

T'FN

FAT'1 30

Handheld Spectrum Analyzer User Manual

v1.1



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GUARANTEE

This device comes with a three-year warranty after sale, and users can purchase extended warranty services before the warranty expires; The warranty period for the battery is one year. The manufacturer or agent is responsible for necessary calibration or inspection work. The equipment is packed and returned to the user only after passing the approved inspection.

The user's responsibility is to inspect and use this device according to the instructions, and if it needs to be repaired, promptly send it to our company or designated agent repair station.

Generally speaking, during the warranty period, any malfunctions that are not caused by human error or improper use will be repaired free of charge by our company. The user needs to pay for the shipping and insurance costs of returning the product to the repair department, while the cost of delivering the repaired product to the user is paid by our company or designated agent repair station.

After the software and hardware designed by our company for this product are correctly installed on the device, the device will execute its programming instructions. However, our company does not guarantee uninterrupted or error free operation of the equipment.

The warranty is limited to the equipment and does not cover any damage to other equipment, personnel, or property caused by improper use.

WARRANTY LIMITATIONS

For incorrect use or insufficient maintenance (including user added software or interfaces), as well as user initiated disassembly, our company will not provide warranty. During the three-year warranty period, verification, repair services, and consultation are free of charge, Before the warranty expires, users can purchase extended warranty services.

Verification and repair services outside the warranty period will incur appropriate material and service fees.

The warranty period for the battery is one year.

The following items are also not covered by the warranty:

- ① Due to the external AC power supply that does not meet the rated voltage requirements of the equipment, overvoltage occurs and causes damage to the equipment.
- ② Due to mechanical external forces (such as impact, falling, etc.) causing deformation and damage to LCD screens, panels, switches, devices, and casings, and involving internal component failures Damage caused by attempting to repair equipment without authorization.
- ④ When the user picks up the goods, they should conduct on-site inspection. If the equipment is damaged, please negotiate with the relevant departments of the freight company. Only the consignee (the individual or unit receiving the equipment) has the right to claim compensation from the carrier for transportation damage.
- ⑤ Damage caused by the device operating outside of the technical specifications of the product environment.

1. SAFETY NOTICE

1.1. PREVENTIVE CARE

Preventive care includes cleaning of instrument surfaces, RF connectors, and random accessories. The surface of the instrument can be cleaned with a soft cotton cloth or cotton ball dipped in water.

Attention: To prevent damage to the display screen, do not use solvents or corrosive liquids for cleaning.

Please clean the RF connector and inner conductor with a cotton ball dipped in anhydrous alcohol. The inner conductor of the connector should be undamaged and have a smooth surface.

1.2. PROTECTION METHODS FOR ELECTROSTATIC DISCHARGE (ESD)

Like many high-performance instruments, it is susceptible to electrostatic damage. Coaxial cables and antennas often accumulate a large amount of static charge, and if the instrument is discharged, it may damage the internal circuit of the instrument. Staff should be aware of the potential hazards of static electricity and take corresponding preventive measures.

When plugging and unplugging connector wires, maintenance personnel should take certain measures to ensure good connection

Proficient in mastering these operating methods to ensure a safe environment for personnel and equipment

1.3. PRECAUTIONS BEFORE USE

When preparing for initial use, please follow the steps as follows: (1) Remove the instrument from the packaging box, check for any damage during shipment, carefully open the packaging box, and inspect the packaging box and materials. If everything is in good condition, it is best to preserve the original packaging materials for future use. If the packaging material is damaged, it indicates that the instrument and packaging box have been impacted by external forces during the shipping process. It is best to maintain the original state and notify the freight company for inspection. Based on the extent of the instrument damage, make compensation claims to the freight company or carrier, and notify our company or the nearest designated agent repair station to arrange maintenance.

(2) Check all random attachments and materials to ensure that the attachments and materials shipped randomly are complete. If the standard random attachments and materials are incomplete, please contact our company.

1.4. BATTERY AND POWER ADAPTER

BATTERY

PLEASE CHARGE THE INSTRUMENT BEFORE USE! IF LEFT FOR A LONG TIME, PLEASE CHARGE AND DISCHARGE THE BATTERY EVERY THREE MONTHS TO ENSURE BETTER PERFORMANCE!

If used improperly, rechargeable batteries may overheat, explode, or ignite. When handling rechargeable batteries, pay attention to the following: Be careful when using rechargeable batteries.

Do not drop, damage or expose rechargeable batteries to excessively high environments.

Do not store rechargeable batteries at high temperatures (such as in cars) for more than one to two days. Defective rechargeable batteries belong to special waste and should comply with national regulations on the disposal of rechargeable batteries.

The power adapter

Please only use the adapter randomly configured with this instrument for charging. Do not use modified or damaged adapters, as using modified adapters may damage the instrument and harm personal safety

Please ensure that the power adapter and device charging interface are dry and clean. The adapter cable should be free from stretching, twisting, and damage.

The battery can be charged while the instrument is working or turned off. Charging while turned off will still cause the instrument to heat up. To avoid overheating, please disconnect the power adapter promptly after fully charging. Before placing the instrument for a long time, please disconnect the instrument and adapter.

The instrument should not be stored in environments with excessively high or low temperatures, as it may affect battery performance.

Charging: Use an AC-DC adapter to connect to an external power source. Shutdown charging: The charging indicator light is red. After charging is complete, the charging indicator light will turn off

Power on charging: The charging indicator light is red, and after charging is complete, the charging indicator light turns green.

1.5. PACKING LIST (SUBJECT TO ACTUAL ORDER)

1	ONE FAT130 HOST	STANDARD CONFIGURATION
2	ENGINEERING INSTRUMENT BOX 2838H (INCLUDING SHOULDER STRAP) ONE	STANDARD CONFIGURATION
3	ONE BATTERY (INTERNAL BATTERY)	STANDARD CONFIGURATION
4	ONE ET101 EXPERIMENTAL ANTENNA	STANDARD CONFIGURATION
5	ONE ET103 OMNIDIRECTIONAL COMMUNICATION ANTENNA (INCLUDING AF ANTENNA COEFFICIENT)	STANDARD CONFIGURATION
6	ONE 15V/4A POWER ADAPTER	STANDARD CONFIGURATION
7	A CAR CHARGER	STANDARD CONFIGURATION
8	ONE APPLICATION MANUAL	STANDARD CONFIGURATION
9	ONE USB 150M WIRELESS NETWORK CARD	STANDARD CONFIGURATION
10	FAT130 INSTRUMENT SOFT PACK	OPTIONAL CONFIGURATION
11	MD-003 3G BEACON	OPTIONAL CONFIGURATION



ENGINEERING BOX (STANDARD)



INSTRUMENT SOFT PACKAGE (OPTIONAL)

2. PRODUCT INTRODUCTION

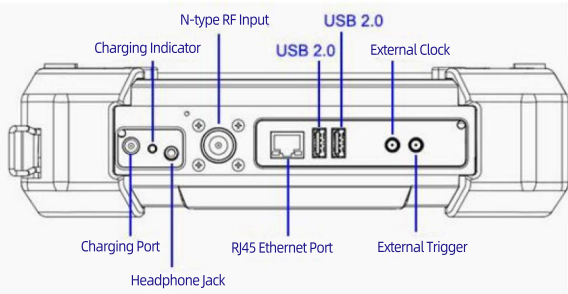
- Frequency coverage ranging from 9kHz to 3GHz;
- FFM fixed frequency scanning (real-time spectrum) function: real-time analysis of bandwidth of 20MHz, continuous tracking, and search for hidden difficult signals
- Spectrum analysis function: channel power, adjacent channel power, occupied bandwidth, field strength
- Interference analysis function: Quickly confirm interference signals through the analysis of spectra and fluorescence maps
- Automatic interference direction and multi-path multi-point AOA positioning, fast locking of interference areas, and approximation search of field strength howling methods provide the simplest, most efficient and economical interference search equipment and methods;
- Excellent indoor and outdoor spectrum coverage maps and communication network clearing tests;
- Excellent recording and playback functions; In addition to screenshot and recording functions, the instrument can store the state or trajectory of the testing interface that customers prefer. Users can directly access and load it from the storage file in the future, which is worry free and efficient!
- The complex function settings and other operations of the spectrum analyzer can be accessed by users using one finger buttons in various functional areas of the interface;
- Low power design, built-in lithium battery with a working time of over 5.5 hours, can meet outdoor all-weather working conditions (70% utilization rate)!
- Weighing 2.5 kilograms, easy to carry and handheld for measurement!

3. INSTRUMENT INTRODUCTION

3.2. LEFT PANEL

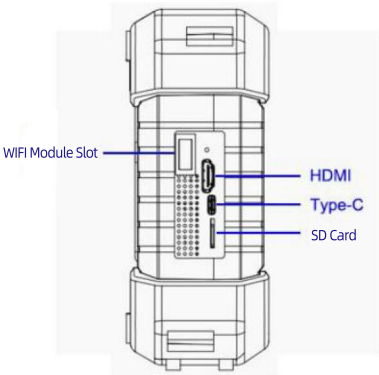


3.1. TOP PANEL



The power adapter interface is used to directly power the instrument or charge the battery. Input DC voltage of 15V, maximum power of 60W. When the AC-DC power adapter is connected to start charging the battery, the indicator light at the adapter interface is red, and the light is green when the battery is fully charged.

Warning: Only use manufacturer approved power adapters and chargers. Please ensure that the sockets are clean and dry. When the plug is very hot, it should be disconnected immediately and stopped from use. Non professionals are not allowed to open the device casing and battery compartment.

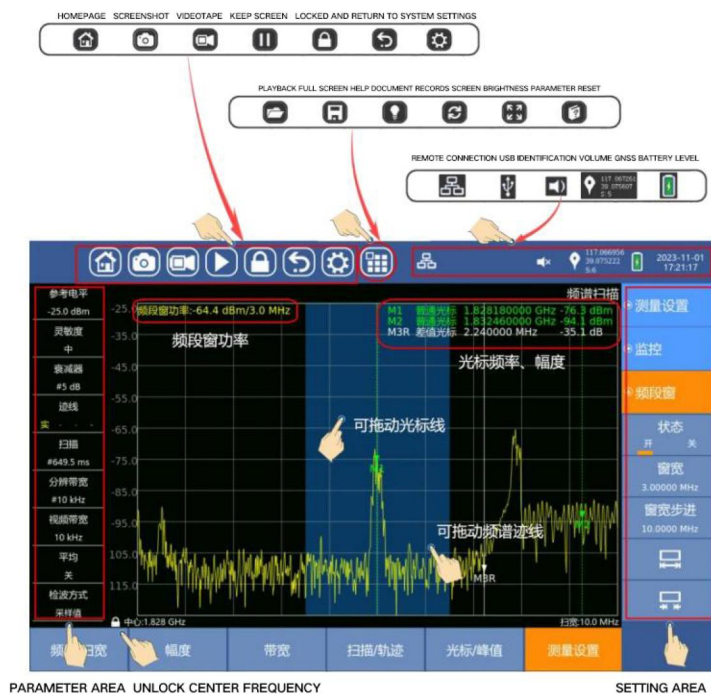


THE INSTRUMENT IS EQUIPPED WITH AN SD CARD INTERFACE AND A TYPE-C INTERFACE ON THE LEFT SIDE.
THE WIFI MODULE PLACEMENT SLOT IS USED TO PLACE RANDOM WIFI MODULES (* THIS SLOT DOES NOT HAVE COMMUNICATION FUNCTION, IT IS ONLY FOR PLACEMENT PURPOSES)
HDMI IS A RESERVED INTERFACE AND IS NOT CURRENTLY AVAILABLE FOR USE.

3.3. POWER ON/OFF

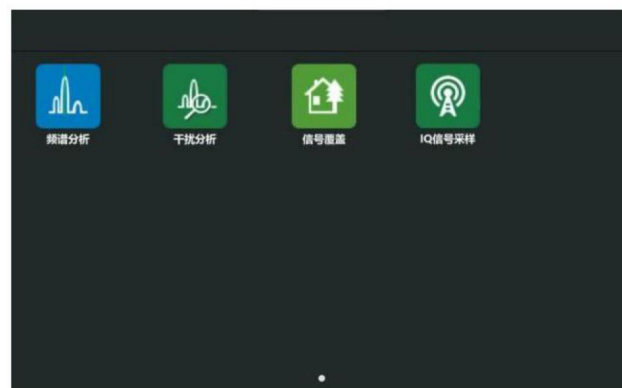
Power on: Press and hold the red power button on the top panel for 2 seconds, and the power indicator light will turn on to turn on the instrument. Wait a few seconds, and the instrument will enter the measurement interface.
Power off: Press the power button once, the indicator light will flash, the interface will shut down, and when the shutdown is complete, the indicator light will stop flashing and turn off

3. 4. INTERFACE INTRODUCTION



4. FUNCTION DESCRIPTION

Equipped with multiple first level apps such as spectrum signal analysis and interference analysis functions.



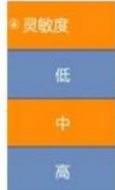
4.1.1. Spectrum scanning

Just lightly click on the instrument function interface, and the corresponding function menu will pop up, making complex spectrum analyzer operations simple, clear, and instantly achievable

Set reference level



Set sensitivity



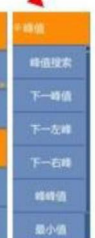
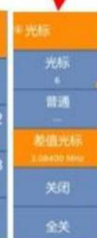
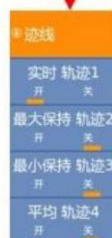
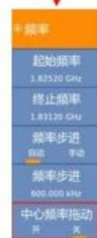
Click on 'Attenuator' to quickly enter the attenuator settings interface.



Set the center frequency



Set scan width



Unlock the center frequency setting to "on" and enable the drag function. It can also be opened by touch 

Fast scanning technology can capture sudden signals in real time, and both experienced technicians and novice testers can obtain key test data through simple operations.



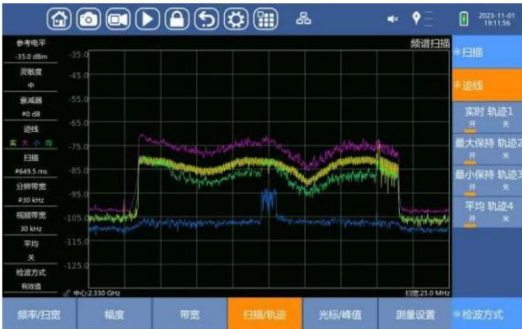
(1) Single finger drag function

- ①Click on <Frequency/Scan Width>,<Frequency>,<Center Frequency Drag>. You can switch the frequency drag function.
- ②Before implementing single finger dragging, you need to press the lock button next to the frequency “”. Make it unlocked “”. At this point, the frequency can be modified by dragging with one finger, as shown in the following figure:



(2) Multi trajectory

Up to 4 trajectories (real-time, maximum hold, minimum hold, average) can be supported and displayed using 4 different colors for differentiation.



(3) Cursor function

The instrument can set up to 6 cursor settings to open simultaneously, including normal cursor or differential cursor, and can select one of M1 to M6 as the active cursor. Peak value: can search for peak value or the next peak value, and can enable peak tracking.



(4) Drag the cursor with one finger

Users can change the frequency of the cursor by touching and dragging the selected cursor line with one finger, as shown in the following figure:



(5) Frequency band window

Status: Set the on/off status of the frequency band window.

Window width: Manually set the value of the frequency band window width.

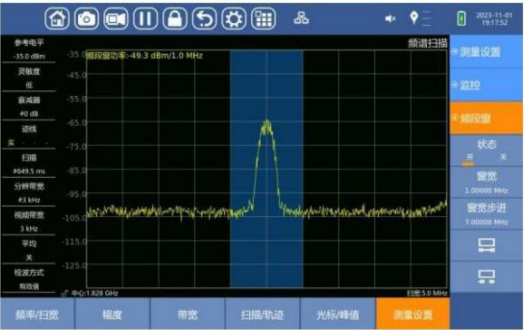
Window width step: Set a step value for the window width.



Expand Window Width: Step in according to the set window width to increase the window width, that is, press the expand window width button once, and the frequency band window width will increase by one window width step value.



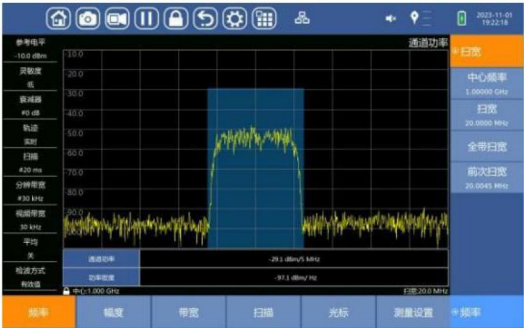
Reduce window width: Step in according to the set window width to reduce the window width, that is, press the reduce window width button once, and the frequency band window width will be reduced by one window width step value.



4.1.2. CHANNEL POWER



Channel power refers to the total power of a signal within a certain sweep frequency.

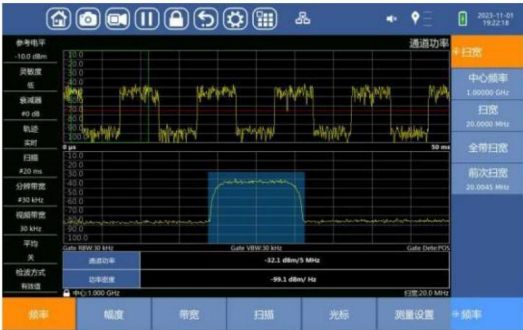


(CHANNEL POWER RF SIGNAL)

Time slot signal measurement

On a frequency channel, it can be divided into multiple time slots. A time slot is also known as a physical channel, and the time slot measurement mode can convert each input time slot signal into a spectral signal for measurement. Dual window measurement can be performed on both time-domain and spectral signals.

Set the RF signal to "time slot" mode, and click on "time slot signal" to set the parameters for the measurement in time slot mode.



(CHANNEL POWER TIME SLOT SIGNAL)

4.1.3. CHANNEL BANDWIDTH



Centered around the center frequency of the current test carrier, including 99% of the total transmission power and the bandwidth occupied by the XdB drop. After collecting a set of data, the system will first calculate the total power within the entire sweep frequency. Then search for the point with the highest energy in the entire data. The difference between the frequency at this point and the center frequency is the center frequency offset. Starting from the point of maximum energy, gradually expand the range to the left and right until within this range:

The width of the background color in the figure represents the carrier bandwidth, the height represents the carrier power, and the position of the center dashed line is the current center frequency offset position.



(Channel bandwidth RF signal)

Time slot signal measurement

The user clicks on <RF Signal> to select the signal type as 'Time Slot', and clicks on <Time Slot Signal> to enter the 'Time Slot Signal Settings' to measure the bandwidth occupied by the time slot signal (Reference can be made to channel power slot parameter measurement).



(Channel bandwidth time slot signal)



4.1.4.

Adjacent Channel Power

Adjacent channel power ratio refers to the power difference between the main channel and its adjacent channels



Measurement settings

Set the number of carriers and adjacent channels, bandwidth of carriers and adjacent channels, resolution bandwidth, etc

邻道功率设置			
信道表	5A	恢复默认	
载波带宽	20 MHz	载波间隔	20.0000 MHz
载波数	10	参考载波	自动
分辨率	300 kHz	有效值	是 否
邻道带宽	20 MHz	邻道个数	6
邻道偏移1	20.0000 MHz	邻道偏移2	40.0000 MHz
邻道偏移3	60.0000 MHz	邻道偏移4	80.0000 MHz
邻道偏移5	100.0000 MHz	邻道偏移6	120.0000 MHz
确定		取消	

Qualified line

The qualified lines for adjacent channel power are divided into absolute qualified and relative qualified. Absolute qualification refers to the actual power of adjacent channels, while relative qualification refers to the power difference between adjacent channels and the carrier. If the adjacent channel power is less than the absolute qualified line value, it is absolutely qualified. If the relative value is less than the relative qualified line value, it is relatively qualified. Similarly, green, red, and white indicate qualified, unqualified, and disabled.

Under adjacent channel power measurement, click on the [Measurement Settings] menu, then click on the <Qualified Line> submenu to bring up the Qualified Line Settings checkbox.

邻道功率 合格线					
信道1	开	模式	绝对	-45 dB	绝对 0 dBm
信道2	关	模式	相对	-60 dB	绝对 0 dBm
信道3	关	模式	绝对	0 dB	绝对 0 dBm
信道4	关	模式	绝对	0 dB	绝对 0 dBm
信道5	关	模式	绝对	0 dB	绝对 0 dBm
信道6	关	模式	绝对	0 dB	绝对 0 dBm
确定		取消			



4.1.5. FIELD STRENGTH

Select [Spectrum Analysis] and click [Field Strength] to enter field strength measurement.



(1) Choose the built-in test antenna, or the user can set the antenna coefficient.

Update antenna coefficient file:

① Put the edited antenna coefficient atn file into the root directory of the USB drive Click on "Measurement Settings" -> "Antenna Management" -> "Copy to Local"

(2) Units: dBm/m, dBV/m, dBmV/m, dBuV/m, Volt/m, Watt/mdB μ A/m



4.1.6. SPECTRUM EMISSION TEMPLATE

The spectrum template can be used to segment and offset spectral traces, with a maximum of 6 offset pairs. This project measurement is to ensure that the modulation processing does not generate excessive spectrum broadening, in order to avoid interference to users operating on other frequencies. The upper window represents the absolute spectrum trace, while the lower window represents the relative spectrum trace, and the relevant parameters and measurement results are displayed in the table below.



(1) Measurement settings

Users can set the carrier, offset number, and offset parameters, and can separately set the starting frequency, ending frequency, channel bandwidth, RBW, VBW, and other spectral parameters of the offset pair. Low frequency spectrum=center frequency offset frequency: High frequency spectrum=center frequency+offset frequency.



(2) Qualified line setting

The user clicks on the [Measurement Settings] menu and clicks on<Qualified Line>to set the parameters of the qualified line.

Each qualified line of the spectrum has four modes: absolute, relative, and/or,

Absolute mode: absolute qualified is qualified

Relative mode: relatively qualified is qualified

And Mode: Absolute and relative qualification is qualified;

Or mode: Absolute or relative qualification is qualified.

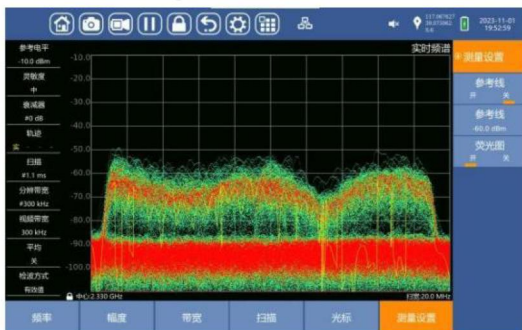
The absolute pass line is displayed in blue in the upper window, and the relative pass line is displayed in purple in the lower window.



REAL TIME SPECTRUM (FFM FIXED FREQUENCY SCANNING)

4.1.7.

Under the real-time spectrum function, users can observe a spectrum with a bandwidth of 20MHz. Users can choose to turn on fluorescence image display under measurement settings.



Reference line

Users can choose to turn on or off the reference line. When the reference line is turned on, a green line will appear in the grid, which can be moved up and down by modifying the value of the reference line.



打开参考线

INTERFERENCE ANALYSIS

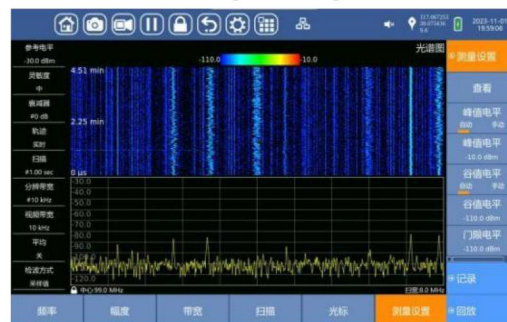
4. 2. (SECOND LEVEL APP)



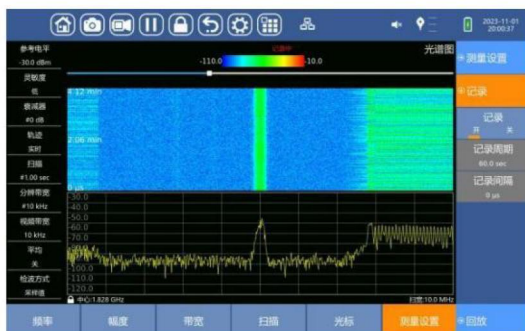
4.2.1.

SPECTROGRAM

The built-in interference analyzer mode targets signals that are difficult to isolate and may threaten the system's capacity and coverage range. Use the 3D spectrogram function to monitor changes in the signal environment over time.



- (1) Display mode: Click on <Measurement Settings> and <View> to switch between "Dual Window" mode and "Single Window" mode. In Dual Window mode, the upper window displays the "Spectrum" and the lower window displays the "Spectrum Scan" mode, making it convenient for users to measure and analyze.
- (2) Peak/valley level: The maximum and minimum values of the signal amplitude that can be recorded in the current spectrum can be set automatically or manually.
- (3) Threshold level: Set a threshold level below which the corresponding spectral color will not be displayed (i.e. the background color will be black).
- (4) Recording: The recording operation of spectrograms can be turned on or off. After the recording starts, a red prompt of "in progress" will appear on the interface, indicating the current recording status. The blue progress bar will start scrolling; after the recording is completed, it will automatically return to the spectral measurement, and the interface will display a prompt of "The recording file has reached the maximum length, recording stopped. The record file is saved in the trajectory file of the file system and is named after the time when the file started recording."



Spectral chart recording status

(5) Replay: Click<File Selection>, the interface will jump to the file system and display all saved record files. Select the specified record file, click<Load>, and start replaying the record file.

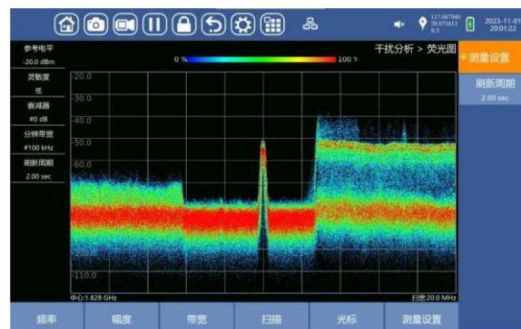
In playback mode, the blue progress bar will scroll along with the playback progress. Clicking "pause" on the spectrum and spectral waveform, as well as the progress bar, will pause at the current time point of recording data for sufficient observation and analysis. Click 'Continue', and the waveform and progress bar will continue to play.



4.2.2. FLUORESCENCE DIAGRAM

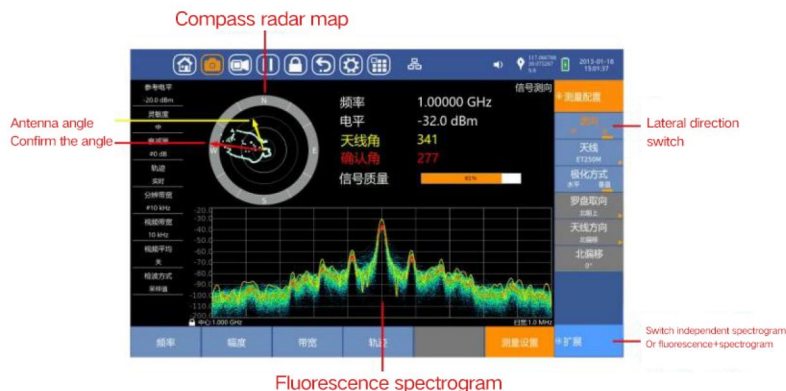
In complex wireless spectrum environments, it is common for multiple signals in the same frequency band to overlap with strong signals and mask weak signals. Through fluorescence imaging, multiple overlapping signals can be displayed simultaneously.

Fluorescence map is a three-dimensional spectral analysis, with the horizontal axis (X) representing the frequency domain, the vertical axis (Y axis) representing the amplitude domain, and the 2nd axis representing the color, representing the number of times the current signal appears. The color tends towards red, indicating more occurrences, and the color tends towards blue, indicating fewer occurrences.

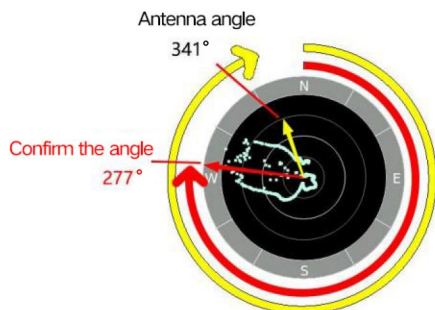


4.2.3. SIGNAL DIRECTION FINDING

Signal direction finding requires the use of directional antennas (ET30B) with GNSS and electronic compass. By rotating the directional antenna and scanning the direction with the strongest interference frequency signal, the interface will automatically record the direction angle of the signal of interest obtained from the electronic compass, and GNSS will automatically record the latitude and longitude of the current test point.



- Antenna angle: refers to the real-time tested antenna direction angle (yellow line), which refers to the direction angle pointed by the directional antenna at that time.
- Confirmation angle: refers to the calculated interference direction angle (red line) of the incoming signal. Definition of direction angle: The general concept is that the compass defines the north direction (N) as zero degrees and rotates clockwise to an angle of 359 degrees.



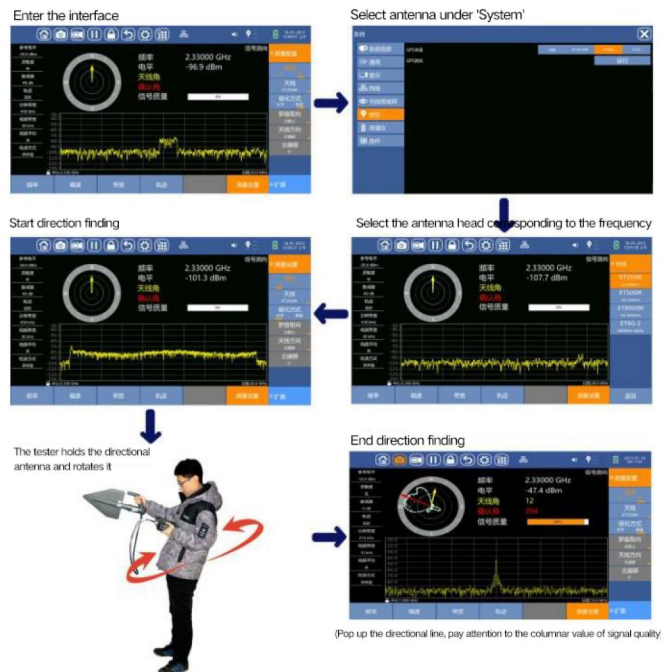
● Automatic direction finding process:

- Choose open and unobstructed areas, city squares, intersections, and test points with good testing conditions on high slopes.



Instrument connection ET30B

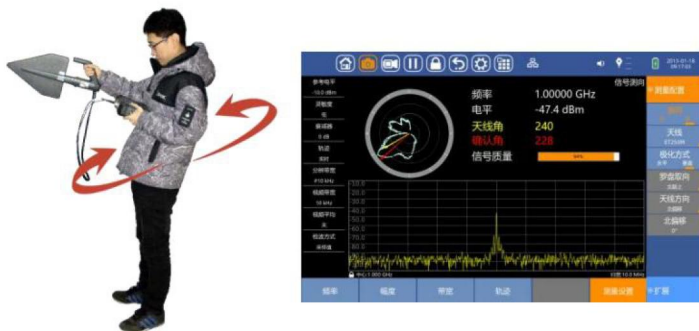
- Operation process: Enter the interface, manually select the directional antenna, press the direction finding button, and the tester holds the directional antenna and rotates it once. Click "Close" to end the direction finding.



- Manual omnidirectional rotation scanning can be done once or multiple times. Turn off the direction finding switch, and the interference aggregation software of the instrument will automatically process hundreds of discrete directional lines collected during the rotation of the directional antenna and calculate them. The interference source direction angle (i.e. the red confirmation angle this time) will automatically pop up on the compass interface. The interference confirmation angle for automatic testing will be affected by uncertainties such as environmental reflection, interference signal strength, and test point selection experience. The reliability parameters of the data will be expressed using a bar chart below the compass interface from 0-100%.



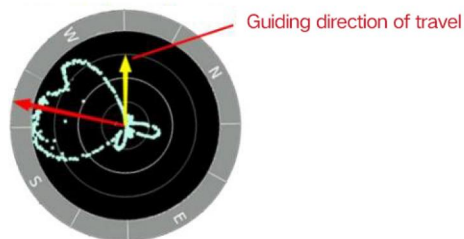
- Artificial fan-shaped rapid scanning; Users can use a handheld directional antenna to perform a fan-shaped area scanning method with a small angle range, which is efficient under known interference conditions. Users can also quickly move while viewing the radar image, gradually making the yellow direction angle of the directional antenna as close as possible to the red confirmation direction angle.



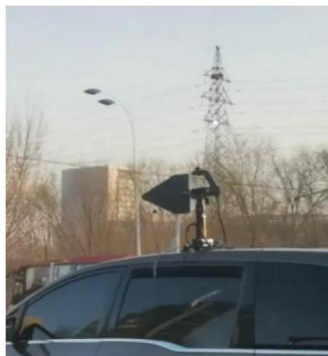
① Manual rotation for sector scanning

② The antenna angle line in the radar image gradually approaches the red confirmation angle

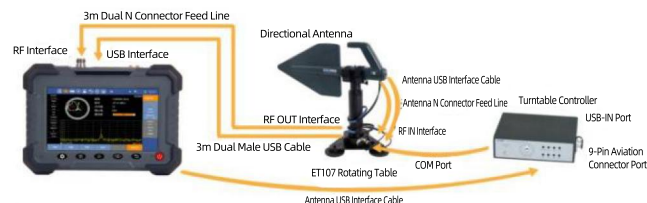
- Guidance function: Adjust the fixed electronic compass on the testing interface to a real-time rotating compass for geography. Users can travel along the antenna direction angle on the instrument interface, making the testing instrument system a powerful guidance tool for interference search, direction finding competition, and beacon positioning.



- Can provide ET107 electric platform rotation scanning tool:
Replacing manual labor, the ET107 car mounted electric rotating platform is simple and practical to configure. Users can automatically complete interference troubleshooting work in the car, regardless of wind or rain, with high efficiency and low cost!



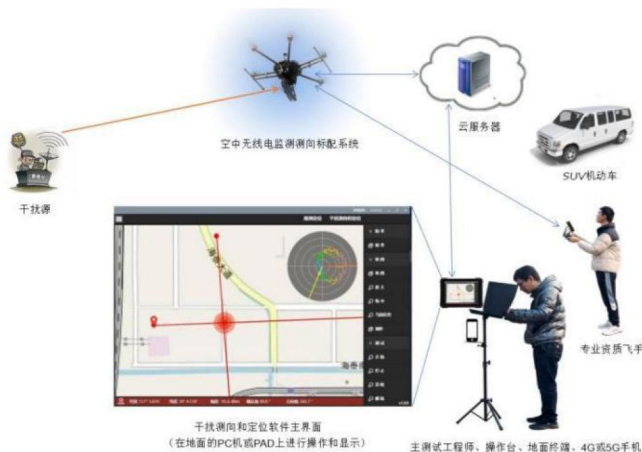
Fix the directional antenna on the E107 electric rotating platform, use the suction cup of the platform to fix it on the roof, and connect the testing and platform control lines to the instrument and vehicle mounted turntable controller through the car window.



- ◆ After turning on the turntable controller, the directional antenna can automatically cycle 360 degree omnidirectional scanning. By controlling the rotation of the platform through the instrument's direction finding, the real-time directional angle of the directional antenna can be observed rotating and moving on the signal testing interface. The electric rotating platform can be set to a fast rotation time of 6 seconds, a medium rotation time of 12 seconds, and a slow rotation time of 18 seconds per revolution.
- ◆ In automatic rotation mode, the instrument pops up a red incoming wave signal direction confirmation angle every 6, 12, and 18 seconds; Users can also manually turn off the test on the instrument interface, and an incoming wave direction confirmation angle will automatically pop up.

Can provide unmanned aerial vehicle monitoring module

- direction finding and positioning:
 - ◆ The spectrometer core can be customized as a monitoring receiver module and integrated into devices such as drones and mobile monitoring stations. Through wireless transmission, wireless monitoring, interference direction finding and positioning can be performed on the user's PC or tablet PAD, resulting in several times higher efficiency!



How to delete low credibility data:

Select the unwanted directional line, press the "Delete Selected Data" button to delete the directional line, and after each operation, the interference coverage area will be recalculated

4.2.4. INTERFERENCE POSITIONING

The instrument, when combined with the ET30B series directional antenna, can achieve interference positioning function. The ET30B series directional antenna transmits information obtained from GNSS and electronic compass to the instrument through a USB interface, obtains signal strength information through an N-type interface, and uses "interference direction line convergence analysis software and AOA triangulation positioning method" (testing points of 3 or more can converge and lock a small range of interference convergence locking area). Then, the field strength approximation search method in section 4.2.5 is used to quickly capture the interference source.

Draft interference investigation path: Select several test points 1, 2, 3, 4, 5, etc. around the suspected interference signal area, and several red confirmation direction corner lines will be generated on the map.

Automatic positioning software, the instrument will automatically analyze the interference confirmation angle credibility of each test point using AI, eliminate the confirmation direction angles with large deviations, gather most of the direction angles with high credibility, and finally form an adaptive interference convergence zone (with a diameter of about 500-1000 meters). Test point data with low credibility can be deleted by users themselves. Improve the reliability of interference aggregation algorithm positioning.





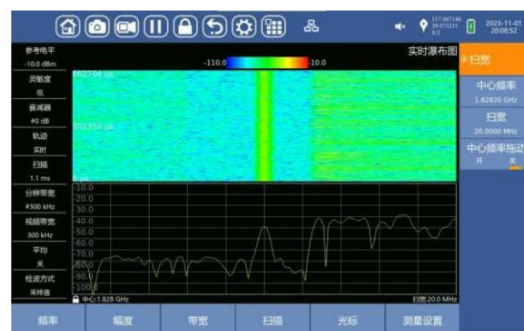
Test map loading instructions:

1. Copy the map file to the root directory of the USB drive, click the “” button, select “Map” as the file type, choose “USB drive” as the save location, check the file that the user needs to copy, click<Copy to Local>, and after copying is complete, the system will automatically exit the file management interface and pop up a prompt box saying “jmap file decompression completed”. Click “OK” to complete loading, and you will see the copied map.
2. After the instrument locks the GNSS information, the red positioning mark appearing on the map indicates the location of the instrument after GNSS locking.

Note: The default level displayed on the map is level 15. If the loaded map is below level 15, please manually perform the map zoom out operation (including the testing function of the map, please refer to this note).

4.2.6. REAL TIME WATERFALL CHART

Under the real-time waterfall chart function, users can observe a waterfall chart with a bandwidth of 20MHz.



4.2.5. FIELD STRENGTH APPROXIMATION SEARCH

It has a tuning function that can determine the position of the signal source based on the strength of the signal. The window above the interface displays the field strength value of the dial, making it convenient for users to observe the current signal peak. The window below is the spectrum mode. The tone sound is displayed in the speaker image of the interface status bar. The volume can be adjusted by touching the screen with your hand, and the switch can turn off the sound.

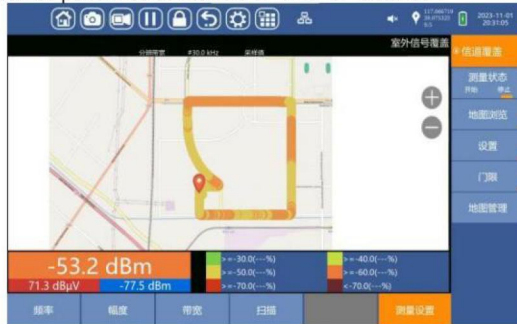
4. 3. SIGNAL COVERAGE (SECONDARY APP)





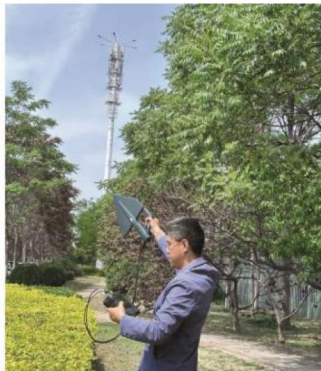
4.3.1. OUTDOOR SIGNAL COVERAGE

When conducting outdoor signal coverage testing, an external GNSS module is required. The outdoor signal strength provides the function of outdoor road testing for frequencies that users are interested in. The map of the area to be tested is imported through a USB peripheral, and after obtaining GNSS information, automatic point testing can be performed at intervals of "time" or "distance".



4.3.2. CLEAR FREQUENCY TEST

Using the frequency clearing function for testing can effectively investigate the area before base station construction or the use of a certain spectrum resource. Prevent spectrum resource interference in the later stage.



The top of the interface displays a coverage map of the areas that the user is concerned about, while the bottom window displays the real-time usage of the spectrum resources that the user is concerned about.



Test status: The user only clicks the "Start" button to start measuring after locking the GNSS information. If the GNSS information is not currently locked, clicking "Start" will prompt "GNSS not locked...". After the test is completed, you can click "Stop". After the test is stopped, the instrument automatically saves the trajectory file of the test to the local disk and names it after the test time.

Scanning mode: Users can choose between "time" and "distance" modes

Distance interval: Only in the "distance" mode, users can manually input distance parameters to mark the sampling points (after setting the distance parameters, the instrument will mark the sampling points on the map according to the set distance interval during road testing) The input range is 1m to 500m

Time interval: Only in the "time" mode, users can manually input the sampling point time interval, set within the range of 100ms to 1 minute

Map browsing: Users can click on [Measurement Settings] and click on <Map Browse> to perform operations such as centering, zooming in, zooming out, and moving up, down, left, and right on the currently loaded map,

Threshold: Users can manually set threshold values for "excellent", "good", "medium", "poor", and "unqualified" by clicking on "Threshold". During testing, the color of the set threshold values will be displayed.

Map management: Users can import outdoor road test maps to the instrument's local area by selecting USB peripherals Select the "Load" button.



4.3.3. INDOOR SIGNAL COVERAGE

Users can import the required indoor architectural drawings through USB peripherals and manually mark the indoor signal coverage. (Select architectural drawings from the file management interface to import indoor architectural drawings)



Frequency standard: Users can perform corresponding tests by moving the frequency standard in the "start" measurement state

To the center: The current cursor can automatically mark the center position of the test area on the screen. Marking: After the user clicks "Mark", the light mark changes from blue to red, and this position is used as the test marking point. And based on the threshold value color, indicate that the current signal strength is completely cleared: all measurement data on the map is cleared. Rollback: Clear the data between this marker and the previous marker. Architectural drawing management: Users can import indoor architectural drawings to the local instrument by selecting USB peripherals. Select the test chart related to 'load' for relevant testing.

4.4 IQ signal sampling (secondary APP)



Select the required sampling rate size for testing, with options including "30.72MHz", "15.36MHz", "7.68MHz", "3.84MHz", and "1.92MHz". Default is "30.72MHz".



5. File management

5.1. file management

The file can be stored in the "Local Disk" and "USB Drive" buttons on the upper part of the user interface. . The file types include status files, measurement result files, report files, image files, trajectory files, architectural drawings, channel lists, audio files, and IQ files.



Image file interface (list mode)



Image file interface (thumbnail mode)

loading: Users can select a file and click< load>to automatically load the file. (For example, selecting "graphic file" and clicking load will enter graphic mode)

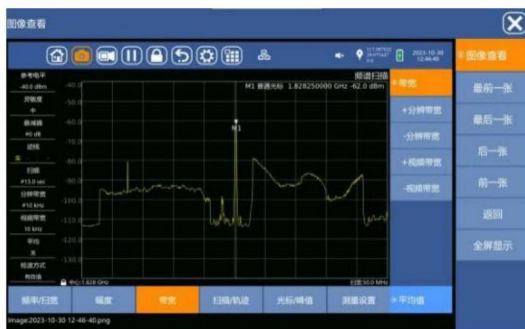


Image file loading interface

Delete: Users can delete selected files

Refresh: Refresh the files in the current storage directory and copy them to the USB drive. The current<save location>is "local disk". After the instrument recognizes the USB drive, clicking<copy to USB drive>will export the selected files to the USB drive.

5.2. File saving

(1) File Save

Users can press the file save button at the top of the interface to save trajectory files, status files, and image files. It can be saved locally or on a USB drive.



Save Trajectory: Save the current instrument settings and measurement trajectory as tra (data type). When viewing a waveform file, the corresponding state and waveform data of the saved waveform file will be loaded simultaneously, and the interface will display a single scan with that state and waveform.

Save Status: Save the current setting status as a STA file.

Save Image: Save the current measured waveform as a PNG image

(2) File Name Naming

Users can input file names through the virtual keyboard at the bottom of the screen, and files can be named using letters or numbers.

(3) Save Path

The instrument can switch the path for saving files, which is default to "local disk". When the user inserts a USB flash drive, the "USB flash drive" selection box is highlighted. The user clicks on "local disk" or "USB flash drive" and clicks the "save" button to save to the corresponding path.

6. System settings

Click the system settings button on the upper part of the interface to enter the system settings menu, where you can view system information, and also view and modify screen display, date and time, network, positioning GNSS source, and options.

6.1. System Information

Click on the<System Information>button on the left to view the instrument serial number, software version, available/full space, battery and remaining power. You can also perform software upgrades and factory reset operations.



6.2. General

Language: Chinese/English Power on Status: When the user clicks "Last", the parameters set during the last test will still be the same when the device is turned off and restarted. When selecting "Default", the device will return to its factory state. Prompt Sound: The user can turn on or off the alarm sound (such as the buzzer alarm in the qualified line settings).

Volume: Users can adjust the sound switch and size. The sound options are "off", "20%", "40%", "60%", "80%", and "100%".

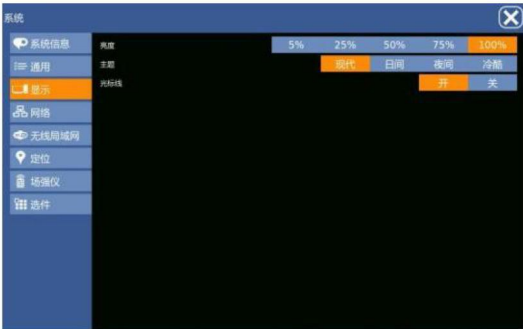
Clock source: internal, external.

Date: The user clicks on the date input box and enters the date through the virtual keyboard that pops up below.

Date format: Three different date display methods can be selected, namely "year month day", "month day year", and "day month year".

Time: Users click on the time input box and enter the time through the virtual keyboard that pops up below.

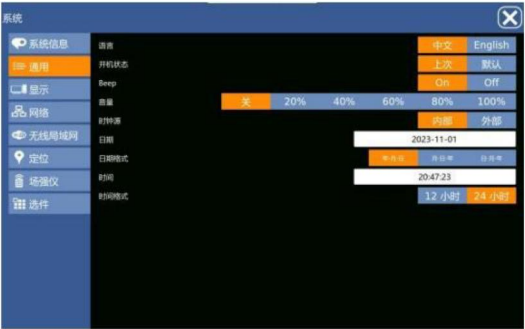
Time format: can be selected as 12 hour or 24-hour format.



6.4. network

Mode: Users can choose between "dynamic" or "static IP", with the default being "static IP". In 'Static IP' mode, users can manually input network parameters such as 'IP address', 'subnet mask', 'control port', and 'gateway'. Host Name: Users can input the network identification name of the instrument. Hotspot: When ON is selected, the device can be set as a WiFi hotspot after connecting to the WiFi module.

Command feedback: Users can choose to turn on or off feedback.



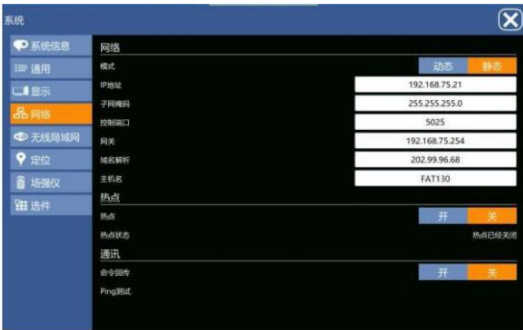
6.3. Display

Brightness: Users can adjust the screen brightness according to their needs, which is divided into 5 brightness modes: "5%", "25%", "50%", "75%" and "100%". Users can also enter the interface to adjust the brightness

After facing, click on the brightness adjustment button at the top of the interface.

Theme: Users can choose from four interface styles according to their needs: modern, daytime, nighttime, and cool.

Light marking: on/off. When the light mark line is set to "on", the frequency mark is displayed by combining the cursor with a light mark line of equal length to the vertical axis; When the light mark line is set to "off", only the cursor is displayed and the light mark line is not displayed.



6.5. Wireless Local Area Network

The instrument needs to be connected to a wireless network card in order to connect to the wireless network. After the interface appears, click "Refresh" to search for the currently available wireless network. Click "Connect" and enter the correct password to connect to the network, as shown in the following figure. Click "Disconnect" to disconnect from the wireless network.



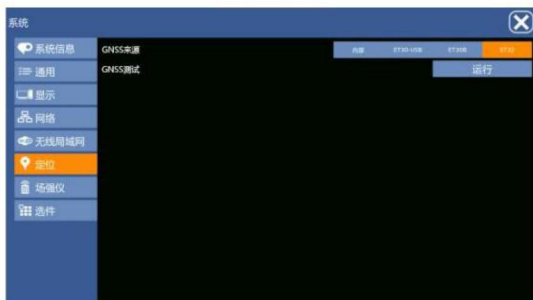
6.6. Positioning

Internal GNSS: used for GNSS gating triggering and can also be used for outdoor coverage measurement. No external components are required.

ET30-USB: Used for directional measurement, which needs to be set when users use the ET30 series antenna.

ET30B: Used for directional measurement, this item needs to be set when users use the ET30B series antenna.

GNSS testing: Click "Run" to test the current GNSS status.



6.7. Options

Users can select option updates as needed, and the option list displays information such as the name and expiration time of each option.

7. Recording tools

(1) Screen recording and playback

The information displayed on the screen can be recorded as a video file and played.

Start screen recording: Click the screen recording button at the top of the screen “ ”.

Recording in progress: Displayed in orange during recording. “ ”

End recording: Click again “ ”. You can end the recording.

Replay: Click the file read button “ ” and select the "Sound and Video" option, highlight the file to be played, and click "Load" to play the file.

During playback, pause and fast forward/rewind operations can be performed, and full screen viewing is also available. After playback ends, clicking on a point on the progress bar can quickly locate and display the waveform trajectory at that moment.

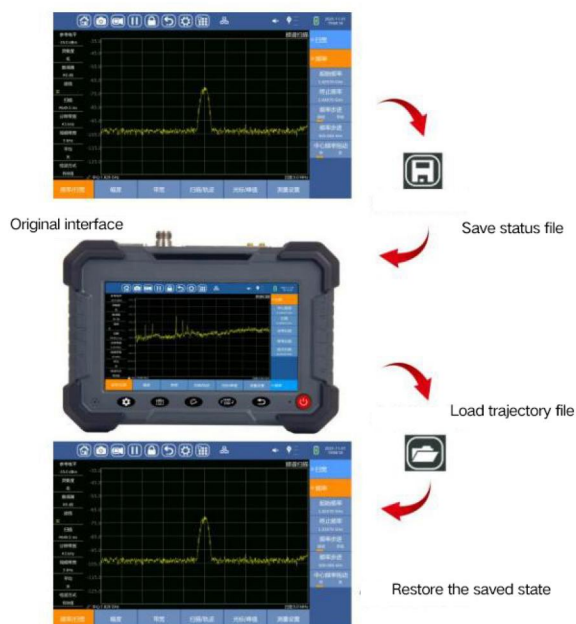


(2) Screenshot

The information displayed on the screen can be saved in an image file.

Status and trajectory

Select 'Status' to save measurement information. Click on 'File Management' to load the test results into the status file, select 'Load Playback' to restore the original measurement state.



Select 'Trajectory' to save the spectral waveform. Click on "File Management", save the trajectory file, and select "Load" to restore the original trajectory state.



8. Wired network connection

1). Connect the computer or smart device to the instrument using an Ethernet cable and configure its IP address to the same subnet as the instrument, i.e. connect to the instrument through the LAN port. 2). Download the VNC client and install it on the computer device, start the VNC client, enter the instrument's IP address and VNC login password 123456 to achieve local area network connection.



9. Remote control

1). Connect the instrument to the USB Wi Fi module, go to "System Settings | Network", and turn on the wireless hotspot. 2). Search for the hotspot SoftAP in the Wi Fi settings of your computer or smart device, connect to it with the password 1234567890, and after successful connection, start the VNC client and enter the IP address (192.168.100.1) and password (123456) to connect to the remote desktop.

Computers or smart devices can also be connected to instruments through cloud servers for remote control operations and display real-time measurement information.



10. App Function Software Table

Primary function	Secondary function	
 Spectrum analysis (standard)	 Spectrum scanning	 Channel power
	 Channel bandwidth	 Adjacent channel power
	 field strength	 Spectrum emission template
	 Real time spectrum	
 Interference analysis (optional)	 Spectral diagram	 Fluorescence image
	 Signal direction finding	 Field strength approximation search
	 Interference positioning	 Real time waterfall chart
 Signal coverage (optional)	 Indoor signal coverage	 Outdoor signal coverage
	 Clear frequency test	
 IQ signal sampling (optional)	 IQ signal sampling	

11. MD-003 3G Beacon machine (optional)

Scope of application (typical values)	Auxiliary experiments, wireless direction finding, positioning, tracking, and experimental verification of spectrum analyzer
Frequency range	55MHz ~ 3GHz
frequency step	1000/100/10/1/0.125MHz
Level reference amplitude	≥5dBm (55MHz ~ 2.9GHz)
Level attenuator	50dB; Step ±1dB
Built in 3 adjustable beacon frequency points	initialization to 1/2/3GHz
Liquid resolution	128*128 (2.8 Inch color)
weight	<500g
Battery working time	>5 hour
Adapter	12V/2A
Overall dimensions	165mm*85mm*40mm

12. Spectrum analyzer technical standards

Secondary function	
model	FAT130
frequency range	9kHz ~ 3GHz
Intermediate frequency bandwidth	20MHz
Amplitude accuracy	±1ppm
Frequency accuracy	±1.5dB (Typical value)
Distinguish bandwidth	10Hz to 10MHz
Attenuator range	0 to 50dB
Display average noise level (DANL) (@ 1GHz)	-160dBm/Hz (High sensitivity) (Typical value)
Third order intercept point	+14dBm (Typical value)
Phase noise (frequency offset of 100) kHz@1 GHz)	-100dBc/Hz (Typical value)
Real time spectrum 100% capture probability signal pulse width (100% POI)	5us
Remote control	
control interface	EthernetWiFi
Support protocols and other modes	SCPI, VNC
IQ Data Collection	
sampling rate	1.92, 3.84, 7.68, 15.36, 30.72MHz
IQ file size	maximum 256 MB
General indicators	
display	7-inch LCD+touch screen
Interface	• 2x USB 2.0 • 1x Ethernet LAN connection • RFinput • External reference input • External trigger input • Type-C, SD Card
data transmission	USB, Ethernet WiFi
storage space	12 GB
Battery specifications	HYLB-1866B (10.8V, 9200mAH, 99.36WH)
working hours	≥5.5 hour
working temperature	-10°C ~ +50°C
Dimensions (length x width x height)	255mm*179mm*71mm
weight	about2.5kg

13. Test antenna table

Antenna type	Name and Model	picture	Frequency range	remarks
Omnidirectional antenna	ET101 experimental antenna		500MHz-3GHz	free
	ET103 communication antenna (AF coefficient: 45-70 dB/m)		30MHz-6GHz	Standard configuration
	Magnetic Car Antenna ET104 (Select Band)		700MHz-3.8GHz	customized
directional antenna	Active handle ET30B directional antenna; ET250M/ET500M/ET8000M		20MHz-8000MHz	Optional selection
	Narrowband Yagi directional antenna		900MHz-3GHz	customized
wave filter	Bandpass filter		500MHz-8GHz	customized

ET30B directional antenna
engineering box
(2-3 antennas can be selected)



ET30B directional antenna
aluminum box
(Only for 1 antenna)



TFA

