level is outside the visible range, the display line will appear at the top or bottom edge of the grid and is indicated by an arrow.

**Limits:** Configure parameters for limit testing. Press the **[Default]** key to disable limit testing; the current limit settings will be saved.

1. **Select:** Selects the active limit line. Up to 6 limit lines are available. The default selection is Limit 1.
2. **Limits (ON/OFF):** Enables or disables the selected limit line.
   When enabled, the limit line is displayed on the measurement screen, and the trace is evaluated against it. Each limit line is shown in a distinct color.
3. Test trace: Set the test trace for the current limit line. The default trace is Trace 1.
4. **Tolerance (ON/OFF):** Enables or disables the display of tolerance lines.
   When enabled, tolerance lines appear on the measurement interface. When disabled, the tolerance settings are ignored.
5. **Type (Upper/Lower):** Specifies whether the current limit line is an upper limit or a lower limit. If the trace amplitude exceeds the upper limit or if it falls below the lower limit, then the test fails.
6. Edit limits: Press this key to open the limit line editing menu. The current limit line will be displayed, and the peak list will be disabled.
   The trace corresponding to the limit line will be activated. The menu includes the following options:
   - **Select:** Choose the limit line to edit. The default selection is Limit Line 1.

- **Select row:** Choose the row from the limit list for editing.
- **Frequency:** Edit the frequency value for the selected point. Adjust using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.
- **Amplitude:** Edit the amplitude value for the selected point. Adjust using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.
- **X Offset:** Set a frequency offset for the current limit line.
- **Y Offset:** Set an amplitude offset for the current limit line.
- **Apply Offset:** Apply the X and Y offsets to all points on the current limit line, then reset both offsets to zero.
- **Insert row:** Insert a new editing point into the limit list.
- **Delete row:** Delete the selected row.
- **Delete limits:** Delete the current limit line and all associated data.

7. **Test limits (ON/OFF):** Enables or disables testing against the current limit line.
8. **Copy limits:** Copies the settings from one selected limit line to another.
9. **Limits construction:** Reconstructs (or restores) the current limit line based on a selected limit line.
10. **Delete all limits:** Deletes all limit lines, clearing all limit data and restoring the limits to factory default settings.

**EMC standard:** None or CISPR.

When None is selected, both the filter type and filter bandwidth can be configured manually.

When CISPR is selected, the filter bandwidth is fixed at the -6 dB point, in accordance with CISPR measurement requirements.

**Note**

If the EMC measurement standard is set to None, all detector types are available: Sample, Peak, Negative Peak, Normal Detection, Average, Quasi-Peak, and EMI Average.

If the standard is set to CISPR, the Sample and Normal Detection detector types are disabled.

**CISPR preset:** Resets the sweep frequency range based on predefined CISPR bands. When a preset frequency band is selected, the start and cut-off frequencies of the current sweep range are automatically updated to match the selected band.

**Phase noise optimization:** Selects the behavior of the Local Oscillator (LO) phase noise to suit different operating conditions.

- **Near-field optimal:** Optimizes LO phase noise at small frequency offsets from the carrier. This setting provides better close-in phase noise performance but sacrifices performance at

larger offsets.

- **Far-field optimal:** Optimizes LO phase noise for larger frequency offsets from the carrier (typically 70 kHz to 300 kHz).
  This mode improves wide-offset performance but degrades close-in phase noise and reduces measurement throughput, especially during frequent center frequency changes.
- **Fast tuning:** Prioritizes measurement speed by reducing LO stabilization time.
  Phase noise performance is compromised across all offset ranges to enable rapid changes in center frequency or span.
  Note: Fast refers to the time required to reposition the LO and begin a new scan. This setting does not affect the actual scan duration.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to their factory default values.

## Single

The **[Single]** key is the quick sweep mode key. For details, refer to the Sweep/Measurement in Chapter 3.

## Input/Output

When using the touch screen, tap **Input/Output** in the expanded panel menu to open the corresponding parameter settings interface. This interface is used to configure calibration, reference frequency input, and input coupling settings.

**Calibration:** Used to verify whether the instrument can correctly detect signals and to manage automatic calibration functions.

1. **Calibration signal:** Turns the internal calibration signal on or off. When no external signal is connected, enabling this function outputs a 100 MHz sine wave, which can be observed on the spectrum display.
2. **Auto calibration:** Turns auto calibration on or off. When enabled, the instrument performs a self-calibration automatically during startup.
3. **Immediate calibration:** Triggers a manual self-calibration using the system's internal calibration source.

**Reference frequency input:** Sets the source of the reference frequency.

1. **Auto detection:** Automatically selects the reference frequency source based on the presence

of an external reference input.

If an external reference is detected, the reference source switches to external; otherwise, it defaults to internal.

2. **Internal:** Forces the reference frequency source to remain internal, regardless of any external reference input.
3. **External:** Forces the reference frequency source to remain external, regardless of any external reference input.

**RF coupling:** Selects the input coupling mode to DC or AC.

**Trigger Output:** Control the trigger output type and output switch.

1. **Trig1 Out:** Peroid, Main trigger, External External2, burst, off.
2. **Trig1 Out Polarity:** Positive, Negative.
3. **Trig2 Out: Period**, Main trigger, External External2, burst, off.
4. **Trig2 Out Polarity:** Positive, Negative.

# Default Setting

Press the **[Default]** key to quickly restore the system to a clean, ready-to-measure state.

To perform a full reset, press **[Default] > Factory Setting**. The system will then reset according to the following steps:

1. Reset the signal analyzer to Signal Analyzer (SA) mode.
2. Open the Frequency menu.
3. Restore default parameters for predefined conditions.
4. Run a processor self-test without affecting calibration data.
5. Clear the cache and delete all input/output trace data.
6. Disable the amplitude display for Traces 2 through 6.
7. Turn off the amplitude correction factor but retain the stored correction data in memory.
8. Disable the limit test but retain the limit line list in memory.
9. Set the internal system state to 0.

The default values of key parameters after the reset are shown in the following table.

| Menu | Parameter | Default Value |
|---|---|---|
| Frequency | Start frequency | 10 MHz |
| Frequency | Cut-off frequency | 8.4 GHz (Max. frequency) |
| Frequency | Frequency offset | 0 Hz |

| | | |
|---|---|---|
| Amplitude | Reference level | 0 dBm |
| Amplitude | Input attenuation | Auto, 10 dB |
| Amplitude | Pre-amplification | OFF |
| Amplitude | Reference level offset | 0 dB |
| Amplitude | Impedance | 50 Ω |
| Bandwidth | Resolution bandwidth | Auto, 10 MHz |
| Bandwidth | Video bandwidth | Auto, 10 MHz |
| Sweep | Sweep time | Auto, 2.6 ms |
| Sweep | Sweep mode | Auto, frequency sweep |
| Sweep | Sweep count | 1001 |
| Sweep | Trigger type | Arbitrary trigger |
| Trace | Select trace | 1 |
| Trace | Trace type | Refresh |
| Trace | Trace detector | Normal |
| Trace | Trace refresh | ON |
| Trace | Trace display | ON |
| Measurement | Measurement type | Frequency sweep |
| Measurement Setting | Average/hold time | 100 |
| Measurement Setting | Average type | Voltage |

# File Storage (Save/Recall)

Press the **[Save/Recall]** key to enter the save menu. The types of files that can be saved in the instrument are state, trace + state, measurement data, limits, correction, and export. A long press on this key captures a screenshot.

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

1. Press the **Export** key to save the current state using the default file name or a user-defined file name.
2. After selecting a state file, press the **Import** key to load the saved state.

**Trace + State:** Press the **Trace + State** panel menu to access the save menu for trace and state data. The instrument's current state and the selected trace can be saved to a file.

There are six traces available for selection.

There are six traces available for selection.

1. Press the **Export** key to save the current state and trace using the default file name or a user-defined file name.
2. After selecting a file, press the **Import** key to load the saved Trace + State file.

**Measurement data:** Press the **Measurement Data** panel menu to access the save menu for measurement data. Selected measurement data types—such as trace, measurement result, peak list, or cursor list—can be saved to a specified file.

The instrument saves the data in .csv format (comma-separated values), suitable for analysis using software like Excel.

Select trace: Six traces are available for selection.

Data type: Trace, peak list, marker list.

1. Press the **Export** key to save the selected measurement data using the default file name or a user-defined file name.
2. After selecting a file, press the **Import** key to load the saved measurement data file.

**Limits:** Press the **Limits** panel menu to open the save menu for limit data. The selected limit line can be saved to a file.

Select limits: Six limit lines are available for selection.

1. Press the **Export** key to save the current limit using the default file name or a user-defined file name.
2. After selecting a file, press the **Import** key to load the saved limit file.

**Correction:** Press the **Correction** panel menu to access the save menu for correction data. The selected correction value can be saved to a file.

Select correction: 10 correction entries available.

1. Press the **Export** key to save the current correction data using the default file name or a user-defined file name.
2. After selecting a file, press the **Import** key to load the saved correction file.

**Export:** Exports the selected file.

**Import:** Imports the currently selected file. (This key is hidden when no file is selected.)

# System Setting (System)

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

**System information:** Enter the system information panel menu to view basic and optional

information.

1. **Basic information:** Includes product name, manufacturer, product model, serial number, software version, intermediate frequency (IF) hardware version, radio frequency (RF) hardware version, IF logic version, RF logic version, and other relevant details.
2. **Option information:** Displays the version number and status of installed options.

**Setting:** Enter the Setup panel menu to configure basic network settings.

1. **Basic Setting**

   **Language:** Simplified Chinese, English, German.

   **Time Format:** Select 12-hour or 24-hour format.

   **Date/Time:** Tap this area to open the system time setting window. Slide up or down to adjust the date and time, then tap ✓ to confirm the settings.

   **Picture format:** Set the screenshot file format; options include BMP and PNG.

   **Power-On parameter:** Choose the system parameter settings to load on startup; options include default, previous, and preset.

   **Backlight:** Adjust the screen backlight by sliding the scroll bar.

   **Sound:** Adjust the sound volume by sliding the scroll bar.

   **HDMI:** Enable or disable the HDMI interface by checking or unchecking the box. Tap ☐ to check, indicating that the interface is enabled.

   **Screenshot inverse color:** Enable or disable color inversion for screenshots.

   **Preset file:** When the power-on parameter is set to preset, this configuration file will be used to initialize the instrument settings at startup.

   **Power off:** When the power switch is set to Power Off, a confirmation window will appear.

2. **Network Setting**

   **Adopter:** LAN switch. Tap ☐ to check, indicating that LAN is enabled.

   **DHCP:** Tap ☐ to check, indicating that DHCP is enabled. If unchecked, manual IP configuration is required.

   **IPV4 address:** The format of an 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 the network administrator for an available IP address.

   **Subnet mask:** The format of subnet mask is nnn.nnn.nnn.nnn. nnn range is 0 to 255. It is recommended to consult the network administrator for an available subnet mask address.

   **Gateway setting:** The format of 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 the network administrator for an available gateway address.

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

3. **Interface Setting**

**Web login username:** Set the username for browser login. Access the instrument via the web address http://IP:9000, where IP is the IPv4 address set in the network settings (e.g., http://192.168.20.117).

**Web login password:** Set the password for browser login. After successful login, users can control the instrument, execute SCPI commands, and configure network settings through the browser.

Once the web login username and password are set, the device can be remotely controlled via a web browser on a PC or mobile device. The web interface replicates the touch screen and mouse-click functions of the physical instrument, allowing intuitive operation as follows.

1) Access Local Area Network

The computer and the signal analyzer must be on the same local area network and able to communicate with each other (e.g., via a successful ping).

Users can view the signal analyzer's local IP address in the **Utility** menu. Once identified, access the instrument by entering http://IP: port in a web browser (e.g., http://192.168.20.117:9000).

**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 to check the basic information and control parameters of the instrument, such as network setting, password and SCPI, as shown in the following Figure 4-4.

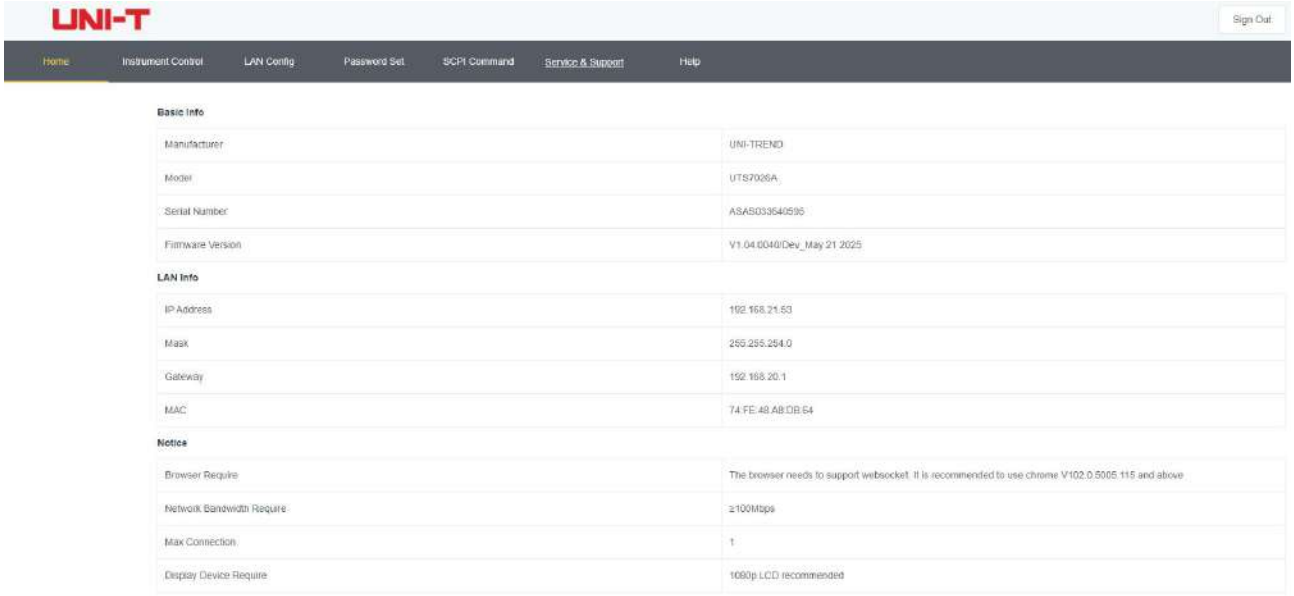


Figure 4-4 Web Basic Information

Log in via the web interface to view the instrument's network configuration, login credentials, and SCPI settings. The web username and password are described above. The login interface and remote control functionality of the signal analyzer are illustrated in Figure 4-5 below.

Figure 4-5 Web Control

All operations available on the instrument's physical touch screen—such as selecting menu panels, tapping function keys, entering numbers and characters, dragging markers, and printing the screen—can also be performed via the web interface.

2) Access Outer Network

a) Connect a network cable to the signal analyzer to establish internet access.

b) Enable the **FRP** (Fast Reverse Proxy) service on the server.

c) Configure the FRP proxy IP address and port number on the signal analyzer.

d) Open a browser and enter http://IP: web_port to access the signal analyzer remotely. The web interface is identical to the local access interface described above.

**Note**: This signal analyzer uses FRP for intranet penetration to enable external network access. The supported FRP version is 0.34.0.

The device is equipped with an FRP 0.34.0 client, which must be used in conjunction with an FRP server. To establish a connection, the FRP server must be running and configured to listen on port 7000. Specifically, the server's configuration file should include: bind_port = 7000.

3) Network Setting

Modify the network and FRP agent network information of the signal analyzer, as shown in the following Figure 4-6.

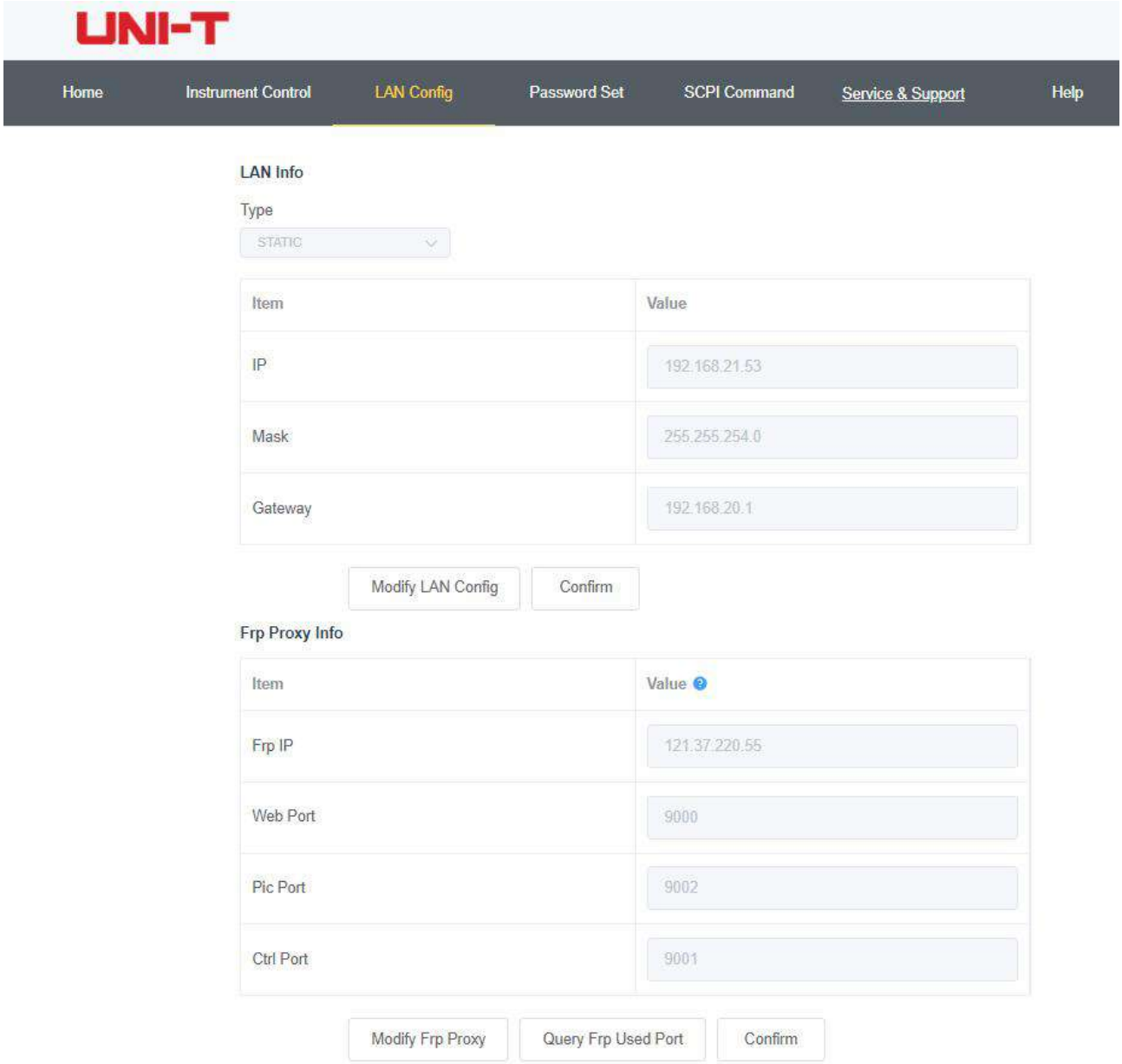


Figure 4-6 Web Network Setting

4) Password Setting

Modify the web login password of the signal analyzer, refer to Figure 4-7 below. The original password can be viewed by navigating to Physical Instruments > System > Setting > Interface Settings.

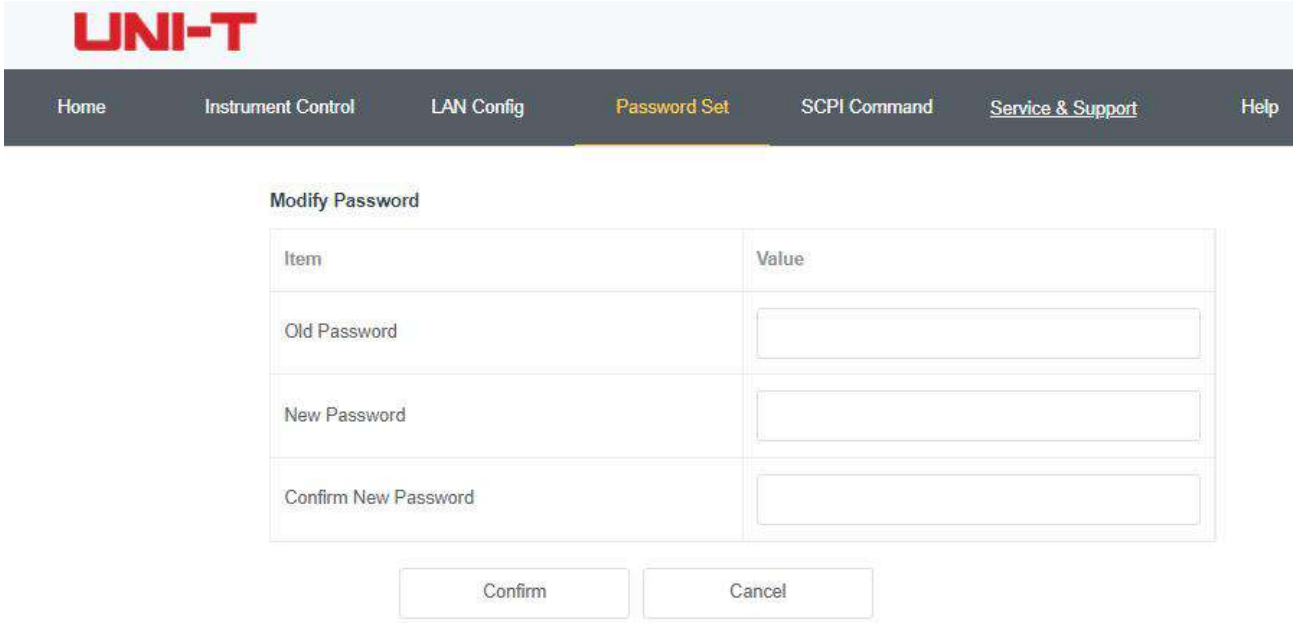


Figure 4-7 Web Password Setting

5) SCPI

Execute an SCPI command, refer to Figure 4-8 below.

Enter the command in the SCPI Command input field, then click the **Send Command** button. The result of the command execution will be displayed in the Report section.

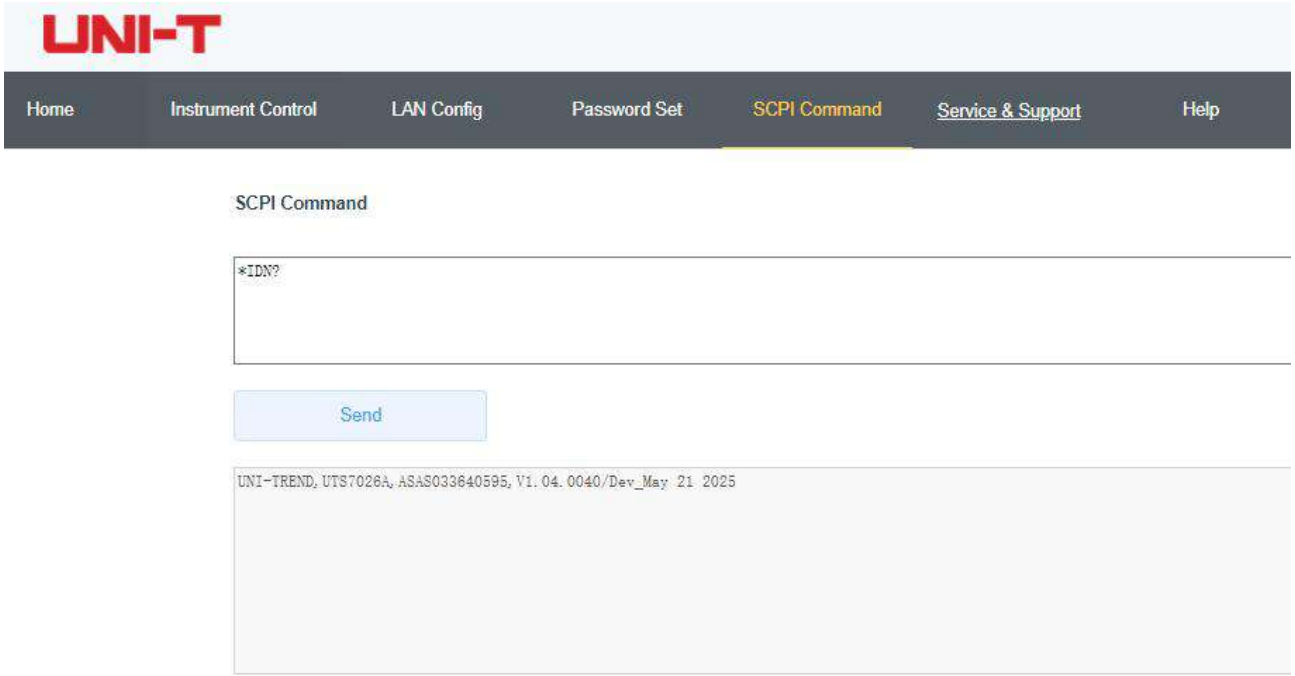


Figure 4-8 SCPI Control

**Restore default setting:** Enter the restore default menu to perform the following steps:

1. Restore system settings: Resets only the system settings of the signal analyzer to their default values.
2. Clear Data: Deletes all stored data on the signal analyzer.

3. Restore All Settings: Resets all settings to factory defaults and clears all user data.

## Screen Lock (Touch/Lock)

Press the **[Touch Lock]** key to enable or disable the touch screen functionality.

When the indicator light is green, the touch function is locked.

When the indicator light is off, the touch function is enabled.

Press the **[Esc]** key to exit screen lock.

## File Management (File)

Press the **[File]** key to access the file system and perform operations such as viewing, creating, deleting, copying, and moving files and folders.

**Check**: Browse and view all files and folders within the file system.

**Create**: In any directory, tap a blank area on the touch screen, then select **New → Folder** from the pop-up menu to create a new folder.

**Delete**: In any directory, select the files or folders to be deleted. Long-press the touch screen to open the context menu, choose **Delete**, and confirm the action.

**Copy**: In any directory, select the files or folders to copy. Long-press the touch screen to open the context menu, choose **Copy**, and confirm the action.

**Move**: In any directory, select the files or folders to move. Long-press the touch screen to open the context menu, choose **Move**, and confirm the action.

## Measurement Mode (Mode/Meas)

Press the **[Mode/Meas]** key to open the Mode Selection window. In spectrum analysis mode, users can access various one-key measurement functions, including channel power, time domain power, occupied bandwidth, third-order intermodulation, adjacent channel power, spectrum monitoring, carrier-to-noise ratio (CNR), and harmonic measurements. For detailed descriptions of these measurements, refer to One-Key Measurement in Chapter 4.

Available modes include spectrum analysis, IQ analysis, EMI, analog demodulation, vector signal analysis, real-time spectrum analysis, phase noise analysis, LTE FDD, LTE TDD, and NR.

Note: Some measurement modes require optional licenses for activation. Please visit the official website to download the corresponding user guides or activation instructions.

# Automatic Tuning (Auto)

Press the **[Auto]** key to enable automatic tuning and quickly check the input signal. When activated, the instrument performs the following steps:

1. Executes a peak search in full sweep bandwidth mode.
2. Marker > Center Frequency: Automatically sets the center frequency to the frequency of the peak signal.
3. Marker > Reference Level: Automatically adjusts the reference level to the amplitude of the peak signal
4. Configures other related parameters to automatic mode for optimal signal observation.

**Note**

The effective frequency range of the automatic tuning function is 10 MHz to 40 GHz. The minimum detectable signal amplitude is −65 dBm.

# 5. One-Key Measurement


- Frequency Sweep
- Channel Power
- Time Domain Power
- Occupied Bandwidth
- Third-Order Intermodulation
- Adjacent Channel Power (ACP)
- Spectrum Monitoring
- Carrier-to-Noise (CNR) Measurement
- Harmonic Measurement


This chapter introduces how to use the **[Mode/Meas]** key on the front panel to perform one-key measurement in signal analysis mode.

## Frequency Sweep

Press **[Mode/Meas] > Spectrum Analysis > Frequency Sweep** to perform measurements using one of the following analysis methods:
Sweep analysis (frequency domain), FFT analysis (frequency domain), Zero sweep bandwidth analysis (time domain).
When frequency sweep is selected, advanced measurement is turned off by default. For detailed instructions, refer to Chapter 4.

To configure frequency sweep analysis parameters, press the **[Meas/Setup]** key. This key also provides access to other measurement settings required for subsequent one-touch measurements.

# Channel Power

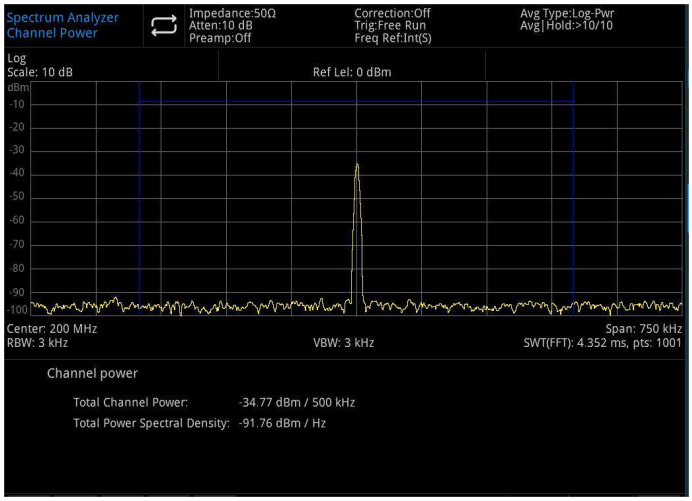


Figure 5-1 Channel Power

Measures the power and power spectral density (PSD) within the user-defined channel bandwidth. A pair of vertical lines on the display indicate the boundaries of the channel. To perform this measurement, configure the center frequency, reference level, and channel bandwidth.

Press **[Mode/Meas] > Spectrum Analysis > Channel Power** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

### Average Type

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Integral bandwidth:** Specifies the integration range used to calculate the power within a channel, such as the main channel bandwidth.

Note: The integral bandwidth is visually indicated by a blue box on the display.

The sweep bandwidth should be set between 1 to 10 times the integral bandwidth. The integral bandwidth can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

## Time Domain Power

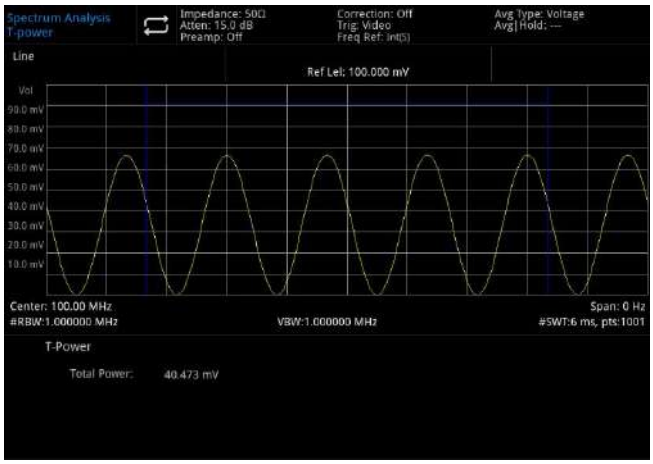


Figure 5-2 Time Domain Power

Press **[Mode/Meas] > Spectrum Analysis > T-Power** to enter zero sweep bandwidth mode and perform power measurements in the time domain. This action opens the corresponding panel menu.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans

used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Start time:** Sets the left boundary for time-domain power measurement. The power calculation is performed over the range from the start line to the stop line. The default value is 0 s. The start time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Stop time:** Sets the right boundary for time-domain power measurement. The calculation range extends from the start line to the stop line. The default value is 10 ms. The stop time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# Occupied Bandwidth

Figure 5-3 Occupied Bandwidth

The occupied bandwidth (OBW) calculation begins by measuring the total power of the spectrum currently displayed on the screen. The user specifies a power percentage (default: 99%) to define the portion of the total power that should lie within the occupied bandwidth.

Measurement steps:

1. The system calculates the total spectral power.
2. Two markers are automatically placed on the spectrum trace—one on the lower frequency side (F1) and one on the higher side (F2)—such that the integrated power between them accounts for the specified percentage (e.g., 99%) of the total power.
3. The remaining power (e.g., 1%) is symmetrically distributed outside these markers.
4. The frequency difference between F1 and F2 is displayed as the occupied bandwidth.

This function can also be used to evaluate the frequency offset between the signal analyzer's center frequency and the signal's actual center frequency. The Transmit Frequency Error is defined as:

Transmit Freq Error = ((F1 + F2) / 2) - Center Frequency

Occupied bandwidth measurements can be performed in either single scan or continuous scan mode. To ensure accurate results, the center frequency, reference level, and channel interval should be configured.

Press **[Mode/Meas] > Spectrum Analysis > Occupied BW** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this

function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Occupied power percentage (% of OBW Power):** This parameter defines the percentage of the total signal power used to determine the Occupied Bandwidth (OBW). The OBW can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**X dB:** The XdB Bandwidth function is used to determine the Emission Bandwidth (EBW) based on a relative amplitude threshold from the signal's peak. This function operates independently of the OBW calculation, though the measured bandwidth should fall within the OBW span.

Measurement steps:

1. Identify the highest point in the signal trace (**P1**).
2. Place two directional markers (**F1 and F2**) on either side of P1 where the amplitude drops by X dB relative to P1.
    - Place two directional markers (F1 and F2) on either side of P1 where the amplitude drops by X dB relative to P1.
    - Place two directional markers (F1 and F2) on either side of P1 where the amplitude drops by

X dB relative to P1.

The Emission Bandwidth is calculated as: EBW = F2 − F1

The X value (in dB) is user-definable from −100.0 dB to −0.1 dB. XdB can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Note**

x An asterisk (*) next to the x dB bandwidth value indicates that the result was not obtained under the optimal signal analyzer settings.

If your primary concern is the emission bandwidth, select Maximum Hold, then press **[Trace] > Detector > Peak Detect**.

The acquired peak data will ensure the accuracy of the emission bandwidth measurement.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# Third-Order Intermodulation

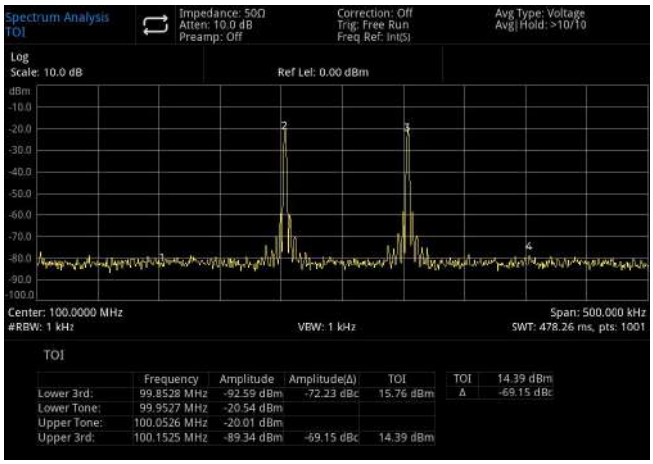


Figure 5-4 Third-Order Intermodulation

Third-Order Intermodulation (TOI) is used to calculate and display the third-order intercept point (IP3), and to mark the fundamental signals and their third-order intermodulation products on the trace, indicating their respective positions and relationships.

Press **[Mode/Meas] > Spectrum Analysis > TOI** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this

function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# Adjacent Channel Power

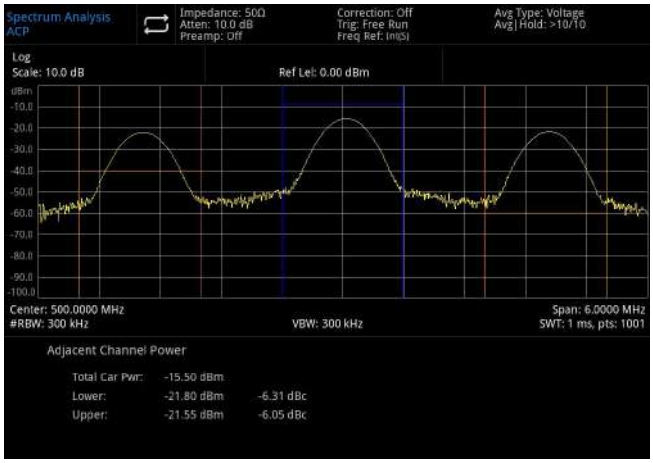


Figure 5-5 Adjacent Channel Power Ratio

Measurement of Main Channel Power, Adjacent Channel Power (Previous and Next):

In this measurement, one main channel and two adjacent channels (one on each side—previous and next) are defined. The main channel is centered on the specified center frequency, while the adjacent channels are symmetrically positioned relative to it. Users can configure the measurement by setting parameters such as main channel bandwidth, adjacent channel bandwidth, and channel spacing (the frequency of distance between the center of the main and adjacent channels).

Each channel's power is computed using the same method as the Channel Power algorithm.

The Adjacent Channel Power Ratio (ACPR) is defined as the ratio of the power measured in an adjacent channel to the power measured in the main channel.

Press **[Mode/Meas] > Spectrum Analysis > ACP** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

### Average Type

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.

- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Noise bandwidth:** Specifies the bandwidth of the main channel over which the power is integrated. The default value is 2 MHz. The main channel bandwidth can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Integral bandwidth:** Specifies the frequency width of each adjacent channel. This bandwidth is linked to the main channel bandwidth. The adjacent channel bandwidth can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Frequency offset:** Specifies the spacing between the main channel's center frequency and that of the adjacent channels. Adjusting the channel interval simultaneously changes the distance of both the previous and next adjacent channels relative to the main channel. The adjacent channel can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Offset side:** Specifies which sidebands to measure.

- Negative: Measures only the negative (lower) sideband.
- Positive: Measures only the positive (upper) sideband.
- Both sides: Measures both positive and negative sidebands.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# Spectrum Monitor

Figure 5-6 Spectrum Monitoring

The x-axis represents frequency, the y-axis represents time, and the color indicates the energy level of the spectrum. This visualization is used to detect intermittent signals. Spectrum monitoring allows

observation of signal changes over a period of time.

Press **[Mode/Meas] > Spectrum Analysis > Spectrum Monitor** to access the corresponding panel menus.

**Measurement Setting**

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each scan.
- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# CNR Measurement

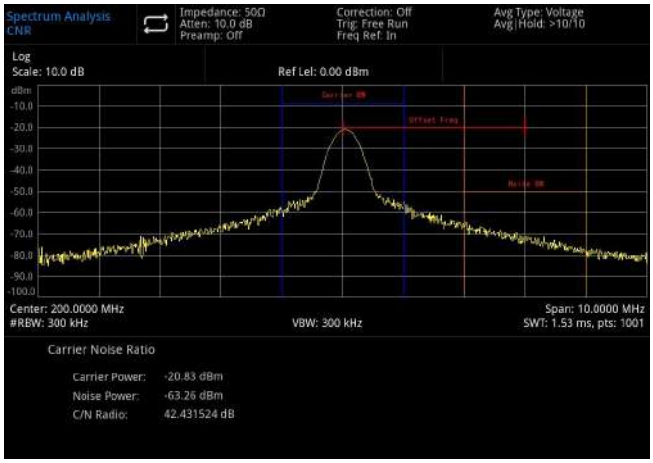


Figure 5-7 CNR Measurement

CNR (carrier-to-noise ratio) measurement: carrier power, noise power, and the carrier-to-noise ratio. The system searches for the maximum positive peak value (**f1**) within the displayed frequency range and designates it as the carrier. The carrier power is calculated based on the power within the carrier bandwidth centered at f1.

A frequency offset is then applied to ensure that no carrier signal exists within the noise measurement range. The noise power is calculated within a defined noise bandwidth centered at **f1 +** frequency offset.

Finally, the carrier-to-noise ratio is computed by dividing the carrier power by the noise power.

Press **[Mode/Meas] > Spectrum Analysis > CNR** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each

scan.

- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Carrier bandwidth:** Specifies the bandwidth used to measure the carrier signal. The carrier bandwidth is associated with the sweep bandwidth and is also linked to the noise bandwidth through the frequency offset. The carrier bandwidth can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Noise bandwidth:** Specifies the bandwidth used to measure the noise signal. The noise bandwidth is also tied to the sweep bandwidth and is linked to the carrier bandwidth via the frequency offset. The noise bandwidth can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Frequency offset:** Specifies the frequency difference between the center of the carrier bandwidth and the center of the noise bandwidth. The frequency offset is linked to the sweep bandwidth and forms the basis for relating to the carrier and noise measurement bands. The frequency offset can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# Harmonic Measurement

Figure 5-8 Harmonic Measurement

Harmonic measurement: Measures the amplitude of each harmonic component of the carrier signal and calculates the Total Harmonic Distortion (THD). Up to 10 harmonics can be measured.

THD (Total Harmonic Distortion): Represents the overall distortion caused by the harmonics relative to the fundamental frequency.

The harmonic analysis waveform is generated by stitching together zero-sweep bandwidth waveforms of each harmonic.

Note: During harmonic analysis, all functions under the **[FREQ]** menu are disabled.

Press **[Mode/Meas] > Spectrum Analysis > Harmonics** to access the corresponding panel menus.

### Measurement Setting

**Average/Hold time (ON/OFF):** Press the average number (ON) to specify the number of scans used for averaging the measurement results. The number of scans can be set from 1 to 999. The average time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu. The average measurement will update after each scan. Select (OFF) to disable this function.

**Average mode (Exponential/Repeat):** Switch between exponential and repeat averaging modes to determine how the signal analyzer processes data once the specified number of averaging scans is reached.

- **Exponential mode:** When the exponential mode is selected, after reaching the specified number of scans, the trace data for each channel is exponentially weighted and combined with the previous average. In this mode, new data is given greater weight than older data, which helps track slowly changing signals. The averaged result is updated and displayed after each

scan.

- **Repeat mode:** When the repeat mode is selected, after reaching the specified number of scans, all previous data is cleared, and a new scan cycle begins.

**Average Type**

- **Logarithmic power average:** Calculates the average of the logarithmic amplitude values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to video detection.
- **Power average:** Calculates the average power (square of the amplitude) of the signal. The detection mode switches to RMS (power) detection.
- **Voltage average:** Calculates the average of the voltage values (in dB) of the signal envelopes within a signal collection unit. The detection mode switches to voltage detection.

**Carrier wave:** Sets the frequency of the carrier harmonic. By default, all harmonic measurements are performed at integer multiples of this specified fundamental frequency. The carrier wave can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Harmonic order:** Specifies the number of harmonic components (i.e., up to which multiple of the fundamental frequency) to be measured for total harmonic distortion (THD) analysis. The harmonic order can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Dwell time:** Sets the measurement time for each specified harmonic. In zero sweep bandwidth mode, the system automatically balances between measurement speed and accuracy. Longer dwell times improve measurement accuracy. Shorter dwell times increase measurement speed.
The dwell time can be adjusted using the numeric keypad, rotary knob, arrow keys, or by tapping the panel menu.

**Measurement preset:** Resets all measurement and configuration parameters of the current measurement mode to factory defaults.

# 6. Factory Default and Troubleshooting

## Factory Default

All working mode parameters have been disabled, and default values will be applied.

| Parameter | Minimum | Maximum |
|---|---|---|
| Center frequency | 5 Hz | 40.199999995 GHz |
| Sweep bandwidth | Zero sweep bandwidth | Full sweep bandwidth |
| Start frequency | 0 Hz | 40.199999990 GHz |
| Cut-off frequency | 10 Hz | 40.200000000 GHz |
| Frequency offset | -100 GHz | 100 GHz |
| Stepped center frequency | 1 Hz | 40.000000000 GHz |
| reference level | -170 dBm | 30 dBm |
| Input attenuation | 0 dB | 55 dB |
| Scale | 0.1dB | 20 dB |
| Reference level offset | -327.6 dB | 327.6 dB |
| Resolution bandwidth | 1 Hz | 5 MHz |
| Video bandwidth | 1 Hz | 5 MHz |
| VBW: 3 dB RBW | 0.00001 | 5000000 |
| Sweep time | 1 ms | 4 ks |
| Sweep count | 11 | 40001 |
| Trace operation offset | -100 dB | 100 dB |
| In-band bandwidth | 0 Hz | 80.4000000000 GHz |
| N dB point | -140 dB | -0.01 dB |
| Peak threshold | -370 dBm | 30 dBm |
| Peak offset | 0 dBm | 200 dBm |
| Average/Hold time | 1 | 10000 |
| Display line | -370 dBm | 30 dBm |
| Integral bandwidth | 100 Hz | 40.200000000 GHz |
| Start time | 0s | 10 ms |
| Stop time | 0 s | 10 ms |
| % OBW power | 10% | 99.99% |
| X dB | -100 dB | -0.1 dB |
| Noise bandwidth (adjacent channel power) | 100 Hz | 40.200000000 GHz |

| | | |
|---|---|---|
| Integral bandwidth (adjacent channel power) | 100 Hz | 40.200000000 GHz |
| Frequency offset (adjacent channel power) | 0 Hz | 20.099000000 GHz |
| Carrie wave bandwidth (carrier to noise ratio) | 100 Hz | 40.19999980 GHz |
| Noise bandwidth (carrier to noise ratio) | 100 Hz | 20.09999995GHz |
| Frequency offset (carrier to noise ratio) | 100 Hz | 20.099000000 GHz |
| Carrier harmonics | 100 Hz | 40.000000000 GHz |
| Harmonics | 2 | 10 |

# Troubleshooting

This chapter lists the possible faults and troubleshooting methods of the signal analyzer. Please follow the corresponding steps to handle it. If these methods are not working, please contact UNI-T and provide your machine device information (Press **[System] > System Info)**.

1. After pressing the power soft switch, the signal analyzer still displays a blank screen, and nothing is displayed.
   a. Check whether the power connector is properly connected and the power switch is turned on.
   b. Check whether the power supply meets the requirements.
   c. Check whether the fuse of the machine is installed or blown.
2. Press the power switch, if the signal analyzer still displays a blank screen and nothing is displayed.
   a. Check the fan. If the fan is rotating but the screen is off, the cable to the screen may be loose.
   b. Check the fan. If the fan does not rotate and the screen is off, it means the instrument is disabled.
   c. In case of the above faults, do not disassemble the instrument by yourself. Please contact UNI-T for assistance.
3. Spectral lines have not been updated for a long time.
   a. Check whether the current trace is in an update state or multiple averaging state.
   b. Check whether the current meets the restriction conditions. Check the restriction settings

and see whether there are restriction signals.

c. In case of the above faults, do not disassemble the instrument by yourself. Please contact UNI-T immediately.

d. Check whether the current mode is in a single sweep state.

e. Check whether the current sweep time is too long.

f. Check whether the demodulation time of the demodulation listening function is too long.

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

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

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

a. Check whether external devices are properly connected and work.

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

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

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

If you need to calibrate the instrument after the guaranteed calibration period, please contact UNI-T company or obtain paid service from authorized measurement institutions.

# 7. Appendix

## Maintenance and Cleaning

(1) General Maintenance

Keep the instrument away from direct sunlight.

**Caution**

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

(2) Cleaning

Regularly inspect the instrument based on its operating conditions. Follow the steps below to clean the exterior surfaces:

a. Exterior Cleaning

Use a soft, dry cloth to gently wipe off dust from the outer surface of the instrument.

b. LCD Screen

Take care when cleaning the LCD screen to avoid damaging the transparent surface. Use a clean, soft cloth and avoid applying excessive pressure.

c. Dust Filter Screen

- Use a screwdriver to remove the screws securing the dust cover.
- Carefully remove the dust filter screen and clean it.
- After cleaning, reinstall the screen and dust cover in the correct order.

d. Power and Cleaning

- Disconnect the power supply before cleaning.
- Wipe the instrument with a soft cloth dampened with water. Ensure the cloth is moist but not dripping.
- Do not use abrasive or chemical cleaning agents 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.**

# Limited Warranty and Liability

UNI-T guarantees that the instrument product is free from any defect in material and workmanship within three years from the purchase date. This warranty does not apply to damages caused by accident, negligence, misuse, modification, contamination, or improper handling. If you need a warranty service within the warranty period, please contact your seller directly. UNI-T will not be responsible for any special, indirect, incidental, or subsequent damage or loss caused by using this device. For the probes and accessories, the warranty period is one year. Visit instrument.uni-trend.com for full warranty information.

Learn more at: www.uni-trend.com

Register your product to confirm your ownership. You will also get product notifications, update alerts, exclusive offers and all the latest information you need to know.

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