S3302 Series Handheld Spectrum Analyzer

User Manual

Saluki Technology Inc.

The document applies to the handheld spectrum analyzers of the following models:

- S3302SA handheld spectrum analyzer (9kHz-4GHz).
- S3302SB handheld spectrum analyzer (9kHz-6.5GHz).
- S3302SC handheld spectrum analyzer (9kHz-9GHz).
- S3302A handheld spectrum analyzer (9kHz-20GHz).
- S3302B handheld spectrum analyzer (9kHz-26.5GHz).
- S3302C handheld spectrum analyzer (9kHz-32GHz).
- S3302D handheld spectrum analyzer (9kHz-44GHz).
- S3302E handheld spectrum analyzer (9kHz-50GHz).
- S3302F handheld spectrum analyzer (9kHz-67GHz).

Standard pack and accessories:

No.	Item
1	Main Machine
2	Power cord
3	Power adapter
4	U disk (manual)
5	USB cable
6	Battery

Options of the S3302 series handheld spectrum analyzer in addition to standard accessories:

Model No.	Description	Note
S3302-05	Programming manual	
S3302-06	Power adapter	
S3302-07	Rechargeable lithium-ion battery	
S3302-08	CAT5 LAN cable	Point to point, 2m
S3302-09	Micro SD card	Capacity: 8GB

Model No.	Description	Note
S3302-10	GPS option	GPS Exposed Antenna(BNC), Built-In GPS Module and Software
S3302-11	USB power meter option	Provide USB Power Measurement function (Option 12-15 needed)
S3302-12	S87230 USB power continuous wave power sensor (9kHz - 6GHz)	Need option 11
S3302-13	S87231 USB power continuous wave power sensor (10MHz - 18GHz)	Need option 11
S3302-14	S87232 USB power continuous wave power sensor (50MHz - 26.5GHz)	Need option 11
S3302-15	S87233 USB power continuous wave power sensor (50MHz - 40GHz)	Need option 11
S3302-16	Interference analyzer option	Waterfall, RSSI
S3302-17	AM/FM/PM analyzer option	To Realize Modulation Characteristics Analysis of AM/FM/PM Signals.
S3302-18	Channel scanner option	To Realize Signal Power Measurement of Multiple Channels and Frequency.
S3302-19	List sweep option	To Realize Continuous Sweep Measurement of Various Frequency Bands .
S3302-20	Zero span IF output	Output the third(3rd.) IF(140.25MHz) or fourth(4th.) IF(31.25MHz) signal
S3302-21	ZE9080A Directional antenna	9kHz-20MHz, N (f) (need option 25)
S3302-22	ZE9080B Directional antenna	20MHz-200MHz, N (f) (need option 25)
S3302-23	ZE9080C Directional antenna	200MHz-500MHz, N (f) (need option 25)
S3302-24	ZE9080D Directional antenna	500MHz-8GHz, N (f) (need option 25)
S3302-25	S89401 antenna amplifier (10kHz - 4GHz, N(f))	For option 21-24
S3302-26	S89901 Horn antenna (1GHz - 18GHz, N(f))	Do not need amplifier
S3302-27	S89902 Horn antenna (18GHz - 40GHz, 2.92mm(f))	Do not need amplifier
S3302-28	Functional bag	
S3302-29	Backpack	
S3302-30	Carrying case	For safety carrying

Model No.	Description	Note
S3302-31	S89901 antenna handle	Need option 26
S3302-32	S89902 antenna handle	Need option 27
S3302-33	Signal analyzer	To realize the rapid analysis of interference signal, and provide the audio output and IQ Capture.
S3302-34	Field strength option	Provide Pscan, Fscan, MScan etc. functions
S3302-35	Tracking generator (100kHz - 4GHz)	For S3302SA only
S3302-36	Tracking generator (100kHz - 6.5GHz)	For S3302SB only
S3302-37	Tracking generator (100kHz - 9GHz)	For S3302SC only
S3302-38	Orientation analysis option	Built-In software(need option10, 50 and directional Antenna)
S3302-39	Coverage map option	Built-In software(need option10)
S3302-41	Portable omnidirectional antenna	Frequency range :700MHz - 2.7GHz (for communication bands)
S3302-42	700MHz - 4GHz directional antenna	Active log-periodic antenna
S3302-43	700MHz - 6GHz directional antenna	Active log-periodic antenna
S3302-44	680MHz - 10GHz directional antenna	Active log-periodic antenna
S3302-45	680MHz - 20GHz directional antenna	Active log-periodic antenna
S3302-46	400MHz - 4GHz directional antenna	Active log-periodic antenna
S3302-47	400MHz - 6GHz directional antenna	Active log-periodic antenna
S3302-48	380MHz - 10GHz directional antenna	Active log-periodic antenna
S3302-49	380MHz - 20GHz directional antenna	Active log-periodic antenna
S3302-50	External electric compass	External USB electric compass (need option38)
S3302-51	6GHz omnidirectional antenna (680MHz - 6GHz)	Portable omnidirectional antenna
S3302-52	8GHz omnidirectional antenna (300MHz - 8GHz)	Portable omnidirectional antenna
S3302-53	VHF/UHF portable antenna	Frequency range: 140MHz/430MHz
S3302-54	Passive directional antenna (700MHz - 4GHz)	Passive log-periodic antenna
S3302-55	Passive directional antenna (700MHz - 6GHz)	Passive log-periodic antenna
S3302-56	Passive directional antenna (680MHz - 10GHz)	Passive log-periodic antenna

Model No.	Description	Note
S3302-57	Passive directional antenna (680MHz - 18GHz)	Passive log-periodic antenna
S3302-58	Passive directional antenna (680MHz - 25GHz)	Passive log-periodic antenna
S3302-59	Passive directional antenna (680MHz - 35GHz)	Passive log-periodic antenna
S3302-60	N/SMA-JJ RF cable (2m)	N male to SMA male RF coaxial cable, DC-18GHz, Length 2m
S3302-61	N/SMA-JJ RF cable (1m)	N male to SMA male RF coaxial cable, DC-18GHz, Length 1m
S3302-67	ZE9080 Antenna transport box	Used for antenna and amplifier, including option 21, 22, 23, 24, 25

Preface

Thank you for choosing S3302 handheld spectrum analyzer produced by Saluki Technology Inc.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

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Saluki Technology

Document Authorization

The information contained in this document is subject to change without notice. The power to interpret the contents of and terms used in this document rests with Saluki.

Product Quality Assurance

The warranty period of the product is 36 months from the date of delivery. The instrument manufacturer will repair or replace damaged parts according to the actual situation within the warranty period.

Product Quality Certificate

The product meets the indicator requirements of the document at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

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Chapter I Overview

Saluki S3302 series handheld spectrum analyzer is a high end handheld instrument, It provides multi-function which includes spectrum analysis, interference analysis, analog demodulation,power measurement, channel scan function, channel power etc. S3302 also provide a easy-to-use functions like occupied bandwidth, adjacent channel power, audio demodulation, noise-carrier ratio measurement. S3302 is equipped with 8.4-inch integrated LCD touch screen improves display clarity and ease of operation. S3302 is a hand-held, small size, light weight, easy to take so it is very suitable for on-site measurement.

Saluki S3302 series handheld spectrum analyzer can be applied to the signal and equipment test in aerospace, microwave and satellite communications, wireless communications, radar surveillance, electronic warfare and electronic surveillance, precision-guided and other industries.

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument.

Warning

"Warning" indicates danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operation may result in personal injuries. You shall fully understand and meet all the conditions in the warning before proceeding to the next step.

Attention

"Attention" indicates important prompts and no danger. It reminds the user to pay attention to a certain operation process, operation method or similar situations. Noncompliance with the rules or improper operations may result in damage to the instrument or loss of important data. You shall fully understand and meet all the conditions in the caution before proceeding to the next step.

Section 1 Product Overview

1 Brief Introduction

S3302 series spectrum analyzer has the advantages of broad operating band, high performance indicators, high sweeping speed, multiple test functions, easy operation, etc. From the perspective of performance indicators, this instrument has low average noise level, low phase noise and high scanning speed. From the perspective of measurement functions, this instrument has various measurement modes such as spectrum analysis, interference analysis, analog demodulation, power measurement, channel scanning and field strength measurement and various intelligent measurement functions such as the channel power, occupied bandwidth, adjacent channel power, tune listening, emission mask and C/N. Due to integration of the 8.4-inch LCD and capacitive touch screen, the display definition and operational convenience are improved. This instrument has a small and light structure, and can be flexibly powered up and easily operation. Therefore, this instrument is applicable to field operation. The appearance is shown in Fig. 1-1.

Fig. 1-1 S3302 Series Spectrum Analyzer

2 Product features

Based on the highly integrated, modular and standardized design, S3302 series spectrum analyzer has excellent performance, with main characteristics as follows:

- Broad frequency coverage: 9 models from 9kHz to 67GHz;
- Low average noise level: -163dBm@1Hz RBW;
- Excellent phase noise performance: -106dBc/Hz@100kHz; offset: @1GHz carrier;

- High sweeping speed: Minimum sweeping time within 1GHz span: <20ms;
- Resolution bandwidth: 1Hz - 10MHz;
- Full-band pre-amplifier: Standard configuration;
- Various measurement modes: Spectrum analysis, interference analysis (spectrogram and RSSI), analog demodulation (AM/FM/PM), channel scanning, high-precision USB power measurement, field strength measurement, etc.
- Various intelligent measurement functions: Field strength measurement, channel power, occupied bandwidth, adjacent channel power, audio demodulation, carrier-noise ratio, emission mask, IQ capture, etc.
- Various auxiliary test interfaces: 10MHz reference input/output interface, GPS antenna interface, zero-span IF output interface, external trigger input interface, etc.
- Convenient and fast user operation experience: 8.4-inch large-screen high-brightness LCD, large-font display, convenient capacitive touch screen, LCD and touch screen integration, various display modes, automatic adjustment of backlight brightness, etc.
- Operating temperature range: -10°C to 50°C This instrument can be powered up with the battery or adapter.

3 Functions

S3302 series spectrum analyzer has a wide range of measurement functions, mainly including:

- Spectrum analysis, used for basic spectrum analysis of signals, including various intelligent measurement functions such as the field strength measurement, channel power, occupied bandwidth, adjacent channel power, emission mask, carrier-noise ratio, audio demodulation and IQ capture;
- Listing scanning (optional), used for continuous scanning measurement of multiple bands;
- Interference analysis (optional), including spectrogram and RSSI measurement;
- Analog demodulation, used for analysis of modulation characteristics of AM/FM/PM signals;
- Power measurement, used for high-precision power measurement of the USB interface;
- Channel scanning (optional), used for signal power measurement of multiple channels or frequencies;
- Field strength measurement (optional), used for CW measurement, frequency scanning measurement and list

scanning measurement;

- GPS positioning (optional), realized with the external GPS antenna;
- Zero-span IF output (optional), used for output of the third or fourth IF signal through the IF output interface under zero span;
- Tracking generator (optional), used for output of generator or tracking generator.

4 Typical application

- On-site comprehensive performance evaluation of electronic weapon equipment

S3302 series spectrum analyzer has the advantages of broad operating band, high performance indicators, high sweeping speed, multiple test functions, easy operation, etc. In addition, this handheld instrument is small and light and can be powered up with the battery. Therefore, this instrument can be applied in on-site installation/ commissioning and maintenance/guarantee of various kinds of electronic weapon equipment such as the radar, communication, electronic countermeasures and reconnaissance and precision guidance.

- On-site testing and diagnosis of transmitter and receiver

S3302 series spectrum analyzer has various measurement modes such as the spectrum analysis, interference analysis, analog demodulation, power measurement, channel scanning and field strength measurement, and various intelligent measurement functions such as the channel power, occupied bandwidth, adjacent channel power, C/N, field strength and emission mask. Therefore, it can be used for comprehensive spectrum analysis and diagnosis services in on-site testing of transmitters and receivers.

- Broadband spectrum monitoring and interference identification

S3302 series spectrum analyzer can be applied with the external directional antenna in electromagnetic environment detection, radio interference analysis, electromagnetic environment background evaluation, spectrum monitoring, identification of illegal channel interference signals, etc.

Chapter II Operation Guide

Section 1 Unpacking Inspection

1 Model confirmation

You'll find the following items after unpacking the carton:

a) S3302 Series Spectrum Analyzer	1 pcs
b) Power adapter	1
c) Three-core power line	1 pcs
d) Quick Operation Guide	1
e)USB cable	1 pcs
f) Built-in rechargeable lithium ion battery	1
g) Product certificate	1
h) Options	Several
i) Packing list	1

Please check the articles above against the order contract and packing list. If you have any questions, please contact us in line with the contact information in Preface or contact the business center of the SALUKI, we'll tackle problems as soon as possible.

Attention

The instrument is a kind of valuable device and should be handled with care.

2 Appearance inspection

Check if instrument is damaged during transportation, if any obvious damage is detected, don't power it up. Contact our business center according to the contact information in the foreword. We'll repair or replace the instrument immediately depending on the situation.

Section 2 Safety Instructions

The safety performance of S3302 series spectrum analyzer complies with the requirements of GJB3947A-2009. This instrument contains no part to be operated by the user. The instrument shell must not be opened without permission; otherwise, personal injury may be caused. In order to protect your safety and properly operate this instrument, please carefully the following safety instruments before operation.

1 Environmental requirements

In order to guarantee the service life and measurement validity and accuracy, S3302 series should be tested under the following environmental conditions.

- Temperature range:

  Storage temperature range: -40°C to +70°C

  Operating temperature range: -10°C to +50°C

Warning

As the battery storage temperature range is -20°C to 60°C, the battery must not work continuously in a long time at high temperature, so as to avoid risks arising from high temperature. It is recommended to use the adapter to supply power.

- Low air pressure:

  Low air pressure (altitude): 0-4600m

2 Selection of power line

S3302 series spectrum analyzer is equipped with the three-core power line conforming to international safety standards. The power line should be inserted into the appropriate power socket with the protective ground wire so as to make the instrument shell grounded during operation. It is recommended to use the power line provided with this instrument. The power line should be replaced with one 250V/10A power line of the same type.

3 Power supply requirements

S3302 series can be powered up in three methods:

- AC power supply and power supply with adapter

The accompanying AC-DC adapter must be used for AC power supply. The adapter input should be 100-240V 50/60Hz AC power.

The AC-DC adapter must not be connected to the test instrument in order to prevent the instrument from overheating when transported and carried with a knapsack. The voltage input range of the AC-DC adapter is relatively wide, so you must ensure that the power voltage is within the range specified in Table 2-1 during operation.

Attention

The working voltage and frequency ranges are subject to the parameters provided on the nameplate of the power adapter.

Table 2-1 Power Supply Requirements

Power supply parameter	Applicable range
Input voltage	100V-240VAC
Rated input currency	1.7A
Work frequency	50/60Hz
Output Voltage/Current	15.0V/4.0A

- DC power supply

Voltage: 15V

Current: 3A (min.)

- Power supply with built-in battery

S3302 series instruments can be powered up with the rechargeable lithium ion battery. The battery will discharge if it is not used for a long time. Therefore, the battery must be recharged before use. Refer to Section 3 for battery operation details. Basic parameters of accompanying battery are as follows:

- Nominal voltage: 10.8V
- Nominal capacity: 7800mAh

Attention

The rechargeable battery must not be exposed to fire or high-temperature environments (above 70°C), or placed in fresh water or salt water, or made wet. It must be kept away from children.

The rechargeable battery is reusable and should be stored in proper container to avoid short circuit. Heavy metals such as nickel and chromium in the battery can pollute natural environment. Waste battery shall not be discarded but shall be put into a special battery recycle box.

4 Electrostatic protection (ESD)

Static electricity is highly destructive to electronic components and equipment, so this instrument must be powered up on the anti-static table. Attention should be paid to electrostatic protection when using the device. If condition permits, the following electrostatic protection measures may be taken:

a) Make sure all the instruments are correctly grounded to prevent static generation.

b) The staff must wear anti-static wrist straps before contact with connectors or core wires or any assembly.

c) The center conductor must be grounded before the cable is connected to the instrument in the test. This can be realized through the following steps: Connect a short-circuiter to one end of the cable to realize short circuit between the central conductor and outer conductor of the cable. When wearing a anti-static wrist band, hold on to the casing of the cable connector and connect the casing to the other end of the cable before removing the short-circuiter.

5 Input/output port protection

The standard impedance of the RF port of S3302 series spectrum analyzer is 50Ω. Therefore, the appropriate load impedance for the test signal or port should be applied in strict accordance with the port requirements during operation, so as to prevent subsequent circuits from damage.

Attention

The RF input end of the spectrum analyzer has the requirements for maximum allowable input level. The applied signal must not exceed the limits; otherwise, this instrument may be damaged.

6 Cleaning of display of front panel

If required after operation of certain time, the display panel of the instrument can be cleaned according to the following steps.

a) Shut down the instrument and disconnect the power line.

b) Wipe display panel with clean and soft cotton cloth with detergent.

c) Dry display panel with clean and soft cotton cloth.

d) Do not connect power line until detergent dries out.

Attention

There is anti-static coating on display surface, do not use fluoride-bearing detergent or acidic/alkaline detergent. Do not spray detergent on display panel directly, otherwise it may penetrate into and damage the instrument.

Section 3 Battery Installation and Replacement

1 Battery description

S3302 series spectrum analyzer is equipped with one large-capacity rechargeable lithium ion battery, with the endurance of about 2.5h. In order to facilitate the long-time field test and prevent the test interruption caused by insufficient battery capacity, the user may purchase the standby battery. It is recommended to purchase one of the same model as that provided along with the instrument.

Attention

To guarantee service life of the battery, the battery should be removed from battery holder during the transportation and long-time storage. and try not to make the battery power less than 5%,otherwise the battery may not be able to charge.

2 Battery installation and replacement

The battery of S3302 series spectrum analyzer can be installed or replaced easily. The user may install or replace it according to the requirements in Fig. 2-1.

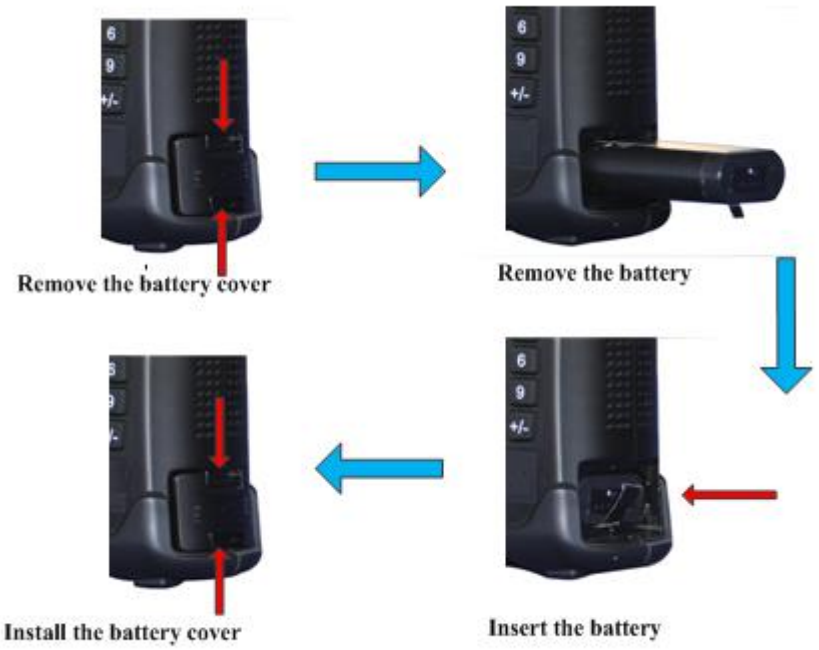


Fig. 2-1Battery Installation and Replacement Steps

3 Battery status check

S3302 series spectrum analyzer is provided with one battery, of which the standby time is 2.5h under full-capacity conditions.

The user can view the battery status in the following methods:

- Observe the battery icon on the system status bar to roughly know the battery capacity. If only 15% exists in the battery icon, replace or charge the battery promptly.
- Take out the battery and press the button on the white point at the tail end of the battery. Then the indicator above the button will be ON, showing the current residual capacity. If only one indicator is ON, the battery should be charged promptly.

4 Battery charging

Attention

The power indicator is located in the yellow power ON key.

The battery can be charged when S3302 series spectrum analyzer is OFF or operating. Charging steps:

a) Install the battery to be charged into the machine.

b) Connect the external power supply with the accompanying AC-DC adapter.

c) If the battery is charged in the OFF state, the power indicator in the left lower corner of the front panel will be yellow and flicker, indicating that the battery is being charged, and after the battery is fully charged, the indicator will be yellow and normally on. If the battery is charged in the operating state, the power indicator will be green and flicker, indicating that the battery is being charged, and after the battery is fully charged, the indicator will be green and normally on. In this case, the battery icon on the right side of the system status bar of the display will be full.

In addition, the battery power more than 5% should be charged for about 4h in the shutdown status.

Section 4 User Inspection

1 Start-up of spectrum analyzer

Connect S3302 series spectrum analyzer to the external power supply with the power adapter. Observe the power indicator on the front panel. If the power indicator is yellow, it indicates that the standby power supply is normal. Gently press the power switch on the front panel for more than 3s. Observe whether the power indicator on the front panel turns green and whether the backlight of the display is ON. You should wait for about 30s for start-up of the display. Then the normal start-up image will appear. The display screen should include no warming prompt 10min after start warm-up.

Note: “Flicker” of the indicator indicates that the electricity quantity of the internal battery is not full and the battery is being charged.

2 Shutdown of spectrum analyzer

Press the yellow power switch [⏻] in the left lower corner of the front panel for about 3s. The spectrum analyzer will automatically exit the measurement application program, and the power supply will be shut down.

Chapter III Basic Operation

Section 1 Description of front panel

The front panel of S3302 series spectrum analyzer is shown below.

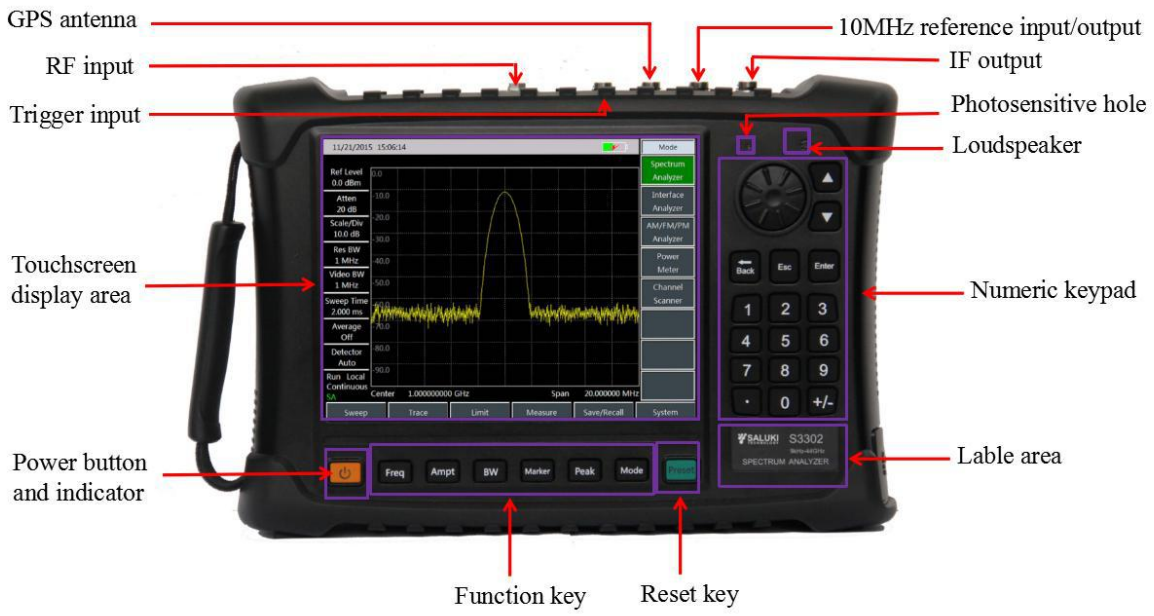


Fig. 3-1 Front Panel

Attention

The keys on the front panel are shown in the [XXX] form in this manual, where XXX is the key name; Bottom buttons on the touch screen are shown in the [XXX] form, where XXX is the button name; and buttons of the right menu are shown in the [XXX] form, where XXX is the menu name.

1 Display zone

S3302 series spectrum analyzer is equipped with one 8.4-inch color touch screen. Parameter setting and information display can be performed by means of touch, thus eliminating the troublesome soft and hard key menu setting steps and greatly simplifying user operations.

The display zone shows the following information when different functions are active: multiple instrument windows, in which various settings and measurement data are shown; operating status information; current input data such as the frequency when required; current operating time of the system; and menu information corresponding to the current valid operating window. Refer to Fig. 3-2 for the specific introduction.

Fig. 3-2 Display Zone

The information display zone in the screen display zone of S3302 series spectrum analyzer shows various settings and instrument statuses of the current measurement. Based on the information location on the screen, the information display zone is divided into the top information display zone, marker, signal standard and title display zone, left information display zone, measurement data display zone, soft key menu display zone, bottom information display zone and bottom function buttons, 7 in total.

1) Top information display zone

The top information display zone in the top of the screen shows the system date/time and the current power supply type, battery capacity and GPS status of the spectrum analysis in sequence from left to right.

Setting and modification of the system date and time: Press [System]→[Date/Time].

Modification of the date format: Press [System]→[Date format].

For the battery type and battery status indicator on the right side of the top information display zone, various symbols are shown depending on the external power supply and battery capacity, the symbols corresponding to various power supply modes of the spectrum analyzer are described as follows:

- If the spectrum analyzer with no battery is powered up with the external power supply, "  " will be displayed;
- If the spectrum analyzer is powered up with the fully charged battery and no external power adapter is connected, " 

" will be displayed; and if the battery is fully charged and the external power adapter is connected, " 

" will be displayed. With the battery capacity decreasing in operation, the green zone of the battery capacity symbol will decrease gradually.
- If the spectrum analyzer with the battery is connected to the external power adapter but the battery capacity is less than 100%, the battery will be charged, and the icon " 

" will be displayed.
- If the spectrum analyzer is not connected with any external power supply, and the battery capacity is less than 20%, the battery is in the undervoltage state, and the icon " 

" will be displayed. In this case, the battery should be charged promptly. If the battery capacity is less than 10%, the spectrum analyzer may further operate for about 10min. In this case, measurement results should be kept promptly. If the battery capacity is less than 5%, the spectrum analyzer will be shut down automatically.

2) Marker, signal standard and title display zone

Press [System]→[Tip Off On], and the title information will be displayed in this zone.

Press [frequency]→[Signal Std], and the current signal standard name will be displayed.

Press [Maker] or [Peak], and the frequency and amplitude information of the current active marker will be displayed.

3) Measurement trace display zone

The measurement trace display zone shows measurement data. The contents displayed in this display zone vary in different measurement modes.

4) Left information display zone

This information display zone on the left upper part of the screen shows the current measurement information, such as the reference level, attenuator setting, display scale, resolution bandwidth, video bandwidth and sweep time, which can be respectively set with corresponding function keys shown in the table below.

Table 3-1 Functions of Left Display Zone in Spectrum Analysis Mode of S3302 Series

Label	Description	Corresponding Functional Key
1	Reference level 0.0dBm	[Amplitude] →[Reference level]
2	Attenuation 20dB	[Amplitude] →[Atten Auto Man]
3	Scale/Division 10.0dB	[Amplitude] →[Scale/Div]
4	Resolution Bandwidth 3MHz	[BW] →[Res BW Auto Man]
5	Video Bandwidth 3MHz	[BW] →[Video BW Auto Man]
6	Sweep time 441.000ms	[Sweep]→[Sweep time Auto Man]
7	Average	[BW] →[Average Off On]
8	Detector Auto	[BW] →[Average Detector]

5) Bottom information display zone

This information zone located at the bottom of the screen mainly includes two kinds of information:

- Local: showing the current operating status of the spectrum analyzer: local or remote control.
- The current center frequency and span information are displayed at the bottom of the screen. In the zero span mode of the spectrum analyzer, the bottom information zone will display the following information in sequence: starting time, center frequency and stop time.

6) Key menu display zone

In order to improve the operation flexibility of S3302 series spectrum analyzer and fully utilize the excellent performance of the touch screen, the host software of S3302 series includes 8 gray touch keys on the right side, of which the corresponding functions are directly displayed in the corresponding key zones.

7) Button function button zone

The bottom function button zone includes 6 function buttons, which have the same functions as hard keys and are applied to display various menu names in different measurement modes so as to facilitate measurement.

2 Number input zone

The number input zone includes the direction keys, knob, number keys, Backspace, Cancel and OK. All the input can be modified by keys and knob in input area. Details of keys in input area are as below.

- **Direction keys:** The UP and DOWN key are applied to increase or decrease the value. The leftward and rightward key are not provided here. The step value of the UP and DOWN key is set according to the step of each parameter.
- **Knob:** Increase or decrease the value. When the knob is rotated clockwise, the value will be increased; otherwise, the value will be decreased. The knob can be used with the UP/DOWN key to change the value, with the same step as the UP/DOWN key.
- **Numeric keys:** Set the number (including the negative number).
- **Backspace:** Cancel the last number one by one according to the number status.
- **Cancel:** Cancel the current invalid data.
- **OK:** Confirm the current parameter setting.

3 Function key zone

The function key zone at the bottom of the screen is used for changing measurement parameter settings, including six keys.

- **[Freq]:** Set the center frequency, starting/stop frequency, span, frequency step, etc. of measurement.
- **[Ampt]:** Set the reference level, attenuator setting, display scale, unit, pre-amplifier control, etc.
- **[Bandwidth]:** Set the resolution bandwidth, video bandwidth, detector type, average, etc. of measurement.
- **[Marker]:** Set specific parameters of the measurement cursor.
- **[Peak]:** Obtain the peak parameter.

- **[Mode]:** Set the measurement mode, including spectrum analysis, interference analysis, analog demodulation, power measurement, channel scanning and field strength measurement.

Reset button

Press [Reset] to shut down the instrument and power up it again.

4 Reset button

Press [Preset] to shut down the instrument and power up it again.

5 Power switch

Start and shut down the spectrum analyzer. When the instrument powered up with the external power supply through the adapter is in the “Standby” state, the yellow indicator near the power switch will be ON. If the power switch is pressed for more than 3s, the indicator will turn green, indicating that this instrument is “operating”. When the power switch is pressed for more than 3s in the operating state, the spectrum analyzer will be shut down.

Note: “Flicker” of the indicator indicates that the electricity quantity of the battery is not full at present and the battery is being charged.

Section 2 Interface Description

Peripheral interfaces of S3302 series are mainly concentrated on the top panel, as shown in Fig. 3-3, and can be divided into three parts: power interface, test port and digital interface.

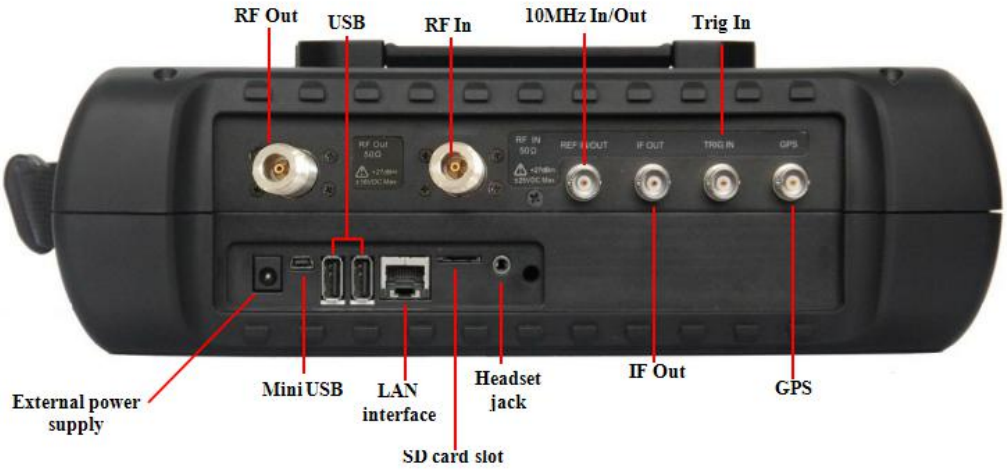


Fig. 3-3 Interface Description

2.1. Power interface

The power interface of the device is for powering the device through DC output of AC-DC adapter or through external DC power source. The conductor inside the external power interface is positive and the external conductor is grounded.

2.2 Test ports

1) RF input port: It is used for inputting the signal to be tested. The indicator of the test signal input port of S3302 series is 50Ω. The N-type female port is applied for S3302A/B and 2.4mm male port for S3302C/D.

2) RF output port: This port is for signal output. 50Ω impedance, N-type female port, provided only when customers need the tracking generator option

3) 10MHz Input/Output port This port is for connecting 10MHz signal of other devices as the reference signal of the analyzer. It can also be used for outputting the internal 10MHz reference signal for other devices.

4) IF output port: Under zero span, this port can be used for outputting the third or fourth IF signals for other devices through software configuration.

5) Trigger input port: The external triggering mode of S3302 series is available. The scope of trigger source must be -5V to +5V when connecting the external trigger source to the trigger input port of the Spectrum Analyzer. Rising edge trigger or fall edge trigger can be set by the software.

6) GPS antenna port: This port can be use for connecting GPS antenna device for locating current position of the Spectrum Analyzer.

Warning

To better protect the Spectrum Analyzer, some identifiers are provided at the test port of the device. The user must pay attention to the content on these identifiers when using this device, in order to avoid any permanent damage to the device.

Refer to 2.4 for details of instrument symbols in the figure.

2.3 Digital interface

1) Mini USB interface: It is used for connection of the external PC, which is used for program control or data transmission of S3302 series through the program control commands or function library.

Attention

Equipment drive should be installed for connecting the device to PC through USB interface for the first time.

2) USB A type interface: This interface is used for connecting USB peripheral equipment, such as USB storage device, USB power detector.

3) LAN (network) interface: This 10/100Mbps network interface can be connected by the network cable to the computer (PC), which is used for program control or data transmission of S3302 series through the program control commands or function library.

4) SD card slot: This Micro SD card slot can bed used to extend the storage space of the device.

5) Headset jack: This is a standard headset jack for 3.5mm/3 line for audio output of FM/AM/SSB demodulation. When a headset is not connected to this jack, the audio output will be realized through the loudspeaker of the device. When a headset is connected to this jack, audio output will be automatically switched from the loudspeaker to the headset.

2.4 Instrument symbols

Instrument symbols (warning labels) in the figure mean that the maximum power of the test port input is +30dBm, and the maximum input DC level is 16VDC. When the device is in operation, the user is not allowed to connect signal exceeding this range to the port. Otherwise, the device may be destroyed!

Chapter IV Spectrum Analysis Mode

This chapter mainly introduces relevant information of the spectrum analysis mode of S3302 series spectrum analyzer, including some typical measurement functions and methods, so that the user that operates this instrument for the first time can have a general knowledge on some typical applications and test operations of the spectrum analysis mode after reading this section and get familiar with the operation of this mode.

Attention

All operations in this chapter are based on the spectrum analysis mode and not separately described below.

Due to rich measurement functions, the spectrum analysis mode of S3302 series includes a number of complex parameters. In addition to basic functional parameters such as the frequency, amplitude, bandwidth average, trace, sweeping and marker parameters, it also includes characteristic functional parameters such as the signal track, noise marker, peak track, counter, list scanner, trigger, limit, field strength measurement, channel power, occupied bandwidth, adjacent channel power, C/N, emission mask, IQ capture, audio monitor, etc.

- Signal Track

If the drift signal is tested, the active marker should be placed onto the peak point of the signal by the signal tracking function of the spectrum analyzer. In this case, the marker peak will always be displayed at the center frequency of the spectrum analyzer, thus facilitating measurement.

- Noise marker

The noise marker displays the noise power at which noise near the active marker is normalized to the 1Hz bandwidth. When the noise marker is enabled, the detector is set into the “Sample” mode, and the amplitude scale is set as “Log”, the marker reading unit will automatically change into dBm(1Hz) or dB/Hz. When the amplitude scale is set as “Linear”, the marker reading unit will automatically change into V(1Hz) or %.

- Peak Track

When the peak tracking function is enabled, the peak will be searched once by the marker after each sweeping.

- Counter

When the frequency counter function is enabled, the marker reading will be made more accurate, which can help to improve the accuracy of frequency measurement. The measurement accuracy is Class Hz, and the error within 10Hz.

- List Scanner

The list scanner function supports the user to edit the scanning segment, and the spectrum analyzer will scan the edited list based on the set frequency range and other parameters.

- Trigger

Select the trigger mode under “Sweep” or “Measure”, including [Free Run], [Video], [External], [Slope] and [Delay]. The user can select the corresponding mode according to needs. When the previous single or continuous sweep finishes, the next sweep or measurement is automatically triggered. Set the trigger mode as [Video]. When the positive slope part of input trigger signal passes through the video trigger level determined by [Trigger Polarity Positive Negative], the sweep will be triggered. In the [external] trigger mode, synchronize the “Sweep” or “Measure” with next voltage cycle.

- Limit

The limit function is applied to monitor signals within one band. The spectrum analyzer provides the upper and lower limit. The user can set the limits. When the amplitude of one signal within one band is more than the set upper limit or less than the set lower limit, the spectrum analyzer will send the alarm signal.

- Field strength measurement

The spectrum analyzer has the function of field strength measurement, including soft menus such as [Field Strength Off On], [Recall Antenna], [Edit Antenna] and [Save Antenna]. The field strength can be rapidly tested with such menus and corresponding test antennas.

- C/N

The C/N function is applied to measure the ratio of the carrier power to noise power, including the carrier bandwidth, noise bandwidth, offset frequency, span, carrier power, noise power and C/N.

- Emission mask

The emission mask function is applied to recall the limit as the mask to measure whether the signal power exceeds the mask limit. The mask parameter is one limit, the value of which is determined by means of limit recalling. The mask can be moved right and left or up and down according to the center frequency and reference power. In the mask, the limit center is always moved right and left to the center frequency, and also moved up and down to the reference power point based on the calculated reference power. The reference power is divided into the peak power and channel power, which are determined by the reference power.

- IQ capture

The IQ capture function is applied to capture IQ data and save such data into the instrument based on the capture time, sample rate and capture mode set by the user.

- Audio monitor

The spectrum analyzer has the tune listening function, which can be applied for radio monitoring. The sound effect can be improved by adjusting the resolution bandwidth during demodulation of the sound difference. In the demodulation mode, the resolution bandwidth should be preferably set as 300kHz-30kHz.

Section 1 Introduction to Typical Measurements

The spectrum analysis mode of S3302 series is a basic operating mode. The Quick Operation Guide of S3302 Series Spectrum Analyzer has introduces some typical measurement of this mode, including some basic measurement methods such as basic signal measurement, improvement of frequency measurement accuracy, measurement of small signals and distinguishing of signals of approximate frequencies. Additionally, this section introduces the advanced typical measurement functions and methods of the spectrum analysis mode of S3302 series, mainly including:

a) Channel power measurement;

b) Occupied bandwidth measurement;

c) Adjacent channel power ratio measurement;

d) Third-order IM distortion measurement;

e) Drift signal measurement;

f) Noise signal measurement;

g) Distortion measurement;

h) Pulse RF signal measurement.

i) Signal source measurement (option).

j) Coverage map (option).

If [Reset] on the front panel is pressed, the spectrum analyzer will operate again. Unless specially explained, it starts from pressing [Reset] key in the following examples.

1 Channel power measurement

Taking the measurement of the channel power of the FM signal for example, this section describes how to apply the channel power measurement function of S3302 series spectrum analyzer to measure the channel power of the signal.

1) Definition of channel power

Channel power measurement of one of the most common measurements of the RF transmission system, in which the channel power refers to the power of the signal within a certain frequency range in the specific interval. If the specific power is not measured in the power amplifier and filter circuit test, it indicates that the system is faulty. The channel power measurement is applied to evaluate the communication transmitter, and determine the quality of RF transmission by comparison with the specific communication protocol.

S3302 series spectrum analyzer can be used for measuring the channel power of the FM signal. As the FM signal is different from the CW signal in several aspects, it can be made more accurate by means of accurate setting.

2) Measurement procedures

The channel power of one FM signal can be measured with S3302 series spectrum analyzer according to the following procedures.

a) Set the signal generator to output the FM signal:

Use the signal generator to generate one FM signal. Set the frequency as 1GHz, power as -10dBm, FM offset as 500kHz and demodulation rate as 10kHz. Connect the output of the signal generator to the RF input end of the spectrum analyzer through one cable, as shown in Fig. 4-1. Enable the ON state of the modulation output and radio frequency.

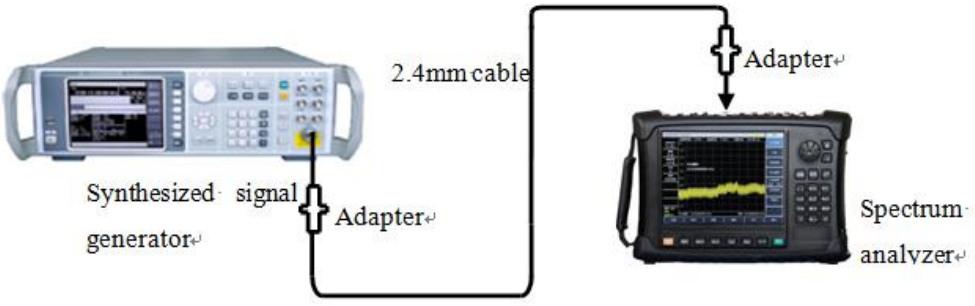


Fig. 4-1 Schematic Diagram of Connection of Signal Generator and Spectrum Analyzer

b) Reset the spectrum analyzer into the default state:

Press [Reset].

c) Enable the channel power measurement function:

Press [Measure], [Channel Power] and [Channel Power Off On]. Thus the channel power measurement function is enabled.

d) Set the center frequency:

Press [Measure], [Channel Power] and [Center Freq] to set the center frequency with number keys. Set the center frequency of the spectrum analyzer as the frequency of the tested signal, i.e. 1GHz.

e) Set the channel power bandwidth:

Press [Measure], [Channel Power] and [Channel BW] and set the channel power bandwidth as 1MHz with number keys.

f) Set the channel power span:

Press [Measure], [Channel Power] and [Span] and set the channel power sweeping bandwidth as 2MHz with number keys.

g) Set the resolution bandwidth and video bandwidth of the spectrum analyzer:

Press [BW] and [RBW Auto Man], and set the resolution bandwidth as 30kHz;

Press [BW] and [VBW Auto Man], and set the video bandwidth as 30kHz or less.

Attention

The channel power bandwidth refers to the frequency width of the power displayed by the spectrum analyzer within the bandwidth, while the channel power span refers to the sweeping frequency range of the spectrum analyzer. The channel power span should be more than or equal to the channel power bandwidth; otherwise, the channel bandwidth will be automatically set to be equal to the channel power span. The ratio of the channel power span to channel power bandwidth is a constant. When the channel power span changes, this ratio will remain unchanged. It can be changed by changing the channel power bandwidth. For example, when the channel power span is doubled, the channel power bandwidth will be increased by the same times.

h) Enable the average function:

Press [BW] and [Average Off On], set the averaging times as 16, and enable the average function.

If the channel power measurement function is enabled, the “Auto” mode of the detector will change into the “Sample” mode. Two vertical white lines on the screen indicates the channel power bandwidth, and measurement results are displayed at the bottom of the screen. The channel power measurement interface is shown in Fig. 4-2.

Fig. 4-2 Channel Power Measurement of FM Signal

2 Occupied bandwidth measurement

Taking the measurement of the occupied bandwidth of the FM signal for example, this section describes how to use the occupied bandwidth measurement function of S3302 series spectrum analyzer to measure the occupied bandwidth of the signal.

1) Definition of occupied bandwidth

The occupied bandwidth refer to the bandwidth including energy of certain proportion to the total transmitted power, with the center frequency of the specified channel as the center. By using the occupied bandwidth measurement function of S3302 series spectrum analyzer, measurement results can be given rapidly, clearly and accurately. Depending on the modulation mode, two methods can be applied to calculate the occupied bandwidth.

a) Power percentage:

The occupied bandwidth of the signal is obtained by calculating the bandwidth of the frequency of certain percentage to the total power of the transmitted power. The power percentage can be set by the user.

b) Power drop XdB:

The occupied bandwidth in this calculation method is defined as follows: spacing between two frequency points corresponding to signal power drop by XdB on both sides of the frequency point where the signal peak power is. The signal power drop XdB can be set by the user.

2) Measurement procedures

The occupied bandwidth can be measured with S3302 series spectrum analyzer according to the following procedures:

a) Set the signal generator to output the FM signal:

Use the signal generator to generate one FM signal. Set the frequency as 1GHz, power as -10dBm, FM offset as 500kHz and demodulation rate as 10kHz. Connect the output of the signal generator to the RF input end of the spectrum analyzer through one cable, as shown in Fig. 4-1. Enable the ON state of the modulation output and radio frequency.

b) Reset the spectrum analyzer into the default state:

Press [Reset].

c) Set the center frequency:

Press [frequency] and [Center Freq] to set the center frequency with number keys. Set the center frequency of the spectrum analyzer as the frequency of the tested signal, i.e. 1GHz.

d) Set the resolution bandwidth:

Press [BW] and [RBW Auto Man], and set the resolution bandwidth as an appropriate value.

e) Set the video bandwidth:

Press [BW] and [VBW Auto Man], and set the video bandwidth as an appropriate value.

In order to improve the measurement accuracy, it is recommended to set the ratio of the resolution bandwidth to video bandwidth to be more than 10. Press [RBW/VBW] to change this ratio.

f) Enable the occupied bandwidth measurement mode of the spectrum analyzer:

Press [Measure], [OBW] and [OBW Off On].

After the occupied bandwidth measurement function is enabled, the spectrum analyzer will change into the occupied bandwidth measurement interface, and measurement results will be displayed at the bottom of the screen. Refer to Fig. 4-3 for the schematic diagram of occupied bandwidth measurement. Two vertical white lines on the

screen intuitively indicates the frequency range of the occupied bandwidth. After the occupied bandwidth measurement function is enabled, the “Auto” mode of the detector will automatically change into the “Sample” mode. The user can change the measurement method, occupied bandwidth span, etc. with corresponding menus, so as to obtain more accurate measurement results.

g) Select the measurement method:

Press [Measure], [OBW] and [Method % XdB], and select the occupied bandwidth measurement method. You can set the method as the power percentage or power drop XdB. The underline indicates the current mode, and the default setting is the percentage.

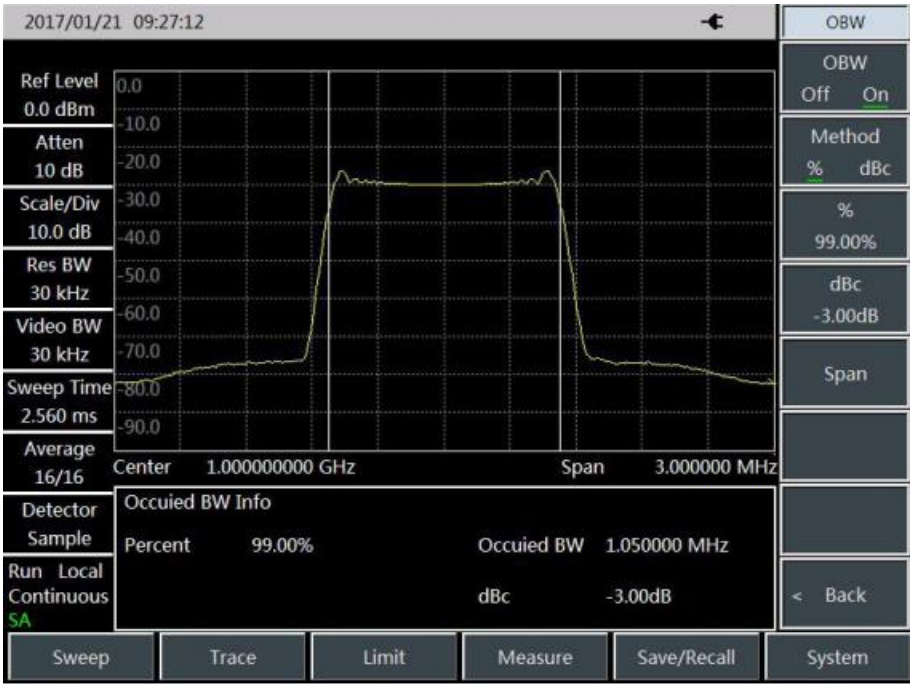


Fig. 4-3 Occupied Bandwidth Measurement

h) Change the percentage:

If the percentage method is selected, you can press [Measure], [OBW] and [% 99%], and use the number keys, UP/DOWN keys or knob to change the percentage. The percentage range is 10% to 99.99%, with the minimum step of 0.01%. The default setting is 99%.

i) Change the dBc value:

If the dBc method is selected, you can press [Measure], [OBW] and [dBc -3.00dB] and use the number keys, UP/DOWN keys or knob to change the dBc value. The dBc range is -0.1dB to -100dB, with the minimum step of 0.01dB. The default setting is -3dB.

j) Change the occupied bandwidth span:

Press [Measure], [OBW] and [Span], and enter the occupied bandwidth span with number keys. Press corresponding soft keys to enter the unit. The default setting is 3MHz.

k) Disable the occupied bandwidth measurement:

Press [Measure], [OBW] and [OBW Off On], and disable the occupied bandwidth measurement. The interface will change into the spectrum measurement interface.

3 Adjacent channel power ratio measurement

Taking the measurement of the adjacent channel power ratio of the FM signal for example, this section describes how to use S3302 series spectrum analyzer to measure the adjacent channel power ratio.

1) Definition of adjacent channel power ratio

The adjacent channel power ratio (ACPR), also known as the adjacent channel leakage power ratio (ACLR) refers to the ratio of the transmitted power of one channel to the radiation power of the adjacent channel. It is generally expressed as the ratio of the power within the specified bandwidth under various offsets of the adjacent channel to the total power of the channel. The adjacent channel power mainly depends on the extension of the modulated sideband and noise of the transmitter.

The adjacent channel power ratio measurement can be applied, as a substitute of the traditional dual-audio IM distortion measurement, in nonlinear system tests. The measurement result of the adjacent channel power ratio can be expressed in two forms: power ratio and power density.

2) Measurement procedures

In the traditional measurement of the narrow-band signal, the distortion performance of the transmitter is evaluated generally by means of dual-audio signal IM measurement. The broadband modulation signal includes both the dense spectrum components and high peak signal (also known as the crest factor). IM products of spectrum components of the signal are always around the spectrum. The IM measurement of the broadband FM signal is complex, while ACPR is closely related to IM products arising from nonlinear distortion. Therefore, ACPR is a better method to measure the nonlinear distortion of the broadband FM signal.

The ACPR of the broadband FM signal can be measured with the ACPR measurement function of S3302 series spectrum analyzer according to the following procedures.

a) Set the signal generator to output the broadband FM signal:

Use the signal generator to generate one FM signal. Set the frequency as 1GHz, power as -10dBm, FM offset as 500kHz and demodulation rate as 10kHz. Connect the output of the signal generator to the RF input end of the spectrum analyzer through one cable, as shown in Fig. 4-1. Enable the ON state of the modulation output and radio frequency.

b) Reset the spectrum analyzer into the default state:

Press [Reset].

c) Set the reference level of the spectrum analyzer:

Press [Amplitude] , [Ref Level] and -10[dBm];

Press [Amplitude] and [Scale/Div] and set the scale as 10dB/division.

d) Set the resolution bandwidth and video bandwidth:

Press [BW] and [RBW Auto Man], and set the resolution bandwidth as 30kHz;

Press [BW] and [VBW Auto Man], and set the video bandwidth as 30kHz or less.

e) Enable the ACPR measurement:

Press [Measure], [ACPR] and [ACPR Off On] to enable the ACPR interface.

f) Set the center frequency of the main channel:

Press [Center Freq] and set the center frequency of the main channel with number keys, i.e. 1GHz.

g) Set the bandwidth of the main channel:

Press [Main Ch BW] and set the bandwidth of the main channel with number keys, i.e. 1MHz.

h) Set the adjacent channel bandwidth:

Press [Adj Ch BW] and set the adjacent channel bandwidth with number keys, i.e. 2MHz.

i) Set the channel spacing:

Press [Ch Spacing] and set the channel spacing as 1MHz with number keys.

j) Enable the ACPR test:

Press [ACPR Off On]. Then the measurement results will be displayed at the bottom of the screen. Refer to Fig. 4-4 for the schematic diagram of ACPR measurement.

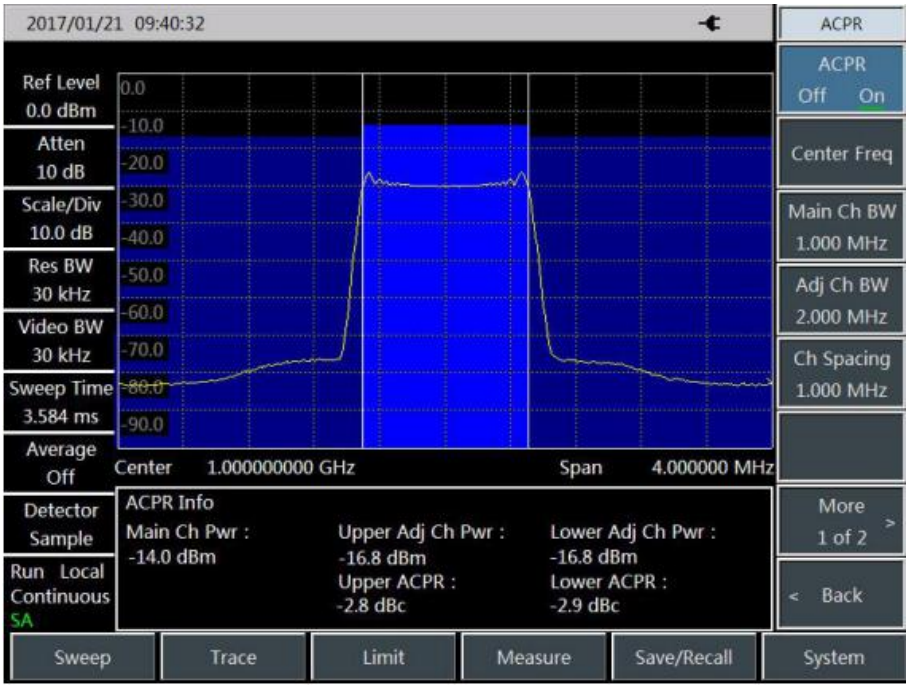


Fig. 4-4 ACPR Measurement

k) Limit setting:

The limit test function can be applied so as to easily observe whether the adjacent channel power is beyond the set range. Press [Measure], [ACPR] and [More 1/2] to enter the ACPR limit test setting menu.

Press [Upper Limit] and enter the upper limit with number keys.

Press [Lower Limit] and enter the lower limit with number keys.

l) Enable the limit test function:

Press [Limit Test Off On] to enable the limit test function. If the adjacent channel power is beyond the set limits, the screen background will become red for indication.

4 Third-order IM distortion measurement

1) Definition of third-order IM distortion

Mutual interference between equipment in common in crowd operating environment of the communications system. For example, second-order and third-order IM distortion is common in narrow-band systems. When there are two signals (F_1 and F_2) in one system, they and second harmonic distortion signals generated by them ($2F_1$ and $2F_2$) mix and become third-order IM products $2F_2$-F_1 and $2F_1$-F_2 very close to original signals, thus resulting in high-order

IM distortion. Such distortion products are mostly generated by devices such as amplifiers and mixers in the system.

The measurement of third-order IM distortion is described below. This section provides an example of how to display two signals at the same time on the screen of the spectrum analyzer, and introduces how to set the resolution bandwidth, mixer level and reference level, as well as some marker functions.

2) Measurement procedures

a) Connect the tested instrument with spectrum analyzer as shown in Fig. 4-5.

This example involves one 6dB directional coupler, one 1GHz signal generator and one 1.001GHz signal generator. Of course, the signal generator of other frequencies are allowed. However, the frequency interval must be approximately 1MHz in this example.

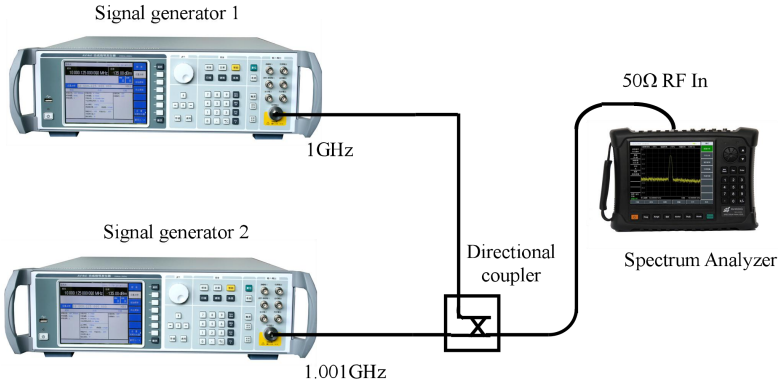


Fig. 4-5 Connection of Third-order IM Distortion Measurement System

Set the output frequency of one signal generator as 1GHz and the output frequency of the other signal generator as 1.001GHz, so that the frequency interval of two signals transmitted into the spectrum analyzer is 1MHz.

Set the same output amplitude for both signal generators (-20dBm in this example).

b) Set the spectrum analyzer until both signals are displayed on its screen at the same time.

Press [Reset].

Press [Frequency], [Center Frequency], 1.0005[GHz].

Press [frequency], [Span] and 5[MHz].

You can see that both signals are at the center of the screen, as shown in Fig. 4-6. If the applied frequency interval is different from that in this example, select the span more than three times of the frequency interval of the signal generators.

c) Reduce the resolution bandwidth until you can see the distortion product:

Press [BW] and reduce the resolution bandwidth with the step key [↓].

d) Adjust both signal generators until the amplitudes of input signals are the same.

Press [Maker], [Delta], [Peak] and [Next Peak]. Adjust the signal generator corresponding to the marker until the amplitude difference is zero. If required, reduce the video bandwidth.

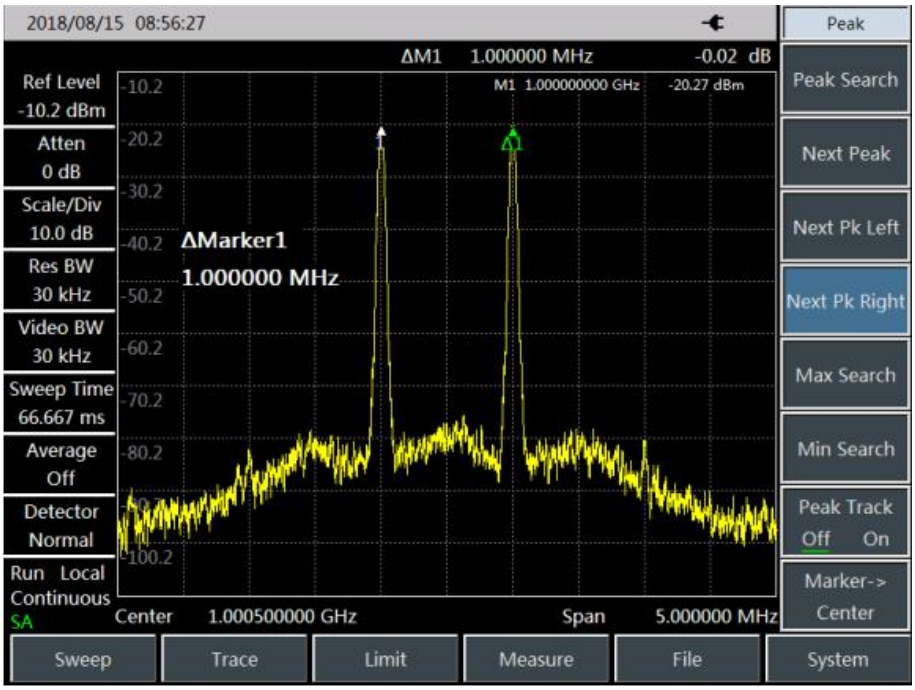


Fig. 4-6 Signals at Center of Display of Spectrum Analyzer

e) Set the reference level and make the signal peak at the reference level:

Press [Peak] and [Peak Search], and read the peak power.

Press [Amplitude], [Reference Level].

In order to achieve the best measurement accuracy, the signal peak of the signal generators should be set at the reference level, as shown in Fig. 4-7.

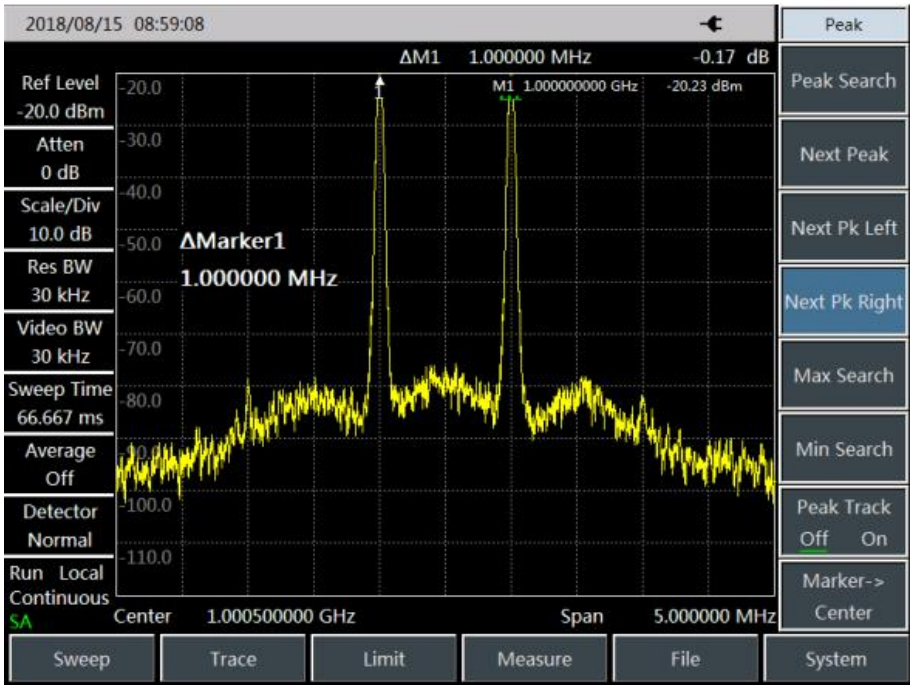


Fig. 4-7 Signal Peak at Reference Level

f) Set the second marker and measure the distortion product:

Once the marker is activated, the second marker will be generated by the differential marker function, and the difference between both markers will be displayed. In this case, relative measurement can be performed easily.

Press [Peak] to activate one marker.

Press [Maker] and [Delta] to activate the second marker.

Press [Peak] and [Next Pk Left] or [Next Pk Right] to set the second marker at the peak point of the distortion product beside the signal generated by the signal generator. As shown in Fig. 4-8, the frequency and amplitude difference of both markers will be shown in the marker display zone, and the marker amplitude difference will be the measured value of third-order IM distortion.

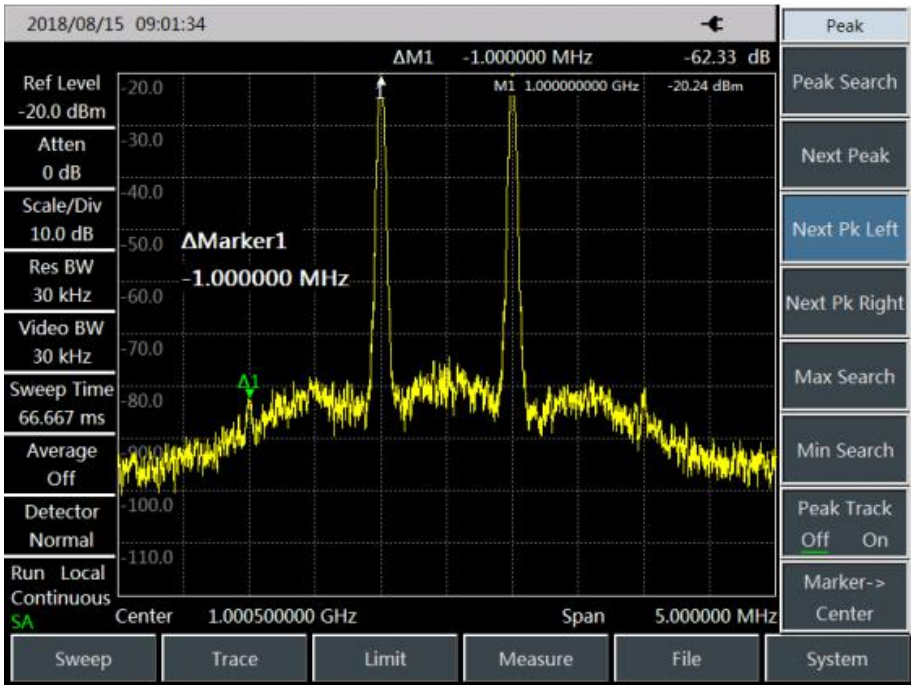


Fig. 4-8 Relative Measurement of Internal Modulation Distortion

g) Calculation of third-order interception (TOI) point:

The ratio (in dB) of the distortion component level to signal level has no great significance for system distortion, unless the signal level is specified. The interception point can be applied to specify and evaluate the system distortion level. The difference between the third-order distortion component level and fundamental signal level is twice of that between the fundamental signal level and third-order interception point. The third-order interception (TOI) point can be calculated by the following formula:

$$TOI = L_{in} - \frac{\Delta dB_{im3}}{2}$$

Where:

L_{in} : Refer to two input signal levels, in dBm.

ΔdB_{im3} : means the difference between the third-order IM product and input signal level, in dB.

As shown in Fig. 4-7, if the differential marker reading is -47.30dB and the signal level is -23.0dBm, the third-order interception (TOI) point is:

$$TOI= -22.2- (-51.11/2)=0.65(dBm)$$

5 Drift signal measurement

1) Definition of drift signal

If the drift signal is measured with the spectrum analyzer, the center frequency should be changed in different period so as to facilitate observation. If the signal tracking function of the spectrum analyzer is enabled, the marker peak will always be displayed at the center frequency of the spectrum analyzer, thus facilitating measurement.

This section introduces how to measure the drift signal, in which the signal tracking function, marker function and maximum holding function of the spectrum analyzer are applied to observe the amplitude trace and occupied bandwidth of the drift signal.

2) Measurement of frequency drift for signal generator

The spectrum analyzer is able to measure the short-time and long-time stability of the signal generator. By using the maximum trace holding function, the spectrum analyzer can display the maximum peak amplitude and frequency drift of the input signal. The max hold function of track may be used to measure the occupied bandwidth of signal.

In this example, the signal tracking function of the spectrum analyzer is applied to keep the drift signal always displayed at the center and the maximum trace holding function to capture the drift.

a) Set the output signal of the signal generator:

Set the signal generator to output the 300MHz and -20dBm signal. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Enable the RF output.

b) Set the center frequency, span and reference level of the spectrum analyzer:

Press [Reset].

Press [Frequency], [Center Frequency], 300[MHz].

Press [frequency], [Span] and 10[MHz].

Press [Amplitude] , [Ref Level] and -10[dBm].

c) Set the marker at the signal peak, and enable the signal tracking function:

Press [Peak] and [Peak Track Off On].

Press [Frequency] and [Signal Track Off On].

d) Reduce the span:

Press [Frequency], [Span] and 500 [kHz]. You can see that the signal is always at the center.

e) Disable the signal tracking function:

Press [Frequency] and [Signal Track Off On].

f) Use the maximum holding function to measure the signal drift.

Press [Trace] and [Max Hold].

When the signal changes, the max hold will maintain the maximum response to the input signal.

g) Activate the trace 2 and set it into the continuous clearing and writing mode.

Press [Trace], [Trace 1 2 3] and [Clear Write].

h) Change the output frequency of the signal generator.

Slowly change the output frequency of the signal generator, with the step of 1kHz and the range of ±50kHz. The spectrum analyzer will display the information shown in Fig. 4-9.

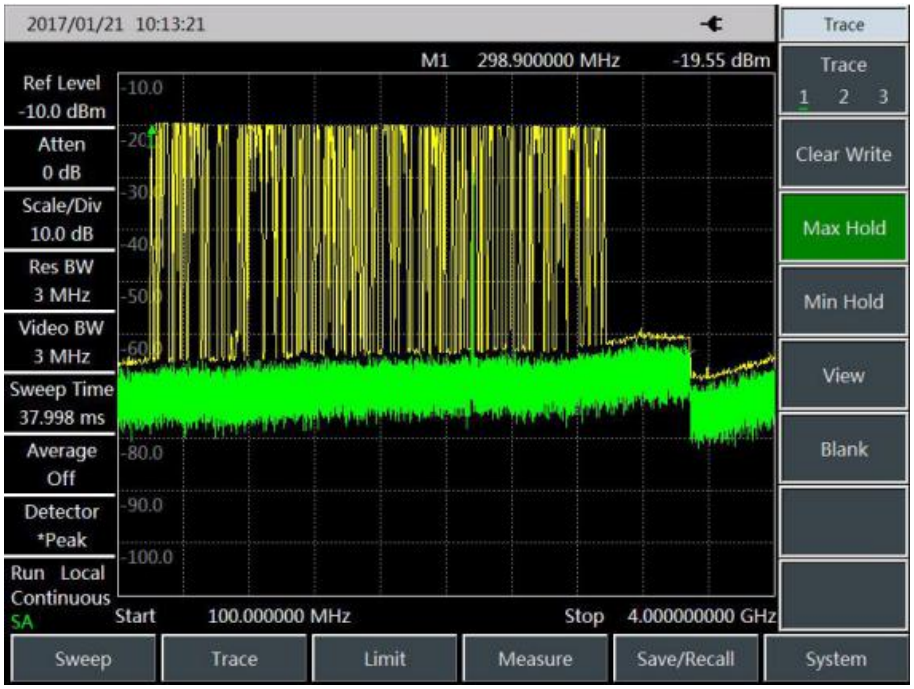


Fig. 4-9 Observation of Drift Signal by Maximum Holding Function

6 Noise signal measurement

1) Definition of noise signal

In communications systems, signal-to-noise ratio (SNR) is usually used to express noise amplitude. When the nose level in the system increases, SNR decreases and it will be harder to demodulate modulated signals. SNR measurement is also used to indicate measurement of ratio of carrier against noise in communications systems.

Measurement of the S/N and noise by the marker function of S3302 series spectrum analyzer is described below. In the example, SNR is measured with the signal (carrier) having only single frequency point. If the modulation signal is tested, this test process should be modified to correct the level of the modulation signal.

2) Measure SNR

a) Set the output signal of the signal generator:

Set the frequency of the signal generator as 1GHz and power as -10dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Enable the ON state of the radio frequency.

b) Set the center frequency, span, reference level and attenuator.

Press [Reset].

Press [Frequency], [Center Frequency], 1[GHz].

Press [Frequency], [Span] and 5[MHz].

Press [Amplitude], [Ref Level] and -10[dBm].

Press [Amplitude], [Atten Auto Man] and 40[dB].

c) Set the marker at the signal peak, and the differential marker at the noise location with the offset of 200kHz.

Press [Peak] and [Peak Track Off On].

Press [Marker], [Delta] and 200[kHz].

d) Enable the noise marker function and observe the S/N:

Press [Marker] and [Noise Marker Off On]. As shown in Fig. 4-10, the S/N reading is in dBc/Hz, as the noise value refers to the noise bandwidth normalized to 1Hz.

This value decreases by 10×log(BW). If you wish to obtain noise values under different channel bandwidth, the measurement result needs to be corrected based on current bandwidth. For example, if the reading of the spectrum analyzer is -85dBc/Hz and the channel bandwidth is bandwidth, S/N is:

S/N=85dBc/Hz - 10×log(30kHz) =40.2dBc/(30kHz)

If the differential marker is less than one fourth of the edge distance between the signal peak and response, errors may occur in noise measurement.

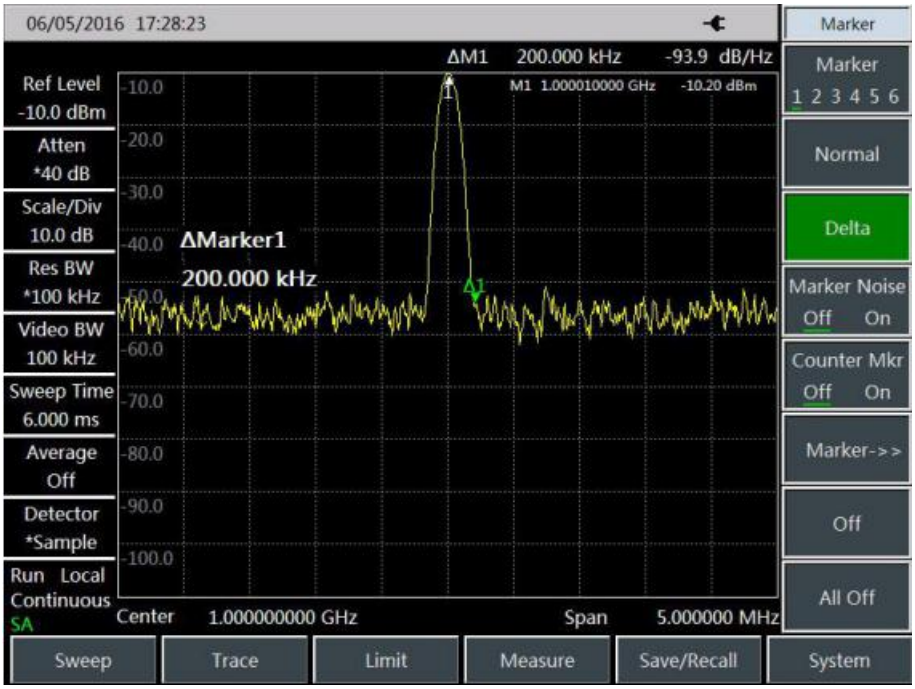


Fig. 4-10 S/N Measurement

3) Noise measurement by noise marker function

In this example, the noise of 1Hz bandwidth is measured by the noise marker function, using the 1GHz external signal.

a) Set the output signal of the signal generator:

Set the frequency of the signal generator as 1GHz and power as -10dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, and enable the ON state of the radio frequency.

b) Set the center frequency, span, reference level and attenuator:

Press [Reset].

Press [Frequency], [Center Frequency], 999.98[MHz]

Press [frequency], [Span] and 100[kHz].

Press [Amplitude], [Ref Level] and -10[dBm].

Press [Amplitude], [Atten Auto Man] and 40[dB].

c) Activate the noise marker:

Press [Maker] and [Noise Marker Off On].

Note: The “Sample” mode of the detector will be enabled automatically. To obtain the noise power under different bandwidth, you can correct the current bandwidth based on 10×log(BW). For example, if the noise power within 1 kHz bandwidth is to be obtained, 10×log (1000) or 30 dB has to be added to the reading.

d) Reduce the measurement error by increasing the sweep time:

Press [Sweep], [Sweep Time Auto Man] and 3[s].

In the “Average” mode of the detector, you can increase the sweep time so that the trace data are averaged in a longer interval, so as to reduce the measurement error.

e) Move the marker to 1GHz:

Press [Maker] and rotate the knob on the front panel until the noise marker reading is 1GHz.

The noise marker value is calculated based on 5% of points on the whole sweep trace, with the marker location as the center. The noise marker will not be at the signal peak since such position has no enough trace points for calculation. Therefore, when the resolution bandwidth is narrow, the noise level will average trace points below the signal peak. As shown in Fig.4-11:

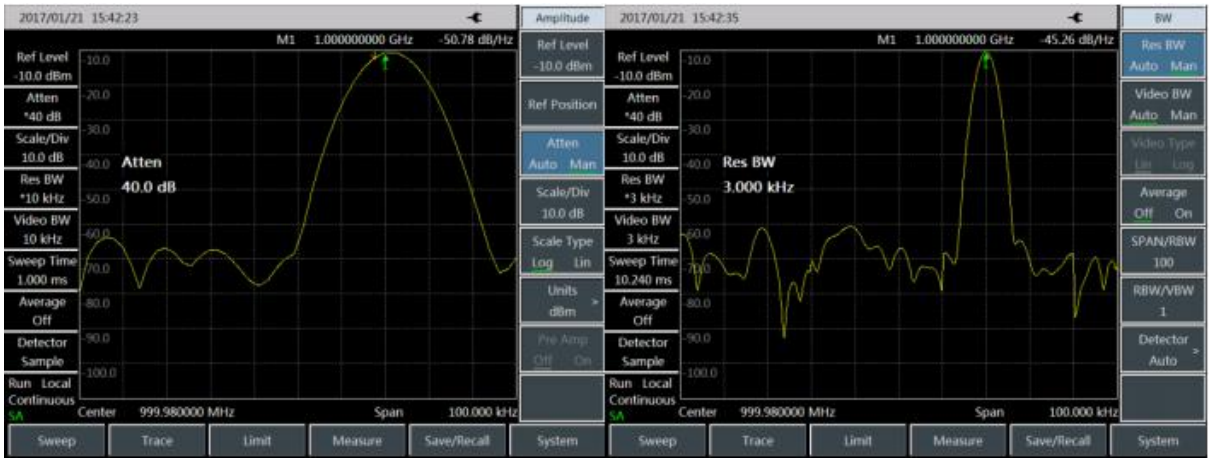


Fig. 4-11 Noise Measurement by Noise Marker Function

f) Set the spectrum analyzer into the zero span mode, with the marker location as the center:

Press [Peak] and [Marker→Center].

Press [frequency], [Span] and [Zero Span].

Read the [Maker].

In this case, the amplitude reading of the noise marker is correct, as the averages of all points are at the same frequency, which is not affected by the shape of the resolution bandwidth filter. The noise marker is calculated based on the average of the interested frequency points. The power of discrete frequency points should be measured in the zero span mode, with the spectrum analyzer tuned to the interested frequency point.

7 Distortion measurement

Mutual interference between equipment in common in crowd operating environment of the communications system. For example, second-order and third-order intermodulation distortion is common in narrowband systems. When there are two signals (F_1 and F_2) in one system, they and second harmonic distortion signals generated by them ($2F_1$ and $2F_2$) mix and become third-order intermodulation products $2F_2$-F_1 and $2F_1$-F_2 very close to original signals, thus resulting in high-order intermodulation distortion. Such distortion products are mostly generated by devices such as amplifiers and mixers in the system. Most transmission units and signal generators have harmonics and their components need to be measured.

1) Identification of distortion generated by spectrum analyzer

In the case of large signal input, the spectrum analyzer may be subject to distortion, which will affect the distortion measurement results of true signals. You can set the attenuator to determine which signal is a distortion signal generated by the spectrum analyzer. This example shows whether the spectrum analyzer is subject to harmonic distortion based on the input signal.

a) Set the output signal of the signal generator.

Set the frequency of the signal generator as 200MHz and power as 0dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Enable the ON state of the radio frequency.

b) Set the center frequency and span of the spectrum analyzer.

Press [Reset].

Press [Frequency], [Center Frequency] and 400[MHz].

Press [frequency], [Span] and 500[MHz].

You can see on the trace of the spectrum analyzer that the harmonic distortion of the signal is subject to 200MHz deviation from the original 200MHz signal, as shown in Fig. 4-11.

c) Set the center frequency of the spectrum analyzer at the first harmonic distortion location.

Press [Peak] and [Next Peak]

Press [Peak] and [Marker→Center].

d) Set the span as 50MHz and reset the center frequency.

Press [frequency], [Span] and 50[MHz].

Press [Marker→] and [Marker→Center].

e) Set the attenuator as 0dB.

Press , [Atten Auto Man] and 10[dB].

Press [Peak] and [Peak Track Off On].

Press [Maker] and [Delta].

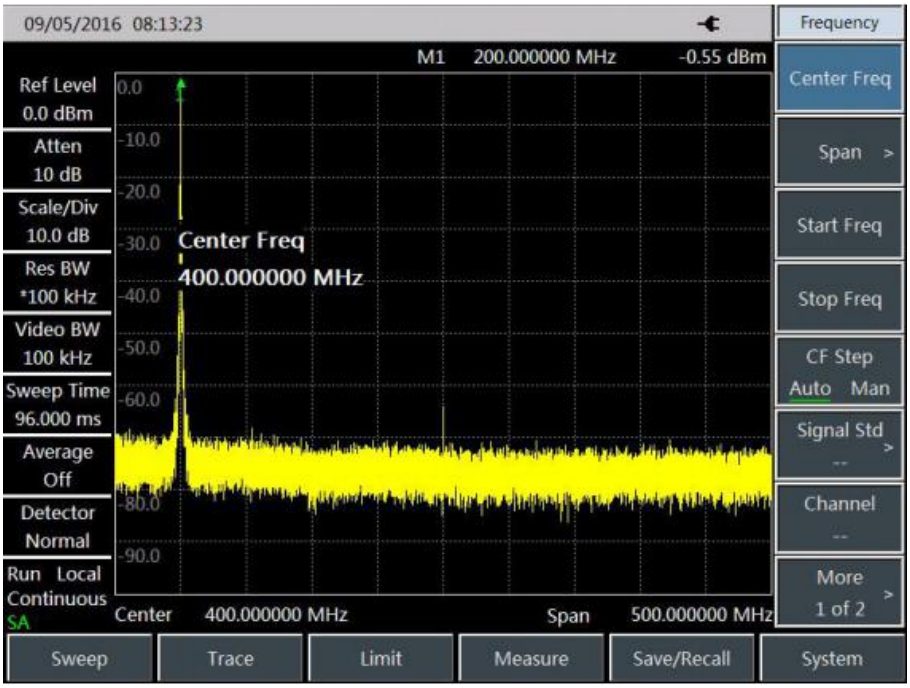


Fig. 4-12 Observation of Harmonic Distortion

f) Increase the attenuator setting to 10dB:

Press [Atten Auto Man] and 10[dB].

Observe the differential marker reading, as shown in Fig. 4-13. The reading is the distortion difference of the attenuator at 0dB and 10dB. If the attenuator is changed and the differential marker reading is 1dB or more, it indicates that the spectrum analyzer is subject to certain distortion. If the differential marker reading is not obvious, the attenuation may be increased.

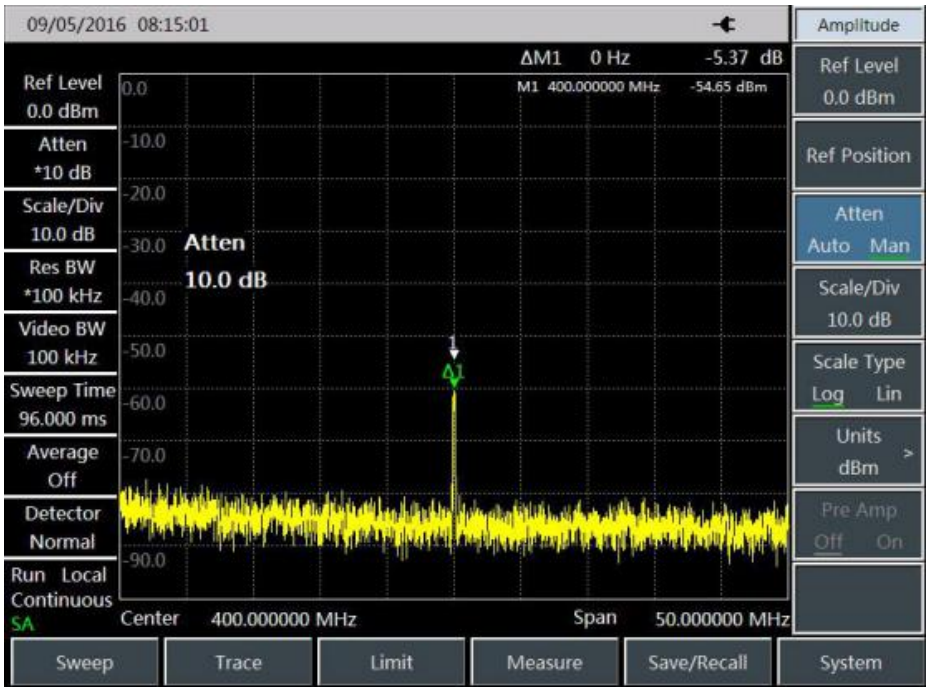


Fig. 4-13 Attenuator Setting - 10dB

The amplitude reading of the differential marker is provided by two sources: 1. If the RF attenuation is increase, S/N will decrease, and this reading will be positive. 2. If the harmonic distortion of the spectrum analyzer decreases, this reading will be negative. The larger the reading, the bigger the error of measurement. In such case, the attenuator setting may be changed to reduce absolute amplitude of such delta marker reading.

2) Quick harmonic measurement

In this section, harmonic components are measured of a signal with frequency of 1 GHz and power of -10 dBm generated by the signal generator.

a) Set the output signal of the signal generator.

Set the frequency of the signal generator as 1GHz and power as -10dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Enable the ON state of the radio frequency.

b) Set the starting frequency and stop frequency of the spectrum analyzer.

Press [Reset] key.

Press [frequency], [Start Freq], 800[MHz], [Stop Freq] and 2.5[GHz].

As shown in Fig. 4-14, the fundamental wave and second harmonic will be displayed on the screen.

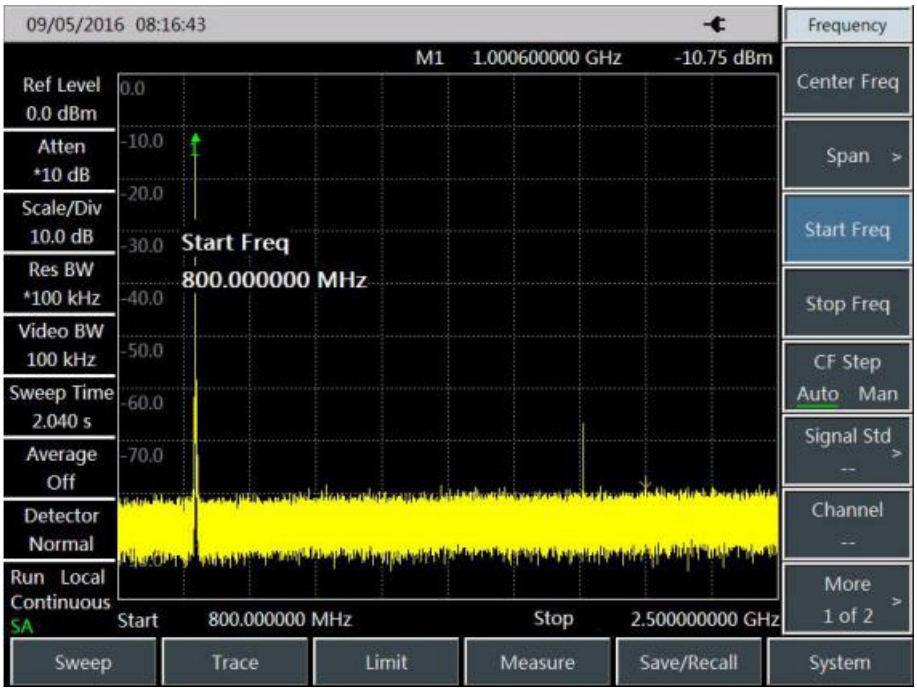


Fig. 4-14 Input Signal and Harmonic

c) Set the video bandwidth to smooth noise so as to improve the resolution.

Press [Bandwidth], [Video Bandwidth Auto Man] to enable auto off.

Use [↓] key to reduce video bandwidth.

d) In order to improve the measurement accuracy, set the peak level of the fundamental wave as the reference level.

Press [Peak] and [Peak Search], and read the peak power.

Press [Amplitude] and [Ref Level], and set it as the peak power. Results are shown in Fig. 4-15.

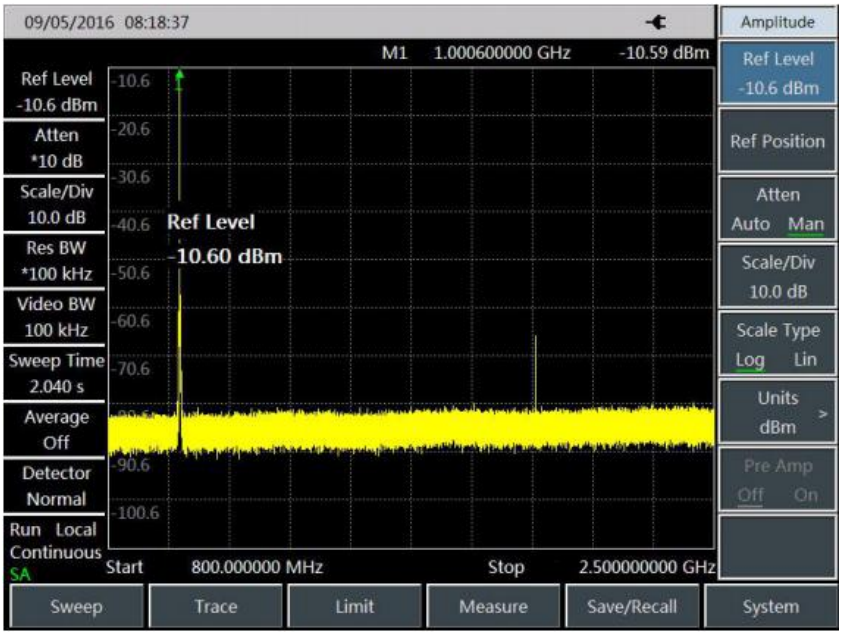


Fig. 4-15 Setting of Signal Peak as Reference Level for Maximum Accuracy

e) Activate the second marker.

Press [Delta], and [Next Peak].

In this case, the fixed marker is on the fundamental wave, while the mobile marker is on the peak point of the second harmonic, as shown in Fig. 4-16.

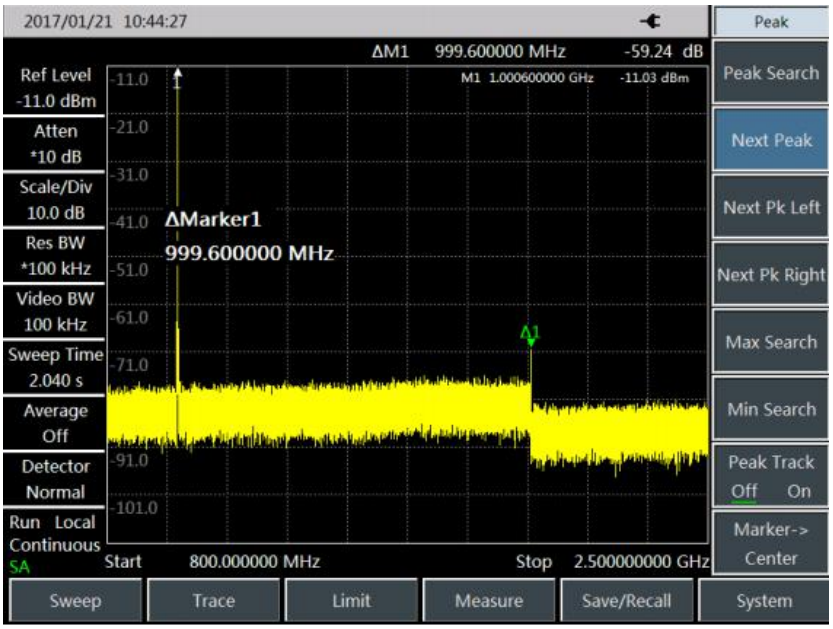


Fig. 4-16 Second Harmonic Measurement based on Marker Difference

f) Measure the harmonic distortion (Method 1).

The fundamental wave and the second harmonic as shown in the figure has am amplitude difference of about -60 dB, or a harmonic distortion of 0.1% (see Fig. 4-17).

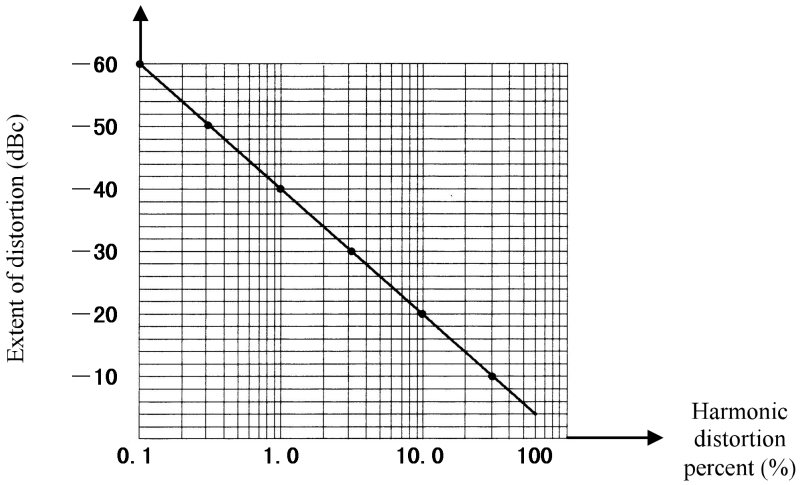


Fig. 4-17 Conversion of Percentage of Harmonic Distortion Amplitude

To measure the third harmonic, press [Next Pk Right] and read the amplitude ratio of other harmonics to the fundamental wave.

g) Measure the harmonic distortion (Method 2).

Press [Amplitude], [Units] and [Volt].

In this case, the unit of the differential marker will automatically change into volt. An easy way to determine distortion percentage is to change the unit to volt. Move the decimal of the proportion indicated by the differential marker rights for two places to obtain the distortion percentage. The minimum ratio that can be displayed is 0.01 or 1%.

3) Accurate harmonic measurement

It takes more steps to measure in this method, but since measurement is done with smaller span and resolution bandwidth for each signal, the signal-to-noise ratio is increased and more accurate measurement result will be obtained. It will be explained below how to measure the harmonic of 1 GHz signals.

a) Set the output signal of the signal generator.

Set the frequency of the signal generator as 1GHz and power as -10dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Enable the ON state of the radio frequency.

b) Set the starting frequency and stop frequency of the spectrum analyzer.

Press [Reset] key.

Press [frequency], [Start Freq], 800[MHz], [Stop Freq] and 2.5[GHz].

c) Set the video bandwidth to smooth noise so as to improve the resolution.

Press [Bandwidth], [Video Bandwidth Auto Man] to enable auto off.

Use [↓] key to reduce video bandwidth.

d) Reduce the span by the signal tracking function.

Press [Peak] to activate the signal peak of marker search.

Press [frequency] and [Signal Track Off On].

Press [frequency], [Span] and 100[kHz].

e) Disable signal tracking.

Press [Frequency] and [Signal Track Off On].

f) Move the signal peak to the top division to obtain the highest amplitude measurement accuracy.

Press [Peak] and [Peak Search], and read the peak power.

Press [Amplitude] and [Ref Level], and set it as the peak power. Results are shown in Fig. 4-18.

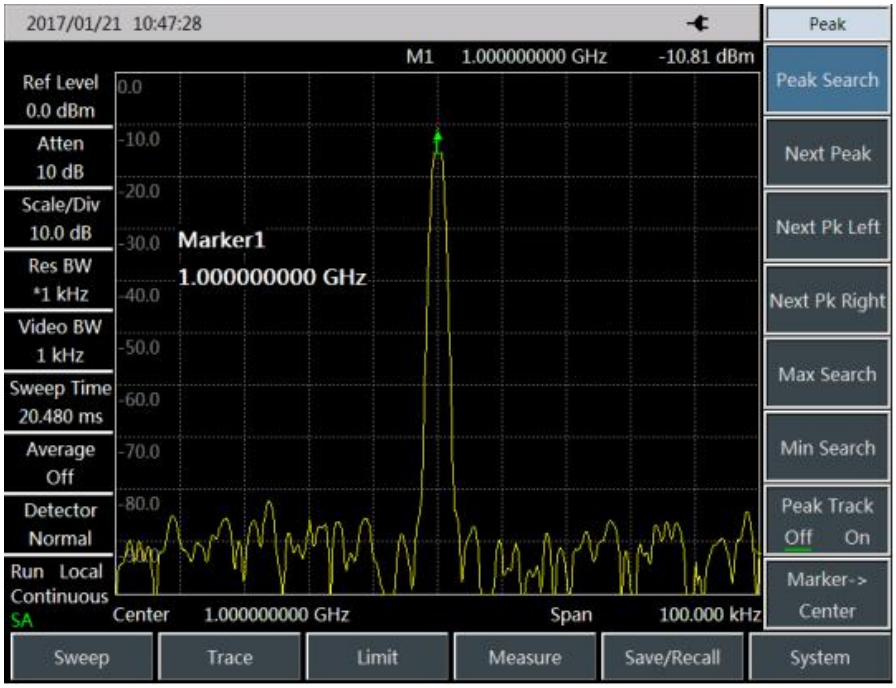


Fig. 4-18 Input Signal under 100kHz Span

g) Set the step of the center frequency as the signal frequency of the fundamental wave.

Press [Frequency] and [Frequency Step Auto ON/OFF] and enter 1 GHz.

h) Measure the second harmonic.

Press [Maker], [Marker→], [Marker→Center] and step key [↑]. Change the center frequency of the spectrum analyzer to second harmonic by stepping operation. Press [Peak] and [Peak Search], and read the peak power.

Press [Amplitude] and [Ref Level], and set it as the peak power. Adjust the harmonic peak to the reference level. The second harmonic amplitude is shown in Fig. 4-19.

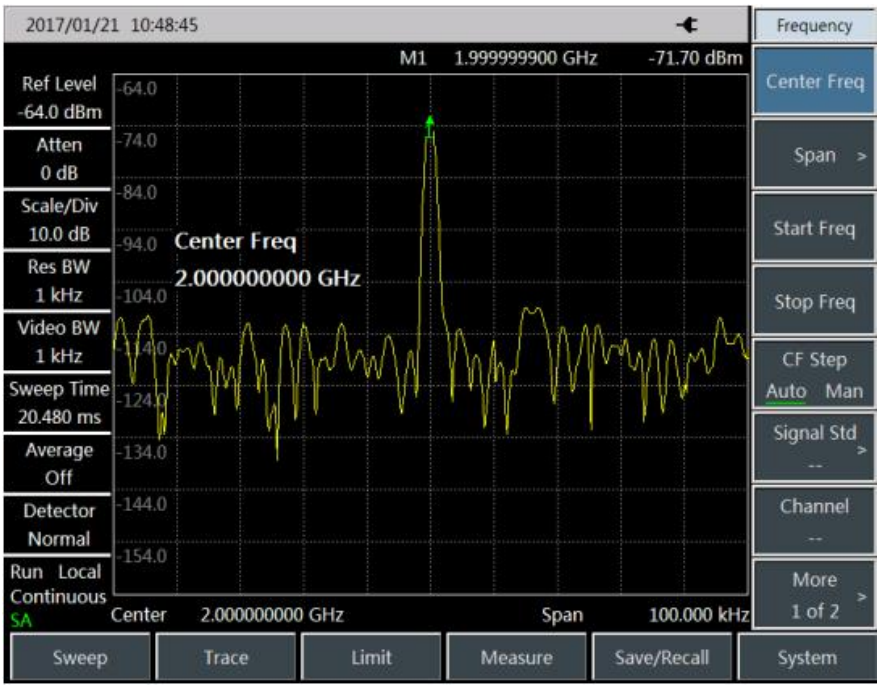


Fig. 4-19 Second Harmonic Amplitude

i) Calculate the harmonic distortion.

Change the distortion percentage of the second harmonic to fundamental wave as shown in Fig. 4-17. The unit can be changed again to volt in order to read the voltage ratio of two signals.

j) Measure other harmonics.

Repeat Step (i) to (j) to other harmonics to be measured. Calculate the distortion percentage of each harmonic.

Total signal harmonic distortion percentage is also subject to frequent test. In order to test such parameter, amplitude of each harmonic should be tested with linear unit (such as volt) rather than relative unit dBc. Press [Amplitude], [Units] and [Volt] to set the amplitude unit as volt. The measured signal amplitude can be applied in the following equation to calculate the total harmonic distortion:

$$\text{Total harmonic distortion} = \frac{100 \times \sqrt{(A_2)^2 + (A_3)^2 + \cdots + (A_n)^2}}{A_1}\%$$

Where:

A_1 - refers to fundamental wave amplitude (V)

A_2 - refers to second harmonic amplitude (V)

A_3 - refers to third harmonic amplitude (V)

A_n refers to n^{th} harmonic amplitude (V)

If the signal amplitude is carefully measured as shown in the above example, the obtained harmonic distortion percentage is accurate.

8 Pulse RF signal measurement

1) Definition of pulse RF signal

The pulse RF signal refers to a RF pulse string of the same repetition frequency and constant pulse width, shape and amplitude. This section introduces several methods of measuring pulse RF signal parameters, including how to measure the center frequency, pulse width and pulse repetition frequency. In addition, the measurement of peak pulse power is also discussed.

The resolution bandwidth has great influence on pulse RF signal measurement. You must understand the relationship between the resolution bandwidth and pulse repetition frequency. If the resolution bandwidth is narrower than the pulse repetition frequency, only individual frequency components of the pulse RF signal will appear on the screen. This is known as the narrow band mode. The mode in which the resolution bandwidth is broader than the pulse repetition frequency is known as the broad band mode. In this case, you can see the spectrum envelope formed by pulse segments that are equalized by the tested pulse repetition frequency.

2) Center frequency, side lobe ratio and pulse width measurement of pulse RF signal

a) Set the output signal of the signal generator:

Set the frequency of the signal generator as 1GHz and power as -20dBm. Connect the output of the signal generator to the input port of the spectrum analyzer, as shown in Fig. 4-1. Set the repetition frequency of pulse modulation as 1kHz and pulse width as 900ns. Enable the pulse modulation and RF output.

b) Set the spectrum analyzer:

The pulse RF signal is generally measured in the broad band mode. In order to prevent the influence of the video filter on measurement results, the video bandwidth should be set as 3MHz.

Press [Reset] key.

Press [Frequency], [Center Frequency] and 1[GHz].

Press [frequency], [Span], 10[MHz], [sweep], [Sweep Time Auto Man] and 60[ms].

Press [BW], [RBW Auto Man], 100 [kHz], [VBW Auto Man] and 100 [kHz].

Press [BW], [Detector] and [Peak] to activate the peak detector.

Enable the center frequency function and adjust the span until the center side lobe and at least one pair of side lobes appear on the screen, as shown in Fig. 4-20.

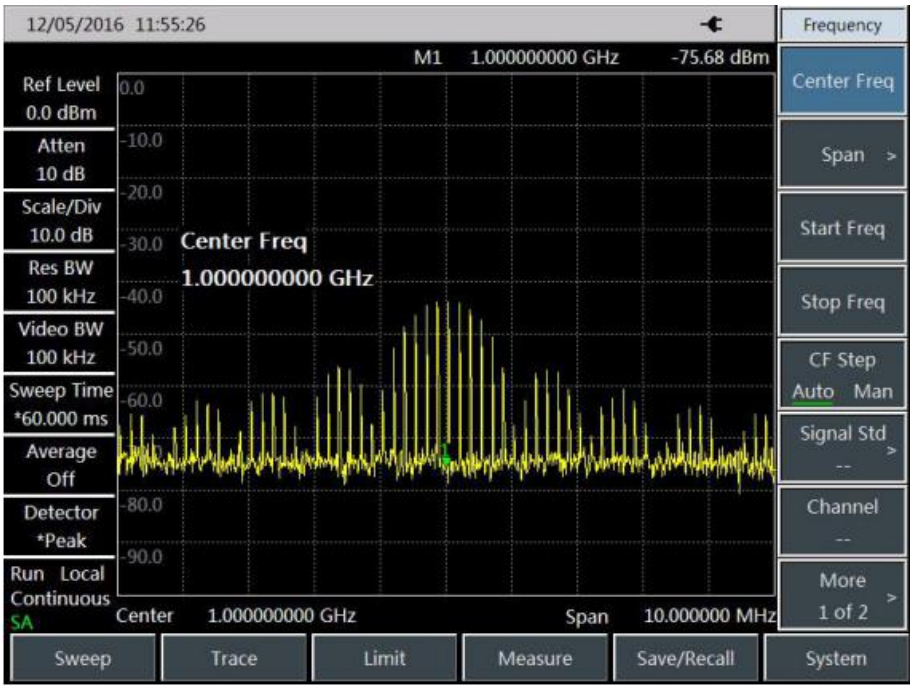


Fig. 4-20 Main Lobe and Side Lobe

Increase the sweep time (decrease the sweeping speed) until the graph is filled into a solid line, as shown in Fig. 4-21. If the spectrum line cannot be filled, it indicates that the instrument is not in the broad band mode. In this case,

the following steps of measurement of the sidelobe ratio, pulse width and peak pulse power will not apply. The resolution bandwidth should be more than 1kHz.

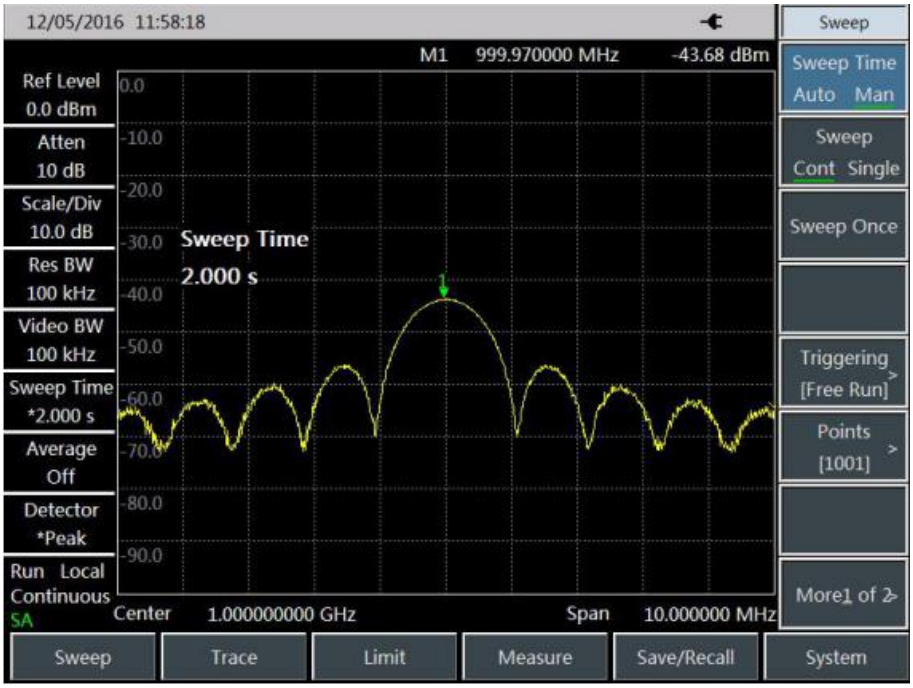


Fig. 4-21 Trace Display in Solid Line Form

c) Read the center frequency of the pulse and amplitude of the main lobe.

Press [Peak].

The marker reading is the center frequency of the pulse and amplitude of the main lobe.

d) Set the marker at the center frequency of the main lobe, and measure the side lobe ratio.

Press [Peak], [Maker], [Delta], [Peak] and [Next Peak].

The amplitude difference between the main lobe and side lobe is the side lobe ratio, as shown in Fig. 4-22.

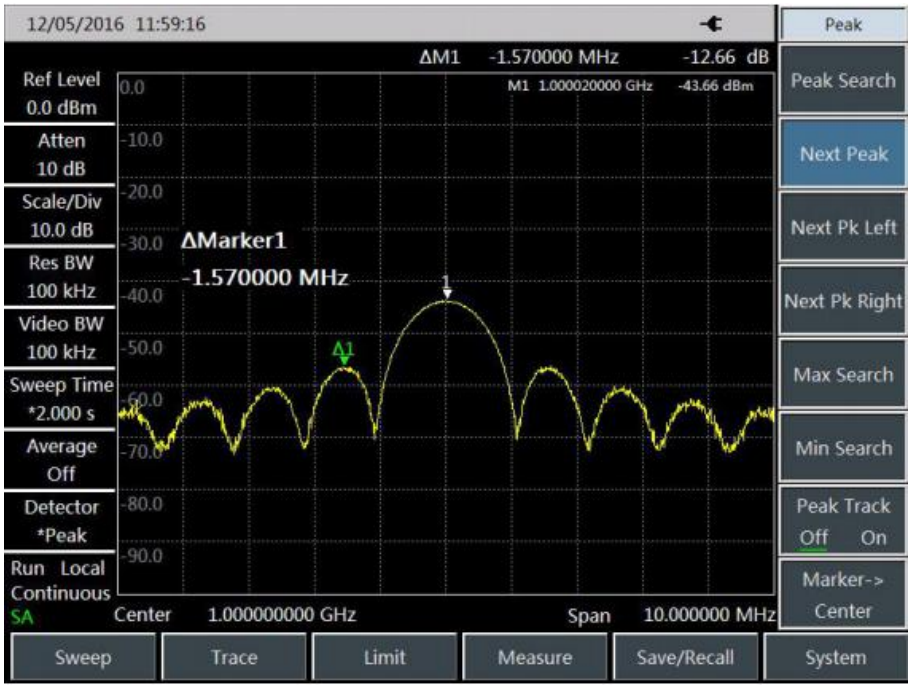


Fig. 4-22 Side Lobe Ratio Shown by the Marker

e) Measure the pulse width, which is equal to the reciprocal of the frequency difference between the peaks of two side lobe envelopes.

Press [Maker], [Delta], [Peak], [Next Pk Right] and [Next Pk Right].

In this case, the reciprocal of the frequency difference indicated by the differential marker is the pulse width, as shown in Fig. 4-23. To obtain the most accurate pulse width, you can manually adjust the marker location and measure the distance between the zero crossing points of two adjacent side lobes. You can also reduce the resolution bandwidth to make the zero crossing point sharper and measurement accuracy higher.

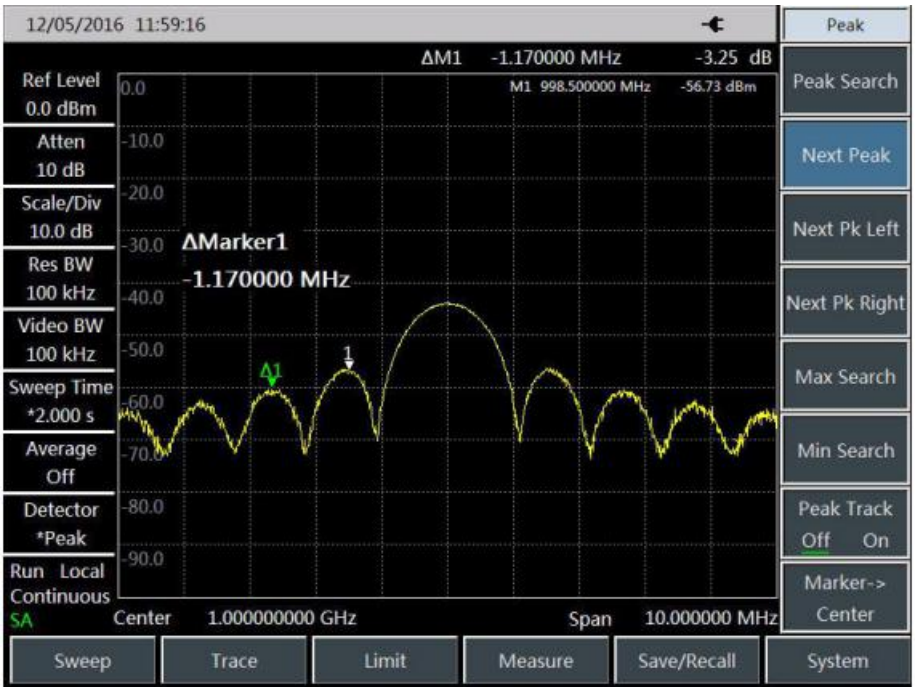


Fig. 4-23 Pulse Width Shown by the Marker

3) Pulse repetition frequency (PRF) measurement

The pulse repetition interval (PRI) refers to the time interval between any two adjacent pulse responses.

a) Set the output signal of the signal generator:

Set the frequency of the signal generator as 1GHz and power as -20dBm. Connect the output of the signal generator to the input port of the spectrum analyzer. Set the repetition frequency of pulse modulation as 1kHz and pulse width as 900ns. Enable the pulse modulation and RF output.

b) Set the spectrum analyzer:

Press [Reset] key.

Press [frequency] and 1[GHz].

Press [frequency], [Span], 10[MHz], [sweep], [Sweep Time Auto Man] and 1.705[s].

Press [BW], [RBW Auto Man] and 1[kHz].

Press [BW], [VBW Auto Man] and 3[MHz].

Press [BW], [Detector] and [Peak] to activate the peak detector.

Adjust the span until the main lobe and at least one side lobes appear on the screen.

Readjust the output amplitude of the signal generator until it is shown in the screen. Reduce the sweep time (i.e. increase the sweeping speed) until the contents similar to those in Fig. 4-24 are displayed.

c) Measure the pulse repetition interval:

Press [Sweep] and [Sweep$Cont|Single]

Press [Peak], [Maker][Delta] and [Peak] [Next Peak]. The difference of two markers is the pulse repetition interval (PRI), and its reciprocal is the pulse repetition frequency (PRF).

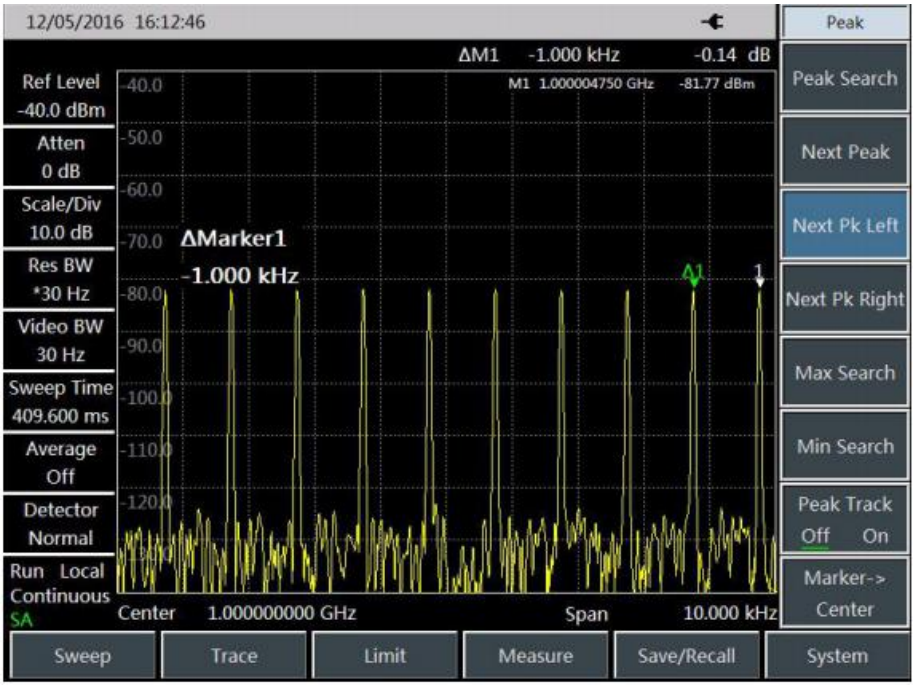


Fig. 4-24 Measurement of Pulse Repetition Frequency

4) Peak pulse power measurement

Now we have obtain the main lobe amplitude and pulse width. In addition, we can easily obtain the resolution bandwidth of the spectrum analyzer. Therefore, the peak pulse power can be obtained based on such parameters.

In the broad-band measurement mode of the spectrum analyzer:

$$\text{Peak pulse power} = (\text{main lobe amplitude}) - (20 \log T_{eff} \times BW_i)$$

Where:

Teff -pulse width, in second. Second

BW_i - impact bandwidth, in Hz (equal to the resolution bandwidth applied in 1.5× "Pulse width measurement")

In the narrow-band measurement mode of the spectrum analyzer:

peak pulse power =(main lobe amplitude) -(20 log T_{eff}/T)

Where:

Teff -pulse width, in second. Second

T——pulse repetition frequency

The phenomenon in which the peak pulse power is not equal to the main lobe amplitude is known as pulse desensitization. The sensitivity of the spectrum analyzer will not be decreased by the pulse signal. Accurately, pulse desensitization is caused by distribution of the CW carrier power of pulse modulation to a number of spectrum components (i.e. carrier and sideband). Therefore, each spectrum only contains part of the total power.

Attention

In measurement of the main lobe amplitude, you should change the attenuator of the spectrum analyzer and verify that the main lobe amplitude will not change accordingly. If the change exceeds 1dB, it indicates that the spectrum analyzer is in the gain compression state. In this case, you must increase the attenuation amount of the attenuator.

9 Signal source measurement (option)

The signal source measurement mode includes independent source output mode and generator output mode, of which the independent source mode is point frequency source mode to realize the signal output at single frequency point and fixed power, and the generator output mode needs to coordinate with spectral analysis function. Under the generator mode, the signal source will scan synchronously with the frequency under spectral analysis.

1) Independent source measurement

Under the independent source measurement mode, it is allowed to realize the signal output at fixed frequency by the following steps:

a) Press [Measure]→[Generator]→[Generator Off On], the point frequency source output will be selected by default after the Generator switch is turned on;

b) Press [Measure]→[Generator]→[Output Power 0dBm], it is allowed to set the power of output signal.

c) Press[Measure]→[Generator]→[CW Freq 1GHz], it is allowed to set the frequency of output signal.

The signal with output frequency of 1GHz and output power of 0dBm is as shown in Fig. 4-25:

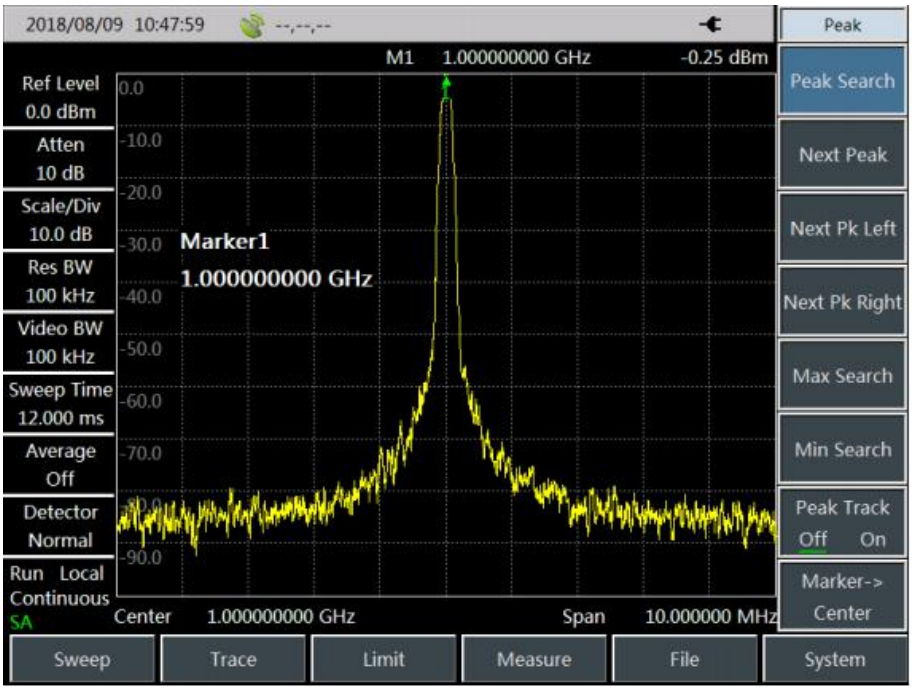


Fig. 4-25 Schematic diagram of point frequency source output signal

2) Generator measurement

Under the tracking mode, it is allowed to measure the magnitude-frequency characteristics of measured piece by using the synchronous frequency scan of signal source and spectral analysis. For details, please refer to the following setting procedures:

a) Press[Freq]→[Start Freq], to set the start frequency as 100MHz;

b) Press [Freq]→[Stop Freq], to set the stop frequency as 4GHz;

c) Press [Measure]→[Generator] →[Generator Off On], to start the source switch;

d) Press [Measure]→[Generator] →[Power -20dBm], to set the power of output signal;

e) Press [Measure] →[Generator] →[Mode CW Track], to change the signal source mode to tracking mode.

The schematic diagram of output signal is as shown in Fig. 4-26:

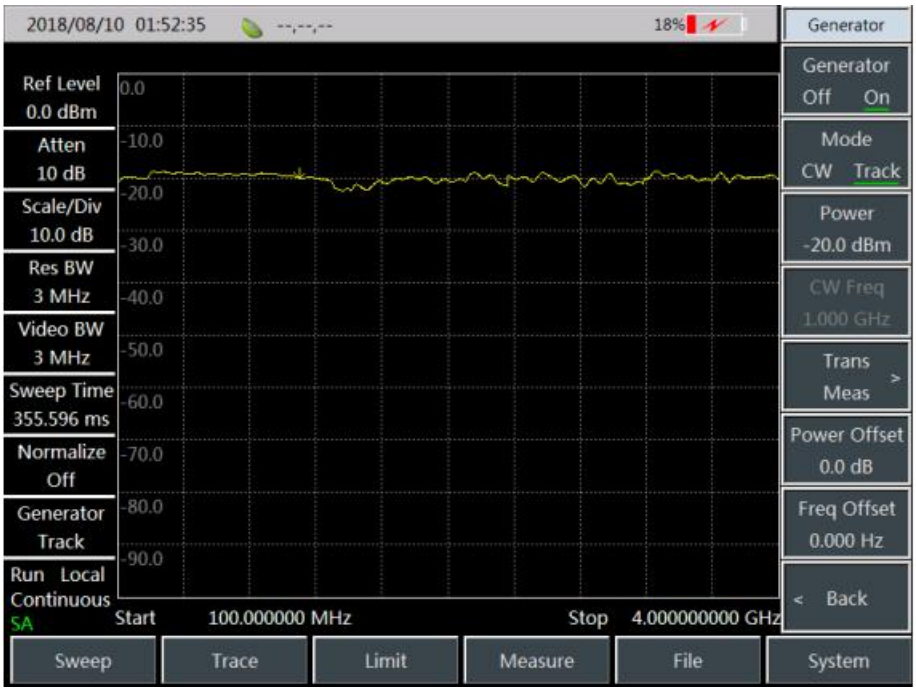


Fig. 4-26 Schematic diagram of tracking mode

3) Generator normalized measurement

The normalized measurement is to subtract the effect of cable loss from the measuring process. It can reflect the magnitude-frequency characteristics of measured piece more accurately. For example, to test the magnitude-frequency characteristics of 2.3GHz~2.4GHz band-pass filter, it is allowed to conduct the following procedures:

a) Press [Freq]→[Start Freq], to set the start frequency as 2.1GHz;

b) Press [Freq]→[Stop Freq], to set the stop frequency as 2.6GHz;

c) Press [Freq]→[Generator]→[Generator Off On], to start the source switch;

d) Press [Measure]→[Generator]→[Mode CW Track], to change the signal source mode to tracking mode;

e) Connect the cable to signal source RF output end and frequency spectrum input end, and press [Measure]→[Generator]→[Trans Meas]→[Normalize Off On], to start the normalization switch;

f) After the scanning is completed, it is allowed to add the filter of measured piece and directly observe the magnitude-frequency characteristics of measured piece.

The magnitude-frequency characteristics diagram of 2.3GHz - 2.4GHz band-pass filter is as shown in Fig.

4-27:

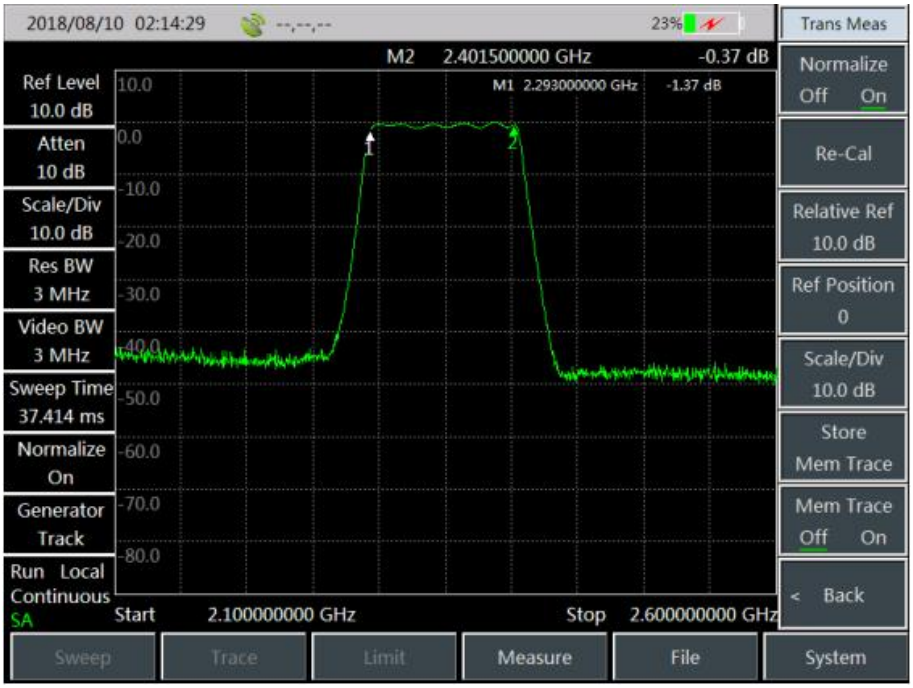


Fig.4-27 Magnitude-frequency characteristics diagram of 2.3GHz-2.4GHz band-pass filter

10 Coverage map (option)

The interference map option can be used for RSSI testing and adjacent channel power ratio testing, and the test results can be marked on the map in real time based on time or distance. The test results marked on the map can be saved to the instrument for later recall.

1) RSSI measurement

Main operation steps of RSSI measurement:

a) Press [Measure]→[Coverage Map]→[Coverage Map Off On], in the default, the measurement mode is RSSI measurement after the interference map switch is turned on.

b) Press [Freq]→[Center Freq], set the measured signal frequency.

c) Press [Measure]→[Coverage Map]→[Measurement Setup]→[RSSI], set the color of the different signals received on the map.

d) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Type Time Dist], set the way to map the information according to the time interval or how to move the distance.

e) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Time], set the time which takes to mark data once on the map.

f) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Dist], set the distance which takes to mark data once on the map.

g) Press [Measure]→[Coverage Map]→[Start Collection], start the RSSI test and mark the results on the map..

The RSSI measurement of the coverage map is shown in Fig. 4-28 as below:

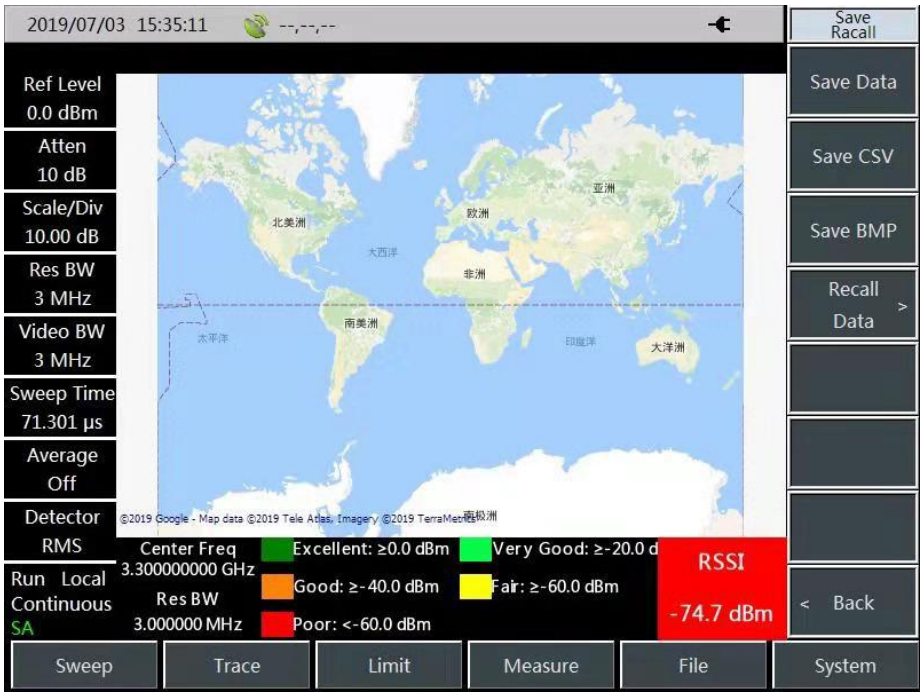


Fig.4-28 Schematic diagram of RSSI measurement

2) Adjacent channel power ratio measurement

Main operation steps of adjacent channel power ratio measurement:

a) Press [Measure]→[Coverage Map]→[Coverage Map Off On], in the default, the measurement mode is RSSI measurement after the interference map switch is turned on.

b) Press [Freq]→[Center Freq], set the measured signal frequency.

c) Press [Measure]→[Coverage Map]→[Measurement Setup]→[ACPR], set the ACPR measurement.

d) Press [Measure]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Main Ch BW], set the main channel bandwidth.

e) Press [Measure]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Adj Ch BW], set the adjacent channel bandwidth.

f) Press [Measure]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Ch Spacing], set the channel interval.

g) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Type Time Dist], set the way to map the information according to the time interval or how to move the distance.

h) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Time], set the time which takes to mark data once on the map.

i) Press [Measure]→[Coverage Map]→[Distance Time]→[Repeat Dist], set the distance which takes to mark data once on the map.

j) Press [Measure]→[Coverage Map]→[Start Collection], start the ACPR measurement and mark the results on the map..

The ACPR measurement of the coverage map is shown in Fig. 4-29 as below:

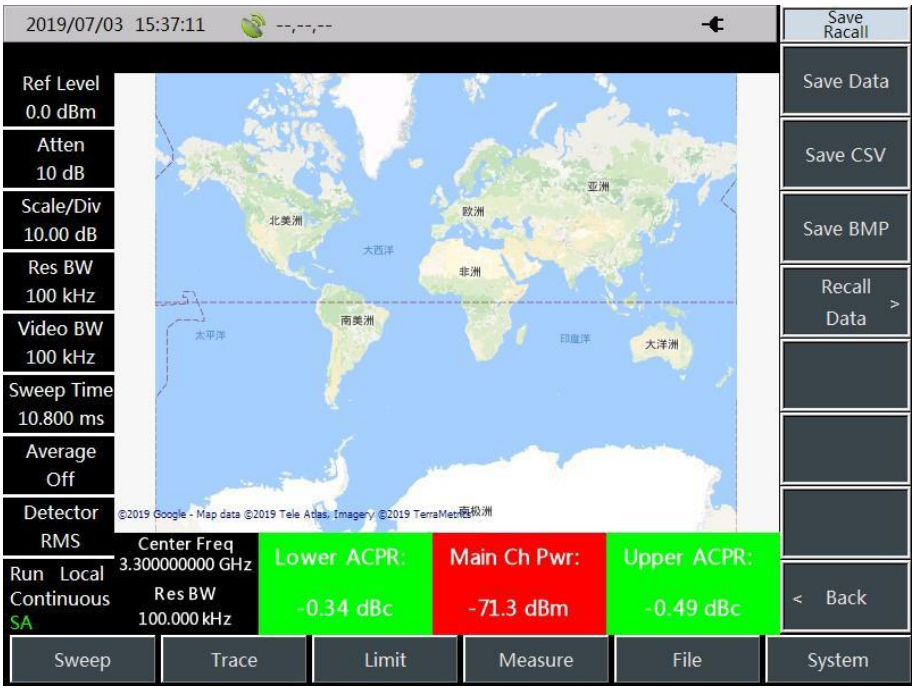


Fig.4-29 Schematic diagram of ACPR measurement

Section 2 Structure of Spectrum Analysis Menu

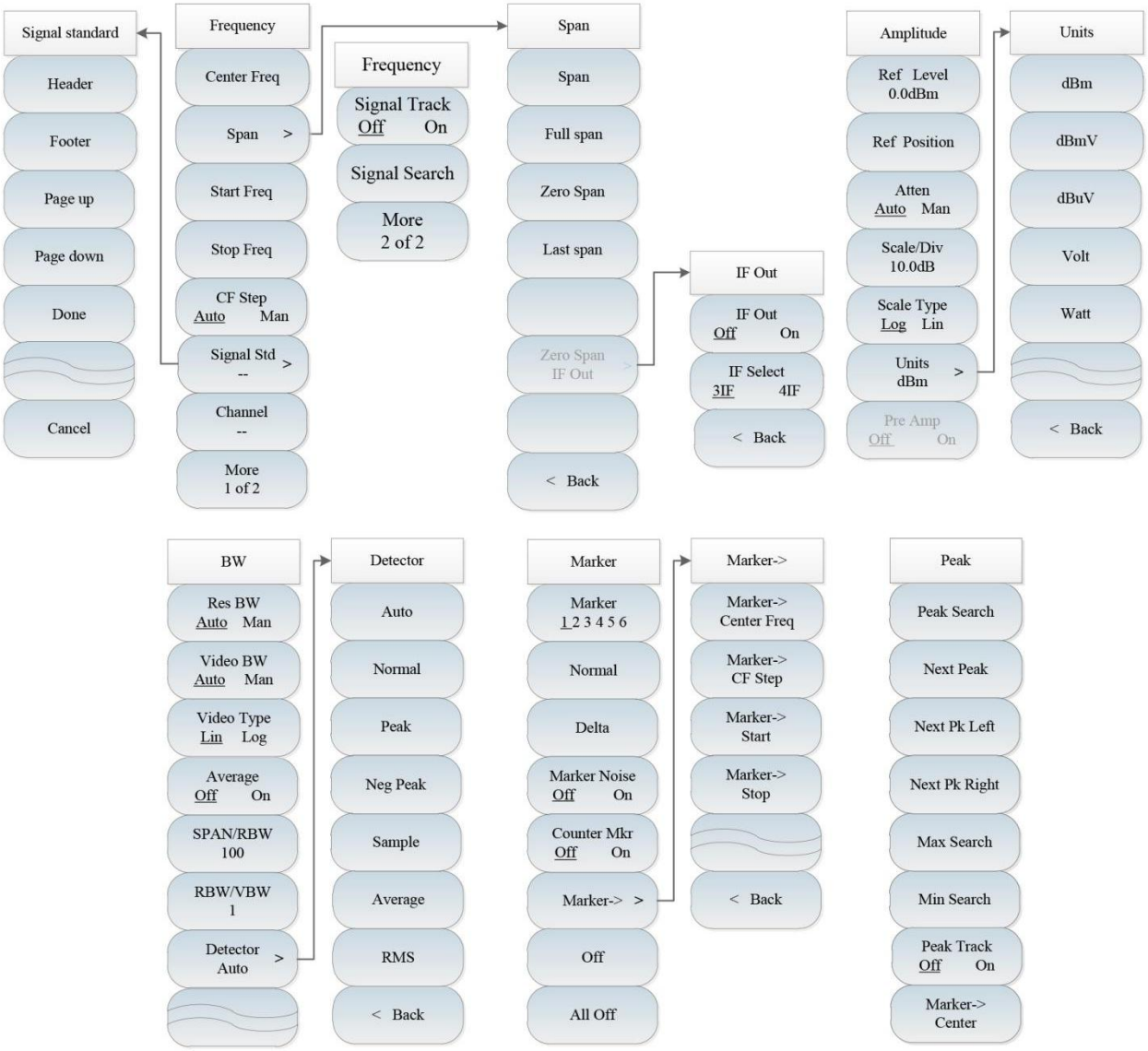


Fig. 4-30 Overall Block Diagram of Spectrum Analysis Menu

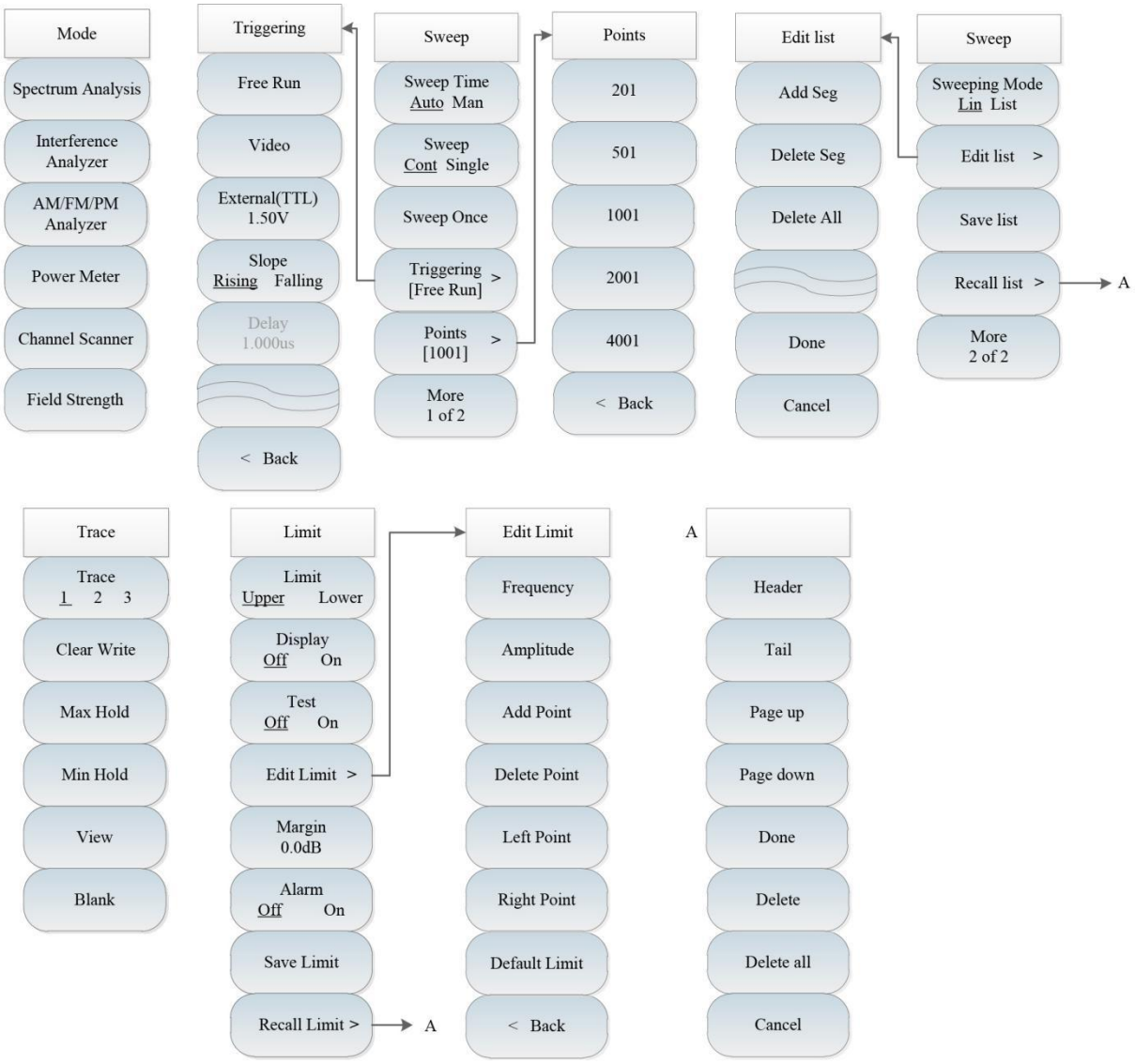


Fig. 4-31 Overall Block Diagram of Spectrum Analysis Menu (continued)

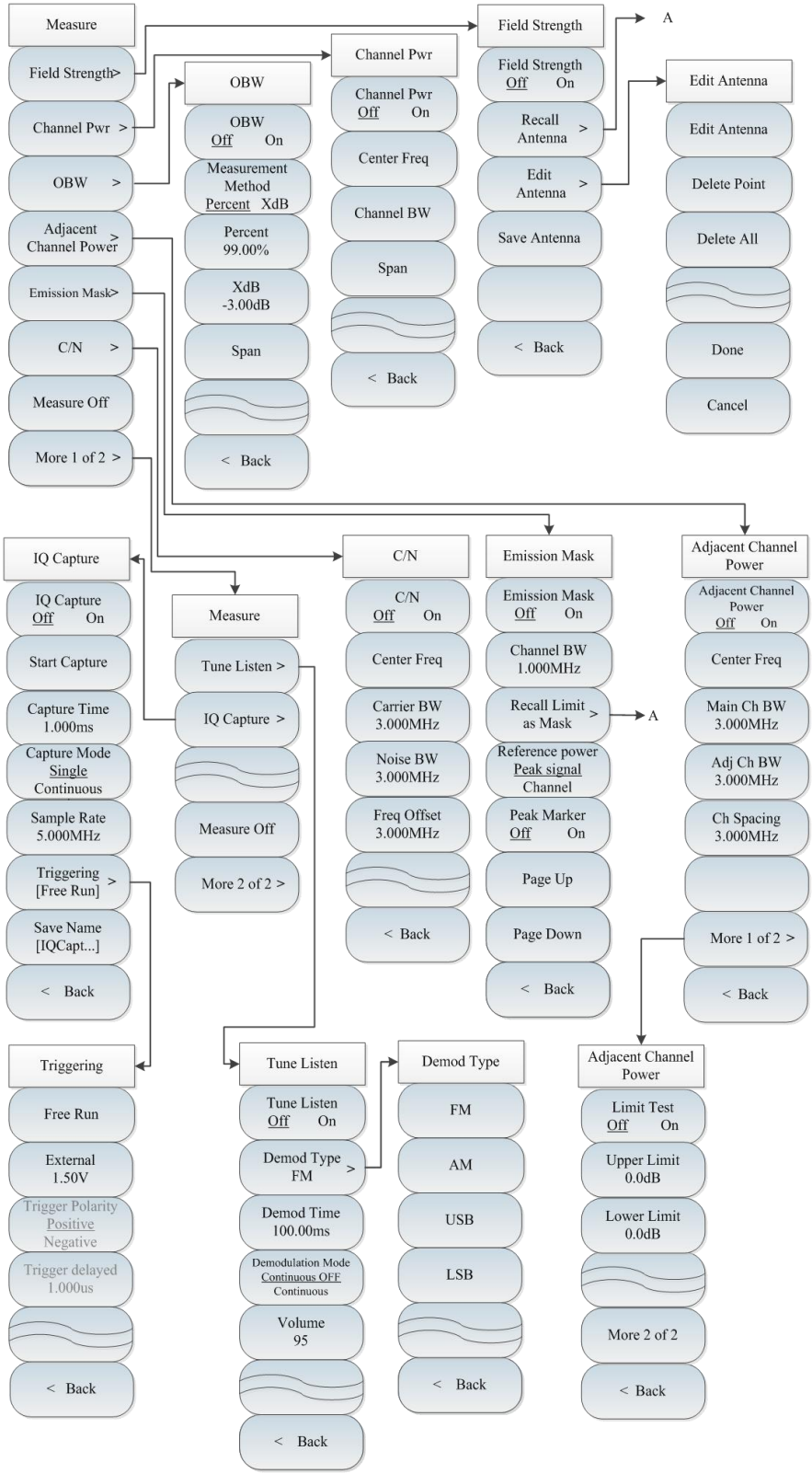


Fig. 4-32 Overall Block Diagram of Spectrum Analysis Menu (continued)

Fig. 4-33 Overall Block Diagram of Spectrum Analysis Menu (continued)

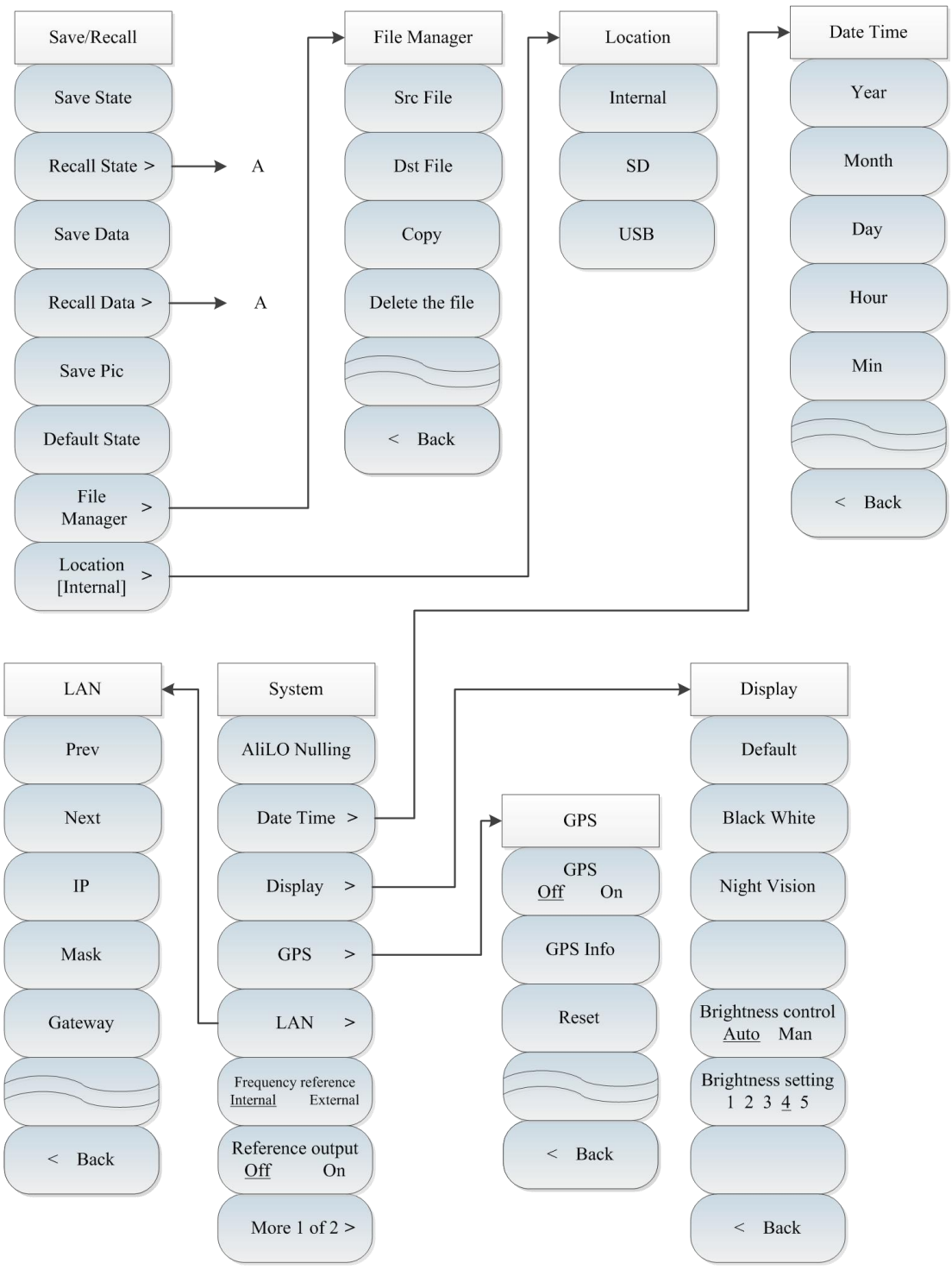


Fig. 4-34 Overall Block Diagram of Spectrum Analysis Menu (continued)

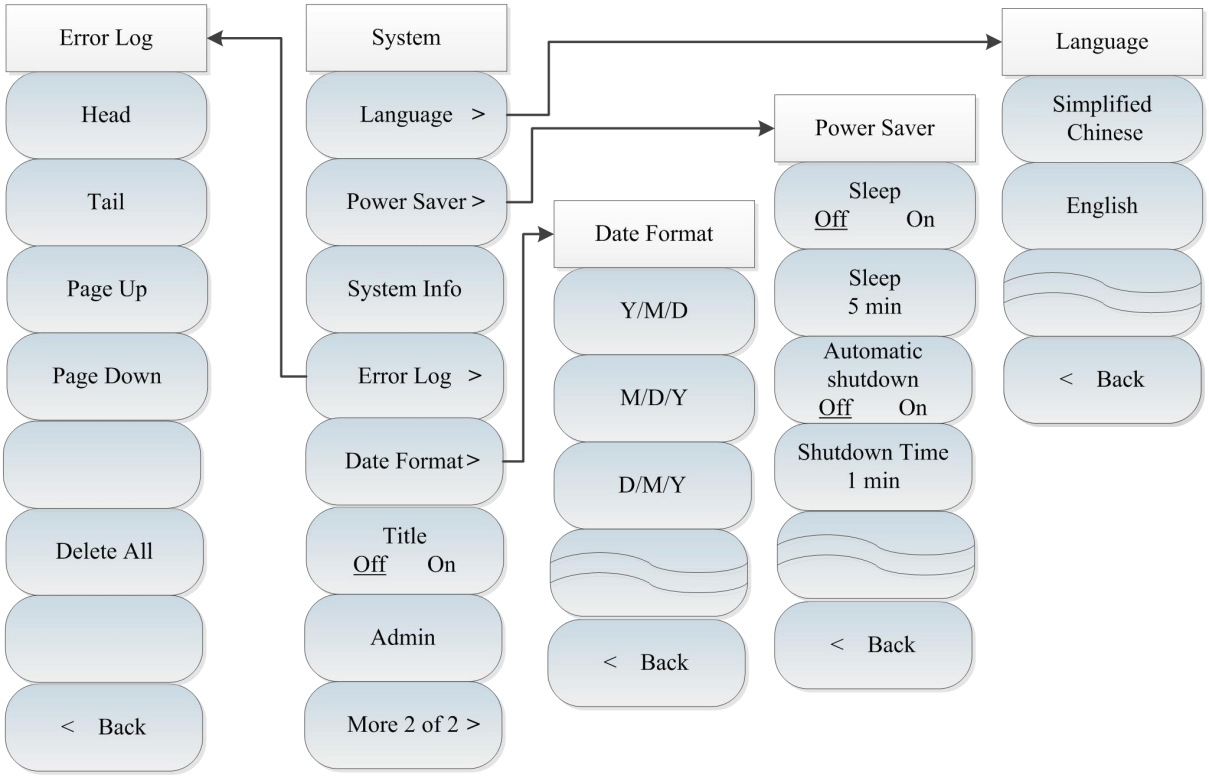
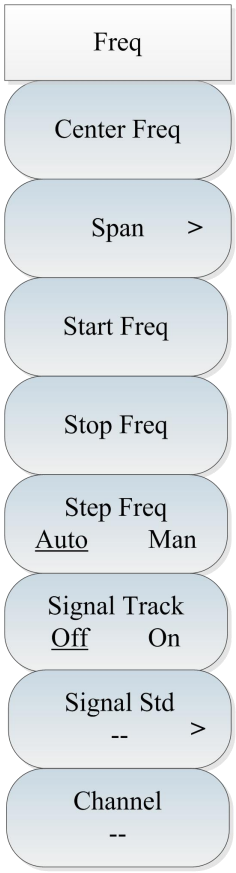


Fig. 4-35 Overall Block Diagram of Spectrum Analysis Menu (continued)

Section 3 Description of "Spectrum Analysis" Menu

1. Frequency menu



· **[Center frequency]:** Press →[Center Freq] and set it with the number keys on the front panel. Then select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or set the center frequency with the [↑] or [↓] key or knob.

·**[Span]:** Press [Frequency]→[Span] to enable the span setting menu. Refer to the [Span] menu description for specific details.

·**[Starting frequency]:** Press [Frequency]→ [Start Freq], and set it with number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu or set the starting frequency with the [↑] or [↓] key or knob.

·**[Stop Freq]:** Press [Frequency]→ [Stop Freq], and set it with number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu or set the stop frequency with the [↑] or [↓] key or knob.

·[Step frequency]: Press [Frequency]→ [Step Freq], and set it with number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu or set the step frequency with the [↑] or [↓] key or knob.

·**[Signal Track Off On]:** Click this menu to enable or disable signal tracking. After each sweeping, the active marker will be set at the peak point of the signal by the signal tracking function. The peak frequency will be set as the center frequency. By selecting [Signal On Off], the signal drifting slowly will be automatically kept at the center of the screen.

[Signal Std]: Click it and the signal standard menu will pop up, including soft menus such as [Head], [Tail], [Page Up], [Page Down] and [Done]. Click [Done] to select the required signal standard file.

[Channel]: Click it to display the contents and number of the selected signal standard.

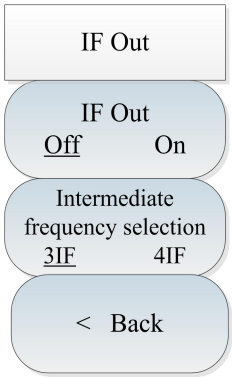
[Special note]: The channel should be set based on the applied signal standard; otherwise, the prompt that setting is not allowed will pop up.

2. Span menu

Span Span Full Span Zero Span Last Span Zero Span IF Out < Back	**[Span]:** Press [Frequency]→ [Span] and set the span of the current mode with number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu or set the span with the [↑] or [↓] key or knob. The span step should be 1, 2 or 5. ·**[Full span]:** Press [Frequency]→ [Span]→ [Full Span], and set the span of the current measurement mode as the maximum span. The full span is related to the instrument mode. For S3302G series spectrum analyzer, the full span is 44.1GHz. ·**[Zero span]:** Press [frequency]→[Span]→[Zero Span], and set the span of the current measurement mode as the minimum span. Under the full span, it should be set as 0Hz. ·**[Last span]:** Press [Frequency]→ [Span]→ [Last Span], and set the span of the current measurement mode as the last span. ·**[Zero Span IF Out]:** Press [Frequency]→ [Span]→ [Zero Span IF Out] to activate the IF output menu. **[Special note]: The full span and zero span function will be invalid when some measurement functions are enabled.** **[Special note]: The IF output menu, as a functional option, can only be applied in the zero span mode.**

3. IF output menu

The zero-span IF output function is optional. The third or fourth IF signal output can be achieved through the IF output interface under the zero span to meet the user's measurement requirements.



·[Special note]: The IF output menu, as a functional option, can only be applied in the zero span mode.

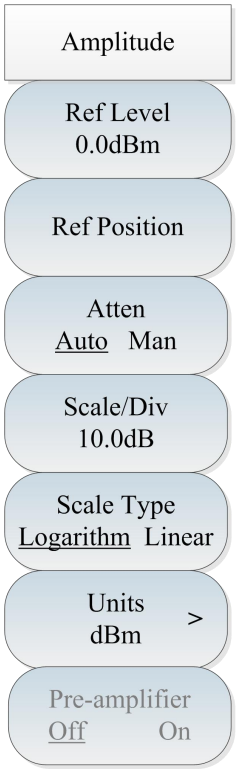
·[IF Out Off On]: Press [Frequency]→ [Span]→ [IF Out]→ [IF Out Off On] and enable or disable IF output with keys.

·[IF Select 3IF 4IF]: Press [Frequency]→[Span]→[IF Out]→[IF Select 3IF 4IF] and select the 3IF or 4IF output with keys.

·[Back]: Press [Frequency]→ [Span]→ [IF Out]→ [Back] to go back to the span menu.

·[Special note]: The IF output function is an option under zero span. If 3IF is selected, the IF output interface will output the third IF frequency, i.e. 140.25MHz; and if 4IF is selected, the IF output interface will output the fourth IF frequency, i.e. 31.25MHz.

4. Amplitude menu



·**[Reference level]:** Press [Amplitude]→ [Ref Level] and set it with number keys on the front panel. Select [dBm], [-dBm], [mV] or [μ V] in the frequency unit menu, or set the reference level with the [↑] or [↓] key or knob.

·**[Reference position]:** Press [Amplitude]→ [Ref Position], and select the position of the reference line in the rectangular coordinate graph by clicking corresponding number keys.

·**[Atten Auto Man]:** Press [Amplitude]→[Atten Auto Man] to adjust the input attenuation of the spectrum analyzer. In the AUTO mode, the input attenuator is associated with reference level. Under Man Mode, use number keys, stepping keys or knob to change the attenuation of the attenuator. The attenuation range is 0dB to 50dB.

·**[Scale/Division]:** Press [Amplitude]→[Scale/Div]. Adjust the size of the vertical coordinate division on the screen, and set the value with number keys on the front panel. Select the frequency unit, or set the value with the [↑] or [↓] key or knob. The setting range is 0.1dB/division to 20dB/division. The default setting is 10dB/division.

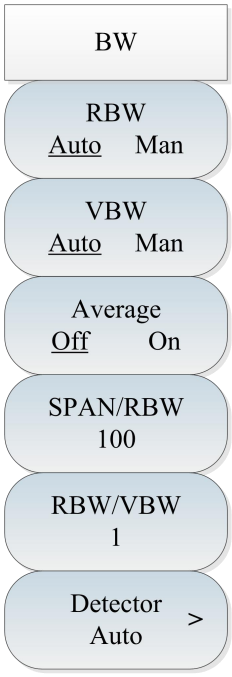
·**[Scale Type Log Lin]:** Press [Amplitude]→ [Scale Type Log Lin], and set the vertical-axis scale as the logarithmic or linear scale. The default logarithmic scale is in dBm, while the default linear scale is in mV.

·**[Amplitude unit]:** Press [Amplitude]→ [Units], and select the vertical-axis unit, including [dBm], [dBmV], [dBuV], [Volt] and [Watt].

·**[Pre-amplifier Off On]:** Turn on or off the pre-amplifier. This function cannot be activated until the reference level is less than -40dBm.

[Special note]: The level of the input signal must be +13dBm or less before the pre-amplifier is turned on; otherwise, the instrument will be damaged.

5. Bandwidth menu



·**[RBW Auto Man]:** Press [BW]→[RBW Auto Man] and adjust the resolution bandwidth within the range of 1Hz-10MHz. The resolution bandwidth can be changed with the number keys, step keys or knob in the manual mode, by the step of 1, 3 or 10. It can be changed with the span according to the SPAN/RBW value in the auto mode.

·**[Video Bandwidth Auto Man]:** Press [BW]→[VBW Auto Man] to adjust the video bandwidth in the active functional zone. The adjustment range is 1Hz-10MHz. In the manual mode, the video bandwidth can be changed with the number keys, step keys or knob in the manual mode, by the step of 1, 3 or 10. In the auto mode, it can be changed with the span according to the RBW/VBW value.

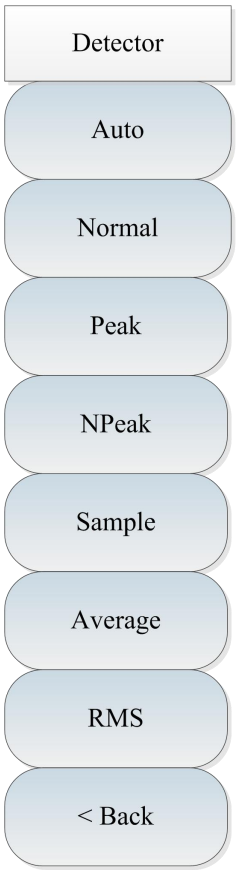
·**[Average Off On]:** Press [BW]→ [Average Off On] to enable the averaging function. The "Sample" mode of the detector will be enabled by this function. At the same time, traces will be continuously averaged to achieve the smoothing effects.

·**[SPAN/RBW]:** Press [BW]→[SPAN/RBW] to set the ratio of the current span to resolution bandwidth. The value will be displayed in the input zone. The default setting is 100. This ratio can be applied in the associated mode of the resolution bandwidth.

·**[RBW/VBW]:** Press [BW]→[RBW/VBW] to set the ratio of the current video bandwidth to resolution bandwidth. The default setting is 1. When the resolution bandwidth changes, the video bandwidth will automatically change in the auto mode to meet the ratio requirements. This ratio will be displayed in the input zone and applied in the associated mode of both bandwidths. If a new ratio is selected, the video bandwidth will change to meet the new ratio requirements, while the resolution bandwidth will remain unchanged.

·**[Detector]:** Press [BW]→ [Detector], and the soft menu of detector mode will pop up. Refer to the [Detector] menu description for details.

6. Detector menu



·**[Auto]:** The default setting of the detector menu is the normal mode.

·**[Normal]:** If noise is detected in this mode, the positive and negative peak measurement results will be displayed at the same time, so as to achieve the display effects similar to those of the analog instrument. If the signal is detected, only the positive peak will be displayed. This is the most commonly used detector mode. You can see the signal and noise floor at the same time, with no signal loss.

·**[Peak]:** Enable the positive peak mode. This mode can ensure that no peak signal will be missing, thus facilitating measurement of signals close to the noise floor. The positive peak detector is selected in the [Max Hold] mode.

·**[Neg Peak]:** Enable the negative peak mode. In this mode, the negative peak level will be displayed on the trace. This is applied in self-inspection of the broadband MMW spectrum analyzer in most cases, and rarely applied in measurement. The modulation envelope of AM signals can be well reproduced. The positive peak detector is selected in the [Min Hold] mode.

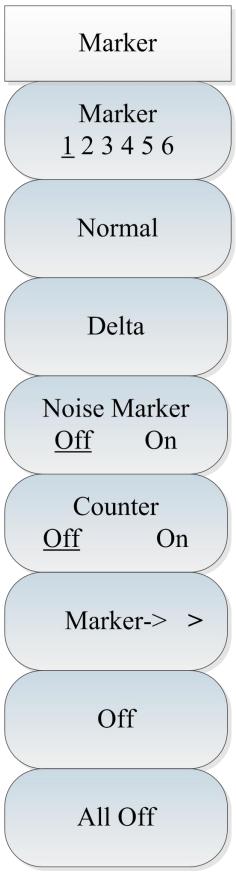
·**[Sample]:** Enable the sample mode of the detector. This mode is conducive for noise signal measurement. Compared with the normal mode, noise can be better measured. This mode is generally applied in the video average and noise marker function.

·**[Average]:** Enable the average mode of the detector. The average of sample data within each sampling interval will be displayed on the trace.

·**[RMS]:** Enable the RMS mode of the detector. The RMS value of sample data within each sampling interval will be displayed on the trace.

·**[Back]:** Go back to the previous menu.

7. Marker menu



·**[Marker 1 2 3 4 5 6]:** Press [Marker]→[Marker 1 2 3 4 5 6] to select various markers. Activate one marker and set it at the trace center. The values will be displayed in the marker display zone in the right upper corner of the screen.

·**[Normal]:** Press [Marker]→ [Normal] to display the marker frequency and amplitude. Move the active marker with the knob, step keys or number keys. The default amplitude is in dB.

·**[Delta]:** Press [Marker]→[Delta] to display the amplitude difference and frequency difference (time difference under zero bandwidth) of two markers. Move the active marker with the knob, step keys or number keys. The default amplitude difference is in dB.

·**[Noise Marker Off On]:** Press [Marker]→ [Noise Marker Off On] to enable or disable the noise marker. If the ON state is selected, the noise marker will be active. Read the noise power at which noise is normalized to 1Hz bandwidth near the active marker. In this case, the “Sample” mode of the detector is active.

·**[Counter Mkr Off On]:** Press [Marker]→[Counter Mkr Off On] to enable or disable the marker counter function. If no marker is active but the marker counter function is enabled, one mobile marker will be activated in the middle of the screen.

·**[Marker>>]:** Press [Marker]→[Marker→], and soft menus related to the marker functions will pop up. Such menus are related to the frequency and bandwidth of the spectrum analyzer and the normal or differential mode of the marker. By using such marker functions, the user can change spectrum analyzer settings with the marker as the reference.

·**[off]:** Press [Marker]→[Off] to disable the current marker and related marker functions, such as: [Noise marker]. [Noise marker].

·**[All Off]:** Press [Marker]→ [All Off] to disable all markers and related marker functions, such as: [Noise marker].

·**[Marker→Center]:** Press [Marker]→ [Marker→]→ [Marker→Center]. The marker will move to the center frequency, and the center frequency will be displayed on the screen.

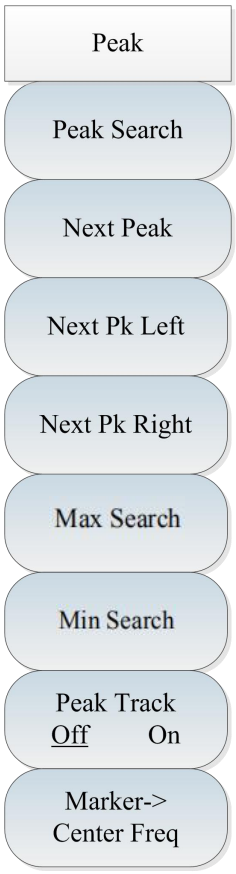
·**[Marker→CF Step]:** Press [Marker]→ [Marker→]→ [Marker→CF Step] and set the step of the center frequency. The step is equal to the marker frequency. If the differential marker function is activated, the frequency step is equal to the frequency of the differential marker.

·**[Marker→Start]:** Press [Marker]→ [Marker→]→ [Marker→Start], and set the starting frequency as the marker frequency.

·**[Marker→Stop]:** Press [Marker]→ [Marker→]→ [Marker→Stop] and set the stop frequency as the marker frequency.

·**[Back]:** Go back to the previous menu.

8. Peak menu



·**[Maximum Peak]:** Press [Peak]→[Peak Search] to set one marker at the peak of the trace. The marker frequency and amplitude will be displayed in the right upper corner of the screen.

·**[Next Peak]:** Press [Peak]→[Next Peak] to move the active marker to next peak associated with the current marker location on the trace. The lower peak can be rapidly found by repeatedly pressing this key.

·**[Next Peak Left]:** Press [Peak]→[Next Pk Left] to find next peak on the left side of the current marker location.

·**[Next Peak Right]:** Press [Peak]→[Next Pk Right] to find next peak on the right side of the current marker location.

·**[Max Search]:** Press [Peak]→[Max Search] to set one marker at the lowest point of the trace. The marker frequency and amplitude will be displayed in the right upper corner of the screen.

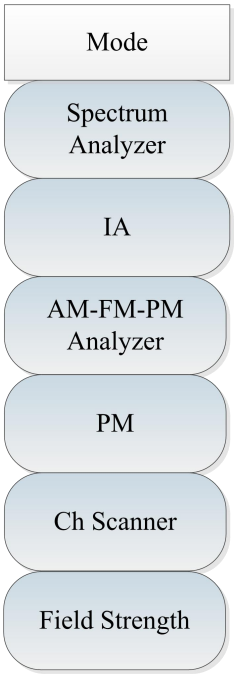
·**[Min Search]:** Press [Peak]→[Min Search] to set one marker at the lowest point of the trace. The marker frequency and amplitude will be displayed in the right upper corner of the screen.

·**[Peak Track Off On]:** Press [Peak]→[Peak Track Off On] to enable the peak tracking function. The current marker will search the peak once after each sweeping. Any operation will not be allowed if the peak tracking function is disabled.

·**[Marker→]:** Press [Peak]→ [Marker→] to set the marker frequency as the center frequency. This function can be applied to rapidly move the signal to the screen center.

9 Mode menu

The default functional mode under the mode menu is the spectrum analyzer mode. You can add the following functional options according to the needs: interference analyzer, AM-FM-PM analyzer, power meter, channel scanner and field strength.



·**[Spectrum Analyser]:** Press [Mode]→ [Spectrum Analyzer] to enable the spectrum analyzer mode.

·**[Interference Analyzer]:** Press [Mode]→ [Interference Analyzer] to enable the interference analyzer mode. Refer to Chapter V “Interference Analyzer Mode” for details.

·**[AM-FM-PM Demodulation]:** Press [Mode]→ [AM-FM-PM Analyzer] to enable the AM-FM-PM analyzer mode. Refer to Chapter VII “AM-FM-PM Analyzer Mode” for details.

·**[Power meter]:** Press [Mode]→ [Power Meter] to enable the power meter mode. Refer to Chapter VI “Power Meter Mode” for details.

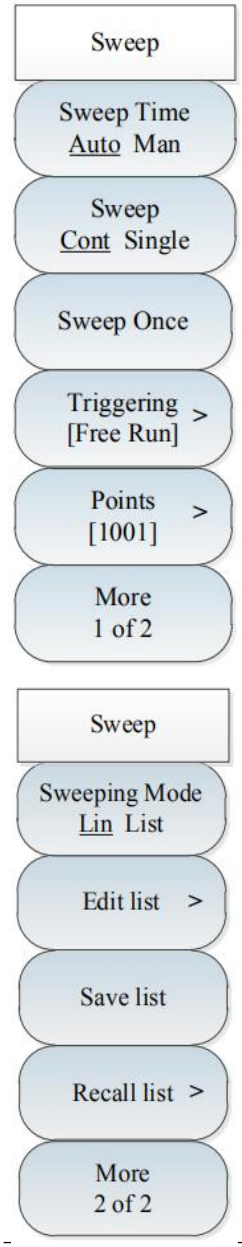
·**[Channel Scanner]:** Press [Mode]→ [Channel Scanner] to enable the channel scanner mode. Refer to Chapter VIII “Channel Scanner Mode” for details.

·**[Field Strength]:** Press [Mode]→ [Field Strength] to enable the field strength measurement mode. Refer to Chapter IX “Field Strength Measurement Mode” for details.

10 Sweep menu

The sweep time refers to the time required for the LO tuning of the spectrum analyzer within the selected frequency interval, and directly affects the time of one test. It generally changes with the span, resolution bandwidth and video bandwidth. In the auto mode, the minimum sweep time will be adopted by the spectrum analyzer after measurement setting. The sweep time can be increased in the manual mode to meet specific measurement needs.

The default sweep mode is linear sweeping, while list sweeping is optional. Multiple segment can be swept continuously. The functions of editing, saving and recalling the list are available, thus facilitating the operation.



· **[Sweep Time Auto Man]:** Press [Sweep]→[Sweep Time] to adjust the sweep time of the spectrum analyzer. Use the number keys, step keys or knob to adjust the sweep time. If "Man" is underlined, the sweep time can be set manually. If "Auto" is underlined, the sweep time will be automatically associated according to the resolution bandwidth, frequency bandwidth and video bandwidth.

· **[Sweep Cont Single]:** Press [Sweep]→[Sweep Type] to enable the continuous or single sweeping mode.

· **[Sweep Once]:** Press [Sweep]→ [Sweep Once] to sweep once again.

· **[Triggering]:** Press [Sweep]→ [Triggering] to select the triggering mode, including [Free Run], [Video], [External], etc. Refer to the trigger menu for details.

· **[Points [1001]]:** This is optional. Press [Sweep]→[Points] to enable the soft menu of points select. You can use soft keys such as [201], [501], [1001], [2001], [4001] to set sweep points.

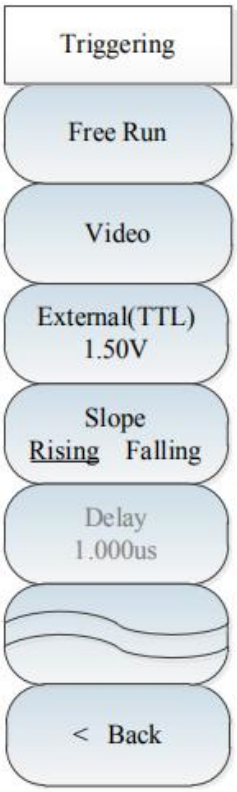
· **[Sweep Mode Lin List]:** Press [Sweep]→[Sweep Mode] to enable the linear or list mode. In the linear mode, sweeping will be performed based on the linear frequency interval, and the frequency intervals of adjacent measurement points are the same. The list mode is optional, in which sweeping will be performed based on the set frequency range and other parameters in the edited list.

·**[Edit List]:** This is optional. Press [Sweep]→[Edit List] to enable the soft menu of list editing. You can use soft keys such as [Add Seg], [Delete Seg] and [Delete All] to manage and edit the sweep lit. The selected segment will be in green. After editing the segment, press [Done] and [OK] to go back to the sweep menu.

	· **[Save List]:** This is optional. Press [Sweep]→[Save List] to save the current list into the spectrum analyzer for future recalling. · **[Recall List]:** This is optional. Press [Sweep]→[Recall List], and the list dialog box will pop up, in which you can recall or delete the required list.

11 Triggering menu

It is applied to select the triggering mode under "Sweep" or "Measure", including [Free Run], [Video], [External], [Slope] and [Delay]. The user can select the corresponding triggering mode based on the needs.

	· **[Free Trigger]:** When the previous single or continuous sweep finishes, the next sweep or measurement is automatically triggered. · **[Video]:** Set the trigger mode as [Video]. Once the input signal exceeds the set video triggering level sweeping will be triggered. The trigger level value can be set by the number keys, stepping keys or knob. The green line on the screen indicates the selected trigger level. · **[External (TTL)]:** Enable the [External] mode. Set the triggering level and synchronize "Sweep" or "Measure" with next voltage cycle. · **[Slope]:** Control the positive or negative polarity of level triggering. The rising edge will be applied for triggering in the case of positive polarity, and falling edge in the case of negative polarity. · **[Delayed]:** The level triggering delay can be set. In this case, the spectrum analyzer will wait for the delay time after receiving the external trigger signal and before sweeping.

12 Trace menu

This is applied to display the trace. You can enable [clear], [max], [min], etc. based on various test needs. For example, if the maximum holding function of the trace is enabled in drift signal measurement, the maximum peak amplitude and frequency drift of the input signal will be display.

· **[Trace 1 2 3]:** Press [Trace]→[Trace 1 2 3] to select the trace. Three traces are available in the spectrum analyzer: 1, 2 and 3. The selected trace number and status menu will be underlined.

· **[Clear Write]:** Press [Trace]→[Clear Write] to refresh all data of the previous trace and continuously display the signal received by the spectrum analyzer in the sweep mode.

· **[Max. Hold]:** Press [Trace]→[Max Hold] to hold the maximum value of the points on the selected trace. In addition, the value will be updated based on the new maximum value detected in each sweeping. In the "Auto" mode of the detector, the positive peak will be enabled.

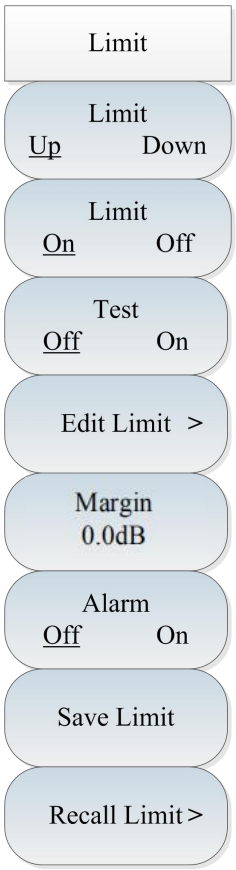
· **[Min Hold]:** Press [Trace]→[Min Hold] to hold the minimum value of the points on the selected trace. In addition, the value will be updated based on the new minimum value detected in each sweeping. In the "Auto" mode of the detector, the negative peak will be enabled.

·**[View]:** Press [Trace]→[View] to hold and display the amplitude data of the selected trace. Such data are not updated in the sweeping mode of the spectrum analyzer.

· **[Blank]:** Press [Trace]→[Blank] to start background processing, without display on the screen.

· **[Special attention]: If [Max Hold] and [Min Hold] are enabled at the same time, the [Sample] function of the detector will be enabled under the auto mode.**

13 Limit menu



· **[Limit Upper Lower]:** Press [Limit]→[Limit Upper Lower] to set the current limit as the upper or lower limit.

· **[Limit Off On]:** Press [Limit]→ [Limit Off On] to enable or disable the limit function.

· **[Test Off On]:** Press [Limit]→ [Test Off On] to enable or disable the limit test.

·**[Edit Limit]:** Press [Limit]→ [Edit Limit], including [Frequency], [Amplitude], [Add Point], [Delete Point], [Left Point], [Right Point] and [Default Limit], to view the frequency and amplitude of the limit point, and add or delete the limit point.

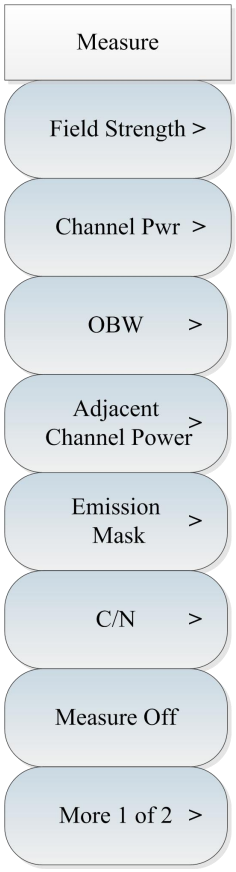
· **[Margin]:** Press [Limit]→ [Margin] to set the offset allowance.

· **[Alarm Off On]:** Press [Limit]→[Alarm Off On] to enable or disable the audio alarm. The enabled audio alarm will be valid when the upper or lower limit test is ON. The buzzer will utter a short sound if the value is beyond the upper and lower limit during sweeping of the current screen.

· **[Save Limit]:** Press [Limit]→ [Save Limit] to save the limit.

· **[Recall Limit]:** Press [Limit]→ [Recall Limit], including [Head], [Tail], [Page Up], [Page Down], [Done], [Delete] and [Cancel] to recall or delete the saved limit.

14 Measurement menu



· **[Field Strength]:** Press [Measure]→[Field Strength] to enable the field strength measurement function and recall the related functional menu. Refer to the [Field Strength] menu description for details.

· **[Channel Power]:** Press [Measure]→[Channel Power] to enable the channel power function and recall the related functional menu. Refer to [Channel Power] menu description for details.

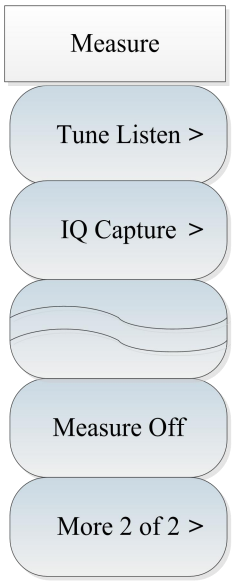
· **[Occupied Bandwidth]:** Press [Measure]→[OBW] to enable the occupied bandwidth function and recall the related functional menu. Refer to [OBW] menu description for details.

· **[ACPR]:** Press [Measure]→[ACPR] to select the adjacent channel power function and recall the related functional menu. Refer to [ACPR] menu description for details.

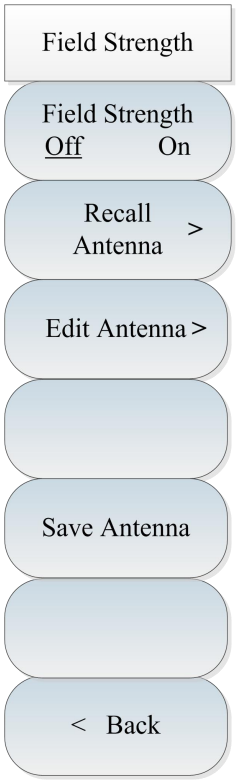
· **[Emission mask]:** Press [Measure]→[Emission Mask] to enable the emission mask function and recall the related functional menu. Refer to [Emission Mask] menu description for details.

· **[C/N]:** Press [Measure]→[C/N] to enable the C/N measurement function and recall the related functional menu. Refer to [C/N] menu description for details.

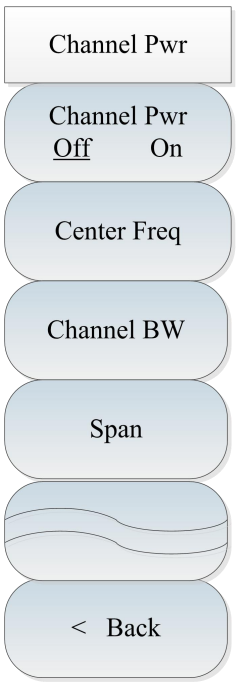
· **[All Meas OFF]:** Press [Measure]→ [All Meas Off] to disable measurement functions.

	· **[Tune Listen]:** Press [Measure]→ [More 1/2]→ [Tune Listen] to enable the tune listening function. Refer to [Tune Listen] menu description for details. ·**[IQ Capture]:** Press [Measure]→ [More 1/2]→ [IQ Capture] to enable the IQ capture function. Refer to [IQ Capture] menu description for details.

The spectrum analyzer has the function of field strength measurement, including soft menus such as [Field Strength Off On], [Recall Antenna], [Edit Antenna] and [Save Antenna]. The field strength can be rapidly tested with such menus and corresponding test antennas.

	· **[Field Strength Off On]:** Press [Measure]→ [Field Strength]→ [Field Strength Off On] to enable or disable the field strength measurement function. · **[Recall Antenna]:** Press [Measure]→ [Field Strength]→ [Recall Antenna], and soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete] will pop up, you can select and recall the saved antenna factor file in the spectrum analyzer. ·**[Edit Antenna]:** Press [Measure]→ [Field Strength]→ [Edit Antenna], and soft menus such as [Add Point], [Delete Point], [Delete All], [Done] and [Cancel] will pop up. You can edit the antenna factor. ·**[Save Antenna]:** Press [Measure]→ [Field Strength]→ [Save Antenna] to save the antenna factor. · **[Back]:** Press [Measure]→ [Field Strength]→ [Back] to exit the field strength menu and go back to the “Measure” menu.

The spectrum analyzer has the function of channel power measurement. You can measure the channel power of the signal by setting relevant parameters in the functional menu and selecting the appropriate resolution bandwidth and span. Refer to the channel power measurement requirements in the first section of this chapter for specific operations.



· **[Channel Power Off On]:** Press [Measure]→ [Channel Power]→ [Channel Power Off On] to enable or disable the channel power measurement function.

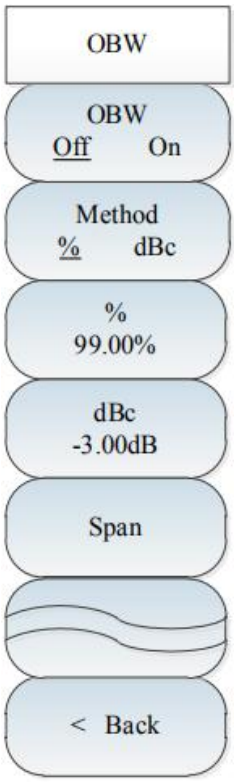
· **[Center frequency]:** Press [Measure]→ [Channel Power]→ [Center Freq] and set the center frequency with number keys.

· **[Channel BW]:** Press [Measure]→ [Channel Power]→ [Channel BW] and set the channel bandwidth with number keys.

· **[Span]:** Press [Measure]→ [Channel Power]→ [Span] and set the channel span with number keys.

· **[Special attention]: The channel power bandwidth refers to the frequency width of the power displayed by the spectrum analyzer within the bandwidth, while the channel power span refers to the sweeping frequency range of the spectrum analyzer. The channel power span should be more than or equal to the channel power bandwidth. Otherwise, the channel power bandwidth will be automatically set to be equal to the channel power span. The ratio of the channel power span to channel power bandwidth is a constant. It remains unchanged when the channel power span is changed. You can change this ratio by changing the channel power bandwidth. For example, when the channel power span is doubled, the channel power bandwidth will be increased by the same times.**

Results can be rapidly, clearly and accurately in occupied bandwidth measurement of the spectrum analyzer. Depending on the modulation mode, two methods can be applied to calculate the occupied bandwidth: power percentage and power drop XdB. The user can select the appropriate occupied bandwidth measurement method according to the needs. Refer to the occupied bandwidth measurement requirements in the first section of this chapter for specific operations.

	· **[OBW Off On]:** Press [Measure]→ [OBW]→ [OBW Off On] to enable or disable the occupied bandwidth measurement function. · **[Method]:** Press [Measure]→ [OBW]→ [Method % dBc] to select the appropriate test method, including percentage and drop dBc. In the percentage method, the occupied bandwidth of the signal is obtained by calculating the bandwidth of the frequency of certain percentage to the total power of the transmitted power, and the power percentage can be set by the user. In the drop dBc method, the occupied bandwidth is defined as follows: spacing between two frequency points corresponding to signal power drop by dBc on both sides of the frequency point where the signal peak power is. The signal power drop dBc can be set by the user. · **[%]:** Press [Measure]→ [OBW]→ [%] to set the power percentage in the percentage method. ·**[dBc]:** Press [Measure]→ [OBW]→ [dBc] to set the signal power drop dBc in the power drop dBc method. · **[Span]:** Press [Measure]→ [OBW]→ [Channel Sweep] to set the sweeping frequency bandwidth of occupied bandwidth measurement.

The spectrum analyzer has the function of adjacent channel power ratio measurement. The user can obtain measurement results by setting relevant parameters of the channel. By using the limit test function, the user can define the adjacent channel limits so as to easily observe whether the adjacent channel power exceeds the set range. Refer to the requirements of adjacent channel power ratio measurement in the first section of this chapter for specific operations.

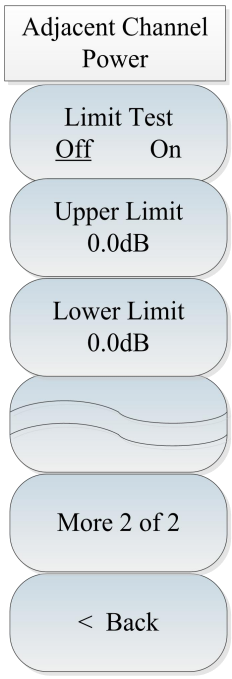
· **[ACPR Off On]:** Press [Measure]→ [ACPR]→ [ACPR Off On] to enable or disable the ACPR measurement function.

· **[Center frequency]:** Press [Measure]→ [ACPR]→ [Center Freq] and set the center frequency with number keys.

· **[Main Ch BW]:** Press [Measure]→ [ACPR]→ [Main Ch BW] and set the main channel bandwidth with number keys.

· **[Adjacent Ch BW]:** Press [Measure]→ [ACPR]→ [Adj Ch BW] and set the adjacent channel bandwidth with number keys.

· **[Ch Spacing]:** Press [Measure]→ [ACPR]→ [Ch Spacing] and set the channel spacing with number keys.



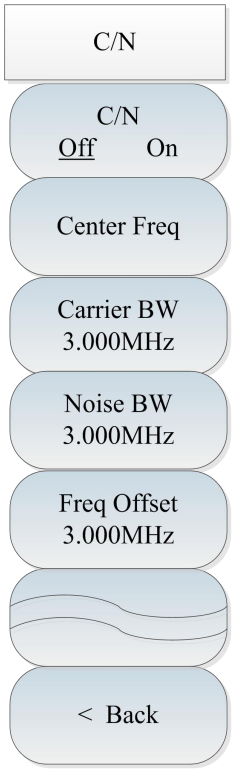
· **[Limit Test Off On]:** Press [Measure]→ [ACPR]→ [Limit Test Off On] to enable or disable the upper and lower limit test of the adjacent channel power.

· **[Upper Limit]:** Press [Measure]→ [ACPR]→ [Upper Limit] to set the upper limit of the power of the adjacent channel test.

· **[Lower Limit]:** Press [Measure]→ [ACPR]→ [Lower Limit] to set the lower limit of the power of the adjacent channel test.

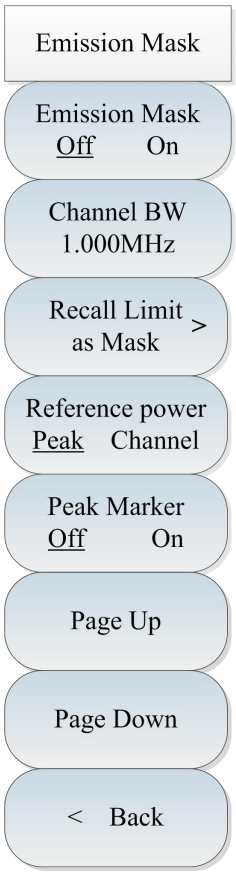
[Special note]: If ACPR exceeds the set limit in the limit test, the screen background will turn red as the mark.

The spectrum analyzer has the C/N measurement function, which is applied to measure the ratio of the carrier power to noise power.



- **[C/N Off On]:** Press [Measure]→ [C/N]→ [C/N Off On] to enable or disable the C/N function.
- **[Center frequency]:** Press [Measure]→ [C/N]→ [Center Freq] and set the center frequency of measurement with number keys.
- **[Carrier BW]:** Press [Measure]→ [C/N]→ [Carrier BW] and set the carrier bandwidth with number keys. The default setting is 3MHz.
- **[Noise BW]:** Press [Measure]→ [C/N]→ [Noise BW] and set the noise bandwidth with number keys. The default setting is 3MHz.
- **[Frequency Offset]:** Press [Measure]→ [C/N]→ [Offset] and set the frequency offset with number keys. The default setting is 3MHz.

The emission mask function is applied to measure whether the signal power exceeds the mask limits, where the limits are recalled as the masks. The mask can be moved right and left or up and down according to the center frequency and reference power. In the mask, the limit center is always moved right and left to the center frequency, and also moved up and down to the reference power point based on the calculated reference power.



· **[Emission Mask Off On]:** Press [Measure]→ [Emission Mask]→ [Emission Mask Off On] to enable or disable the emission mask function.

·**[Channel BW]:** Press [Measure]→ [Emission Mask]→ [Channel BW] and set the reference channel bandwidth with number keys.

· **[Recall Limit]:** Press [Measure]→ [Emission Mask]→ [Recall Limit], and relevant soft menus will pop up, including [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete]. The user can select the limit file to be recalled.

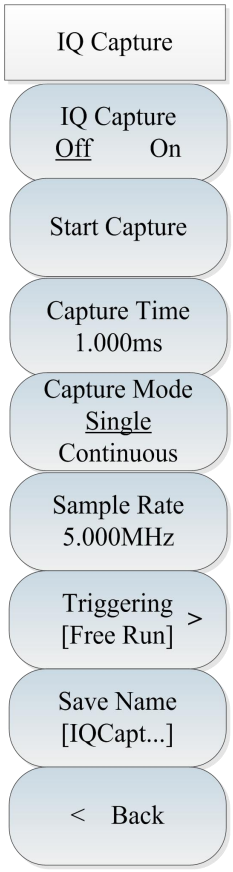
· **[Reference power]:** Press [Measure]→[Emission Mask]→[Ref Power] to set the reference power setting mode. The peak power or channel power may be used as the reference power.

· **[Peak Markers Off On]:** Press [Measure]→ [Emission Mask]→ [Peak Markers Off On] to enable or disable the peak marker.

· **[Page Up]:** Press [Measure]→ [Emission Mask]→ [Page Up] to view the information on the previous page.

· **[Page Down]:** Press [Measure]→ [Emission Mask]→ [Page Down] to view the information on the following page.

By using the IQ capture function, the original IQ data can be captured according to the capture time, sample rate and capture mode set by the user, and data files can be saved for data analysis.



· **[IQ Capture Off On]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [IQ Capture Off On] to enable or disable the IQ capture function.

· **[Start Capture]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Start Capture] to start IQ capture.

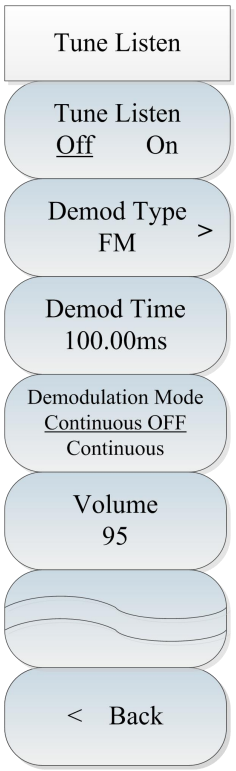
· **[Capture time]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Capture Time] to set the IQ capture time.

· **[Capture Mode]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Capture Mode] to enable the single or continuous IQ capture. In the single mode, the data will be captured once only. In the continuous mode, the data will be captured once after each sweeping of the stroke, and capturing will not be stopped until otherwise set by the user.

· **[Sample rate]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Sample Rate] to set the sample rate of IQ capture.

· **[Triggering]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Triggering] to set the triggering mode, including [Free Run] and [External]. In the [External] mode, [Slope] and [Delay] can be set.

· **[Save Name IQCapture]:** Press [Measure]→ [More 1/2]→ [IQ Capture]→ [Save Name] to save the captured data.



· **[Tune Listen Off On]:** Press [Measure]→ [More 1/2]→ [Tune Listen]→ [Tune Listen Off On] to enable or disable the tune listening function.

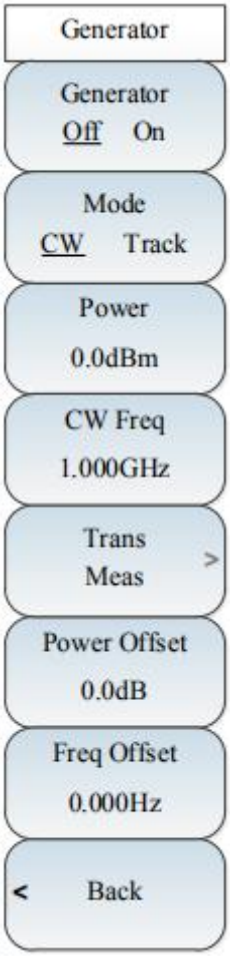
· **[Demodulation type]:** Press [Measure]→ [More 1/2]→ [Tune Listen]→ [Demod Type] to set the demodulation type. The following demodulation types are available: [FM], [AM], [USB] or [LSB].

· **[Demodulation Time]:** Press [Measure]→ [More 1/2]→ [Tune Listen]→ [Demod Time] to set the listening time.

[Listen Mode]: Press [Measure]→ [More 1/2]→ [Tune Listen]→ [Listen Mode] to set the listening mode. The default setting is the intermittent listening mode, in which the data will be listened for the set listening time after sweeping of one screen, and the above cycle is repeated. In the continuous mode, data will not be swept but will be continuously listened after sweeping of one screen.

· **[Volume]:** Press [Measure]→ [Tune Listen]→ [Volume] to set the loudspeaker volume in the tune listening mode.

15 Signal source menu (option)



·**[Signal Source Off On]:** press [Measure] → [More 1 of 2]→[Generator] →[Generator Off On], to activate or deactivate the signal source.

·**[Tracking Mode Off On]:** press[Measure]→[More 1 of 2] →[Signal Source] →[Mode CW Track], to activate or deactivate the signal source tracking mode.

·**[Special Notice]:** the tracking mode switch is effective when the signal source switch is started. In case of Off, the independent source mode and the point frequency source output will be activated independent of spectral analysis. At this time, the set point frequency and output power menus will be effective but the transmission measurement, power offset and frequency offset menus are ineffective; in case of Track, the tracking mode will be activated, the synchronous scanning will be done at signal source frequency and spectral analysis mode frequency, the set point frequency menu will be infective, and the output power, power offset, frequency offset and transmission measurement will be effective.

·**[power 0.0 dBm]:** press [Measure]→[More 1 of 2] →[Generator] → [Power 0.0dBm], to change the output power by using number key or key [↑] or[↓].

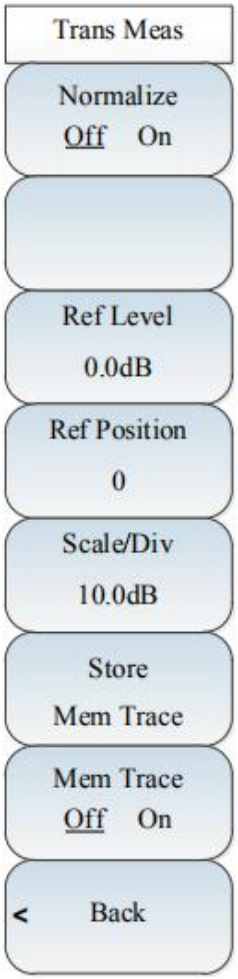
·**[Special Notice]:** the output power range is -40dBm~0dBm with step size of 1dB.

·**[CW Freq 1.000GHz]:** press [Measure] →[More 1 of 2] →[Generator] →[CW Freq 1.000GHz], to change the CW frequency by using number key or key [↑] or [↓].

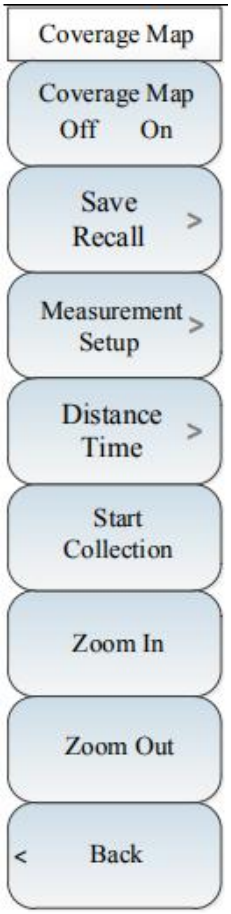
·**[Power Offset 0.0dB]:** press [Measure]→[More 1 of 2]→[Generator] → [Power Offset 0.0dB]. When there is gain or loss between generator output and peripheral equipment, it is allowed to use this parameter to set the signal source power offset so as to indicate the actual power of system. This parameter cannot change the actual output power of generator but its power reading.

·**[Special Notice]: The parameter range is -200dB~200dB with default value of 0dB and step size of 1dB, which is effective when the tracking mode is activated.**

·**[Freq Offset 0.000Hz]:** press [Measure] →[More 1 of 2] →[Generator] →[Freq Offset 0.000Hz], to set the offset value of generator output signal

	frequency and current spectrometer scan frequency. ·**[Special Notice]:** The parameter range is -300MHz - 300MHz with default value of 0Hz, which is effective when the tracking mode is activated. The frequency offset must be set to ensure that the generator can reach the maximum frequency at 100kHz.
	·**[Normalize Off On]:** press [Measure]→[More 1 of 2] →[Generator] → [Trans Meas] → [Normalize Off On], to activate or deactivate the normalized measurement. ·**[Ref Level 0.0dB]:** press [Measure]→[More 1 of 2] →[Generator] → [Trans Meas] →[Ref Level 0.0dB], to activate the normalized and adjust the ref level so as to adjust the vertical position of trace on screen. ·**[Special Notice]: The parameter range is -200dB to 200dB with default value of 0dB and step size of 1dB, which is effective when the tracking mode and normalized are activated.** ·**[Ref Position 0]:** press [Measure] →[More 1 of 2] →[Generator] → [Trans Meas] →[Ref Position 0], to activate the normalized and adjust the ref position so as to adjust the vertical position of normalized ref level on screen. ·**[Special Notice]:** The parameter range is 0 - 10 with default value of 5 and step size of 1, which is effective when the tracking mode is activated. ·**[Scale/Div 10.0dB]:** press [Measure]→[More 1 of 2]→[Generator]→ [Trans Meas] →[Scale/Div 10.0dB], to activate the normalized and adjust the scale/div so as to adjust the Y-axis precision of trace on screen. ·**[Special Notice]:** The parameter range is 0~10 with default value of 5 and step size of 1, which is effective when the tracking mode is activated. ·**[Store Mem Trace]:** press [Measure]→[More 1 of 2]→[Generator]→ [Trans Meas]→[Store Mem Trace]. It is allowed to save the data of current mem trace. ·**[Mem Trace Off On]**: press [Measure]→[More 1 of 2]→[Generator]→ [Trans Meas]→[Mem Trace Off On]. Set whether the mem trace is displayed or not.

16 Coverage map menu (option)



·**[Coverage Map Off On]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Coverage Map Off On], to set the coverage map function.

·**[Save/ Recall]:** press[Measure]→[More 1 of 2]→[Coverage Map]→ [Save/ Recall], to open the save/recall submenu.

·**[Measurement Setup]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup], to open the measurement submenu.

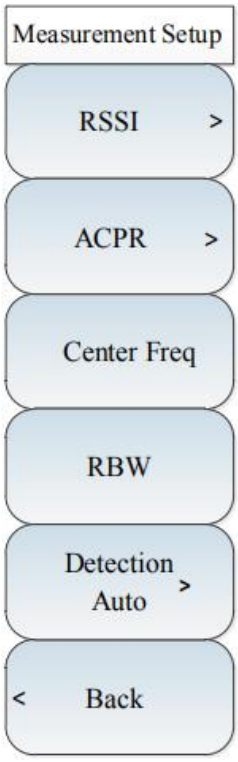
·**[Distance/ Time]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Distance Time], to open the distance/time submenu.

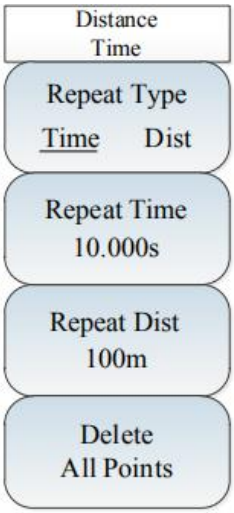
·**[Start Collection]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Start Collection], to start measuring the data and mark the location and measurement results on the map. The interval between each two annotations can be set via the [Distance Time] menu.

·**[Zoom In]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Zoom In], to set the map zoom in display.

·**[Zoom Out]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Zoom Out], to set the map zoom out display.

	·**[Save Data]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Save Recall]→[Save Data], to save the collected data to the instrument. ·**[Save CSV]:** press[Measure]→[More 1 of 2]→[Coverage Map]→[Save Recall]→[Save CSV], to save the collected data as .csv file. ·**[Save BMP]:** press[Measure]→[More 1 of 2]→[Coverage Map]→[Save Recall]→[Save BMP], to save the collected data as a picture. ·**[Recall Data]:** press[Measure]→[More 1 of 2]→[Coverage Map]→[Save Recall]→[Recall Data], to recall the saved data.

	·**[RSSI]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Measurement Setup]→[RSSI], to open the RSSI measurement submenu. ·**[ACPR]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Measurement Setup]→[ACPR], to open the ACPR measurement submenu. ·**[Center Freq]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Measurement Setup]→[Center Freq], to set the center frequency. ·**[RBW]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Measurement Setup]→[RBW], to set the resolution bandwidth. ·**[Detection]:** press [Measure]→[More 1 of 2]→[Coverage Map]→ [Measurement Setup]→[Detection], to open the detection submenu.

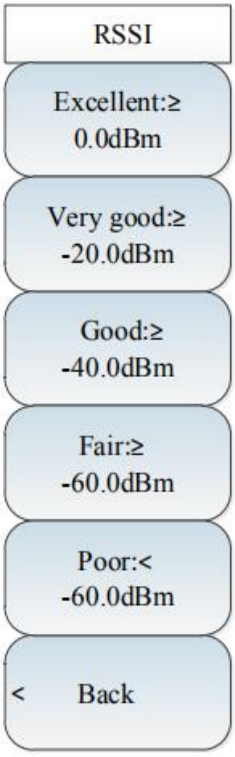


·**[Repeat Type]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Distance Time]→[Repeat Type], to set the repeat type.

·**[Repeat Time]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Distance Time]→[Repeat Time], to set the interval time between acquisitions. Only valid when the type is set to Time.

·**[Repeat Dist]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Distance Time]→[Repeat Dist], to set the interval distance between acquisitions. Only valid when the type is set to Distance.

·**[Delete All Points]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Distance Time]→[Delete All Points], to delete all collected points on the map.



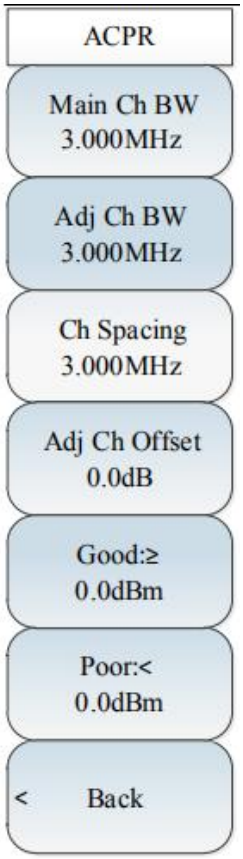
·**[Excellent:≥0.0dBm]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[RSSI]→[Excellent:≥0.0dBm], to set the color when the measured signal is greater than this value.

·**[Very good:≥-20.0dBm]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[RSSI]→[Very good:≥-20.0dBm], to set the color when the measured signal is greater than this value.

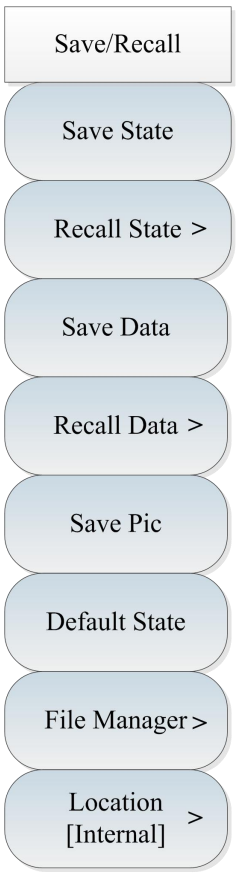
·**[Good:≥-40.0dBm]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[RSSI]→[Good:≥-40.0dBm], to set the color when the measured signal is greater than this value.

·**[Fair:≥-60.0dBm]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[RSSI]→[Fair:≥-60.0dBm], to set the color when the measured signal is greater than this value.

·**[Poor:<-60.0dBm]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[RSSI]→[Poor:<-60.0dBm], to set the color when the measured signal is lower than this value.

	·**[Main Ch BW]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Main Ch BW], to set the main channel bandwidth. ·**[Adj Ch BW]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Adj Ch BW], to set the adjacent channel bandwidth. ·**[Ch Spacing]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Ch Spacing], to set the channel interval space. ·**[Adj Ch Offset]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Adj Ch Offset], to set the adjacent channel offset. ·**[Good]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Good:≥0.0dBm], to set the color when the measured signal is greater than this value. ·**[Poor]:** press [Measure]→[More 1 of 2]→[Coverage Map]→[Measurement Setup]→[ACPR]→[Poor:<0.0dBm], to set the color when the measured signal is lower than this value..

17 File menu



· **[Save Status]:** Press [Save/Recall]→[Save State] to save the current sweeping parameters.

· **[Recall state]:** Press [Save/Recall]→ [Recall State], and the state file list will pop up, including relevant soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete]. You can read the saved state file and recall the corresponding state parameters into current sweeping.

· **[Save Data]:** Press [Save/Recall]→ [Save Data] to save the trace data.

· **[Recall Data]:** Press [Save/Recall]→ [Recall Data], and the data file list will pop, including relevant soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete]. You can read the saved data file and recall the corresponding state parameters into current sweeping.

· **[Save Pic]:** Press [Save/Recall]→ [Save Pic] to capture the current screen picture.

· **[Default State]:** Press [Save/Recall]→[Default State] to recover the default setting.

· **[File Management]:** Press [Save/Recall]→ [File Manager] and the file manager menu will pop up, including relevant soft menus such as [Src File], [Dst File], [Copy] and [Delete File]. You can copy and delete the file.

· **[Location]:** Press [Save/Recall]→[Location] to select the saving location. “Internal” means the internal memory, while “Others” means the memory with the USB interface and SD card. If the security characteristics are selected, the internal memory will not be available.

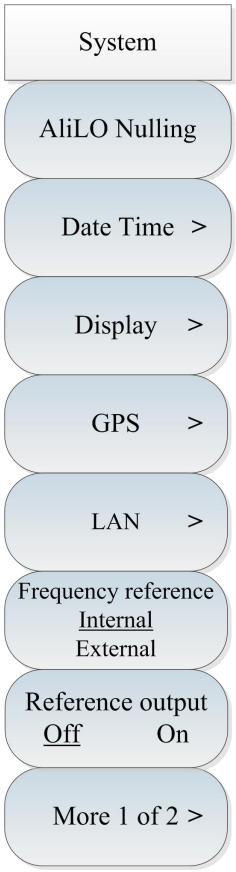
18 System menu

The system menu lists the system-related settings of S3302 series spectrum analyzer. In addition to the date/time, date format, system language, network setting and frequency reference, characteristic menus such as the LO nulling alignment, GPS positioning (optional) and power saver are available.

S3302 series spectrum analyzer has the function of LO nulling alignment, which is conducive for LO null calibration when required. To accurately measure the amplitude of the signal with the frequency below 5MHz, attention should be paid to the zero-frequency signal. If the zero-frequency signal is above >-20dBm, LO null calibration should be performed so as to prevent gain compression caused by too large amplitude of the zero-frequency signal.

The optional GPS positioning function of S3302 series can be achieved with the external GPS antenna. The user can view the number of current satellites in service and the longitude, latitude and altitude information. This function is applicable to accurate positioning in fields.

In the power saver mode, the spectrum analyzer will enter the sleep state in the case of no operation within the sleep time, including shutdown of the LCD, internal module power, etc. If any key is pressed again, the spectrum analyzer will exit the sleep state and change into the normal operating mode.



[AliLO Nulling]: Press [System]→[AliLO Nulling] to enable the LO nulling alignment function. The user can easily apply this function when required. Alignment results will be saved in the internal memory of the instrument.

· **[Date]:** Press [System]→ [Date/Time] to set the date and time.

· **[Display setting]:** Press [System]→ [Display] to set the display mode, including relevant settings of [Default], [Black & White], [Night Vision] and [Brightness].

·**[GPS]:** Press [System]→ [GPS] and soft menus related to GPS will pop up, including [GPS Off On], [GPS Info] and [Reset]. You can enable or disable the GPS function, view GPS details and reset GPS.

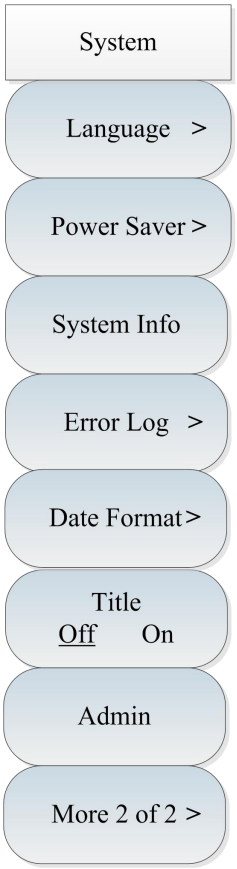
· **[Special note]: The GPS positioning function is optional.**

· **[Internet setting]:** Press [System]→ [LAN] to set the network setting of the spectrum analyzer, including [Prev], [Next], [IP], [Mask] and [Gateway].

· **[Freq Ref Int Ext]:** Press [System]→[Freq Ref Int Ext] to select the internal or external frequency reference according to the needs.

· **[Ref Output Off On]:** Press [System]→[Ref Output Off On] to enable or disable the interval reference according to the needs in the internal reference mode.

· **[Special note]: The external reference frequency must be 10MHz±100Hz, and the amplitude must be 0dBm (range: -2dBm to +10dBm). The external reference frequency must be applied through the "10MHz reference input" of the cover.**



· **[System language]:** Press [System]→ [Language] to set the language, including [simplified Chinese] and [English].

· **[Power Saver]:** Press [System]→ [Power Saver] to set the auto sleep and auto shutdown mode, including [Sleep Off On], [Sleep], [Shut Down Off On] and [Shut Down], so as to minimize power loss.

· **[System information]:** Press [System]→[System Info] to view the system information, including the application software version, custom image version, etc.

· **[Date Format]:** Press [System]→ [Date Format] to set the date format.

· **[Error Log]:** Press [System]→ [Error Log] and relevant soft menus will pop up, including [Head], [Tail], [Page Up], [Page Down] and [Delete All]. You can view relevant error information.

· **[Tip Off On]:** Press [System]→ [Tip Off On] to select the current title of the name.

· **[System Admin]:** Press [System]→[Admin] and enter the administrator password to perform system administration and setting.

[Special note]: The administration function is only available to the factory commissioning personnel or technical support personnel when required, and must not be applied by the user; otherwise, the instrument may be damaged.

Chapter V Interference Analyzer Measurement Mode (optional)

Section 1 Introduction to Typical Measurements

The interference analyzer mode is an extension of the spectrum analyzer mode. In S3302 series spectrum analyzer, the interference analyzer mode is divided into the following three modes:

Spectrum measurement (refer to the relevant chapter of spectrum analysis requirements for specific operations, not repeated here);

Spectrogram measurement;

Received signal strength indicator (RSSI) measurement.

Attention

All operations in this chapter are based on the interference analyzer mode, which will not be described separately below.

1 Spectrogram measurement

The cyclic or intermittent signal can be easily observed in the 3D spectrogram display, i.e. frequency, amplitude and time. The time signal amplitudes are reflected by various colors in the spectrogram display.

In order to better observe the measured signal, the following steps can be taken:

a) Press [Frequency]→[Span]→[Full Span] and [Peak] to obtain the maximum value of the current signal. Then press [Marker→Center] and set the current peak as the center frequency. In this case, the maximum value will be displayed at the center of the trace zone.

b) Press [BW]→[RBW Auto Man] and set the appropriate resolution bandwidth with the number keys, [↑], [↓] or knob. Similarly, set the appropriate video bandwidth.

c) Press [Amplitude]→[Ref Level] and set the current maximum point close to the top of the display zone. Press [Scale/Div] and set the appropriate scale/division to facilitate viewing

d) Press [Auto Save]→ [Sweep Interval] and set the sweep interval.

Attention

If the sweep interval is more than 0, the trace will be in the maximum holding state, so as to ensure that the maximum value of the signal in each sweeping will be displayed on the screen.

e) Press [Sweep Time] and set the record time. Then press [Auto Save Off On] to enable the auto saving mode. In this case, the data will be saved automatically after sweeping of one screen.

f) Press [Auto Save]→[Time Cursor] and move the horizontal line with the number keys, [↑], [↓] or knob in the vertical direction of the spectrogram. The following spectrogram will display the trace information on the line.

Attention

If the time marker value is more than 0., the trace and spectrogram will not be refreshed.

g) The interference analyzer mode of S3302 series spectrum analyzer involves six independent markers, which are used for reading the amplitude and frequency corresponding of the marker. Specific operations are as follows: [Maker]→[Marker 1 2 3 4 5 6].

h) Press [Save/Recall]→[Save Pic] to save the current spectrogram information in the picture form.

The spectrogram test structure is in Fig. 5-1 (the displayed contents vary from parameter settings, and Fig. 5-1 only shows an example).

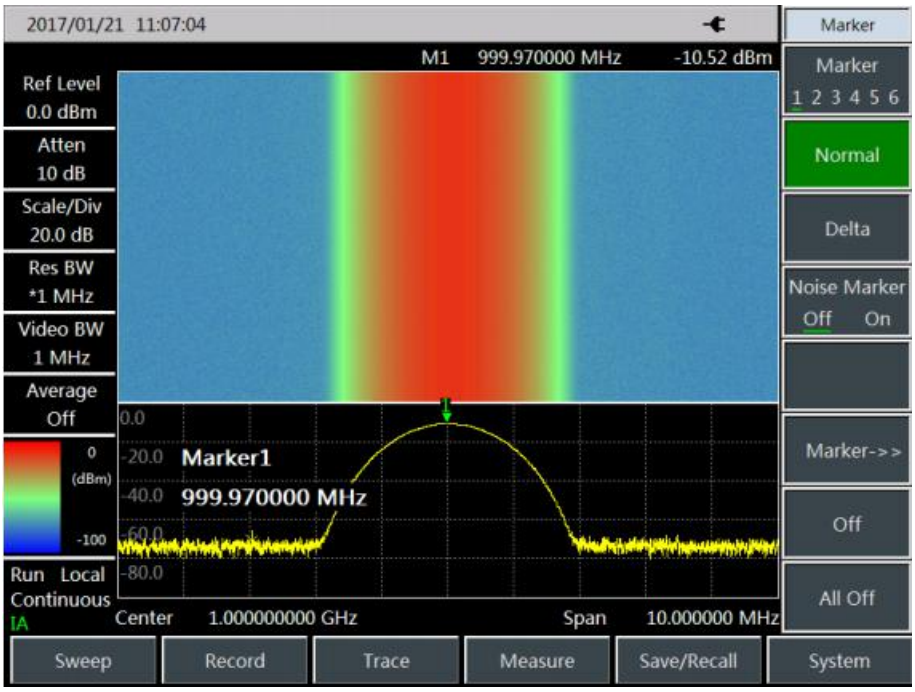


Fig. 5-1 Interference Analyzer Spectrogram

2 RSSI measurement

RSSI measurement is mainly applied to measure the strength changes of one CW signal within a certain period. In order to better observe the measured signal, the following steps can be taken:

a) Press [Auto Save]→[Sweep Interval] to set the sweep interval, which represents the sweep time between two adjacent points in each sweeping.

b) Press [Auto Save]→[Sweep Time] to set the span record time. After reaching the set span time, the display interface will not be refreshed.

c) Press [Auto Save]→[Auto Save Off On] to enable the auto saving function. The data will be automatically saved into the file after sweeping of each screen.

Attention

If the span time is set, only the latest data points on the screen will be recorded, instead of all data points within the whole span.

The RSSI test structure is shown in Fig. 5-2 (the displayed contents vary from parameter settings, and Fig. 5-2 only shows an example).

Fig. 5-2 RSSI Test Diagram of Interference Analyzer

Section 2 Structure of Interference Analyzer Menu

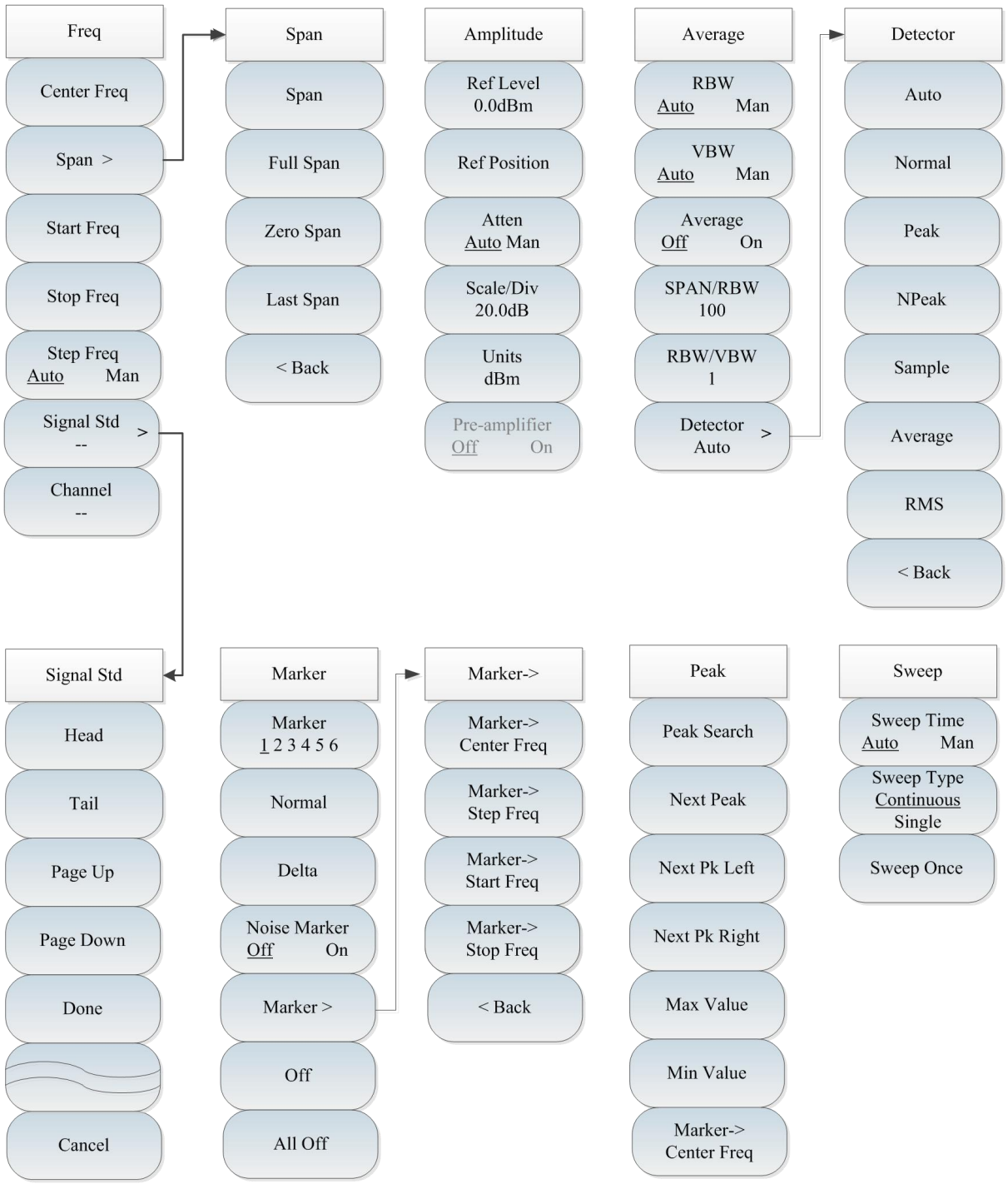


Fig. 5-3 Overall Block Diagram of Interference Analyzer Menu

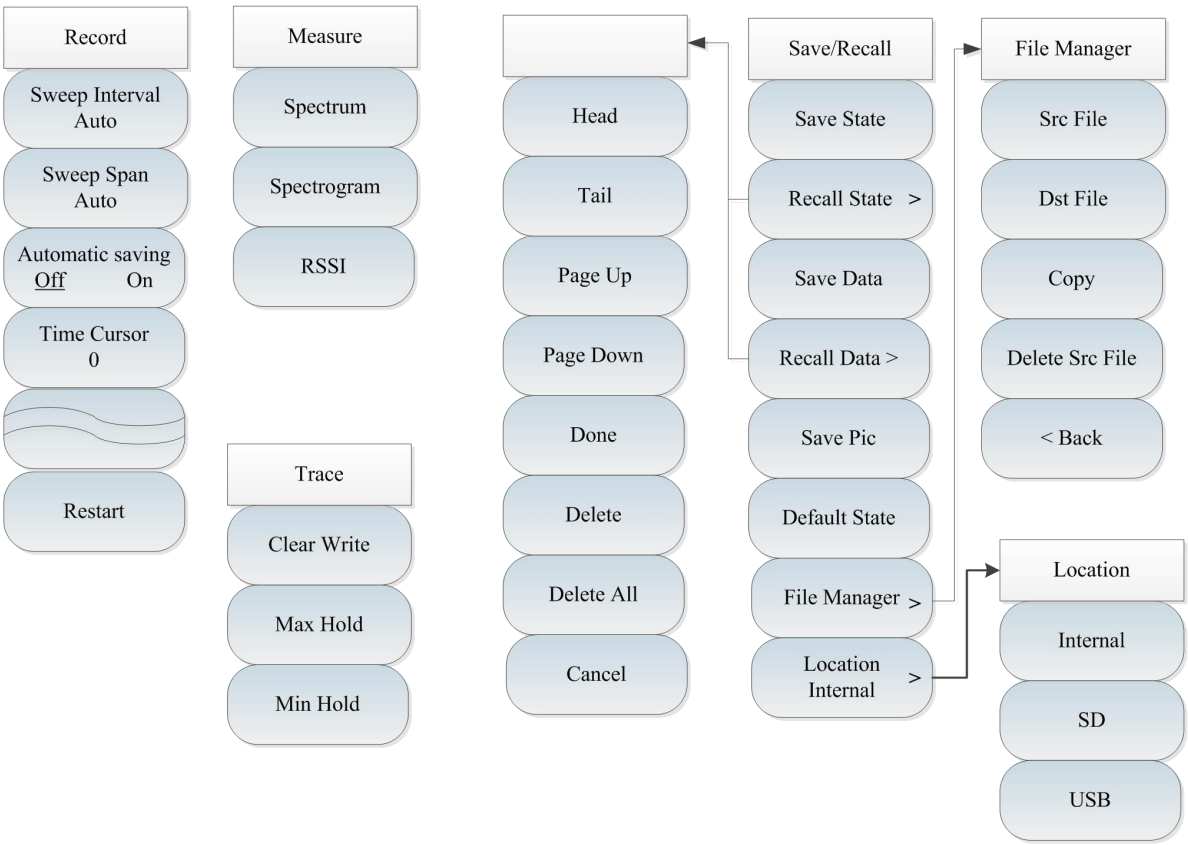
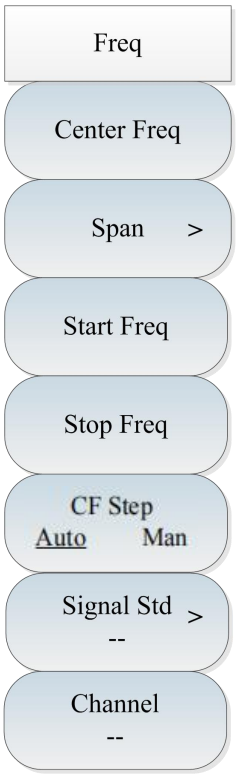


Fig. 5-4 Overall Block Diagram of Interference Analyzer Menu (continued)

Section 3 Description of Interference Analyzer Menu

1 Frequency menu



· **[Center frequency]:** Press [Frequency]→[Center Freq], and set it with number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu or set the center frequency with the [↑] or [↓] key or knob.

· **[Special note]: When the [↑] or [↓] key or knob is applied, the frequency step should be the same as the set value of [Step Freq]. You can set the step frequency with the number keys or [↑] or [↓] key or knob after changing [CF Step Auto Man] into [CF Step Auto Man].**

· **[Span]:** Press →[Span] to activate the span menu. Set the span with the number keys, and select the frequency unit, or set the span with the [↑] or [↓] key or knob. Refer to [Span] menu description for details.

· **[Special note]: When the span is changed with the [↑] or [↓] key or knob, the step should be 1-2-5 (the RSSI mode must be set under zero span).**

· **[Starting frequency]:** Press [Frequency]→[Start Freq], and set it with number keys on the front panel. Select the frequency unit, or set the value with the [↑] or [↓] key or knob.

· **[Stop frequency]:** Press [Frequency]→[Stop Freq], and set it with number keys on the front panel. Select the frequency unit, or set the value with the [↑] or [↓] key or knob.

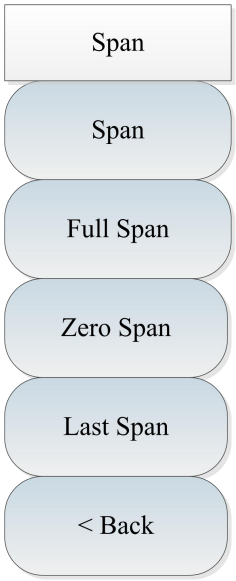
· **[Signal standard]:** Press [Frequency]→[Signal Std] and select the signal standard with the [↑] or [↓] key or knob, recall the signal standard by [Done] or [OK] in the dialog box. Refer to the dialog box for details.

· **[Special note]: When the signal standard is applied, the center frequency and span will be set as those defined in the signal standard.**

· **[Channel No.]:** Press [frequency]→[Channel], and the channel setting dialog box will pop up. Set the channel with the number keys or [↑] or [↓] key or knob.

· **[Special note]: The channel should be set based on the applied signal standard; otherwise, the prompt that setting is not allowed will pop up.**

2 Span menu



· **[Span]:** Press →[Span] to activate the span menu. Set the span with the number keys, and select the frequency unit, or set the span with the [↑] or [↓] key or knob. Refer to [Span] menu description for details.

· **[Special note]: When the span is changed with the [↑] or [↓] key or knob, the step should be 1-2-5.**

· **[Full span]:** Press [Frequency]→ [Span]→ [Full Span] and set the current span as 44.1GHz.

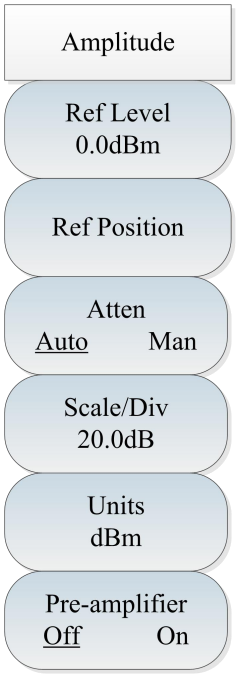
· **[Span]:** Press [Frequency]→ [Span]→ [Zero Span] and set the current span as 0Hz.

· **[Last span]:** Press [Frequency]→ [Span]→ [Zero Span] and recover the last span.

· **[Back]:** Press [Frequency]→ [Span]→ [Back] to go back to the [Frequency] menu.

· **[Special note]: The RSSI mode must be enabled under zero span.**

3 Amplitude menu



· **[Reference level]:** Press [Ampt]→ [Ref Level] and set it withe number keys on the front panel. Select [dBm], [-dBm], [mV] or [uV] in the frequency unit menu, or set the value with the [↑] or [↓] key or knob.

· **[Special note]: When the [↑] or [↓] key or knob is applied, the step should be 10dB.**

· **[Reference position]:** Press [Ampt]→ [Ref Position], and set the reference position with the number keys or [↑] or [↓] key or knob.

· **[Atten Auto Man]:** Press [Ampt]→[Atten Auto Man] to enable the auto or manual mode of the attenuator. You can change the mode with the number keys or the [↑] or [↓] key or knob.

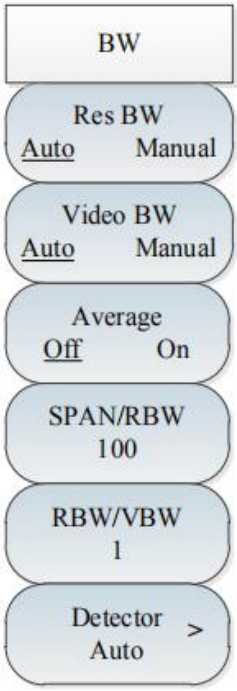
· **[Special note]: The attenuation range is 0dB - 60dB, with the step of 10dB.**

· **[Scale/Division]:** Press [Ampt]→[Scale/Div] and set it with the number keys or the [↑] or [↓] key or knob. The scale/division setting range is 0.1dB-20dB.

· **[Units]:** The amplitude unit is dBm in the interference analyzer mode.

· **[Pre-amplifier Off On]:** Press [Ampt]→[Pre Amp Off On] to turn on or off the pre-amplifier.

4 Bandwidth menu



· **[Res BW Auto Man]:** Press [BW]→[Res BW Auto Man], and set it with the number keys on the front panel or the [↑] or [↓] key or knob.

[Special note]: The resolution bandwidth depends on the bandwidth of the IF filter, while the trace shape depends on the filter of IF bandwidth. This instrument supports variable resolution bandwidth settings from 1Hz to 10MHz, with the step of 1-3-10.

· **[Video BW Auto Man]:** Press [BW]→[Vedio BW Auto Man] and change it with the number keys or the [↑] or [↓] key or knob.

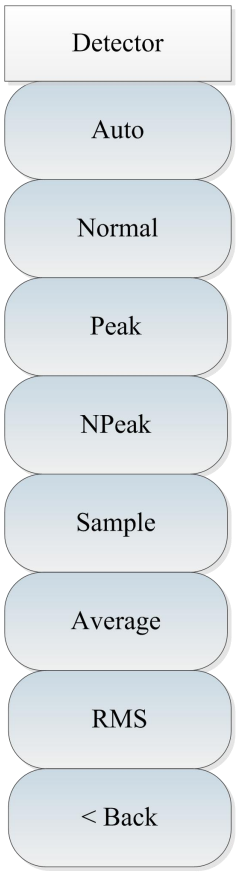
[Special note]: The video bandwidth filter is used for smoothing the trace so as to improve the ability to detect weak noise signals. This instrument supports variable resolution bandwidth settings from 1Hz to 10MHz, with the step of 1-3-10.

· **[Average Off On]:** Press [BW]→[Average Off On]. The averaging function can be used smoothing the displayed trace without changing the video bandwidth filter. It can be changed with the number keys or the [↑] or [↓] key or knob.

·**[SPAN/RBW]:** Press [BW]→[SPAN/RBW] to set the ratio of the span to resolution bandwidth. In the auto mode, the resolution bandwidth will change automatically with the span. This ratio can be changed with the number keys or the [↑] or [↓] key or knob.

·**[RBW/VBW]:** Press [BW]→[RBW/VBW]. In the auto mode, the video bandwidth will change automatically with the resolution bandwidth. This ratio can be changed with the number keys or the [↑] or [↓] key or knob.

· **[Detector]:** Press [BW]→ [Detector] to enable the detector function menu. Refer to [Detector] menu for details.



· **[Auto]:** Press [BW]→ [Detector]→ [Auto] to enable the spectrum analyzer mode of the detector.

· **[Normal]:** Press [BW]→ [Detector]→ [Normal] to enable the most commonly used detector mode. You can see the signal and noise floor at the same time, with no signal loss.

· **[Peak]:** Press [BW]→ [Detector]→ [Peak] to prevent missing of any peak signal. This function can be applied to measure the signal close to the noise floor.

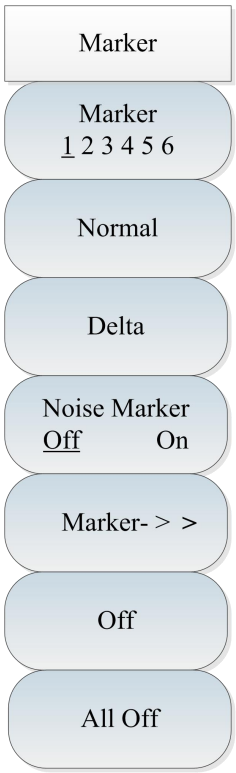
· **[Neg Peak]:** Press [BW]→[Detector]→[Neg Peak]. This function is used in self-inspection of the MMW integrated test instrument in most cases and rarely in tests. By using this function, the modulation envelope of AM signal can be well reproduced.

· **[Sample]:** Press [BW]→ [Detector]→ [Sample]. This function is conducive for noise signal measurement. Compared with the normal mode of the detector, noise can be better measured.

· **[Average]:** Press [BW]→ [Detector]→ [Average] to average the data within the sampling interval.

· **[RMS]:** Press [BW]→ [Detector]→ [RMS] to obtain the RMS value of the data within the sampling interval.

5 Marker menu



· **[Marker 1 2 3 4 5 6]:** Press [Marker]→ [Marker 1 2 3 4 5 6] to change various markers. The selected marker will be underlined.

· **[Normal]:** Press [Marker]→[Normal] to enable the normal mode of the current marker.

· **[Delta]:** Press [Marker]→[Delta] to enable the delta mode of the current marker. In this case, the frequency difference and amplitude difference (time difference under zero span) between the differential marker and reference marker will be displayed. The amplitude will be displayed in dB.

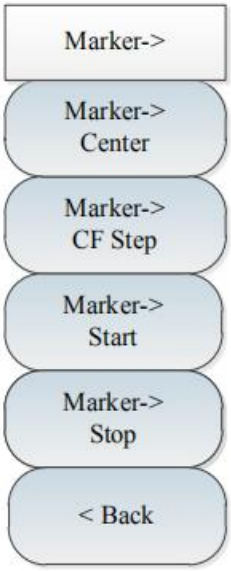
· **[Noise Marker Off On]:** Press [Marker]→[Noise Marker Off On]. The noise marker will indicate the noise power normalized to 1Hz bandwidth near the active marker. In this case, the "Sample" mode of the detector will be enabled. If the noise marker is enabled, the unit of the marker reading will automatically change into dB/Hz.

· **[Marker→]:** Press [Marker]→ [Marker→] to open the marker function menu. By using such marker functions, the user can change the instrument display, with the marker as the reference. Refer to [Marker→] menu for details.

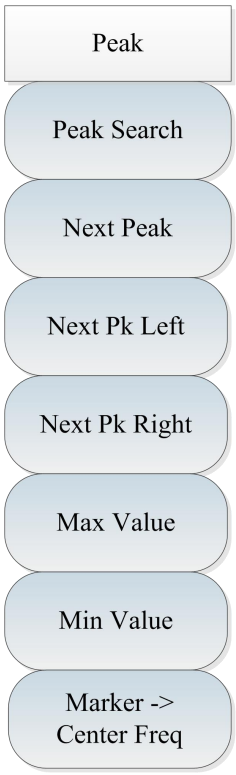
· **[Off]:** Press [Marker]→ [Off] to disable the current active marker.

· **[All Off]:** Press [Marker]→ [All Off] to disable all active markers.

[Special note]: Marker functions are not available in the RSSI mode.

	· **[Marker→Center]:** Press [Marker]→ [Marker→]→ [Marker→Center]. The marker will move to the center frequency, and the center frequency will be displayed on the screen. · **[Marker→CF Step]** Press [Marker]→ [Marker→]→ [Marker→CF Step] and set the step of the center frequency. The step is equal to the marker frequency. If the differential marker function is activated, the frequency step is equal to the frequency of the differential marker. · **[Marker→Start]** Press [Marker]→ [Marker→]→ [Marker→Start], and set the starting frequency as the marker frequency. · **[Marker→Stop]:** Press [Marker]→ [Marker→]→ [Marker→Stop] and set the stop frequency as the marker frequency. · **[Back]:** Go back to the previous menu. **(not available in the RSSI mode)**

6 Peak menu



· **[Max Peak]:** Press [Peak]→[Max Peak] to set the current active marker at the maximum peak of the measured trace. The frequency and amplitude of the marker will be displayed in the middle upper part of the screen.

· **[Next Peak]:** Press [Peak]→[Next Peak] to set the active marker at next peak associated with the current marker location on the trace.

· **[Next Pk Left]:** Press [Peak]→[Next Pk Left] to find next peak on the left side of the current marker location.

· **[Next Pk Right]:** Press [Peak]→[Next Pk Right] to find next peak on the right side of the current marker location.

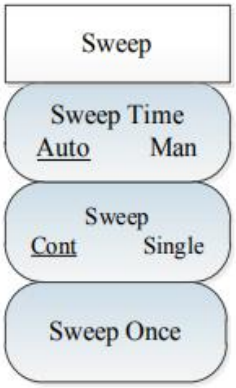
[Max Value]: Set one marker at the highest point of the trace. The frequency and amplitude of the marker will be displayed in the right upper corner of the screen. The active functions will not change when this key is pressed.

[Min Value]: Press [Peak]→[Min Search] to set one marker at the lowest point of the trace. The frequency and amplitude of the marker will be displayed in the right upper corner of the screen. The active functions will not change when this key is pressed.

· **[Marker→Center]:** Press [Peak]→[Marker→Center] and set the center frequency as the marker frequency. By using this function, the signal can be rapidly moved to the screen center.

(not available in the RSSI mode)

7 Sweep menu

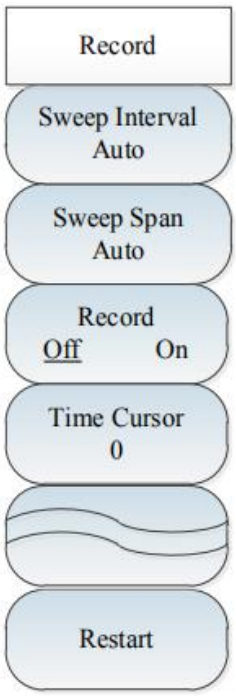


·**[Sweep Time Auto Man]:** Press [Sweep]→[Sweep Time Auto Man] to switch the sweep time between the auto and manual modes. The current state is underlined. In the auto mode, the minimum sweep time will be set automatically by the integrated test instrument based on the current state and displayed on the screen. In the manual mode, you can enter the sweep time with the number keys and select the time unit with corresponding soft keys. When RBW and VBW are changed in the auto mode, the sweeping speed will change accordingly. The larger the RBW and VBW values are, the higher the sweeping speed is; and vice versa. Based on the compliance with minimum sweep time constraints, the maximum sweep time of S3302 series spectrum analyzer can be set as max. 800s under the non-zero span and max. 600s under zero span.

·**[Sweep Cont Single]:** Press [Sweep]→[Sweep Cont Single]. The sweep type is decisive to the sweeping mode of the integrated test instrument and the time to stop sweeping and start holding. Two options are available in the interference analyzer mode: continuous and single.

·**[Sweep once]:** Press [Sweep]→[Sweep once] to sweep once again.

8 Auto Save menu



· **[Sweep Interval]:** Press [Auto Save]→[Sweep Interval Auto], and set the sweeping interval. In the default mode, the trace will be in the maximum holding state, so that all signals measured within the sweeping interval can be recorded.

· **[Sweep Span]:** Press [Auto Save]→ [Sweep Span Auto]. The span time will be the whole sweeping period. After reaching the span time, recording will be stopped.

· **[Record Off On]:** Press [Auto Save]→ [Record Off On] to enable or disable the "Auto Save" mode.

[Special note]: This function cannot be enabled until the span time is set.

· **[Time Cursor]:** Press [Auto Save]→ [Time Cursor] to view historical data.

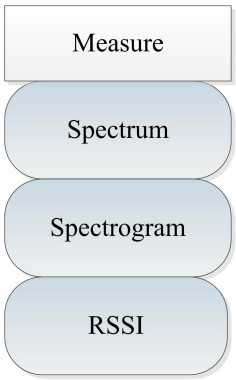
[Special note]: This must be applied in the spectrogram mode.

· **[Restart]:** Press [Auto Save]→ [Restart Measurement] to restart sweeping.

[Special note]: This is not available in the spectrum analyzer mode.

The time cursor function is not available in the RSSI mode.

9 Measurement menu



· **[Spectrum]:** Press [Measure]→ [Spectrum] to enable the spectrum measurement mode.

· **[Spectrogram]:** Press [Measure]→ [Spectrogram] to enable the spectrogram measurement mode.

·**[RSSI]:** Press [Measure]→ [RSSI] to enable the RSSI measurement mode.

10 File menu

Refer to the introduction to the spectrum analyzer measurement mode for file menu details.

Chapter VI Power Meter Mode (optional)

Section 1 Introduction to Typical Measurements

In the power meter mode of S3302 series spectrum analyzer, the USB interface is connected with the an external USB power probe through the USB cable to test the power. Using SAV8723XUSB power probe provided by SALUKI., RF/microwave signals up to 40GHz can be tested, and the true average power with high dynamic range from -60dBm to +20dBm can be measured. The measurement reading will be shown on the display interface of the USB power meter mode of S3302 series. The block diagram of the test is shown in Fig. 6-1. The attenuator can be added according to the needs.

Attention

All operations in this chapter are based on the power meter mode, which will not be separately described below. This mode can be selected as follows: [Mode] →[Power Meter].

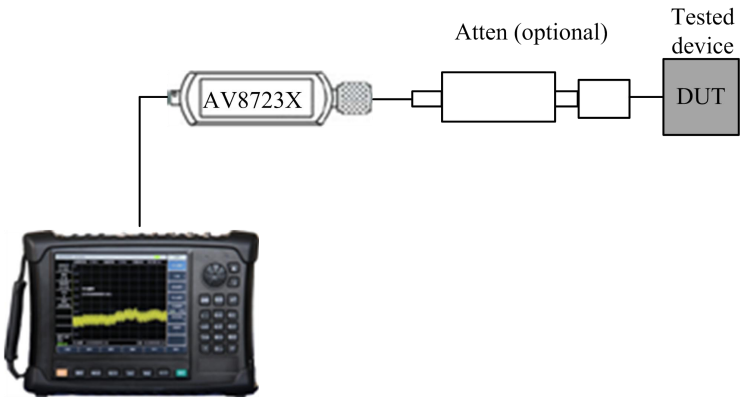


Fig. 6-1 Power Meter Structure

The power meter interface is shown in Fig. 6-2 (an example).

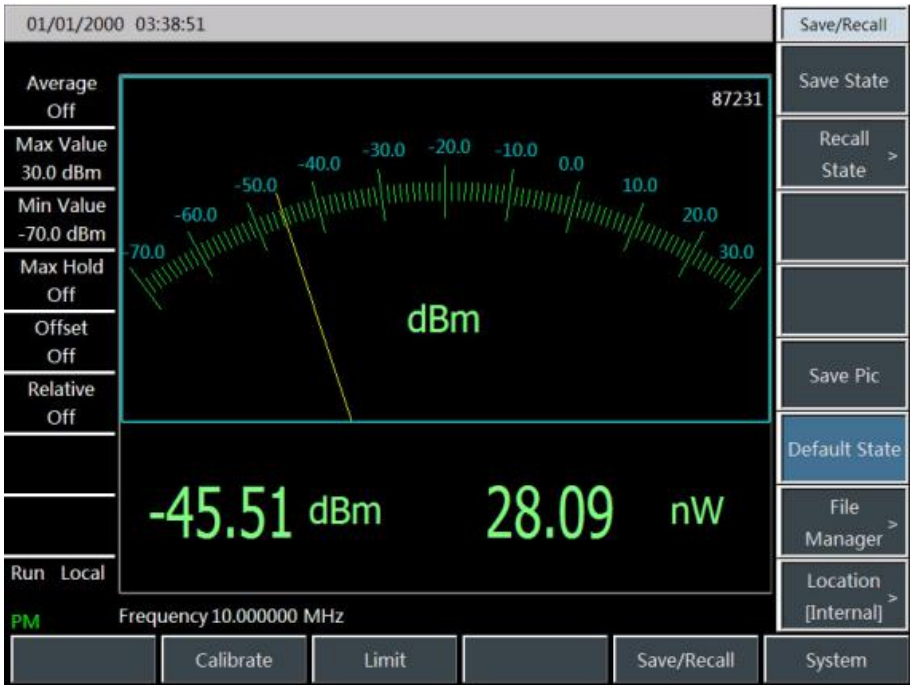


Fig. 6-2 Power Meter Interface

It is recommended to purchase the USB-based high-performance microwave power probe, which is developed by SALUKI.. The following models are mainly available, and you can purchase the power probe according to test needs.

Attention

At first, observe the maximum input power range identified on the USB power probe, and ensure that the input is within the specified range, so as to prevent the probe from damage as a result of over high power.

Table 6-1 SAV8723XUSB Power Probe

Model	Frequency range	Input power range	Input connector mode
SAV87230	9kHz - 6GHz	-50dBm to +20dBm	N(m)
SAV87231	10MHz - 18GHz	-60dBm to +20dBm	N(m)
SAV87232	50MHz - 26.5GHz	-60dBm to +20dBm	3.5mm(m)
SAV87233	50MHz - 40GHz	-60dBm to +20dBm	2.4mm(m)

Connection of power probe

a) Connect the small end of the USB cable to SAV8723XUSB power probe.

b) Connect the large end of the USB cable to the USB interface of the spectrum analyzer. The green indicator of the power probe will be ON a moment later.

c) The USB power probe can be shut down after the USB cable is removed. In this case, the green LED indicator will be OFF.

Attention

SAV8723XUSB power probe is provided with a USB cable. You can use your own USB cable conforming to international safety standards.

Section 2 Structure of Power Meter Menu

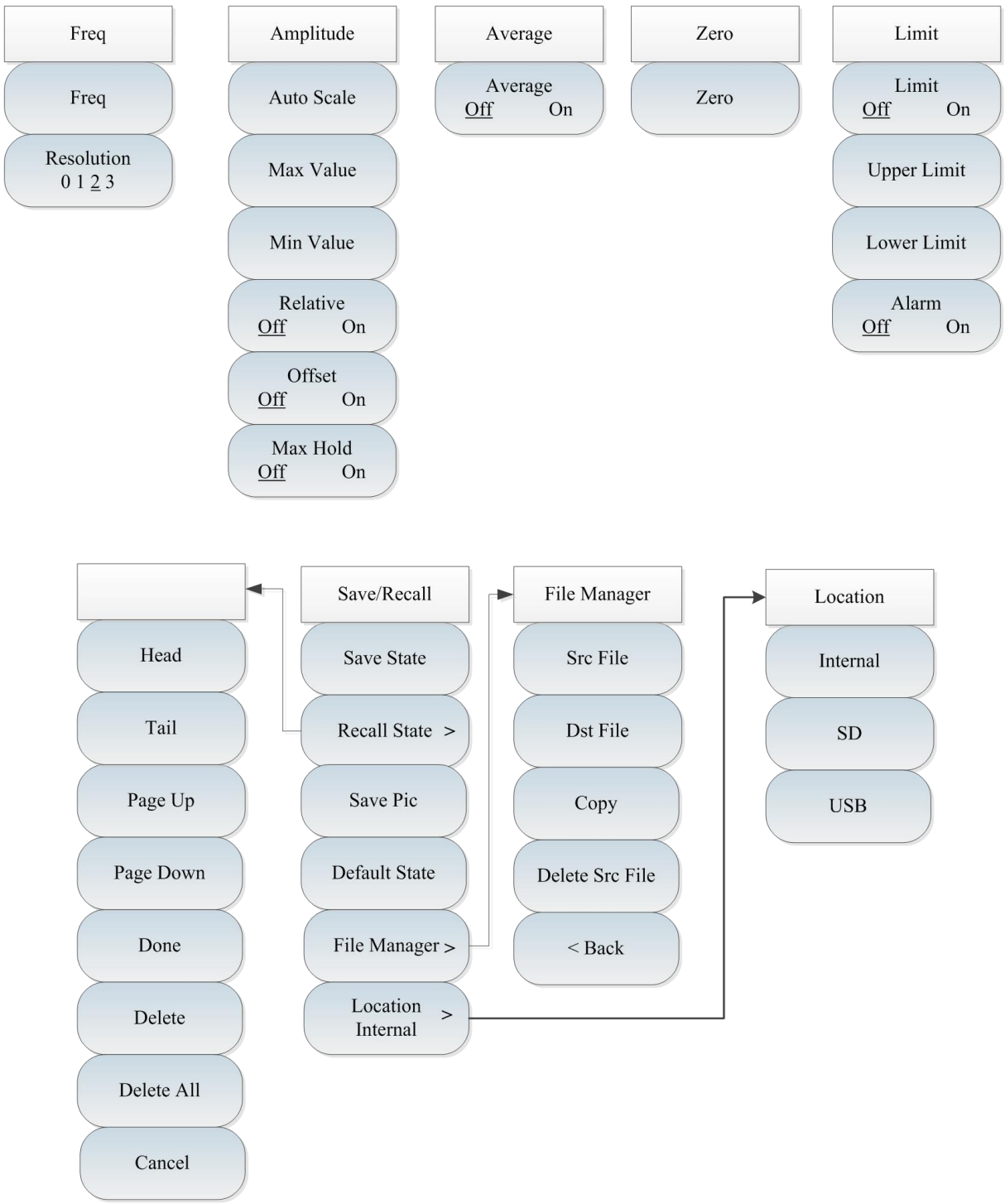
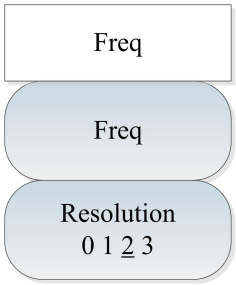


Fig. 6-3 Overall Block Diagram of Power Meter Menu

Section 3 Description of Power Meter Menu

1 Frequency menu

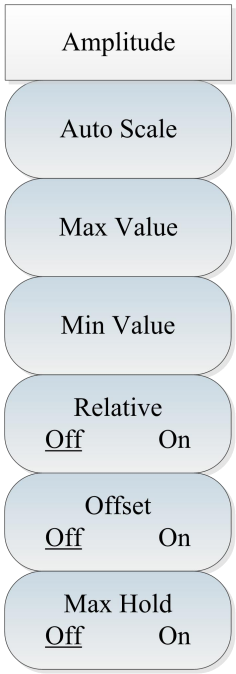


· **[Freq]:** Press [Freq]→[Frequency] and set the frequency with the number keys. Then select the corresponding frequency menu, or change the frequency with the [↑] or [↓] key or knob, with the step of 10MHz.

[Special note]: The frequency setting range is related to the selected USB power probe. Refer to Schedule C-1 for details.

· **[Resolution 0 1 2 3]:** Press [Freq]→[Resolution 0 1 2 3] and change the display accuracy of measurement data. 0 indicates the integer, 1 indicates one decimal, 2 indicate two decimals, and 3 indicates 3 decimals.

2 Amplitude menu



[Auto Scale]: Press [Ampt] →[Auto Scale] and make the measurement signal displayed within 10dB.

[Max Value]: Press [Ampt] →[Max Value] to set the maximum value of the current signal. You can change the maximum value with the number keys or [↑] or [↓] key or knob. The default step is 1dB.

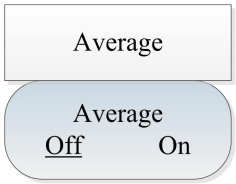
[Min Value]: Press [Ampt] →[Min Value] to set the minimum value of the current signal. You can change the minimum value with the number keys or [↑] or [↓] key or knob. The default step is 1dB.

[Relative Off On]: Press [Ampt] →[Relative Off On]. The relative measurement function reflects the power change of the set reference signal, in dB and %. When the relative measurement function is enabled, the current power level will be measured and saved. At the same time, one power level relative to the saved value will be displayed.

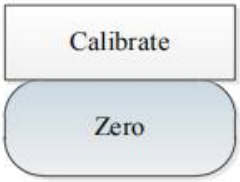
· **[Offset Off On]:** Press [Ampt] →[Offset Off On]. If the power of the tested part is higher than the maximum power that can be measured by the instrument, the attenuator can be connected to reduce the tested power to be within the normal measurement range. The power offset function can be used for setting the offset of the added attenuator or connecting cable so as to balance the attenuation amount or cable loss. At the same time, the amplifier gain can be increased by setting the power offset. If the value is positive, the loss will be compensated; and if the value is negative, the gain will be compensated.

· **[Max Hold Off On]:** Press [Ampt]→ [Max Hold Off On] to enable the maximum holding function. In this case, the measured maximum value of the signal will be displayed.

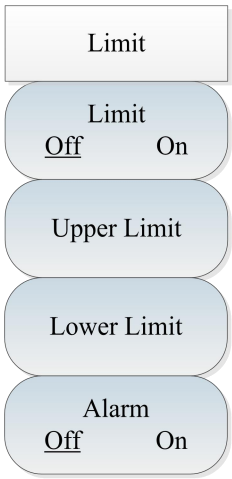
3 Bandwidth menu

	· **[Average Off On]:** Press [BW]→[Average Off On]. Change the average with the number keys or [↑] or [↓] key or knob, with the step of 1. · **[Special note]: The averaging function is generally applied to smooth the trace in measurement of the low-power signal or signal close to the noise power, so as to reduce the influence of random noise on measurement, and improve the measurement accuracy. However, the measurement speed will be reduced at the same time. The averaging frequency is decisive to the average reading frequency. The higher the averaging frequency is, the more noise will be reduced.**

4 Calibrate menu

	· **[Zero]:** Press [Calibrate]→ [Zero]. · **[Special attention]: To improve measuring precision of the instrument, zero calibration of the instrument is necessary before small signal power measuring of AV8723X Series USB Power Probe. Zero calibration refers to measurement and saving of noise of the whole measurement channel. Deduct zero correction value, i.e. the noise of the whole measurement channel during the measurement to obtain input signal level of the channel. The USB power probe is calibrated in the same way as the ordinary power probe. The calibration here refers to internal calibration of the USB power probe, in which the switch is added at the front end of the measurement channel. The user can measure and save the channel noise without disconnecting the sensor from the tested part. The RF signal should be always applied on the power probe during internal zero calibration, so as to reduce the wear of the probe connector and shorten the test time.**

5 Limit menu

	**[Limit Off On]:** Press [Limit]→[Limit Off On] to enable the limit. **[Upper Limit]:** Press [Limit]→[Upper Limit]. Change the upper limit with the number keys or [↑] or [↓] key or knob, with the step of 1dB. **[Lower Limit]**: Press [Limit]→[Lower Limit]. Change the lower limit with the number keys or [↑] or [↓] key or knob, with the step of 1dB. **[Alarm Off On]:** Press [Limit]→[Alarm Off On]. The limit alarm should be enabled when the limit is ON. If the measured data exceed the set limits, the instrument will send alarm prompts.

6 File menu

Refer to the file menu description in the spectrum analyzer mode.

Attention

The functions of saving and recalling the data file are not available in the power meter mode!

Chapter VII AM-FM-PM Analyzer Mode (optional)

Section 1 Introduction to Typical Measurements

The AM-FM-PM analyzer mode is used for displaying the spectrum of AM, FM and PM signals and analyzing relevant parameters. The main spectrum and relevant parameters are shown below:

RF spectrum: Similar to the spectrum analyzer mode, the frequency spectrum of the modulation signal will be displayed, and the occupied bandwidth can be measured.

Audio spectrum: Display the frequency spectrum of the demodulated audio signal.

Audio waveform: Display the waveform of the demodulated audio signal within the time domain.

Parameter analysis: Measure and analyze the carrier power, modulation rate, carrier offset, modulation depth (AM), modulation frequency offset (FM), modulation phase deviation (PM), S/N, modulation distortion and total harmonic distortion of the modulated signal.

Attention

All operations in this chapter are based on the AM-FM-PM analyzer mode, which will not be separately described below.

Three spectrograms can be displayed at the same time or respectively in the AM-FM-PM analyzer mode. Press [Measure] and select [RF Spectrum], [Audio Spectrum], [Audio Waveform] and [Summary] to display one or all spectrum(s).

In order to better observe the measured signal, the following steps can be taken:

1) Press [Measure]→[Demod Type AM FM PM] to select the type of the analog signal to be demodulated.

2) Press [Frequency]→ [Center Freq] and set the center frequency of the measured signal.

3) Press [BW]→[IFBW], and set the appropriate IF bandwidth with the number keys or [↑] or [↓] key or knob.

4) Press [Amplitude]→[Ref Level] and set the reference level of the RF spectrum. Press [Scale/Div] and set the appropriate scale/division to facilitate the viewing of RF spectrum.

5) Press [Audio Spectrum]→ [Span] and set the appropriate span. Press [Scale/Div] and set the appropriate scale/division to facilitate the viewing of the frequency spectrum of the audio signal.

6) Press [Audio Waveform] → [Sweep Time], and set the display time of the audio signal waveform. Press [Scale/Div] and set the appropriate scale/division to facilitate the viewing of the frequency spectrum of the audio signal.

Attention

Set the appropriate IF bandwidth. The IF bandwidth should be more than the width of the modulation signal, so as to accurately demodulate the signal. You can observe the bandwidth in the RF spectrum. At the same time, noise may be produced in the case of too large IF bandwidth, which will affect the accuracy of parameter measurement.

Taking the FM signal measurement for example, the AM-FM-PM analyzer mode is introduced as follows. At first, input the FM signal generated by one signal source to the RF input end of the instrument. Set the signal frequency as 6GHz, amplitude as -10dBm, modulation rate as 3kHz and modulation offset as 30kHz. Measurement procedures are as follows:

1) Press [Measure]→ [Demod Type AM FM PM] and select FM.

2) Press [Freq]→ [Center Freq] and set the center frequency of the measured signal as 6GHz.

3) Press [BW]→ [IFBW] and set the IF bandwidth as 100kHz.

4) Press [Audio Spectrum]→ [Span], and set the span as 50kHz.

5) Press [[Audio Waveform] → [Sweep Time] and set the sweep time as 2ms.

Measurement results are shown in Fig. 7-1.

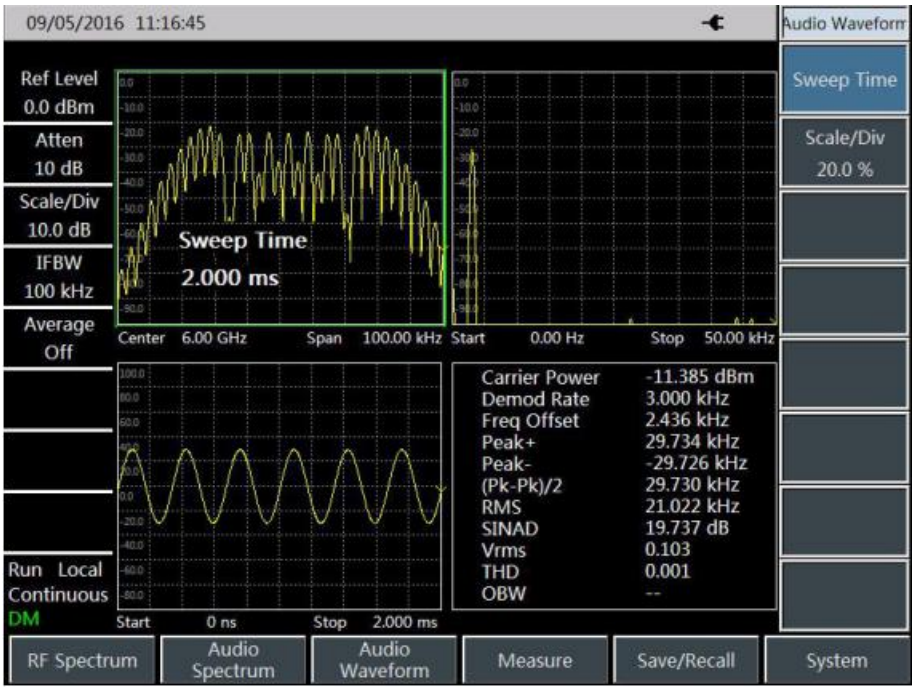


Fig. 7-1 FM Demodulation Analysis Results

Section 2 Structure of AM-FM-PM analyzer Menu

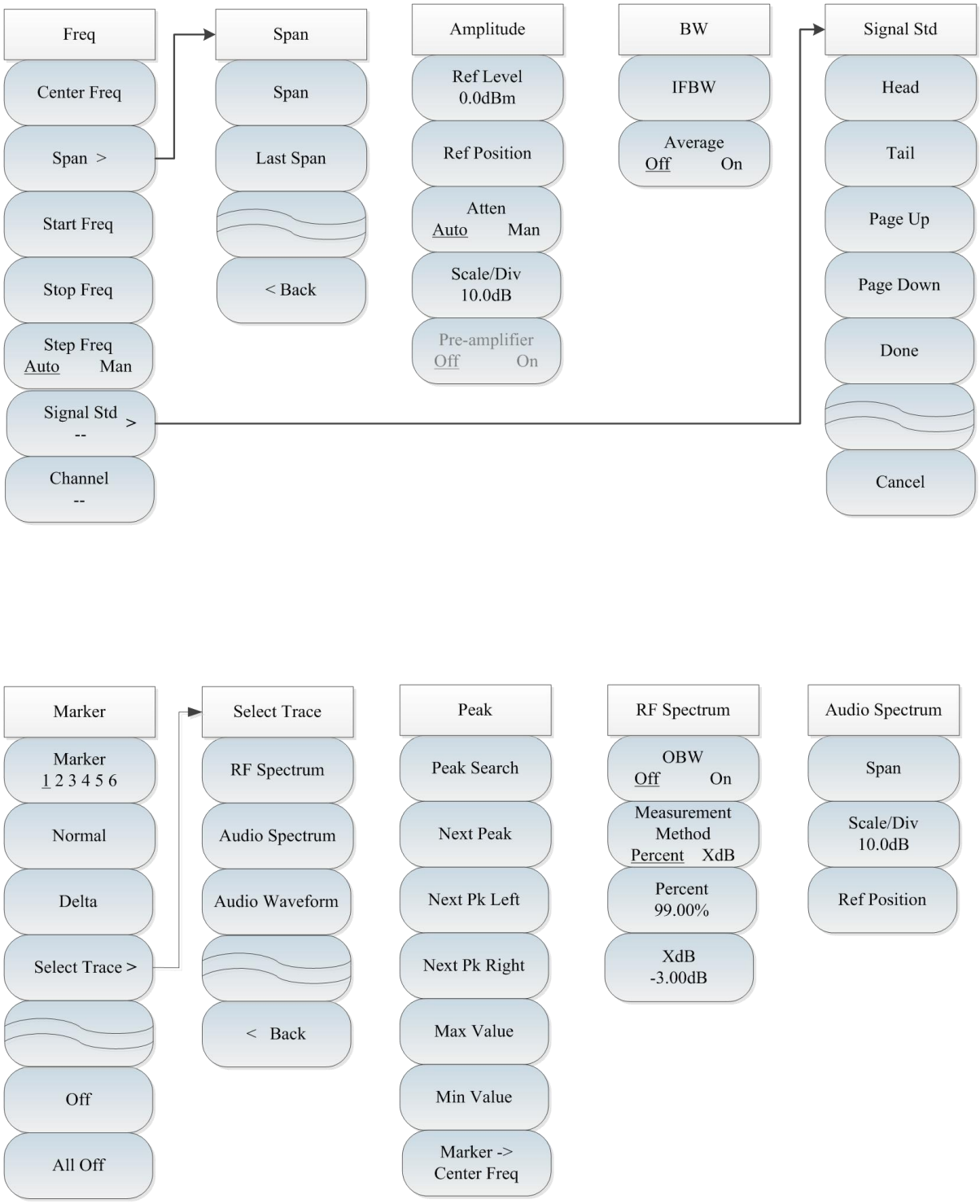


Fig. 7-2 AM-FM-PM Analyzer Menu

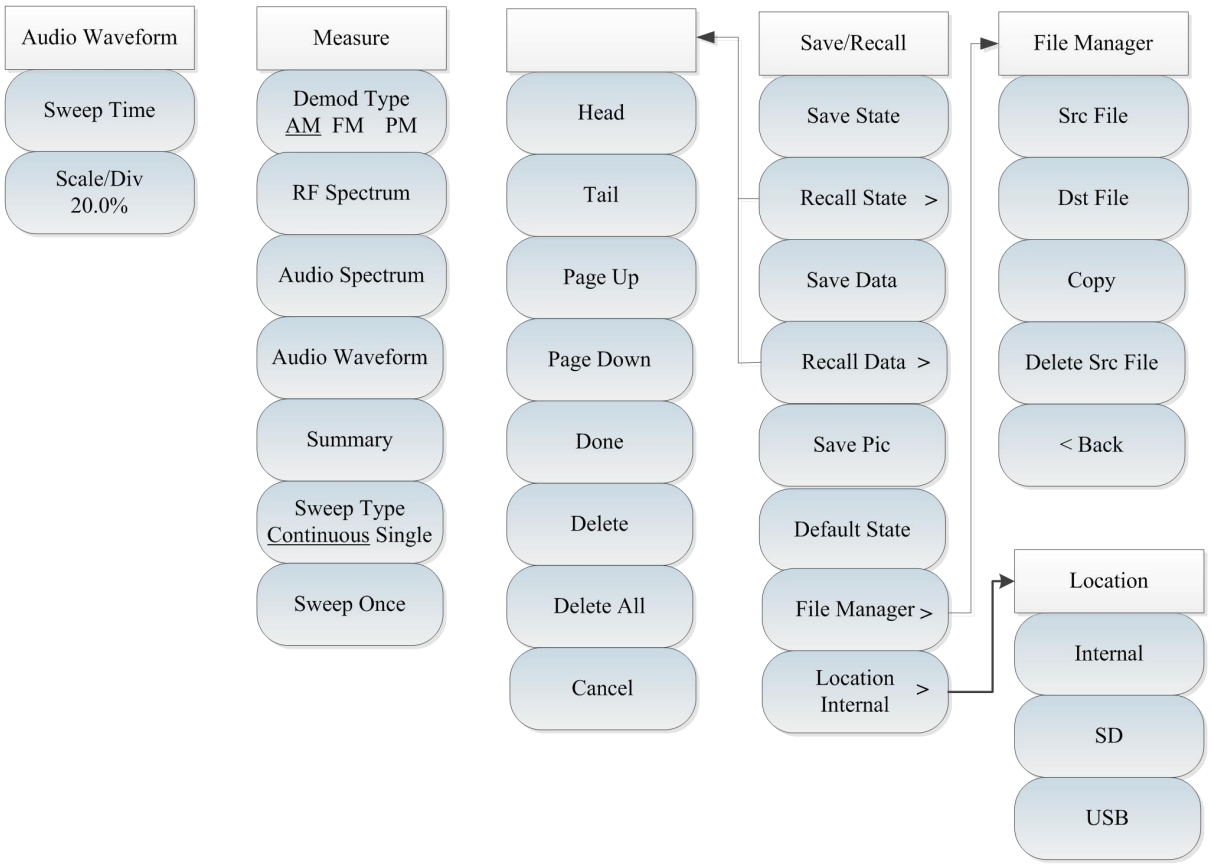


Fig. 7-3 AM-FM-PM Analyzer Menu (continued)

Section 3 Description of AM-FM-PM Analyzer Menu

1 Frequency menu

[Center Freq]: Press [Freq]→[Center Freq] and set it with the number keys on the front panel. Then select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or set the center frequency with the [↑] or [↓] key or knob.

[Special note]: When the [↑] or [↓] key or knob is applied, the frequency step should be the same as the set value of [Step Freq]. You can set the step frequency with the number keys or [↑] or [↓] key or knob after changing [CF Step Auto Man] into [CF Step Auto Man].

[Span]: Press [Freq]→[Span] to activate the span menu. Set the span with the number keys, and select the frequency unit, or set the span with the [↑] or [↓] key or knob. Refer to [Span] menu description for details.

[Special note]: When the span is changed with the [↑] or [↓] key or knob, the step should be 1-2-5.

· **[Start freq]:** Press [Freq]→[Start Freq], and set the starting frequency with the number keys on the front panel. Select the corresponding frequency unit or set the starting frequency with the [↑] or [↓] key or knob.

[Stop Freq]: Press [Freq]→[Stop Freq], and set the stop frequency with the number keys on the front panel. Select the corresponding frequency unit or set the stop frequency with the [↑] or [↓] key or knob.

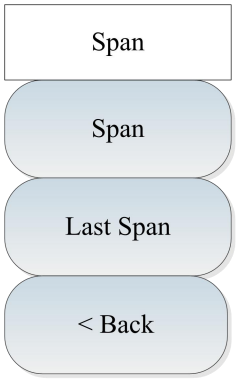
[Signal Std]: Press [Freq]→[Signal Std], and relevant soft menus will pop up, including [Head], [Tail], [Page Up], [Page Down] and [Done]. Select the related signal standard, and recall it with [Done] or [ok] in the menu.

[Special note]: When the signal standard is applied, the center frequency and span will be set as those defined in the signal standard.

[Channel]: Press [Freq]→[Channel], and the channel setting dialog box will pop up. Set the channel with the number keys or [↑] or [↓] key or knob.

[Special note]: The channel should be set based on the applied signal standard; otherwise, the prompt that setting is not allowed will pop up.

2 Span menu



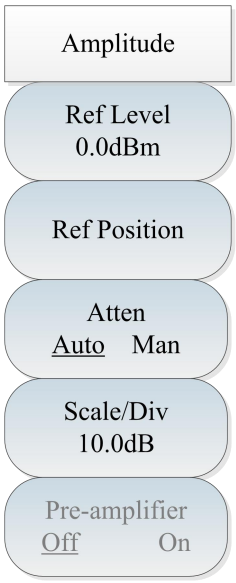
[Span]: Press [Freq]→[Span] to activate the span menu. Set the span with the number keys, or change the span by selecting the frequency unit or with the [↑] or [↓] key or knob.

· **[Special note]: When the span is changed with the [↑] or [↓] key or knob, the step should be 1-2-5.**

· **[Last span]:** Press [Freq]→ [Span]→ [Last Span] and recover the last span.

· **[Back]:** Press [Freq]→ [Span]→ [Back] to go back to the [Frequency] menu.

3 Amplitude menu



· **[Reference level]:** Press [Ampt]→ [Ref Level] and set it withe number keys on the front panel. Select [dBm], [-dBm], [mV] or [uV] in the frequency unit menu, or set the value with the [↑] or [↓] key or knob.

· **[Special note]: When the [↑] or [↓] key or knob is applied, the step should be 10dB.**

· **[Reference position]:** Press [Ampt]→ [Ref Position], and set the reference position with the number keys or [↑] or [↓] key or knob.

· **[Atten Auto Man]:** Press [Ampt]→[Atten Auto Man] to enable the auto or manual mode of the attenuator. You can change the mode with the number keys or the [↑] or [↓] key or knob.

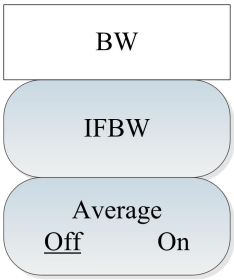
· **[Special note]: The attenuation range is 0dB to +60dB, with the step of 10dB.**

· **[Scale/Division]:** Press [Ampt]→[Scale/Div] and set it with the number keys or the [↑] or [↓] key or knob. The scale/division setting range is 0.1dB-20dB.

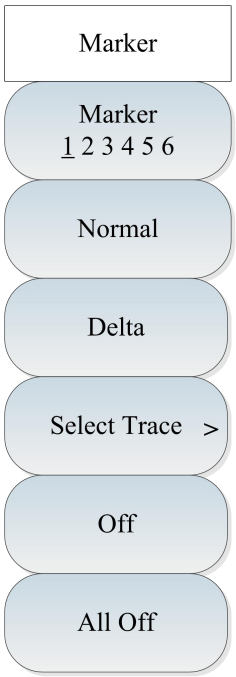
· **[Pre Amp Off On]:** Press [Ampt] to control the ON/OFF state of the pre-amplifier. This function cannot be activated until the reference level is

	less than -40dBm.

4 Bandwidth menu

	· **[IF bandwidth]** Press [BW]→ [IFBW] and set the IFBW with the number keys on the front panel. Select the corresponding frequency unit, i.e. [GHz], [MHz], [kHz] or [Hz], or set the IFBW with the [↑] or [↓] key or knob. · **[Special note]: The IF bandwidth should be more than the bandwidth of the modulated signal so as to accurately demodulate the signal. You can observe the bandwidth of the modulated signal in the RF spectrum. Noise may be generated in the case of too large IF bandwidth, which will affect the accuracy of parameter measurement. The IF bandwidth range is from 10kHz to 300kHz, with the step of 1-3-10.** · **[Average Off On]:** Press [BW]→[Average Off On]. The averaging function is used for smoothing the displayed trace. When the averaging function is enabled, the averaging frequency can be selected with the number keys or [↑] or [↓] key or knob.

5 Marker menu



· **[Marker 1 2 3 4 5 6]:** Press [Marker]→ [Marker 1 2 3 4 5 6] to change various markers. The selected marker will be underlined.

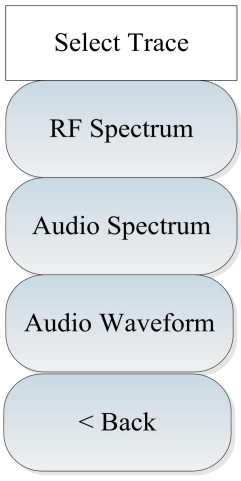
· **[Normal mode]:** Press [Marker]→[Normal] to enable the normal mode of the current marker.

· **[Delta mode]:** Press [Marker]→[Delta] to enable the delta mode of the current marker. In this case, the frequency difference and amplitude difference (time difference under zero span) between the differential marker and reference marker will be displayed. The amplitude will be displayed in dB.

· **[Select Trace]:** Press [Marker]→ [Select Trace], and soft menus related to the trace will pop up, including [RF Spectrum], [Audio Spectrum] and [Audio Waveform]. Refer to the [Select Trace] menu for details.

· **[Off]:** Press [Marker]→ [Off] to disable the current active marker.

· **[All Off]:** Press [Marker]→ [All Off] to disable all active markers.



· **[Select Trace]:** Press [Marker]→ [Select Trace].

· **[RF spectrum]:** Press [Marker]→ [Select Trace]→ [RF Spectrum] to select the trace in the RF spectrum. In this case, the marker can only be operated on this trace.

·**[Audio Spectrum]:** Press [Marker]→ [Select Trace]→ [Audio Spectrum], and select the trace in the audio spectrum. In this case, the marker can only be operated on this trace.

· **[Audio Waveform]:** Press [Marker]→ [Select Trace]→ [Audio Waveform], and select the trace in the audio waveform. In this case, the marker can only be operated on this trace.

6 Peak menu

Peak

Peak Search

Next Peak

Next Pk Left

Next Pk Right

Max Value

Min Value

Marker-> Center Freq

· **[Maximum Peak]:** Press [Peak]→[Max Peak] to set the current active marker at the maximum peak of the measured trace. The frequency and amplitude of the marker will be displayed in the middle upper part of the screen.

· **[Next Peak]:** Press [Peak]→[Next Peak] to set the active marker at next peak associated with the current marker location on the trace.

· **[Next Peak Left]:** Press [Peak]→[Next Pk Left] to find next peak on the left side of the current marker location.

· **[Next Peak Right]:** Press [Peak]→[Next Pk Right] to find next peak on the right side of the current marker location.

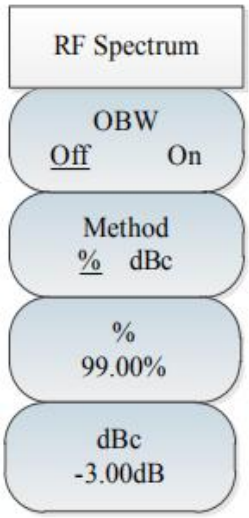
· **[Maximum value]:** Set one marker at the highest point of the trace. The frequency and amplitude of the marker will be displayed in the right upper corner of the screen. The active functions will not change when this key is pressed.

· **[Minimum value]:** Press [Peak]→[Min Search] to set one marker at the lowest point of the trace. The frequency and amplitude of the marker will be displayed in the right upper corner of the screen. The active functions will not change when this key is pressed.

· **[Marker→Center]:** Press [Peak]→[Marker→Center] and set the center frequency as the marker frequency. By using this function, the signal can be rapidly moved to the screen center, which is only effective for the RF spectrum.

· **[Special note]: Each peak, maximum value and minimum value will be searched on the selected trace. Refer to [Select Trace] menu for details.**

7 RF spectrum menu



· [Special note]: The occupied bandwidth measurement in the RF spectrum is similar to that in the spectrum analyzer mode. The RF spectrum is only applied in the AM-FM-PM analyzer mode.

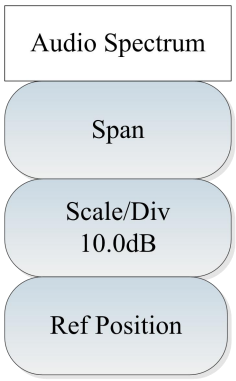
· [OBW Off On]: Press [RF Spectrum]→ [OBW Off On] to enable or disable the occupied bandwidth measurement.

· [Method % dBc]: Press [RF Spectrum]→ [Method % dBc] and select various measurement methods: percentage or drop dBc. In the percentage method, the occupied bandwidth of the signal is obtained by calculating the bandwidth of the frequency of certain percentage to the total power of the transmitted power, and the power percentage can be set by the user. In the drop dBc method, the occupied bandwidth is defined as follows: spacing between two frequency points corresponding to signal power drop by dBc on both sides of the frequency point where the signal peak power is. The signal power drop dBc can be set by the user.

· [Percentage]: Press [RF Spectrum]→ [%] and set the percentage.

·[XdB]: Press [RF Spectrum]→ [dBc] and set the dBc value.

8 Audio spectrum menu

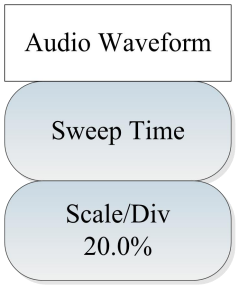


· **[Span]:** Press [Audio Spectrum]→ [Span], and set the span of the audio spectrum. The span should be large enough to display the audio signal and related harmonics. You can change the span with the number keys and select the frequency unit, or with the [↑] or [↓] key or knob.

· **[Scale/Division]:** Press [Audio Spectrum]→ [Scale/Div], and set the scale of the audio spectrum, so as to facilitate the observation of the audio spectrum trace. You can change the scale unit with the number keys and select the power unit [dB] or [-dB], or use the [↑] or [↓] key or knob.

· **[Reference position]:** Press [Audio Spectrum]→ [Ref Position], and set the reference position of the audio spectrum to facilitate the observation of the audio spectrum line. You can change the reference position with the number keys and click [OK], or with the [↑] or [↓] key or knob.

9 Audio waveform menu



· **[Sweep time]:** Press [Audio Waveform]→ [Sweep Time] and set the audio waveform sweeping time. The longer the sweep time is and the more points are sampled, the stabler the measurement results will be.

· **[Scale/Division]:** Press [Audio Waveform]→ [Scale/Div] and set the scale of the audio waveform to facilitate the observation of the audio spectrum trace. You can change the scale unit with the number keys and select [%] or click [OK], or with the [↑] or [↓] key or knob.

· **[Special note]: The scale unit changes with the type of the modulation signal. The scale unit should be percentage (%) in AM signal measurement, frequency unit (Hz, kHz or GHz) in FM signal measurement and radian (Rad) in PM signal**

	measurement.

10 Measurement menu

Measure Demod Type AM FM PM RF Spectrum Audio Spectrum Audio Waveform Summary Sweep Type Continuous Single Sweep Once	· **[Demo Type AM FM PM]:** Press [Measure]→ [Demod Type AM FM PM] and select the type of the modulation signal. · **[RF Spectrum]:** Press [Measure]→ [RF Spectrum] to display the RF spectrum only. · **[Audio Spectrum]:** Press [Measure]→ [Audio Spectrum] to display the audio spectrum only. · **[Audio Waveform]:** Press [Measure]→ [Audio Waveform] to display the audio waveform only. · **[Summary]:** Press [Measure]→[Summary] to display the RF spectrum, audio spectrum and audio waveform at the same time. · **[Sweep Cont Single]:** Press [Measure]→[Sweep Cont Single] to enable continuous or single sweeping. · **[Sweep Once]:** Press [Measure]→[Sweep Once] to trigger sweeping once. Sweeping can only be performed once again in the single mode.

11 File menu

Refer to the file menu description in the spectrum analyzer mode.

Chapter VIII Channel Scanner Mode (optional)

Section 1 Introduction to Typical Measurements

The channel scanner mode can be applied to measure the signal power of multiple channels. The signal power is displayed in the bar graph or list form. At most, the signal power of 20 channels can be displayed. This can be divided into three modes according to the channel setting: channel scanner, frequency scanner and list scanner.

Channel scanner: Set the measured channel by setting the signal standard, starting channel and channel step.

Frequency scanner: Set the measured channel by setting the starting frequency and frequency step.

List Scanner: Set the measured channel by setting the list.

The bandwidth and number of measured channels can be set in the above three modes.

Attention

All operations in this chapter are based on the channel scanner mode, which will not be separately described below.

1 Channel Scanner

Below is an example of the Channel Scanner mode, mainly involving the following procedures.

1) Press [Sweep]→ [Channel Scanner] → [Signal Std], and set the signal standard of measurement.

2) Press [Sweep]→[Channel Scanner]→[Start Channel] and set the starting channel of measurement. In this case, the starting channel should meet the requirements of the selected signal standard.

3) Press [Sweep]→[Channel Scanner] →[Number of Channels], and set the number of measured channels. At most 20 channels can be measured at the same time.

4) Press [Sweep]→[Channel Scanner] →[Channel Step] and set the channel step of measurement. A certain number of channels will be measured with the starting channel as the initial channel, based on the set channel step.

5) Press [Sweep]→ [Display Graph Table] and enable the graph display mode.

6) Press [Sweep]→[Power Display Curr Max] and enable the maximum option. Set the maximum power of each displayed channel.

Attention

The power cannot be set as the maximum value until the maximum holding function is enabled.

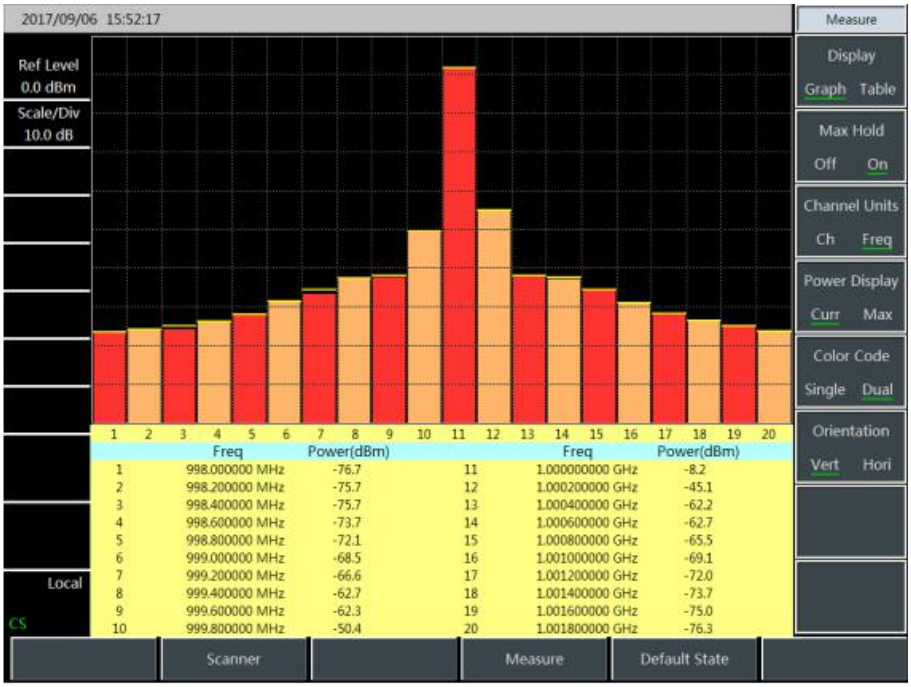


Fig. 8-1 Schematic Diagram of Channel Scanner

2 Frequency Scanner

Below is an example of the Frequency Scanner mode, mainly involving the following procedures.

1) Press [Sweep]→ [FScan] → [Start Freq], and set the center frequency of the starting channel.

2) Press [Sweep]→ [FScan]→ [Step Freq], and set the frequency step of the measured channel.

3) Press [Sweep]→ [FScan] → [Bandwidth], and set the bandwidth of the measured channel.

4) Press [Sweep]→ [FScan] → [Number of Channels], and set the number of measured channels. At most 20 channels can be measured at the same time.

5) Press [Sweep]→ [Display Graph Table] and enable the graph display mode.

6) Press [Measure]→ [Power Display Curr Max], and enable the “Current” option. Set the current power of each channel.

7) Press [Measure]→ [Color Code Single Dual] and enable the dual color mode.

8) Press [Measure]→ [Orientation Vert Hori] and enable the horizontal mode.

Fig. 8-2 Schematic Diagram of Frequency Scanner

3 List scanner

Below is an example of the Frequency Scanner mode, mainly involving the following procedures.

1) Press [Sweep]→ [MScan] → [Edit List] and edit the channel list to be swept. The information of each channel can be set by setting the signal standard and channel number or setting the frequency and bandwidth in the list.

2) Press [Sweep]→ [MScan] →[Number of Channels], and set the number of measured channels. At most 20 channels can be measured at the same time.

3) Press [Sweep]→ [Display Graph Table] and enable the graph display mode.

4) Press [Sweep]→[Power Display Curr Max], and enable the “Current” option. Set the current power of each channel.

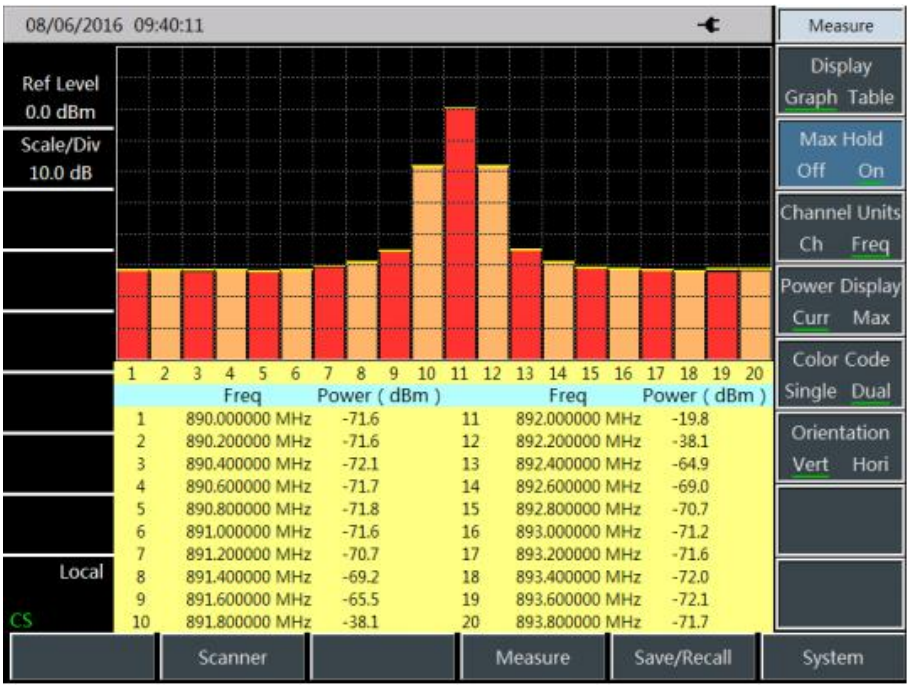


Fig. 8-3 Schematic Diagram of List Scanner

Section 2 Structure of Channel Scanner Menu

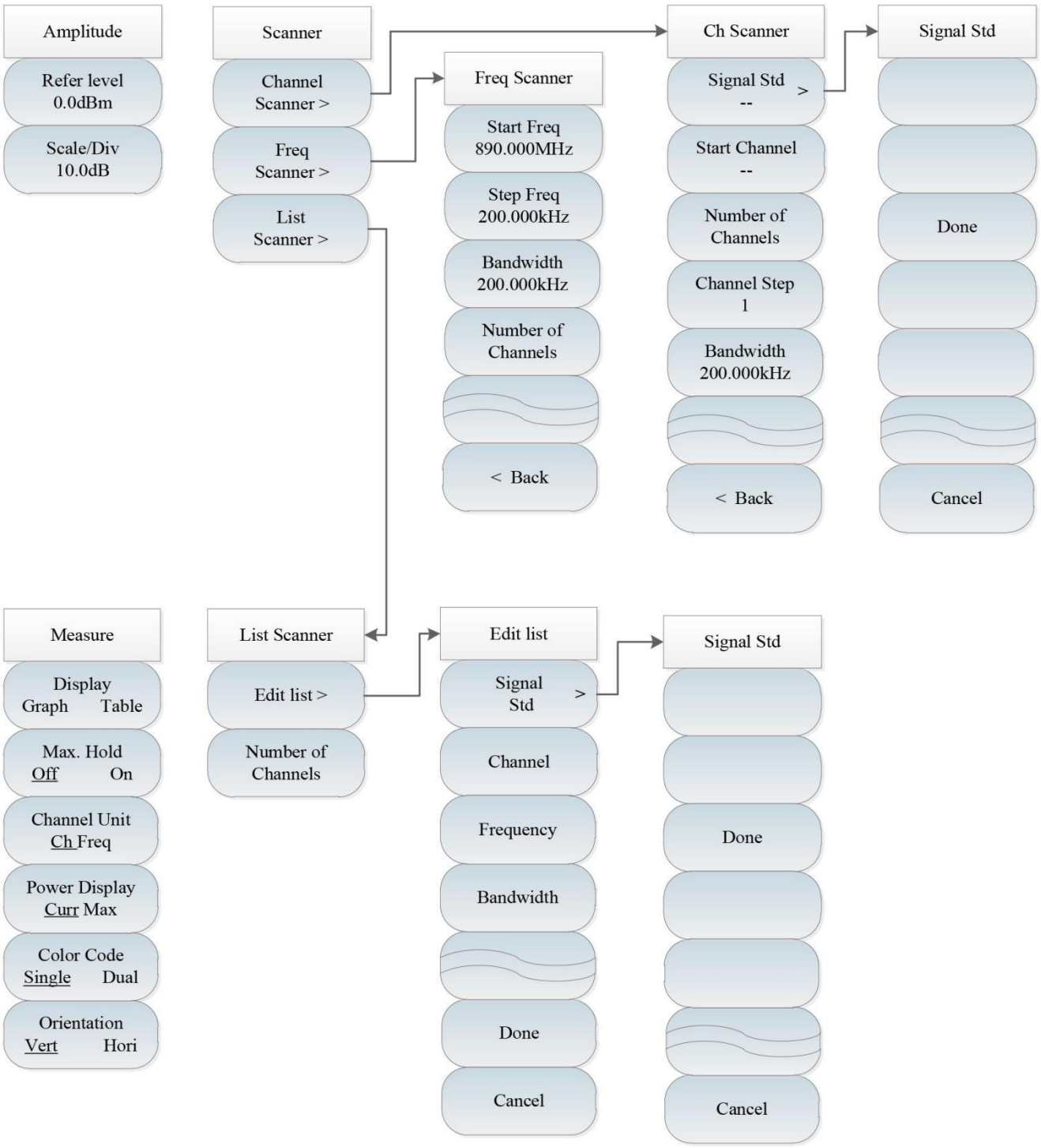
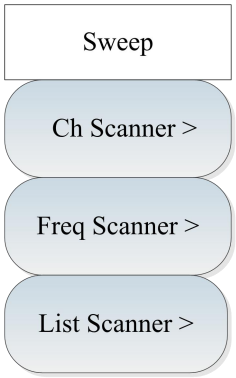


Fig. 8-1 Channel Scanner Menu

Section 3 Description of Channel Scanner Menu

1 Sweep menu

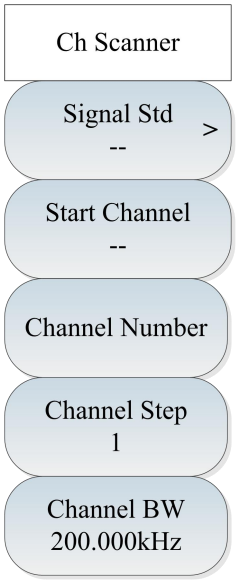


· **[Channel Scanner]:** Press [Sweep]→ [Channel Scanner], set the channel scanner mode and activate [Channel Scanner] menu. You can the channel parameters in [Channel Scanner] menu. Refer to [Channel Scanner] menu.

· **[Freq Scanner]:** Press [Sweep]→ [Freq Scanner], set the frequency scanner mode and activate [Freq Scanner] menu. You can the channel parameters in [Freq Scanner]. Refer to [Freq Scanner] menu.

· **[List Scanner]:** Press [Sweep]→ [List Scanner], set the list scanner mode and activate [List Scanner] menu. You can the channel parameters in [List Scanner]. Refer to [List Scanner] menu.

2 Channel Scanner menu



· **[Signal standard]:** Press [Sweep]→ [Channel Scanner]→ [Signal Std], and the existing signal standard list will pop up, including relevant menus such as [Head], [Tail], [Page Up] and [Page Down]. Click [Done], and select the corresponding signal standard.

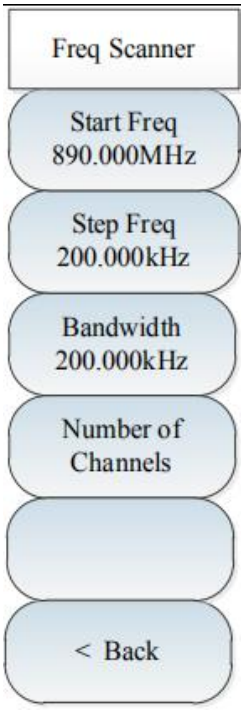
· **[Start Channel]:** Press [Sweep]→[Channel Scanner]→[Start Channel], and set the number of the starting channel. In this case, the starting channel will be the initial channel of measurement and cannot be set until the signal standard is selected.

· **[Number of Channel]:** Press [Sweep]→ [Channel Scanner]→ [Number of Channels], and set the number of measured channels. At most 20 channels can be measured.

· **[Channel Step]:** Press [Sweep]→ [Channel Scanner]→ [Channel Step], and set the step between the measured channels.

· **[Bandwidth]:** Press [Sweep]→ [Channel Scanner]→ [Bandwidth], and set the bandwidth of the measured channel.

3 Frequency Scanner menu



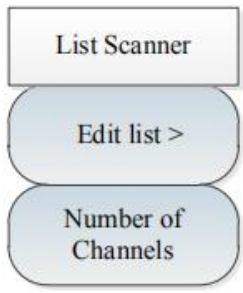
· **[Start frequency]:** Press [Sweep]→ [Freq Scanner]→ [Start Freq], and set the center frequency of the starting channel.

· **[Step Freq]:** Press [Sweep]→ [Freq Scanner]→ [Step Freq], and set the frequency step between channels.

· **[Bandwidth]:** Press [Sweep]→ [Freq Scanner]→ [Bandwidth], and set the bandwidth of the measured channel.

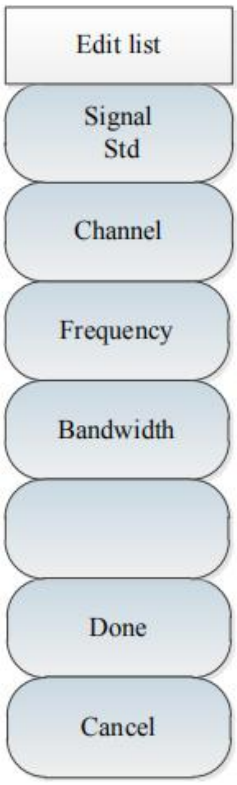
· **[Number of Channels]:** Press [Sweep]→[Freq Scanner]→[Number of Channels], and set the number of measured channels. At most 20 channels can be measured.

4 List Scanner menu



·**[Edit list]:** Press [Sweep]→ [List Scanner]→ [Edit List], and the corresponding [Edit List] menu will pop up. Refer to [Edit List] menu for details.

· **[Number of Channels]:** Press [Sweep]→ [List Scanner]→ [Number of Channels], and set the number of measured channels. At most 20 channels can be measured.



· **[Signal std]:** Press [Edit List] → [Signal Std], and the signal standard list will pop up, including [Head], [Tail], [Page Up] and [Page Down]. Select the required signal standard and click [Done].

· **[Channel]:** Press [Edit List]→ [Channel] to display the selected signal standard, channel range, etc. The user can also emit channel and click [Done] to save the setting.

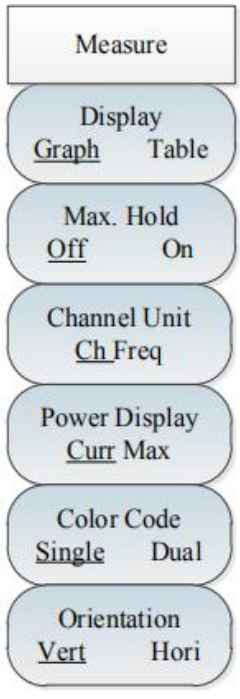
· **[Center freq]:** Press [Edit List]→ [Center Freq], edit the center frequency of the selected channel, and click [Done] to save the setting.

· **[Bandwidth]:** Press [Edit List]→ [Bandwidth], edit the bandwidth of the selected channel, and click [Done] to save the setting.

· **[Done]:** Press [Edit List]→ [Done] to save the modified settings and go back to the List Scanner menu.

· **[Cancel]:** Press [Edit List]→ [Cancel] to cancel the modified settings and go back to the List Scanner menu.

5 Measurement menu



· **[Display Graph Table]:** Press [Measure]→[Display Graph Table] and select the graph/table mode, as shown in Fig. 8-7 and 8-8.

· **[Max Hold Off On]:** Press [Measure]→ [Max Hold Off On] to enable or disable the maximum holding function.

· **[Channel Units Ch Freq]:** Press [Measure]→[Channel Units Ch Freq] and set the channel or frequency display mode.

· **[Power Display Curr Max]:** Press [Measure]→[Power Display Curr Max] and set the current or maximum display mode. The maximum power cannot be set until the maximum holding function is enabled.

· **[Color Code Single Dual]:** Press [Measure]→[Color Code Single Dual], and set the single or dual display mode.

· **[Orientation Vert Hori]:** Press [Measure]→[Orientation Vert Hori] and set the vertical or horizontal display mode.

6 File menu

Refer to the description of the file menu in the spectrum analyzer mode.

Chapter IX Field Strength Measurement Mode (optional)

Section 1 Introduction to Typical Measurements

The field strength measurement is indispensable in radiation strength measurement of the tested equipment and can be divided into three modes: PScan, FScan and MScan.

PScan: Observe the offset, amplitude and field strength of the current point by setting the point frequency.

FScan: Observe the amplitude and field strength changes within a certain frequency range by setting the starting frequency, step frequency and number of points.

MScan: Observe the amplitude and field strength of frequency points in the list by recalling the edited or saved list.

Attention

All the operations in this chapter are based on the Field Strength mode, which will not be separately described below.

1 [PScan]

Main operation procedures of [PScan]:

1) Press [Measure]→ [PScan] to enable the point frequency measurement mode.

2) Press [Freq]→ [Frequency] and set the point frequency within the range of [1MHz, 44.1GHz].

3) Press [BW]→ [BW] and set the bandwidth as 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

4) Press [Swp/Ant]→ [Recall Antenna], and select the antenna factor file.

5) Press [Demod] and set the demodulation type and volume.

The schematic diagram of PScan mode is shown in the figure below (example).

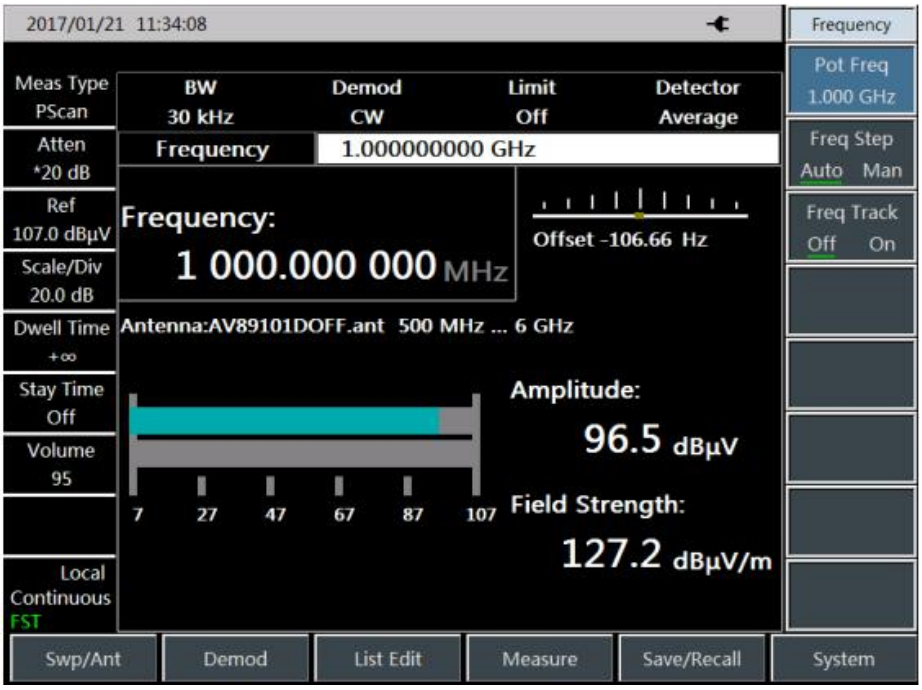


Fig. 9-1 Schematic Diagram of PScan Mode

2 FScan

Main operation steps of FScan:

1) Press [Measure]→ [FScan] to enable the frequency sweeping mode.

2) Press [Freq]→ [Start Freq] and set the starting frequency of sweeping.

3) Press [Freq]→ [Step Freq] and set the step frequency of sweeping.

4) Press [Freq]→ [Points] and set the number of sweeping points.

5) Press [BW]→ [BW] and set the bandwidth as 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

6) Press [Swp/Ant]→ [Recall Antenna], and select the antenna factor file.

7) Press [Swp/Ant]→ [Dwell Time +∞ Man], and set the dwell time.

8) Press [Swp/Ant]→ [Dwell Time Off On] to enable or disable the dwell time.

9) Press [Marker]→ [Marker Off On] to enable or disable the marker.

10) Press [Peak] to directly set the marker at the maximum point.

Attention

The dwell time refers to the time of dwelling at the frequency point exceeding the set limit in the ON state.

The schematic diagram of FScan mode is shown in the figure below (example).

Fig. 9-2 Schematic Diagram of FScan Mode

3 MScan

Main operation steps of MScan:

1) Press [Edit List]→ [Edit List] and edit the current list.

2) Press [Measure]→[MScan] to enable the MScan mode.

3) Press [List Edit]→ [Edit List]→ [Freq] and set the step frequency of sweeping.

4) Press [List Edit]→ [Edit List]→ [Bandwidth] and set the bandwidth as 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

5) Press [Swp/Ant]→ [Recall Antenna], and select the antenna factor file.

6) Press [Swp/Ant]→ [Dwell Time +∞ Man], and set the dwell time.

7) Press [Swp/Ant]→ [Dwell Time Off On] to enable or disable the dwell time.

8) Press [Marker]→ [Marker Off On] to enable or disable the marker.

9) Press [Peak] to directly set the marker at the maximum point.

Attention

The MScan mode must be changed with the list.

The schematic diagram of MScan mode is shown in the figure below (example).

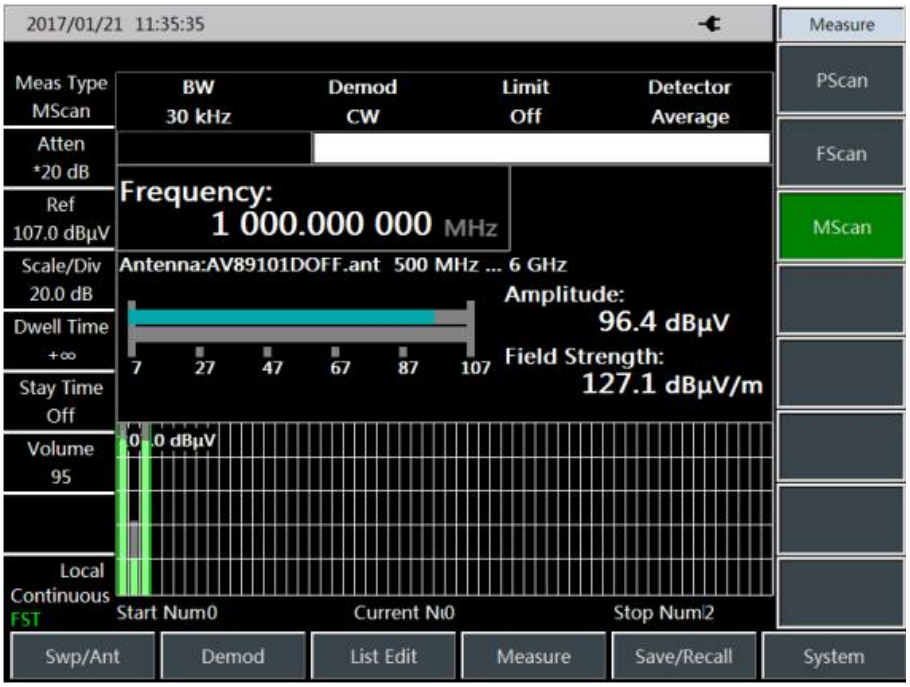


Fig. 9-3 Schematic Diagram of MScan Mode

Section 2 Structure of Field Strength Menu

Fig. 9-4 Overall Block Diagram of Field Strength Menu

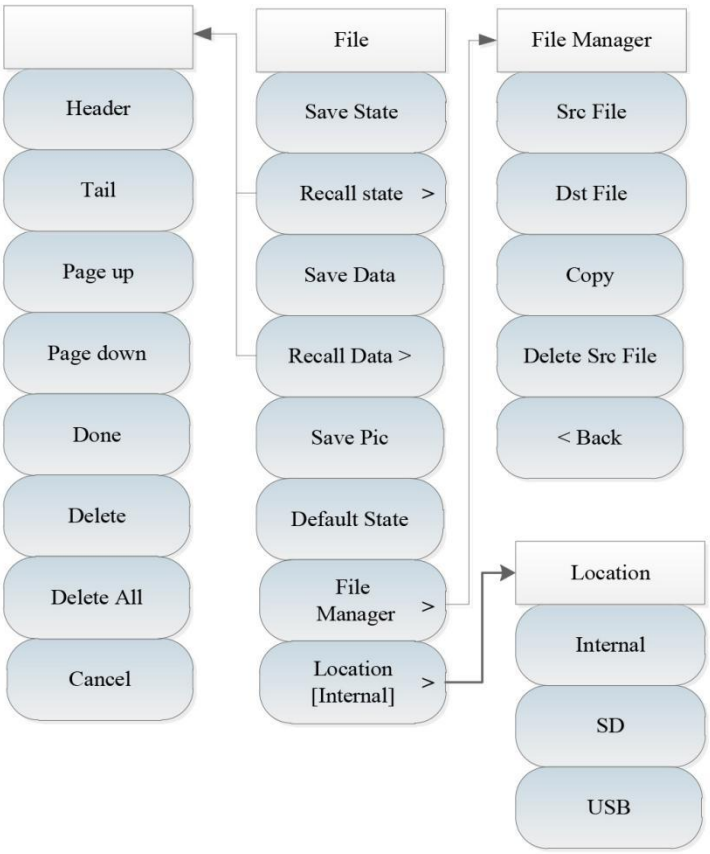


Fig. 9-5 Overall Block Diagram of Field Strength Menu (continued)

Section 3 Description of Field Strength Menu

1 Frequency menu ([PScan] mode)

Freq Freq 500MHz Step Freq Auto Man Freq Track Off On	· **[Freq]:** Press [Freq]→ [Freq] and set the frequency with the number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or change the point frequency with the [↑] or [↓] key or knob. · **[Special note]: The point frequency setting range is 1MHz to 44.1GHz.** · **[Freq step]:** Press [Freq]→[Freq Step Auto Man] and set the point frequency step with the [↑] or [↓] key or knob. The frequency step should be set as 1MHz in the auto mode. · **[Freq Track Off On]:** Press [Freq]→[Freq Track Off On] to enable or disable frequency tracking. When the frequency tracking is enabled, the instrument is able to automatically track the frequency of the peak point, and the tracked frequency will be displayed on the current frequency display zone of the screen. · **[Special note]: The peak point in frequency tracking refers to the peak point of the amplitude signal searched within the current bandwidth range.**

2 Frequency menu ([FScan] mode)

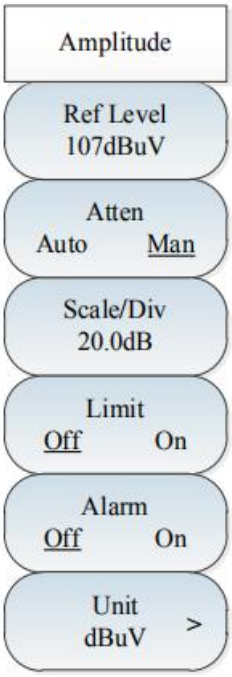
· **[Stt Freq 500MHz]:** Press [Freq]→[Stt Freq 500MHz] and set the starting frequency with the number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or set the starting frequency with the [↑] or [↓] key or knob.

· **[Special note]: The setting range of the starting frequency is 1MHz to 44.1GHz.**

· **[Step Freq 10MHz]:** Press [Freq]→[Step Freq 10MHz], and set the sweeping frequency step with the [↑] or [↓] key or knob.

· **[Poins 58]:** Press [Frequency]→[Point 58] and set the number of frequency sweeping points between 2 and 58.

3 Amplitude menu



· **[Ref Level 107dBuV] :** Press [Ampt]→ [Ref Level 107dBuV] and set the reference value with the number keys on the front panel. Select [dBuV], [-dBuV], [mV] or [uV] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob.

· **[Special note]: The setting range of the reference value is -43dBuV to 147dBuV.**

· **[Atten Auto Man]:** Press [Ampte]→[Atten Auto Man]. In the auto mode, the attenuation amount of the attenuator will be adjusted automatically according to the reference value. In the manual mode, the set attenuation amount will always be applied in the attenuator.

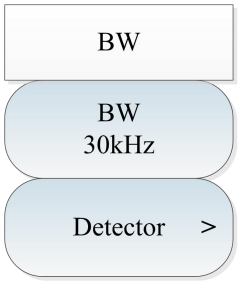
· **[Scale/Div 20.0dB]:** Press [Ampt]→ [Scale/Div 20.0dB] and set the scale/division with the number keys on the front panel. Select [dB] or [-dB] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob.

· **[Limit Off On]:** Press [Ampt]→ [Limit Off On] to enable or disable the limit.

· **[Alarm Off On]:** Press [Ampt]→ [Alarm Off On] to enable or disable the audio alarm.

· **[Units dBuV]:** Press [Amplitude]→ [Units] to enable the unit menu, including [dBm], [dBmV], [dBuV], [Volt] or [Watt].

4 Bandwidth menu

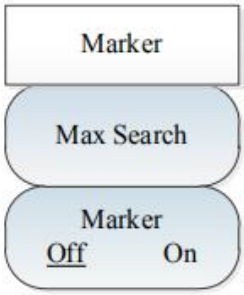


· **[BW 30kHz]:** Press [BW]→ [BW 30kHz] and set the bandwidth with the number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob.

· **[Special note]: The bandwidth must be set as 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.**

· **[Detector]:** Press [BW]→ [Detector] to enable the detector menu, including: Peak, Average and Real Time.

5 Marker menu

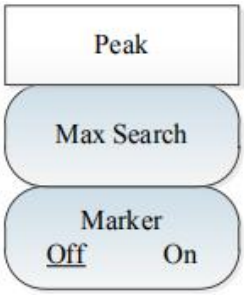


· **[Max Search]:** Press [Marker]→[Max Search] to set the marker at the maximum point.

· **[Marker Off On]:** Press [Marker]→ [Marker Off On] to enable or disable the marker display.

· **[Special note]: The marker menu will be valid only in the FScan and MScan mode.**

6 Peak menu

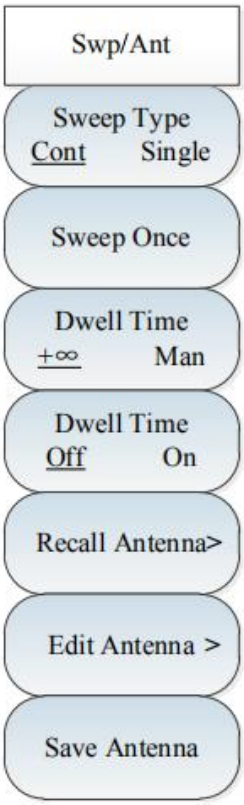


· **[Max Searche]:** Press [Peak]→[Max Search] to set the marker at the maximum point.

· **[Marker Off On]:** Press [Peak]→[Marker Off On] to enable or disable the marker display.

· **[Special note]: The peak menu will be valid only in the FScan and MScan mode.**

7 Sweep/Antenna menu



· **[Sweep Cont Single]:** Press [Swp/Ant]→[Sweep Cont Single] to enable the continuous or single sweeping mode.

· **[Sweep Once]:** Press [Swp/Ant]→ [Sweep Once] to sweep once again.

· **[Dwell Time +∞ Man]:** Press [Swp/Ant]→[Dwell Time +∞ Man] to set the dwell time. The dwell time refers to the time of dwelling at the point with the amplitude beyond the limits in the ON state. The default setting is infinite, and the manual setting range is 1ms to 40s.

· **[Special note]: The dwell time will be valid only when the limits are in the ON state.**

· **[Dwell Time Off On]:** Press [Swp/Ant]→[Dwell Time Off On] to set the dwell time. The dwell time refers to the waiting time at each point in sweeping. The default setting is the OFF state, and the manual setting range is 1ms to 40s.

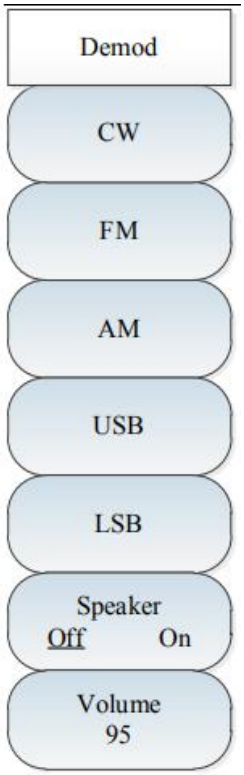
· **[Special note]: The dwell time will be valid only in the FScan and MScan mode.**

· **[Recall Antenna]:** Press [Swp/Ant]→ [Recall Antenna] and soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete] will pop up. You can select and recall the saved antenna factor file.

·**[Edit Antenna]:** Press [Swp/Ant]→ [Recall Antenna], and soft menus such as [Add Point], [Delete Point], [Delete All], [Done] and [Cancel] will pop up. This menu is applied to edit the antenna factor.

·**[Save Antenna]:** Press [Swp/Ant]→[Save Antenna] to open the antenna saving dialog box, where the antenna factor file can be saved.

8 Demodulation menu



· **[CW]:** Press [Demod]→ [CW] to disable the demodulation mode.

· **[FM]:** Press [Demod]→ [FM] to enable the FM mode.

· **[AM]:** Press [Demod]→ [AM] to enable the AM mode.

· **[USB]:** Press [Demod]→ [USB] to enable the upper sideband mode.

· **[LSB]:** Press [Demod]→ [LSB] to enable the lower sideband mode.

· **[Speaker Off On]:** Press [Demod]→[Speaker Off On] to enable or disable the audio alarm function.

· **[Special note]: If the audio alarm is enabled, the demodulation mode such as [FM], [AM], [USB] and [LSB] will not be available.**

· **[Volume 95]:** Press [Demod]→[Volume 95] to set the demodulation volume. Set the required volume with the number keys or [↑] or [↓] key or knob.

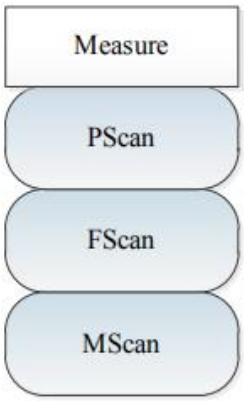
9 Edit List menu

·**[Edit list]:** Press [List Edit]→ [Edit List], and soft menus such as [Add Point], [Delete Point], [Delete All], [Done] and [Cancel] will pop up, by which the list can be edited.

·**[Save List]:** Press [List Edit]→[Save List] to open the list saving dialog box, where the list file can be saved.

· **[Recall List]:** Press [List Edit]→ [Recall List] and soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete] will pop up, by which the saved list can be selected and recalled.

10 Measurement menu



- **[PScan]:** Press [Measure]→[PScan] to enable the MScan mode of field strength.
- **[FScan]:** Press [Measure]→[FScan] to enable the FScan mode of field strength.
- **[MScan]:** Press [Measure]→[MScan] to enable the MScan mode of field strength.
- **[Special note]: Ensure that the list exists before enabling the MScan mode. You can view it by clicking [Edit List]- [Edit List].**

11 File menu

Refer to the description of the file menu in the spectrum analyzer mode.

Chapter X Signal Analyzer Mode (optional)

Section 1 Introduction to Typical Measurements

The signal analysis measurement mode is to provide the rapid analysis of interference signal, realize the display and playback of historical data by waterfall chart, quickly realize the modification of center frequency and span parameters by shortcut menu and quickly realize the audio output and IQ Capture function.

Attention

All operations of this chapter are based on that the signal analysis mode has been selected. This will not be separately described below.

The main interface of signal analysis measurement mode will measure by reference to interference analysis waterfall chart for the convenience of observing the periodic or jumped interference signal. The signal analysis is specially designed with shortcut menu to quickly set the center frequency and span parameters, activate the audio output and IQ Capture and improve the rapid analysis of interference signal. The main interface display of signal analysis is as shown in Fig. 10-1:

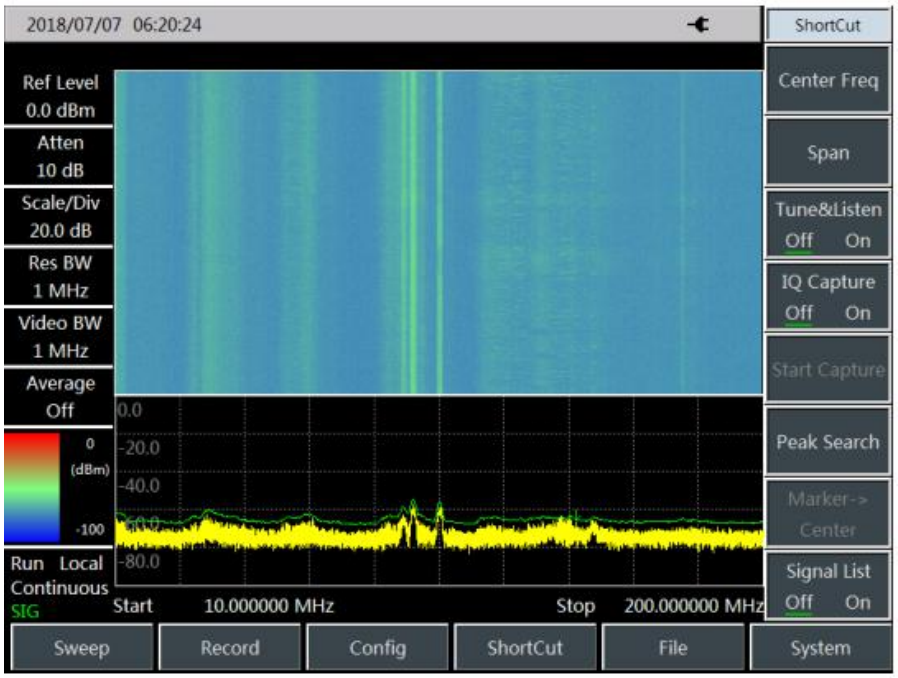


Fig.10-1 Main interface display of signl analysis measurement mode

The signal analysis includes signal list menu to view the frequency, amplitude, capture time and other parameters of captured interference signal, as shown in Fig. 10-2.

Fig.10-2 Interface of signal list

IQ Capture function can directly save IQ data of interference signal and its interface is as shown in Fig. 10-3:

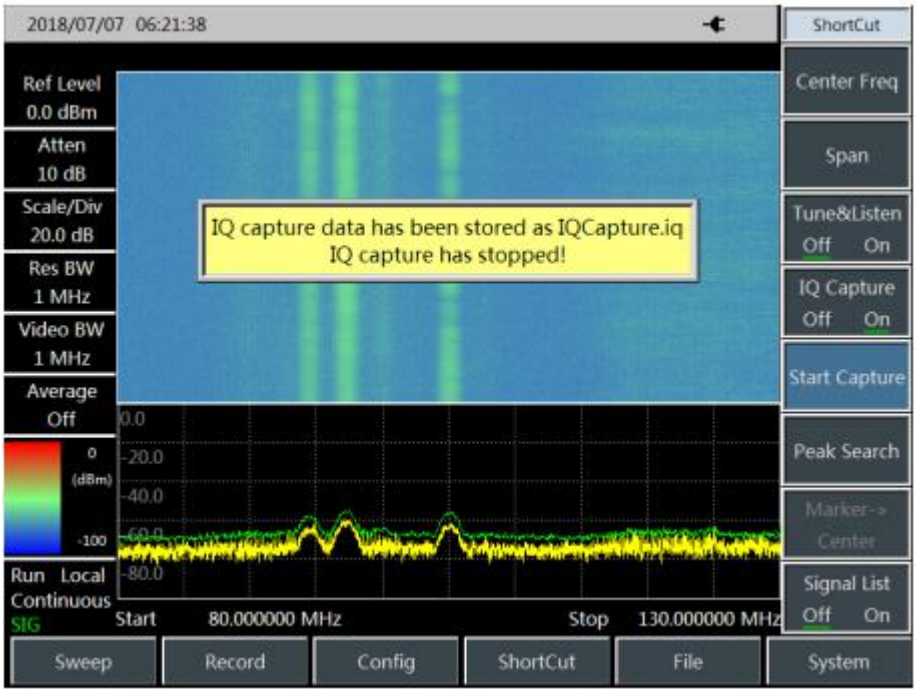


Fig.10-3 Schematic diagram of IQ capture function

Under the signal analysis mode, the current test task can be saved quickly as an automatically generated file as per current intermediate frequency and test time.

The storage task of signal analysis is as shown in Fig. 10-4:

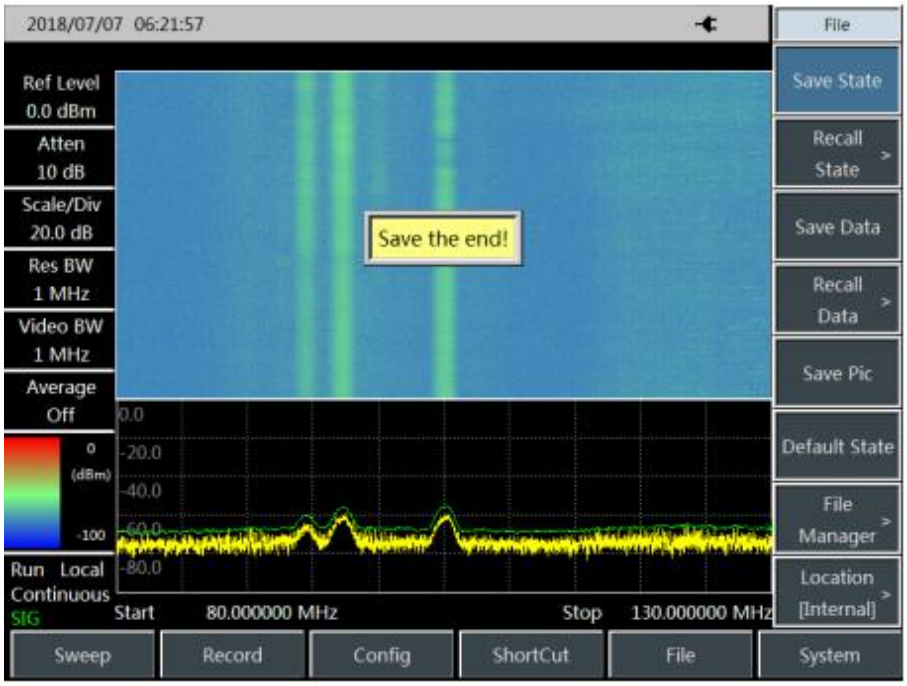


Fig.10-4 Schematic diagram of signal analysis storage task

Section 2 Structure of Signal Analysis Menu

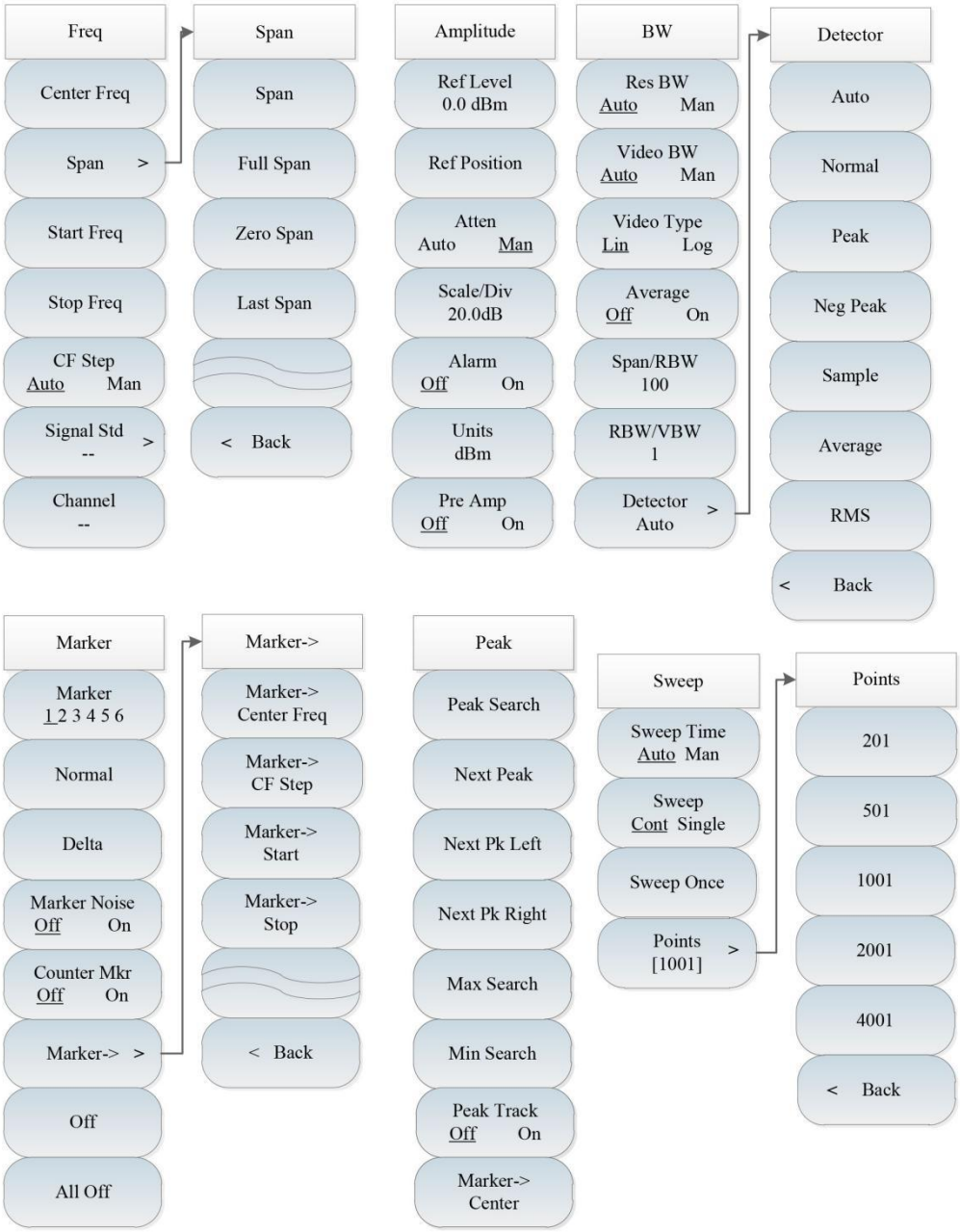


Fig.10-5 Block diagram of signal analysis menu

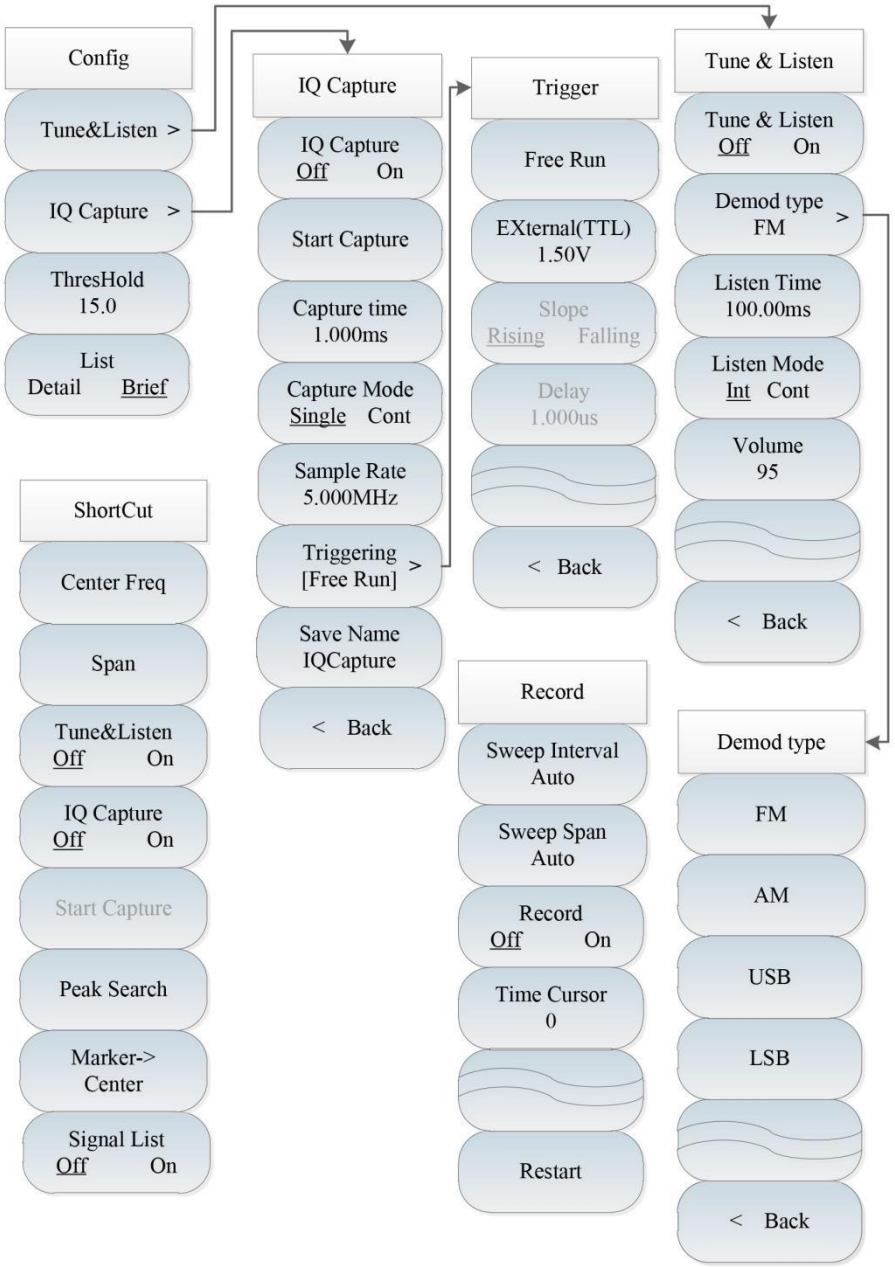


Fig.10-6 Block diagram of signal analysis menu (continued)

Section 3 Description of Signal Analysis Menu

1 Frequency menu

·**[Center Freq]:** press [Freq]→[Center Freq], to select [GHz], [MHz], [kHz] or [Hz] by number key on front panel or [↑] or [↓] key and spinning wheel in frequency menu.

·**[Special Notice]: in case of using [↑] or [↓] key and spinning wheel, the frequency step is same with the set value of [Step Freq]. After pressing [Step Freq Auto Man] to switch to [Step Freq Auto Man], it is allowed to use the number key or [↑] or [↓] key and spinning wheel to set the step frequency.**

·**[Span]:** press [Freq]→[Span], to activate the span sub-menu by using number key, frequency unit or [↑] or [↓] key and spinning wheel. For details, please refer to the description of [Span].

·**[Special Notice]:** use [↑] or [↓] key and spinning wheel to change span as per the step size of 1-2-5.

·**[Start Freq]:** press [Freq]→[Start Freq], to use the number key on front panel, frequency unit or [↑] or [↓] key and spinning wheel to set the Start Freq.

·**[Stop Freq]:** press [Freq]→[Stop Freq], to use the number key on front panel, frequency unit or [↑] or [↓] key and spinning wheel to set the Stop Freq.

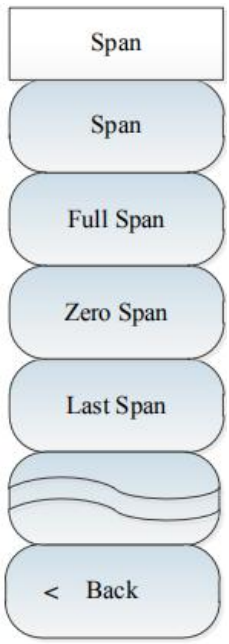
·**[Signal Std]:** press [Freq]→[Signal Std], to select a signal standard by using [↑] or [↓] key and spinning wheel and call it by [Done] menu or [Enter] key.For details, please refer to the dialog box menu.

·**[Special Notice]: after the signal standard is loaded, the center frequency and span will be set as defined in signal standard.**

·**[Channel]:** press [Freq]→[Channel], to pop up the channel number dialog box and set the channel number by using number key or [↑]or [↓]key and spinning wheel.

·**[Special Notice]: the channel number shall be set after the signal standard has been loaded. Otherwise the message of failure to set will be given.**

2 Span menu



·**[Span]:** press [Freq]→[Span], to activate the span sub-menu by using number key, frequency unit or [↑] or [↓] key and spinning wheel. For details, please refer to the description of [Span].

·**[Special Notice]:** use [↑] or [↓] key and spinning wheel to change span as per the step size of 1-2-5.

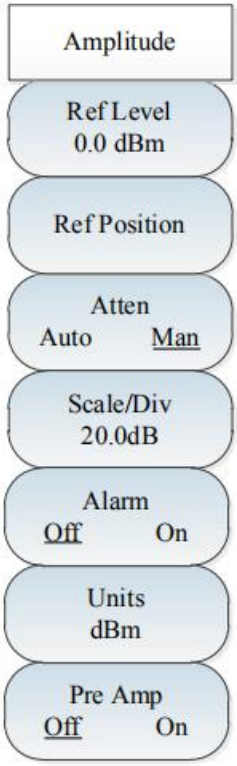
·**[Full Span]:** press [Freq]→[Span] →[Full Span], to set the current span as 44.1GHz.

·**[Zero Span]:** press [Freq]→[Span] →[Zero Span], to set the current span as 0Hz.

·**[Last Span]:** press [Freq]→[Span] →[Zero Span], to recover the span to last value.

·**[Back]:** press [Freq]→[Span] →[Back], to return to [Freq] sub-menu.

3 Amplitude menu



·**[Ref Level]:** press [Ampt]→[Ref Level], to set the ref level by using the number key on front panel, [dBm], [-dBm], [mV] or [uV] or [↑] or [↓] key and spinning wheel.

·**[Special Notice]:** in case of using [↑] or [↓] key and spinning wheel, the step is 10dB.

·**[Ref Position]:** press[Ampt]→[Ref Position], to change the ref position by using the number key or [↑] or [↓] and spinning wheel.

·**[Atten Auto Man]:** press [Ampt]→[Atten Auto Man], to use the menu to activate the automatic or manual mode of attenuator by number key or[↑] or[↓] key and spinning wheel.

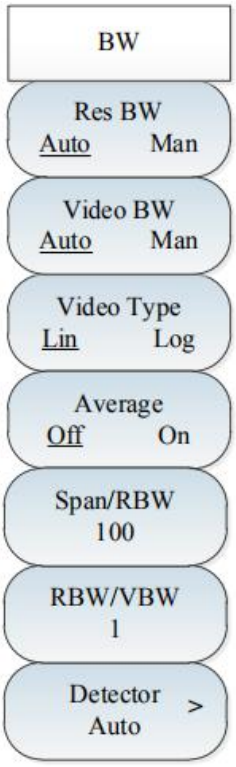
·**[Special Notice]:** the setting range of attenuator is 0dB - 50dB with step size of 10dB.

·**[Scale/Div]:** press [Ampt]→[Scale/Div], to set the scale/div as 0.1dB～20dB by number key or [↑] or [↓] key and spinning wheel.

·**[Units]:** the amplitude unit shall be taken as dBm.

·**[Pre Amp Off On]:** press [Ampt]→[Pre Amp Off On], to activate or deactivate the preamplifier

4 Bandwidth menu



·**[Res BW Auto Man]:** press [BW]→[Res BW Auto Man], to set the RBW by using the number key on front panel or [↑] or [↓] key and spinning wheel.

·**[Special Notice]:** the RBW depends on the bandwidth of intermediate frequency filter while the shape of trace depends on the intermediate frequency bandwidth filter. This apparatus can change the RBW within 1Hz - 10MHz and at the step size of 1-3-10.

·**[Video BW Auto Man]:** press [BW]→[Video BW Auto Man], to change the video bandwidth by using the number key or [↑] or [↓] key and spinning wheel.

·**[Special Notice]:** the video bandwidth filter is used to smooth trace so as to improve the ability of detecting weak signal in noise signal. This apparatus can change the RBW within 1Hz~10MHz and at the step size of 1-3-10.

·**[Video type Lin Log]:** press [BW]→[Video type Lin Log], to set the data processing of video bandwidth filter.

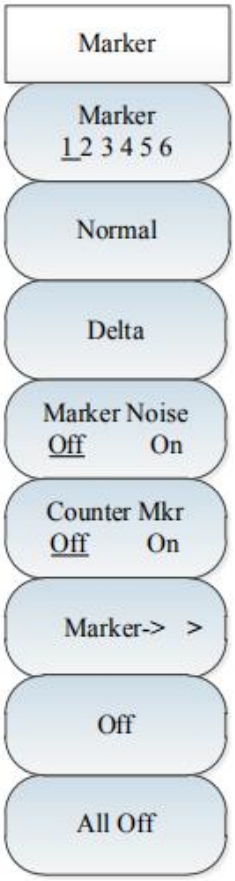
·**[Average Off On]:** press [BW]→[Average Off On], to smoothen the trace by using the number key or [↑] or [↓] key and spinning wheel when the video bandwidth filter is not changed.

·**[SPAN/RBW]:** press [BW]→[SPAN/RBW], to set the ratio between span and RBW by using the number key or [↑] or [↓] key and spinning wheel. Under the automatic mode, the RBW will vary with span.

·**[RBW/VBW]:** press [BW]→[RBW/VBW], to set the ratio between RBW and VBW by using the number key or [↑] or [↓] key and spinning wheel. Under the automatic mode, the video bandwidth will vary with RBW.

·**[Detection]:** press [BW]→[Detector], to open the detection sub-menu. For details, please refer to [Detector] menu.

5 Marker menu



·**[Marker 1 2 3 4 5 6]:** press [Marker]→[Marker 1 2 3 4 5 6], to activate the different marker display. The selected marker will be underlined.

·**[Normal]:** press [Marker]→[Normal], to set the current marker display mode as normal.

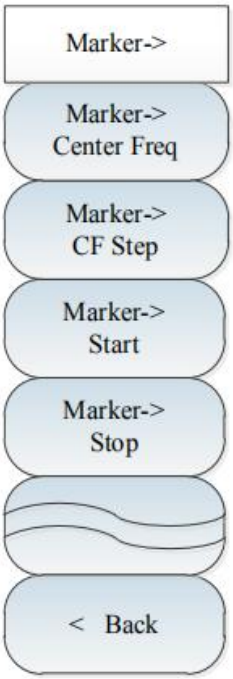
·**[Delta]:** press [Marker]→[Delta], to set the current marker display mode as delta. The delta shows the frequency difference and amplitude difference between difference marker and reference marker (or time difference under zero span). If amplitude, the show value is expressed in dB.

·**[Marker Noise Off On]:** press [Marker]→[Marker Noise Off On], to show the noise power which is used to normalize the noise adjacent to the activated marker to 1Hz bandwidth. At this time, the detector is set as sampling detection mode. After the marker noise is activated, the unit of marker reading is automatically switched to dBm/Hz.

·**[Marker->]:** press [Marker]→[Marker->], to open the marker function sub-menu. This function enables that user can use the marker to change the apparatus display. For details, please refer to [Marker→] function menu.

·**[Marker Off]:** press [Marker]→[Marker Off], to deactivate the current marker.

·**[All Off]:** press [Marker]→[All off], to deactivate all activated markers.

	·**[Marker->Center Freq]:** press [Marker]→[Marker->]→[Marker->Center Freq], to move the marker to the center frequency place and display the reading of center frequency on screen. ·**[Marker->Step Freq]:** press [Marker]→[Marker->]→[Marker->Step Freq], to set the step size of center frequency, namely, the frequency step is equal to marker frequency. When the difference marker function is activated, the frequency step is equal to the frequency of difference marker. ·**[Marker->Start Freq]:** press [Marker]→[Marker->]→[Marker->Start Freq], to set the start frequency as marker frequency. ·**[Marker->Stop Freq]:** press [Marker]→[Marker->]→[Marker->Stop Freq], to set the stop frequency as marker frequency. ·**[Return]:** return to the previous menu.

6 Peak menu

·**[Peak Search]:** press [Peak]→[Peak Search], to set the current marker at the maximum peak point of measuring trace and indicate the frequency and amplitude of the marker.

·**[Next Peak]:** press [Peak]→[Next Peak], to move the marker to next peak point on trace which is linked with current marker.

·**[Next Pk Left]:** press [Peak]→[Next Pk Left], to search the next peak on the left of current marker position.

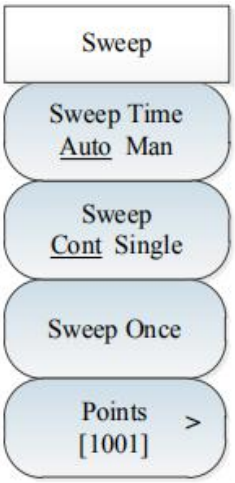
·**[Next Pk Right]:** press [Peak]→[Next Pk Right], to search the next peak on the right of current marker position.

·**[Max Search]:** this is used to place a marker at the highest point of trace and display the frequency and amplitude of the marker in the top right corner of screen. When this key is pressed, the activated function will not change.

·**[Min Search]:** this is used to place a marker at the lowest point of trace and display the frequency and amplitude of the marker in the top right corner of screen. When this key is pressed, the activated function will not change.

·**[Marker→Center]:** press [Peak]→[Marker→Center], to set the center frequency as marker frequency. This function can quickly move the signal to the center of screen.

7 Sweep menu



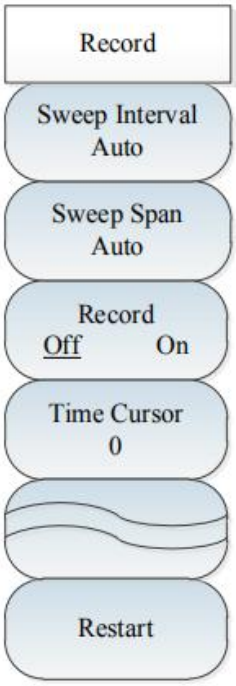
·**[Sweep Time Auto Man]:** press [Sweep]→[Sweep Time Auto Man], to switch the sweep time between automatic and manual modes. The current state will be underlined. When the sweep time is automatic, the integrated tester will automatically set the fastest sweep time as per the current apparatus state and the fastest sweep time will be displayed on screen. When the sweep time is manual, it is allowed to enter the sweep time by using number key and select the time unit to complete setting by using relevant soft key. In case of automatic sweep time, the scan frequency speed will vary with RBW and VBW. The bigger RBW and VBW are, the quicker the scan speed is; the less RBW and VBW are, the slower the scan speed is. When the minimum sweep time limit is met, the sweep time of S3302 series spectrum analyzer can set up to 800s for non-zero span and 600s for zero span.

·**[Sweep Type Cont Single]:** press[Sweep]→[Sweep Type Cont Single], to select the sweeping mode. The setting of sweep type can decide the scanning direction of an integrated tester and the time when it can stop scanning and enter the hold mode. Under the interference analysis mode, there are two sweeping modes, continuous sweeping and single sweeping.

·**[Sweep Once]:** press [Sweep]→[Sweep Once], to start single again.

·**[Points]:** press [Sweep]→[Points], to select the scan points as [201], [501], [1001], [2001] and [4001].

8 Record menu



·**[Swp Interval]:** press [Record]→[Swp Interval Auto], to set the scan interval. After the sweep time is set, the trace will switch to the maximum hold mode by default to ensure that all measured signals within scan interval can be recorded.

·**[Sweep Span]:** press [Record]→[Sweep Span Auto]. The span time means the whole sweep time. When the span time is reached, the record will stop.

·**[Record Off On]:** press [Record]→[Record Off On], to switch the auto save switch by menu.

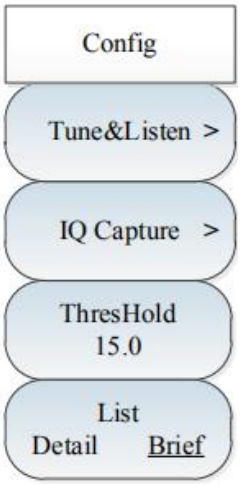
·**[Special Notice]:** the auto save function can be activated after the span time is set.

·**[Time Cursor]:** press [Record]→[Time Cursor], to view the historical data.

·**[Special Notice]:** it can be used only under the waterfall chart measurement mode.

·**[Restart]:** press [Record]→[Restart], to restart the scanning.

9 Configuration menu



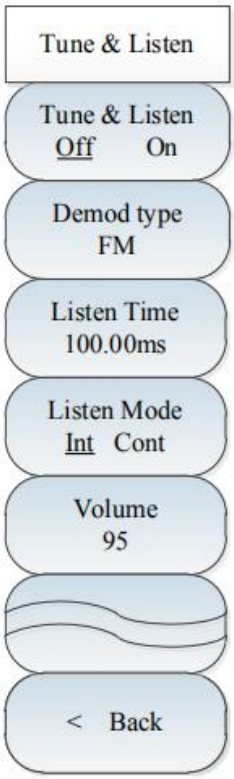
·**[Tune&Listen]:** press [Config]→[Tune&Listen], to activate the Tune Listenfunction. For details, please refer to the description of [Tune Listen] menu.

·**[IQ Capture]:** press [Config]→[IQ Capture], to activate IQ Capture function.For details, please refer to the description of [IQ Capture] menu.

·**[Threshold 15.0]:** press [Config]→[Threshold 15.0], to set the threshold value by using number key, spinning wheel or up or down key.

·**[List Detail Brief]:** press [Config]→[List Detail Brief], to select the signal list display mode by menu. Under the brief mode, display the frequency, bandwidth and amplitude of capturing the interference signal; under the detail mode, display the capture time and capture frequency of signal.

10 Tune listen menu



·**[Tune&Listen Off On]:** press [Config]→[Tune&Listen]→[Tune&Listen OffOn], to activate or deactivate the Tune Listen function.

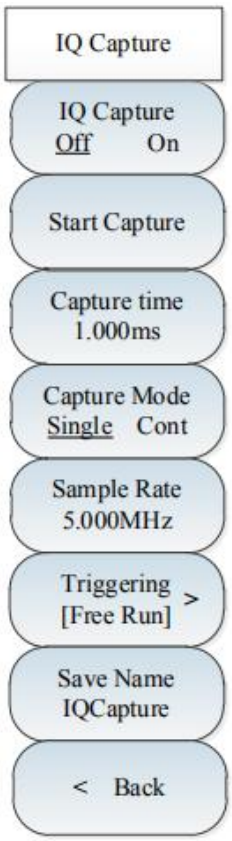
·**[Demod type]:** press [Config]→[Tune&Listen]→[Demod type], to set the demodulation type. It is allowed to select [FM], [AM], [USB] or [LSB].

·**[Listen Time]:** press[Config]→[Tune&Listen]→[Listen Time], to set the listen time.

·**[Listen Mode]:** press [Config]→[Tune&Listen]→[Listen Mode], to set the listen mode. the default state is intermittent listen mode, under which the data will be first scanned for one screen and then be demodulated as per listen time and such cycle will recirculate; the continuous mode is to scan the data for one screen and then demodulate continuously till that the data is not scanned.

·**[Volume]:** press[Config]→[Tune&Listen]→[Volume], to set the sound volume of loudspeaker under listen mode.

11 IQ capture menu



·**[IQ Capture Off On]:** press [Config]→[IQ Capture]→[IQ Capture Off On], to activate or deactivate IQ Capture function.

·**[Start Capture]:** press [Config]→[IQ Capture]→[Start Capture], to start IQ data capture and record function.

·**[Capture Time]:** press [Config]→[IQ Capture]→[Capture Time], to set IQ Capture Time. It should be noted that IQ Capture Time cannot exceed sweep time.

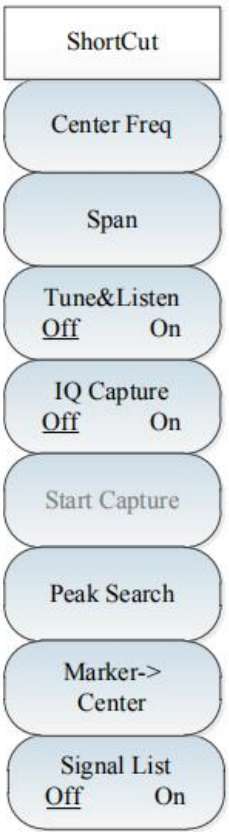
·**[Capture Type]:** press [Config]→[IQ Capture]→[Capture Type], to set IQ Capture type as single or continuous.

·**[Sample Rate]:** press [Config]→[IQ Capture]→[Sample Rate], to pop up the dialog box of sample rate and set the sample rate of IQ Capture as 12.5MHz, 5MHz, 1.25MHz, 500kHz, 125kHz or 50kHz.

·**[Triggering]:** press[Config]→[IQ Capture]→[Triggering], to select [Free Run] or [External]. In case of external trigger, it is allowed to set [Slope] or [Delay].

·**[Save Name]:** press [Config]→[IQ Capture]→[Save Name], to set the name of IQ Capture file.

12 ShortCut menu



·**[Center Freq]:** press [ShortCut]→[Center Freq], press [Freq]→[Center Freq], to set the center frequency by using the number key on front panel, [GHz], [MHz], [kHz] or [Hz] or[↑]or[↓]key and spinning wheel in frequency unit menu.

·**[Span]:** press [ShortCut]→[Span],press [Freq]→[Span], to activate the span sub-menu by using number key, frequency unit or [↑]or [↓]key and spinning wheel.

·**[Tune Listen Off On]:** press [ShortCut]→[Tune&Listen Off On], to activate or deactivate the tune listen function.

·**[IQ Capture Off On]:** press [ShortCut]→[IQ Capture Off On], to activate or deactivate IQ Capture function.

·**[Start Capture]:** press [ShortCut]→[Start Capture], to start IQ Capture.

·**[Peak Search]:** press [ShortCut]→[Peak Search], to set the current marker at the maximum peak point of measuring trace and indicate the frequency and amplitude of the marker.

·**[Marker→Center Freq]:** press [ShortCut]→[Marker→Center Freq], to set the center frequency as marker frequency. This function can quickly move the signal to the center of screen.

·**[List Off On]:** press[ShortCut]→[List Off On], to open or close the signal list.

13 File menu

Please refer to the file menu description under spectral analysis mode.

Chapter XI Location Analyzer Mode (optional)

Section 1 Introduction to Typical Measurements

The location analyzer mode is mainly used for the positioning function of the interference source or the unknown signal source, and the orientation of the interference signal can be quickly realized by using the external receiving antenna and the electronic compass.

Attention

This mode requires an optional receiver antenna and an electronic compass option. Since the azimuth measurement of the electronic compass used in the orientation analysis uses the principle of geomagnetism, please try to keep a distance from the magnetic object when testing.

The location analyzer mode mainly includes three measurement modes:

1 Point Scan

Below is an example of the point scan mode, mainly involving the following procedures.

1) Press [Measure]→[Point Scan], select point scan measurement mode.

2) Press [Freq]→[Pot Freq], set point frequency value.

3) Press [BW]→[BW], set bandwidth value, the bandwidth is set as s 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

4) Press [Swp/Ant]→ [Recall Antenna], select the antenna factor file.

5) Press [Demod], set the demodulation type and volume.

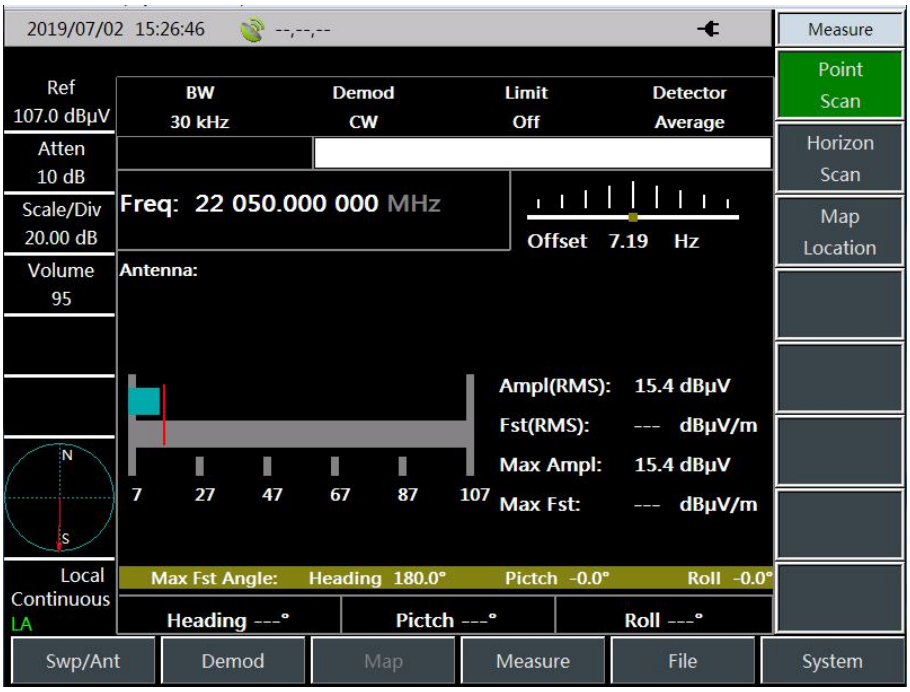


Fig. 11-1 Schematic diagram of point scan

2 Horizon Scan

The horizon scan is to display the measured value information after one rotation of the current measuring point on a horizontal disc. The main procedures of the horizon scan measurement are as follows:

1) Press [Measure]→[Horizon Scan], select horizol scan measurement mode.

2) Press [Freq]→[Pot Freq], set point frequency value.

3) Press [BW]→[BW], set bandwidth value, the bandwidth is set as s 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

4) Press [Swp/Ant]→ [Recall Antenna], select the antenna factor file.

5) Press [Demod], set the demodulation type and volume.

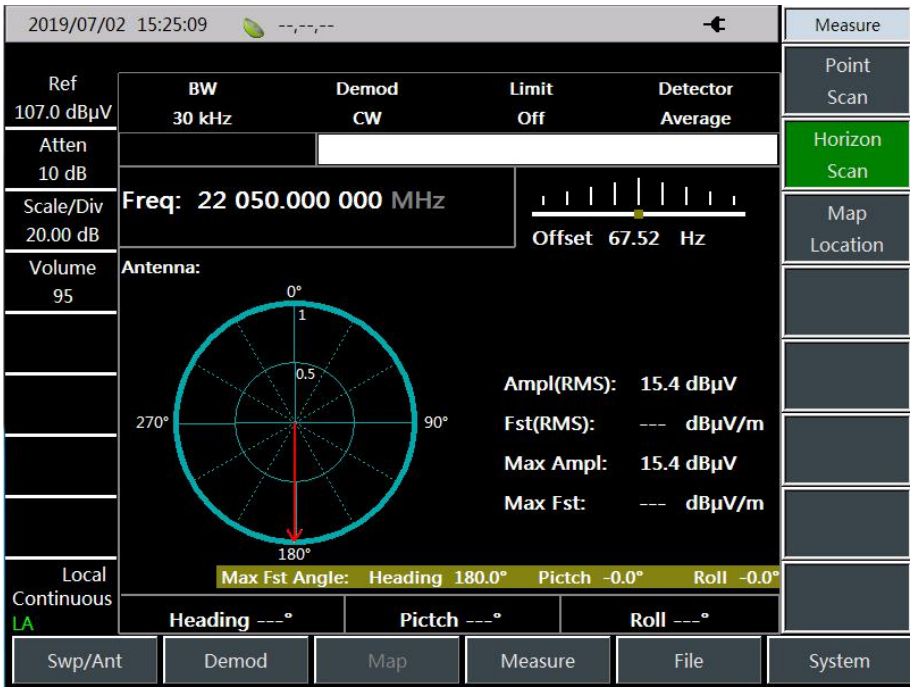


Fig. 11-2 Schematic diagram of horizon scan

3 Map Location

The map location is to display the test information on the current measurement location on the map, and the map location can directly display the location information of the interference source. The main procedures of the map measurement are as follows:

6) Press [Measure]→[Map Location], select map location measurement mode.

7) Press [Freq]→[Pot Freq], set point frequency value.

8) Press [BW]→[BW], set bandwidth value, the bandwidth is set as s 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.

9) Press [Swp/Ant]→ [Recall Antenna], select the antenna factor file.

10) Press [Demod], set the demodulation type and volume.

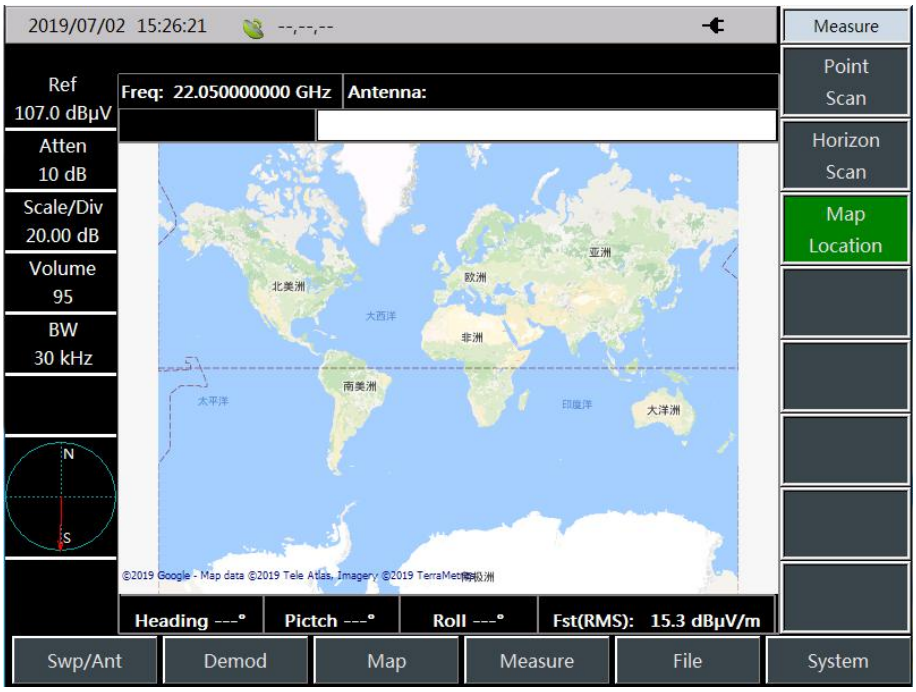


Fig. 11-3 Schematic diagram of map location

Section 2 Structure of Location Analyzer Menu

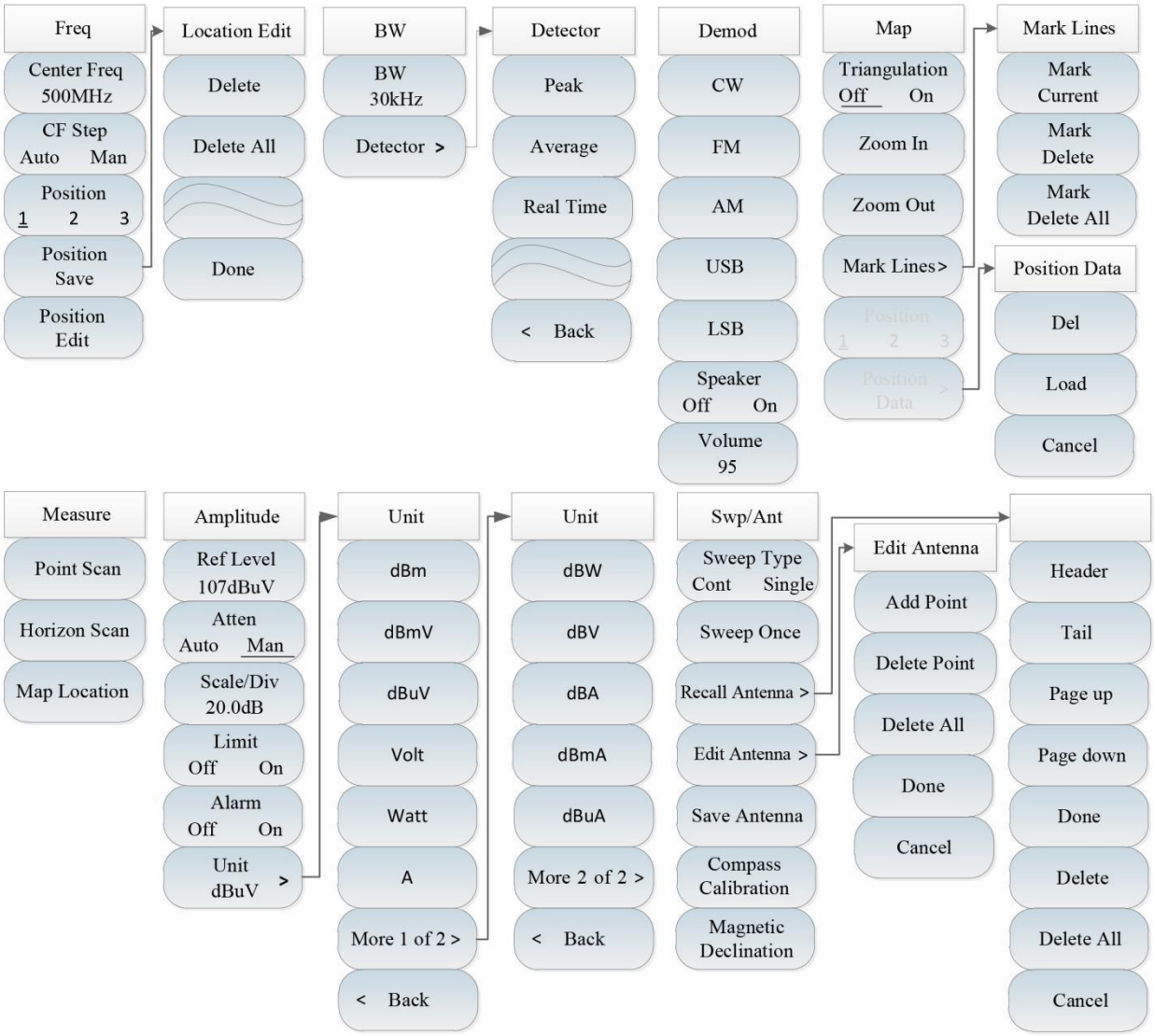
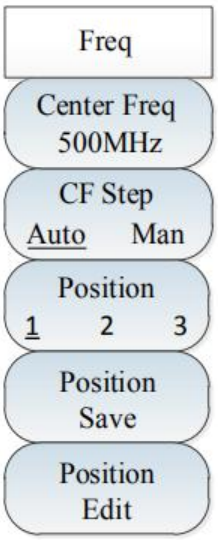


Fig.11-4 Block diagram of location analyzer menu

Section 3 Description of Location Analyzer Menu

1 Frequency menu



·**[Center Freq]:** press [Freq]→[Center Freq], to select [GHz], [MHz], [kHz] or [Hz] by number key on front panel or [↑] or [↓] key and spinning wheel in frequency menu.

·**[Special Notice]: in case of using [↑] or [↓] key and spinning wheel, the frequency step is same with the set value of [Step Freq]. After pressing [Step Freq Auto Man] to switch to [Step Freq Auto Man], it is allowed to use the number key or [↑] or [↓] key and spinning wheel to set the step frequency.**

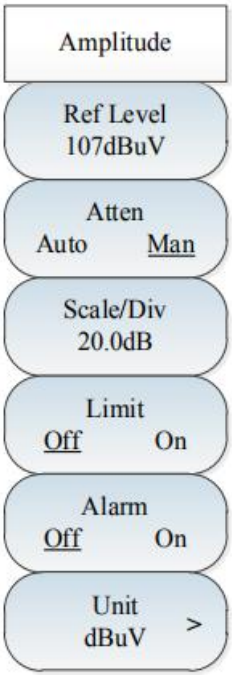
·**[CF Step Auto Man]:** press [Freq]→[CF Step], by using number keyto select [GHz], [MHz], [kHz] or [Hz] by number key on front panel or [↑] or [↓] key and spinning wheel in frequency menu.

·**[Positon 1 2 3]:** Press [Freq]→[Position], by switching the menu indication to achieve the data saving.

·**[Position Save]:** Press [Freq]→[Position Save], this menu enables data saving of the current positioning information.

·**[Position Edit]:** Press [Freq]→[Position Edit], can open the positioning data editing submenu, select [Del], [Load] and [Cancel].

2 Amplitude menu



· **[Ref Level 107dBuV] :** Press [Ampt]→ [Ref Level 107dBuV] and set the reference value with the number keys on the front panel. Select [dBuV], [-dBuV], [mV] or [uV] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob.

· **[Special note]: When using the [↑] or [↓] key and rotary wheel, the step is 10dB.**

· **[Atten Auto Man]:** Press [Ampte]→[Atten Auto Man]. In the auto mode, the attenuation amount of the attenuator will be adjusted automatically according to the reference value. In the manual mode, the set attenuation amount will always be applied in the attenuator.

· **[Special note]: The attenuator setting range is 0dB to 50dB, step is 10dB.**

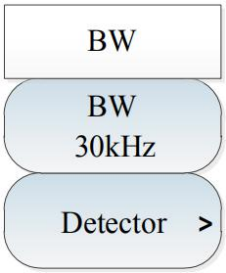
· **[Scale/Div 20.0dB]:** Press [Ampt]→ [Scale/Div 20.0dB] and set the scale/division with the number keys on the front panel. Select [dB] or [-dB] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob. The range is 0.1dB to 20dB.

· **[Limit Off On]:** Press [Ampt]→ [Limit Off On] to enable or disable the limit.

· **[Alarm Off On]:** Press [Ampt]→ [Alarm Off On] to enable or disable the audio alarm.

· **[Unit dBuV]:** Press [Amplitude]→ [Unit] to enable the unit menu, including [dBm], [dBmV], [dBuV], [Volt] , [Watt], [A], [dBW], [dBV], [dBA], [dBmA], [dBuA].

3 Bandwidth menu

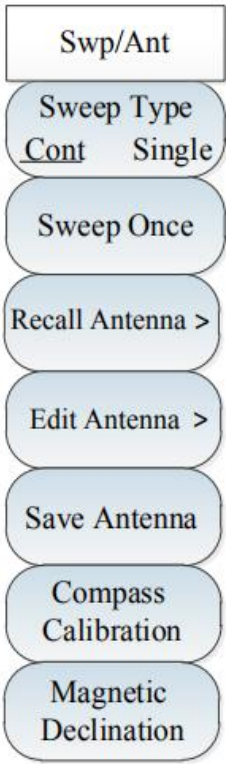


· **[BW 30kHz]:** Press [BW]→ [BW 30kHz] and set the bandwidth with the number keys on the front panel. Select [GHz], [MHz], [kHz] or [Hz] in the frequency unit menu, or set the reference value with the [↑] or [↓] key or knob.

· **[Special note]: The bandwidth must be set as 150Hz, 300Hz, 600Hz, 1.5kHz, 2.4kHz, 6kHz, 9kHz, 15kHz, 30kHz, 50kHz, 120kHz or 150kHz.**

· **[Detector]:** Press [BW]→ [Detector] to enable the detector menu, including: Peak, Average and Real Time.

4 Sweep/Antenna menu



· **[Sweep Cont Single]:** Press [Swp/Ant]→[Sweep Cont Single] to enable the continuous or single sweeping mode.

· **[Sweep Once]:** Press [Swp/Ant]→ [Sweep Once] to sweep once again.

· **[Recall Antenna]:** Press [Swp/Ant]→ [Recall Antenna] and soft menus such as [Head], [Tail], [Page Up], [Page Down], [Done] and [Delete] will pop up. You can select and recall the saved antenna factor file.

·**[Edit Antenna]:** Press [Swp/Ant]→ [Recall Antenna], and soft menus such as [Add Point], [Delete Point], [Delete All], [Done] and [Cancel] will pop up. This menu is applied to edit the antenna factor.

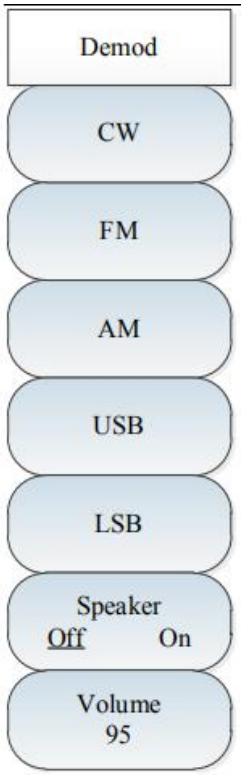
·**[Save Antenna]:** Press [Swp/Ant]→[Save Antenna] to open the antenna saving dialog box, where the antenna factor file can be saved.

·**[Compass Calibration]:** Press [Swp/Ant]→[Compass Calibration] to open the calibration function, in which case the electronic compass needs to be rotated horizontally.

· **[Special note]: After pressing [Compass Calibration], the menu switches to [Stop Calibration], which can be used to stop the calibration.**

·**[Magnetic Declination]:** Press [Swp/Ant]→[Magnetic Declination], set the geomagnetic declination value of the current measurement position.

5 Demodulation menu



· **[CW]:** Press [Demod]→ [CW] to disable the demodulation mode.

· **[FM]:** Press [Demod]→ [FM] to enable the FM mode.

· **[AM]:** Press [Demod]→ [AM] to enable the AM mode.

· **[USB]:** Press [Demod]→ [USB] to enable the upper sideband mode.

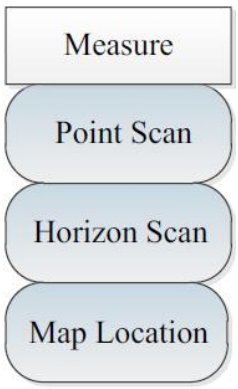
· **[LSB]:** Press [Demod]→ [LSB] to enable the lower sideband mode.

· **[Speaker Off On]:** Press [Demod]→[Speaker Off On] to enable or disable the audio alarm function.

· **[Special note]: If the audio alarm is enabled, the demodulation mode such as [FM], [AM], [USB] and [LSB] will not be available.**

· **[Volume 95]:** Press [Demod]→[Volume 95] to set the demodulation volume. Set the required volume with the number keys or [↑] or [↓] key or knob.

6 Measurement menu

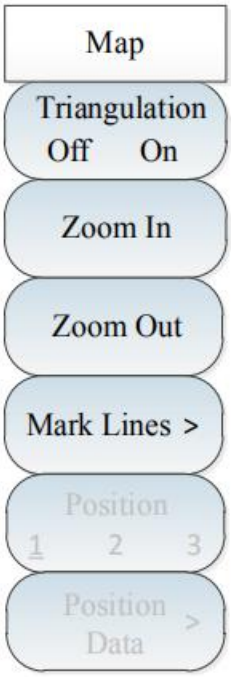


· **[Point Scan:** Press [Measure]→[Point Scan] to select the point scan mode of location analyzer.

· **[Horizon Scan]:** Press [Measure]→[Horizon Scan] to select the horizontal scan mode of location analyzer.

· **[Map Location]:** Press [Measure]→[Map Location] to select the map location mode of location analyzer.

7 Map menu



· **[Triangulation Off On]:** Press [Map]→[Triangulation Off On], the real-time positioning mode indicates that the current measurement is refreshed in real time with the GPS and the compass, and the recall positioning method is called to display the positioning data measured at different positioning points onto the current map.

· **[Zoom In]:** Press [Map]→[Zoom in] to zoom in the current map scale.

· **[Zoom Out]:** Press [Map]→[Zoom out] to zoom out the current map scale.

· **[Mark Lines]:** Press [Map]→[Mark Lines], open the mark submenu, [Mark Current], [Mark Delete], [Mark Delete All]. Through the submenu can display different locations and directions on the map.

· **[Position 1 2 3]:** Press [Map]→[Position 1 2 3], select the location point you want to recall.

· **[Position Data]:** Press [Map]→[Position Data], open the positioning data table of the selected point, select [Delete], [Recall], [Cancel].

8 File menu

Refer to the description of the file menu in the spectrum analyzer mode.

Chapter XII Operating Principle

S3302 series spectrum analyzers have four operating bands: 9kHz - 20GHz, 9kHz - 26.5GHz, 9kHz - 32GHz and 9kHz - 44GHz, and various measurement functions such as spectrum measurement analysis, field strength measurement, occupied bandwidth measurement, channel power measurement, adjacent channel power measurement, tune listening and IQ capture. With options for interference analysis, AM-FM-PM signal demodulation analysis and USB power measurement, the RF signal parameters such as the frequency and amplitude can be measured. The functional block diagram of S3302 series spectrum analyzer is shown in Fig. 12-1.

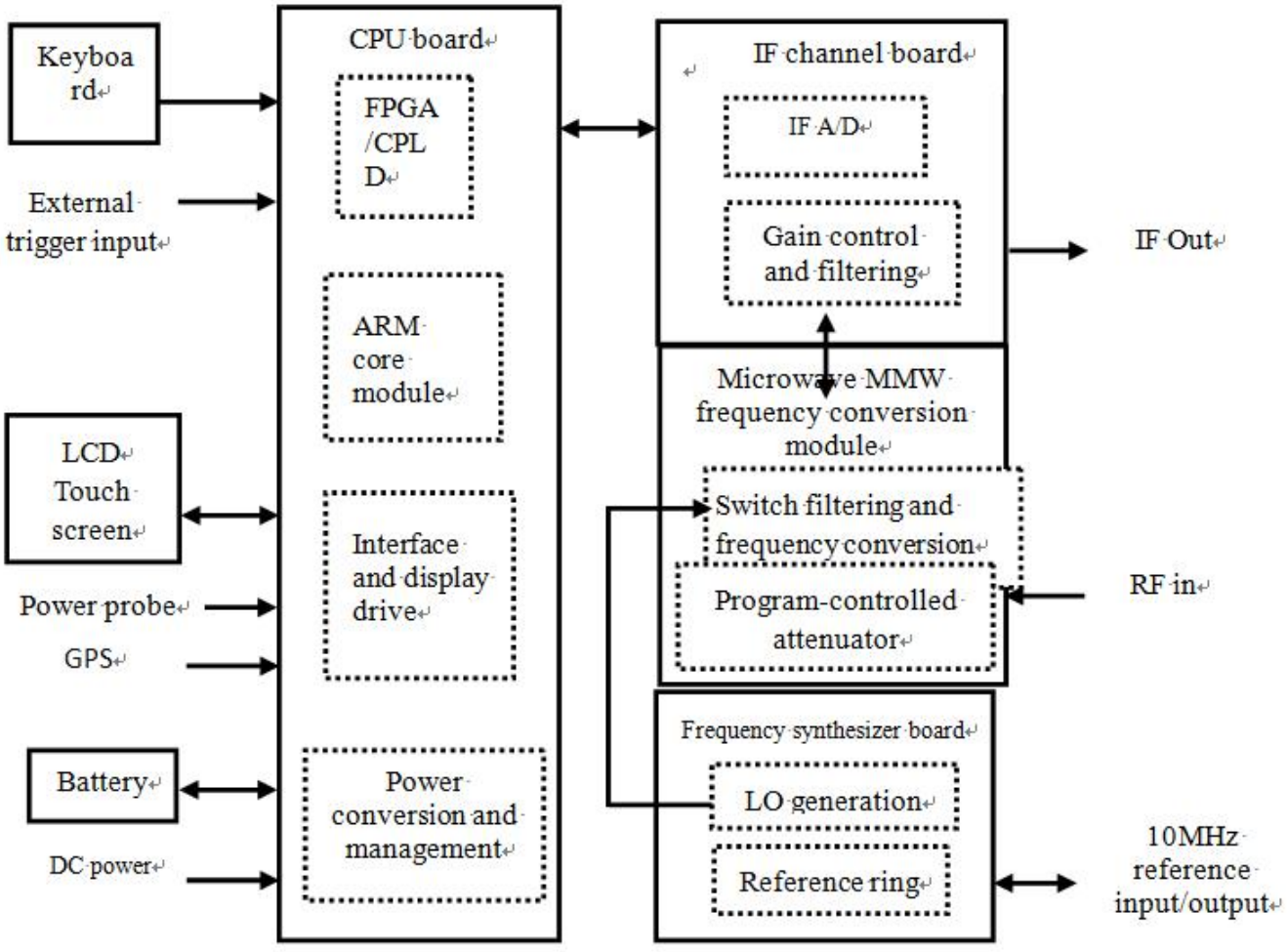


Fig. 12-1 Overall Functional Block Diagram

System hardware can be divided into the microwave MMW frequency conversion module, frequency synthesizer board, IF channel board, CPU board, display, keyboard, battery, etc.

The microwave MMW frequency conversion module includes two parts: 60dB program-controlled step attenuator and switch filtering and frequency conversion part. The attenuation value of the program-controlled step attenuator

is automatically associated according to the reference level or manually set by the user to provide the appropriate mixer level. The switch filtering and frequency conversion part is used for band filtering and frequency conversion of RF input signals and output of IF signals to the IF channel board.

The IF channel board is used for filtering IF signal input of the frequency conversion module. Gain control is implemented based on bands so as to adjust the amplitude of AD sample signals and finally output differential digital signals to FPGA after AD conversion, so as to achieve the functions of digital down-conversion, IF filtering, video filtering, etc.

The CPU board includes the power conversion and management circuit, interface and display circuit, FPGA/CPLD control and digital signal processing circuit and ARM core module, and is used for DC/DC conversion and operation management of the power supply of the whole instrument, digital signal processing, logic circuit control, etc. Finally, digital signals in the sweep curve, spectrogram and other forms, as test results are transmitted to the LCD display.

The frequency synthesizer board has the function of providing 10MHz reference input/output for the outside, with the internal reference ring output signal as the LO frequency reference, and also providing high-stability clock signals for AD sampling and FPGA. The LO generation circuit is used for providing LO signals for the mixer in the microwave MMW frequency conversion module, and related to the hardware sweeping speed, phase noise, sideband emission and other indicators of the whole instrument.

Chapter XIII Troubleshooting and Repair

This chapter will introduce how to find out problems and receive the after-sales service. Interpretation of internal errors of the spectrum analyzer is also included.

If you have any problem in operation of S3302 series spectrum analyzer or want to purchase related components, options or accessories, we will provide complete after-sales services.

In general, the trouble is caused by failure of hardware/software or users' misuse. Please contact us immediately in case of any trouble. If the warranty is valid, we will provide maintenance services free of charge according to the commitment in the warranty; otherwise, we will charge costs.

Section 1 Fault Information Description

This section will help you to simply judge and deal with faults of S3302 series spectrum analyzer. If necessary, report the problems to us as accurately as possible so that we can solve the problems as soon as possible.

You can check S3302 series instrument according to the following prompts in the case of any fault: Please contact us if the failure cannot be removed.

- If S3302 series cannot be started when the Power key is pressed, check whether the power supply is normal, whether the adapter indicator is ON and whether the power supply battery is normal. If the above items are normal, the instrument failure may occur. In this case, contact us for repair.
- If the system or applicable program fails after start-up of S3302 series instrument, press [Reset] to recover the known state. If S3302 still cannot work properly, an instrument failure may occur. In this case, contact us for repair.
- If the performance indicators of S3302 series are abnormal, check whether the test tools and test environment conform to the requirements, whether the connector of the test port is damaged and whether the performance indicators of the calibration kit are normal. If the above items are normal, instrument failure may occur. In this case, contact us for repair.
- If LAN communication of S3302 series fails. First check the IP address and the yellow indicator beside the LAN interface on the top panel. If the indicator does not flicker, check the LAN cable and connections. If all the above items are in good conditions, it indicates that the instrument may be faulty. Contact us for repair.

Section 2 Repair Method

If you cannot solve the problem of S3302 series, contact us by telephone or fax. If it is confirmed that repair is required, please pack the instrument by the following steps:

1) Prepare one copy of paper file describing the instrument failure, and place it into the packing box together with the tester.

2) Use the original packaging materials to pack the instrument properly to minimize damage.

3) Set pads in the four corners of the outer packing box, and place the instrument into the outer packing box.

4) Seal the opening of the packing box with sticky tape and strengthen the packing box with nylon straps.

5) Mark “Fragile! No touch! Handle with care” on the packing case.

6) Ship this instrument as a precision instrument, and keep a copy of all the shipping documents.

-END OF DOCUMENT-