SALUKI TECHNOLOGY

S6362D Optical Spectrum Analyzer User Manual

Saluki Technology Inc.

This manual applies to the following models of optical spectrum analyzers.

- S6362D Optical Spectrum Analyzer

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Foreword

Thank you for choosing and using S6362D optical spectrum analyzer developed and produced by Saluki Technologies Co., Ltd.! With high, precision and frontier technologies comprehensive, the product enjoys high quality and cost performances compared with similar products.

We will take the responsibility to maximally meet your needs and provide you with high-quality measuring instruments and first-class after-sales service. We aim to provide "high quality and considerate service", and operate on the principle of making customers satisfactory with our products and services.

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Version

A.1 2021.11

Saluki Technology Inc.

Manual Authorization

The contents of this manual are subject to change without notice. The contents and terms used in this manual are interpreted by Saluki Technology Inc.

Product warranty

The warranty period of this product is 18 months from the date of shipment. The instrument manufacturer will repair or replace the damaged components according to the user's requirements and actual conditions within the warranty period. For specific maintenance issues, see the contract.

Product quality certificate

This product is guaranteed to meet the specifications in this manual from the date of shipment. The calibration and measurement are completed by measuring bodies with national qualification, with relevant data to be provided for reference by users.

Quality/Environmental Management

This product complies with the quality and environmental management systems during R&D, manufacturing and testing. Saluki Technology Inc. is qualified and has passed ISO 9001 and ISO 14001 management systems.

Safety Precautions

Warning

The symbol "Warning" indicates a hazard. It reminds the user to pay attention to a certain operation process, operation method or the like. In case of any failure of observing the rule or maloperation, personal injury can occur. Further operation cannot be preceded until the warning conditions are fully understood and met.

Notice

The "Notice" symbol indicates some important information which will not cause danger. It reminds the user to pay attention to a certain operation process, operation method or the like. Failure to observe the rules or operate correctly may cause damage to the instrument or loss of important data. Proceed to the next step only after fully understanding and meeting the caution conditions indicated.

Contents

1. Manual navigation

This chapter introduces the user's manual functions, chapter structure and main contents of S6362D optical spectrum analyzer, as well as the instrument-related documents provided to users.

1.1. About the Manual

This manual introduces the basic functions and operation methods of S6362D optical spectrum analyzer produced by Saluki Technologies Co., Ltd. It describes such contents as product features, basic operations, configuration guide, menu description, remote control, maintenance, technical indicators and testing methods, etc. of the instrument to help users get familiar with and master the operation method and key points of the instrument as soon as possible. To facilitate your skillful use of such instrument, please read carefully and follow this manual in advance for correct operation.

This manual contains the following chapters:

- Overview

This part introduces in general the main performance characteristics, typical application examples and safety precautions of operation for S6362D optical spectrum analyzer. The purpose is to enable users to have a preliminary understanding of the main performance characteristics of the instrument and to guide users to operate the instrument safely.

- Operation Guide

It introduces in detail the operation methods of various measurement functions of the instrument, including configuring the instrument, starting the measurement process and obtaining the measurement results. This part mainly includes two parts: functional operation guide and advanced operation guide. For users who are not familiar with the S6362D optical spectrum analyzer, the basic operation guide introduces and enumerates each function systematically and in detail so that users can understand and master some basic usage of the instrument, such as setting the center wavelength, reference level, and sweep width, etc. The advanced operation guide introduces relatively complicated testing processes and advanced operation skills for users who have basic knowledge about using the optical spectrum analyzer but are not familiar with some special usage, and guides them to implement the measurement processes. For example, the list configuration of Side Mode Suppression Ratio (SMSR) analysis and Wavelength Division Multiplexing (WDM) analysis, etc.

- Troubleshooting and Repair

This part includes the introduction of the working principles, fault diagnosis, solutions and repair methods.

- Technical Indicators and Testing Methods

This part introduces the product features, main technical indicators and recommended testing methods of S6362D optical spectrum analyzer.

- Appendixes

This part lists the necessary reference information for S6362D optical spectrum analyzer, including: programmed command quick reference table, etc.

1.2 Related Documents

Product documentation for S6362D optical spectrum analyzer includes:

- User's Manual

1.2 Related Documents

- Program Control Manual
- Quick Start Guide
- Online Help

User's Manual

This manual describes the functions and operation methods of the instrument in detail, including configuration, measurement, program control and maintenance, etc. The purpose is to guide users to fully understand the functional characteristics of the product and master common testing methods of the instrument. Main chapters include:

- Manual Navigation
- Overview
- Operation Guide
- Troubleshooting and Repair
- Technical Indicators and Testing Methods
- Appendixes

Program Control Manual

This manual introduces remote programming basics, SCPI basics, SCPI commands, programming examples and I/O driver function library in detail. The purpose is to guide users to quickly and comprehensively master the program control commands and methods of the instrument. Main chapters include:

- Remote Control
- Program Control Commands
- Repair Methods
- Appendixes

Quick Start Guide

This manual introduces the basic methods for configuration and start-up measurement of the instrument to enable users to quickly understand the characteristics of the instrument, and master the basic settings and basic operation methods. Main chapters include:

- Get Prepared
- Typical Applications
- Get Help

Online Help

Online help is integrated in the instrument, providing fast text navigation help to make it convenient for users in local and remote control operation. Both the hard keys on the front panel of the instrument or the user interface tool bar offer corresponding shortcut keys to activate this function. Main chapters are identical to those of the User's Manual.

2 Overview

This chapter introduces the main performance characteristics, main applications and main technical indicators of S6362D optical spectrum analyzer. It also gives introductions on correct operation of the instrument and precautions such as electrical safety.

2.1 Product Overview

S6362D optical spectrum analyzer is a new type of high-performance diffraction grating optical spectrum analyzer, which is applicable to spectral characteristics measurement of LED, LD, SLD, DFB -LD in the range of 600~1700nm, noise coefficient and gain test of fiber amplifier system, transmission characteristics test of passive devices such as optical isolators and filters, etc. Its performance index fully meets the test requirements of Dense Wavelength Division Multiplexing (DWDM), and is an ideal test instrument for optical active and passive devices.

2.1.1 Product Features

2.1.1.1 Basic Functions

The main performance features of S6362D optical spectrum analyzer are:

1) Minimum spectral resolution: 0.02nm;

2) Spectral sweep range: 600~1700nm;

3) Wide dynamic range: 78dB;

4) Maximum sensitivity: -90dBm;

5) Free space light input;

6) Optional built-in light source output configuration;

7) Powerful multi-application spectral data analysis capabilities;

8) 12.1-inch touch display and full Chinese operation.

2.1.1.2 High Performance

1) Excellent dynamic range

The spectral dynamic range detected by the wide dynamic version of S6362D optical spectrum analyzer

can reach more than 70dB, which can better meet the needs of customers, especially the needs of SMSR test.

2) Better power accuracy

The power accuracy of S6362D optical spectrum analyzer is ± 0.4dB (after 1310nm/1550nm calibration) , which better meets the measurement and testing requirements of communication band.

3) Wavelength accuracy

The S6362D optical spectrum analyzer can provide you with the required wavelength accuracy to meet the test requirements within the test range ± 0.1nm (600 nm-1500 nm, and 1620 nm-1700 nm). Resolution: 0.05nm, sweep width: 10nm, sampling points: 1001), ± 0.02nm (1500nm-1620nm, after

calibration.) Resolution: 0.05 nm, sweep width: 10nm, sampling points: 1001), which can meet the testing requirements of communication optical band, optical devices, etc.

2.1.1.3 Agility

1) Chinese/English operation interface, with large true color LCD touch screen

The S6362D optical spectrum analyzer adopts fully self-designed software, with large screen and Chinese/English operation interface, and a panoramic view of the current state information. The operation interface can also be set in English according to different purposes and occasions, which is convenient for you to use.

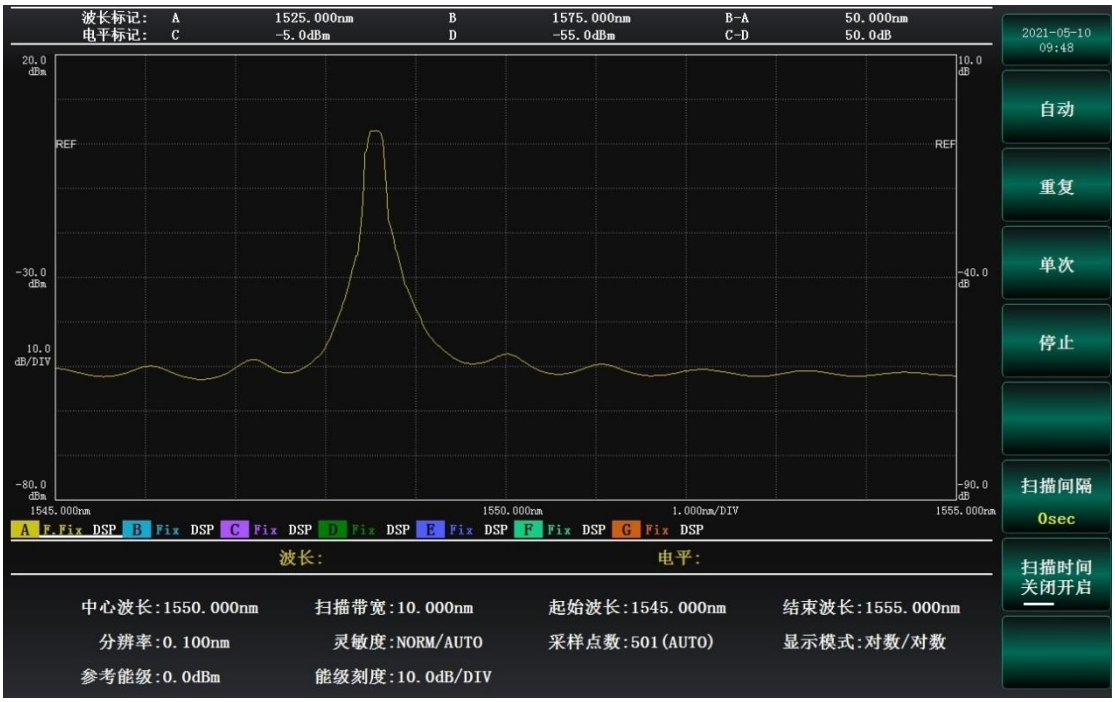


Figure 2-1 Screenshot of actual operation interface

2) Rich program control interfaces

The S6362D optical spectrum analyzer offers additional extension interfaces such RS232 interface and network interface, which are freely selectable for convenient realization of remote control.

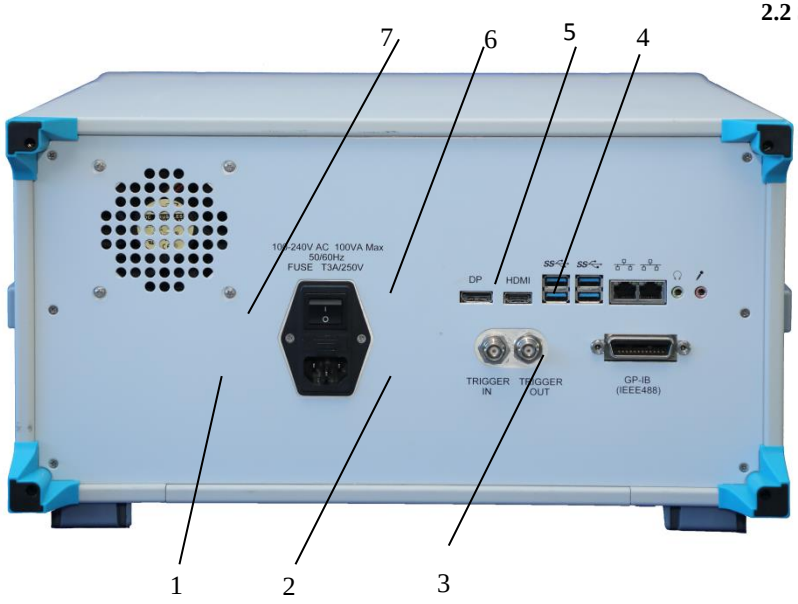


Figure 2-2 Rear panel interface of S6362D optical spectrum

analyzer The functions of each part of the rear panel of the instrument are shown in

Table 2.1. Table 2.1 Function description of each part of the rear panel of the instrument

No.	Name	Function description	Remarks
1	Power interface	For power cord access to the power supply.	
2	External trigger input interface		Not used yet
3	GPIB interface	GPIB can be used to connect and control the instrument.	
4	LAN Interface	Network cable can be used to connect the instrument to the network or directly connect with other computers.	
5	USB interface	It is used to access USB devices such as USB keyboard, USB mouse and U disk.	
6	DP interface	DP line can be used to connect the display device.	
7	Power switch	The switch used to control the power supply.	

2.1.2 Typical Applications

1) Emission spectrum waveform analysis of optical transceiver module and LD module;

2) WDM transmission signal analysis;

3) Measurement and analysis of spectral parameters of photoelectric system.

2.2 Safe Operation Guide

Please read carefully and strictly observe the following precautions!

2.2 Safe Operation Guide

We will spare no effort to ensure that all production processes meet the latest safety standards and provide users with the highest safety guarantee. The design and testing of our products and the auxiliary equipment used meet relevant safety standards, and a quality assurance system has been established to monitor the product quality and ensure the products to always comply with such standards. In order to keep the equipment in good condition and ensure operation safety, please observe the precautions mentioned in this manual. If you have any questions, please feel free to consult us.

In addition, the correct use of this product is also your responsibility. Please read carefully and observe the safety instructions before starting to use this instrument. This product is suitable for use in industrial and laboratory environments or field measurement. Always use the product correctly according to its restrictions to avoid personal injury or property damage. You will be responsible for problems caused by improper use of the product or noncompliance with the requirements, and we will not be held responsible. **Therefore, in order to prevent personal injury or property damage caused by dangerous situations, please always observe the safety instructions.** Please keep the basic safety instructions and the product documentation properly and deliver them to end users.

2.2.1 Safety Marks

2.2.1.1 Product-related Marks

Safety marks on the products are described as follows (Table 2.2):

Table 2.2 Products safety marks

Symbol	Meaning	Symbol	Meaning
	Notice, reminding users of information to be paid special attention to. It reminds users of the operation information or instructions to be paid attention to.		Power ON/OFF
	Notice, handling heavy equipment.		Standby indication
	Danger! Hazard of electric shock.		DC
	Warning! Hot surface.		AC

	Protective conductive end		DC/AC
	Ground		Reinforced insulation protection of the instrument
	Ground terminal		EU mark for batteries and accumulators. Please refer to Item 1 of "2.2.8 Waste Disposal/Environmental Protection" in this section for specific instructions.
	Notice, please handle classical sensitive devices with care.		EU mark for separate collection of electronic devices. Please refer to Item 2 of "2.2.8 Waste Disposal/Environmental Protection" in this section for specific instructions.
	Warning! Radiation. Please refer to Item 7 of "2.2.4 Operation Precautions" in this section for specific instructions.		

2.2.1.2 Manual-related marks

In order to remind users to operate the instrument safely and pay attention to relevant information, the following safety warning marks are used in the product manual, which are explained as follows:

Danger mark, personal injury or equipment damage may be caused if not avoided.

Warning mark, personal injury or equipment damage may be caused if not avoided.

Caution mark, slight or medium personal injury or equipment damage may be caused if not avoided.

Notice mark, indicating some important information which will not cause danger.

Tips on information about the instrument and its operation.

2.2.2 Operation Status and Locations

Please note before operating the instrument:

1) Unless otherwise specified, the S6362D optical spectrum analyzer should be operated in an environment that allows for smooth placement of the instrument and indoor operation. The maximum altitude for operating the instrument shall not exceed 4,600m, and the maximum altitude for transporting the instrument shall not exceed 4,500m. The range of actual supply voltage is ±10% of the marked voltage, and the range of supply frequency is ±5% of the marked frequency.

2) Unless otherwise specially stated, the instrument has not received any waterproof treatment, do not place the instrument on surfaces with water, vehicles, cabinets, tables and other objects that are not fixed and do not meet the load conditions. Please place the instrument securely and fix it on the surface of a solid object (e.g., an ESD workbench).

3) Do not place the instrument in an environment where mist is easily formed, for example, moving the instrument in a environment where cold and heat are in alternation, where water droplets formed on the instrument may cause electric shock and other hazards.

4) Do not place the instrument on the surface of a heat-dissipating object (e.g., a radiator). The operating environment temperature shall not exceed the value specified in the description of relevant indicators of the product. Overheating of the product will lead to electric shock, fire and other risks.

5) Do not insert any object into the instrument through the opening on the instrument casing, or cover up any notch or opening on the product, which is used for internal ventilation and preventing the instrument from getting overheat.

2.2.3 Electrical Safety

Precautions for electrical safety of the instrument:

1) Before the instrument is powered on, the actual supply voltage should match the supply voltage marked on the instrument. If the power supply voltage changes, the fuse model of the instrument shall be changed synchronously.

2) According to the power requirements of the real panel of the instrument, a three-core power cord should be adopted while ensuring reliable grounding of the ground wire during operation. Either floating ground or poor grounding may cause damage to the instrument and even cause injury to operators.

3) Do not damage the power cord, otherwise electric leakage will be caused, resulting in damage to the instrument and even injury of the operators. If an external power cord or extension socket is used, it should be checked before use to ensure electrical safety.

4) If the power supply socket does not provide an on/off switch,to cut the power of the instrument, you can just directly unplug the instrument, and therefore, it should be ensured that the power plug can be inserted or drawn conveniently.

5) Do not use damaged power cords. Before connecting the instrument to the power cord, check the integrity and safety of the power cord, and properly place the power cord to avoid the impact due to human factors, such as, too long power cord that may trip the operator.

6) The TN/TT power supply network is required for the instrument, and the maximum rated current of its fuse is 16A (if a fuse with higher rated current is used, it shall be discussed and determined with the manufacturer).

7) Keep the socket clean and tidy, and ensure the plug and the socket in good contact and reliable engagement.

8) Neither the socket nor the power cord can be overloaded, otherwise fire or electric shock will be caused.

9) If the instrument is tested in a circuit with the voltage V_{rms} more than 30 V, it shall be protected properly to avoid damage (e.g. by using appropriate test instruments, adding fuses, limiting current value, electrical isolation and insulation, etc.).

10) The instrument shall comply with IEC60950-1/EN60950-1 or IEC61010-1/EN 61010-1 standards to connect with PC or IPC.

11) Unless otherwise allowed, do not open the housing of the instrument, which may expose internal circuits and devices of the instrument and cause unnecessary damage.

12) If the instrument needs to be fixed at the test site, a qualified electrician is required to install the protective earth wire between the test site and the instrument first.

13) Take appropriate overload protections to prevent overload voltage (caused by lightning, for instance) from damaging the instrument or causing personal injury.

14) When opening the housing of the instrument, do not place objects not belonging to the interior of the instrument, otherwise, short circuit, damage to the instrument and even personal injury may be caused.

15) Unless otherwise stated, the instrument has not received any waterproof treatment, so keep the instrument from contacting with liquid to prevent damage to the instrument or even personal injury.

16) Do not place the instrument in an environment where fog is easily formed, for example, moving the instrument in a environment where cold and heat are in alternation, where water droplets formed on the instrument may cause electric shock and other hazards.

2.2.4 Operation Precautions

1) Instrument operators need to have certain professional and technical knowledge, good psychological quality, and certain emergency response capabilities.

2) Before moving or transporting the instrument, please refer to the relevant instructions in "2.2.7 Transportation" of this section.

3) The inevitable use of substances in the production process of the instrument may cause allergy to personnel. If an operator of the instrument has allergic symptoms (e.g. rash, frequent sneezing, ophthalmia or dyspnea) during the operations, please seek medical care in time to find out the reason and solve the symptoms.

4) Please refer to the relevant instructions in "2.2.8 Waste Disposal/Environmental Protection" of this section before disassembling this instrument for disposal.

5) In case of fire, the damaged instrument will release toxic substances. Therefore, the operators should wear appropriate protective equipment (e.g. Protective masks and exposure suits) for safety.

6) Laser products shall have different warning signs according to the laser category, because the radiation characteristics of laser and such equipment have high-intensity electromagnetic power characteristics, which will cause harm to human body. If the product is integrated with other laser products (e.g. CD/DVD drive), it will not provide other functions except the settings and functions described in the product manual in order to prevent the injury of the laser beam to the human body.

7) Electromagnetic compatibility level (in accordance with EN 55011/CISPR 11, EN 55022/CISPR 22 and EN 55032/CISPR 32 standards)

— Class A equipment:

The equipment can be used except in residential areas and low-voltage power supply environment.

Note: class A equipment is suitable for industrial operation environment, because it produces wireless communication disturbance in residential areas. Therefore, operators need to take relevant measures to reduce the impact of such disturbance.

— Class B equipment:

Equipment suitable for residential areas and low-voltage power supply environment.

2.2.5 Maintenance

1) Only authorized and specially trained operators are allowed to open the casing of the instrument. Before such operations, it is required to disconnect the power cord to prevent damage to the instrument or even personal injury.

2) The repair, replacement and maintenance of the instrument should be performed by dedicated electronic engineers of the manufacturer, and the parts subject to replacement and maintenance should receive safety tests to ensure safe use of the product in the future.

2.2.6 Batteries or Power Modules

Before using batteries and power modules, carefully read the relevant information to avoid explosion, fire and even personal injury. In some cases, disused alkaline batteries (e.g. lithium batteries) shall be disposed of in accordance with**EN 62133**standard. Precautions for use of batteries include the following:

1) Do not damage the battery.

2) Do not expose batteries and power modules to heat sources such as open fire; avoid direct sunlight and keep them clean and dry; clean the connection port of the battery or power module with a clean and dry soft cotton cloth.

3) Do not short circuit the battery or power module. Do not store multiple batteries or power modules in cartons or drawers because the batteries are likely to cause short circuit due to being in contact with each other or other conductors; Do not remove the original outer packaging of the battery and power module before use.

4) Batteries and power modules must not be subjected to mechanical impact.

5) If the battery fluid leaks, please do not touch the skin and eyes, otherwise wash it with a large amount of water and get medical treatment in time.

6) Please use the manufacturer's original batteries and power modules. Any incorrect replacement and charging of alkaline batteries (such as lithium batteries) is likely to cause an explosion.

7) Discarded batteries and power modules shall be recycled and disposed of separately from other wastes. Due to the toxic substances inside the battery, they shall be properly discarded or recycled according to local regulations.

2.2.7 Transportation

1) If the instrument is heavy, please handle it with care. If necessary, use tools (a crane, for instance) to move the instrument so as to prevent damaging the body.

2) The handle of the instrument is suitable for personal handling of the instrument and cannot be fixed on the transportation equipment when during the transportation of the instrument. In order to prevent property loss and personal injury, please follow the manufacturer's safety regulations on the transportation of the instrument.

3) When operating the instrument on the vehicle, the driver should drive carefully to ensure transportation safety, and the manufacturer is not responsible for any emergencies during the transportation. Therefore, please do not use this instrument during the transportation, and reinforcement and preventive measures should be taken to ensure the transportation safety of the product.

2.2.8 Waste disposal/environmental protection

1) Do not dispose of devices marked with batteries or accumulators together with unclassified waste; Instead, such devices should be collected separately and disposed of in a suitable collection location or through the customer service center of the manufacturer.

2) Do not dispose of waste electronic devices together with unclassified waste; Instead, such devices should be collected separately. The manufacturer has the right and responsibility to help end users dispose of waste products. If necessary, please contact the customer service center of the manufacturer for corresponding disposal so as not to damage the environment.

3) During mechanical or thermal processing of the product or its internal components, toxic substances (dust of heavy metals, such as lead, beryllium, and nickel, etc.) may be released. Therefore, specially trained technicians with relevant experience are required to disassemble the product to avoid personal injury.

4) During the reprocessing, please refer to the safety operation rules recommended by the manufacturer to dispose of toxic substances or fuel released from the product with specific methods to avoid causing personal injury.

3 Operation Guide

This chapter introduces the pre-operation precautions, front/back panel browsing, basic measurement methods, and data file management of the S6362D optical spectrum analyzer, so that users can have a preliminary understanding of the instrument itself and its measurement processes. This section contains some contents consistent with the relevant sections in Quick Start.

3.1 Get Prepared

3.1.1 Preparations before Operation

The chapter introduces precautions for the S6362D optical spectrum analyzer before initial setting and operation.

Warning

Avoid damaging the instrument

Pay attention to the follow to avoid electric shock, fire and personal injury:

➢ Do not open the cabinet arbitrarily.

➢ Do not try to disassemble or refit any part of the instrument not mentioned in the manual. Otherwise, such consequences as reduced electromagnetic shielding property and internal component damage can occur, affecting product reliability. In this case, we will not provide any free maintenance any more even if the product is still in the warranty period.

➢ Please carefully read the relevant contents in "2.2 Safe Operation Guide" of this manual and the safety precautions therein for operation. Also please pay attention to the requirements for specific operating environment mentioned in the data page.

Notice

Electrostatic Protection

Take electrostatic protection measures at workplaces to avoid any damage caused by the instrument. For details, please refer to the relevant contents in "2.2 Safe Operation Guide" of the manual.

Notice

Pay attention to the following when operating the instrument:

Improper operating or measuring position can damage the instrument or the one connected to it. Pay attention to the following before powering on the instrument:

- To ensure that the fan blades and heat radiation holes are unobstructed, the instrument shall be at least 10cm away from the wall, and ensure that all fanvents are unobstructed;
- Keep the instrument dry;
- Keep the instrument level, and arrange it properly;
- Make sure the environment temperature meets with the requirement noted in the data page;
- Make sure the port input signal amplitude is within the range specified, and the optical fiber connector conforms to the marked style;

Tips

Effect of electromagnetic interference (EMI)

Since EMI can affect the measurement result, pay attention to the following:

- Select proper shield cables. For example, to use the double-shielded RF/network connection cable;
- Please close any cable connection port that is enabled but temporarily unused or connect a matching load to the connection port in time;
- Please refer to the EMC level labels in the Data Page.

3.1.1.1 Unpacking

1) Visual examination

Step 1: check whether the outer package and the shockproof packing of the instrument are damaged. If there is any damage, keep the outer package for standby and

proceed with the following examination steps.

Step 2: unpack, and check the mainframe and articles provided in the package for any damage;

Step 3: check carefully the articles mentioned above as per Table 3.1 for any problem;

Step 4: in case of any outer package damage, or damage or problem to the instrument or articles provided in the package, never power the instrument on or start it up! Please contact our service consultation center

with the service hotline provided on the cover, and we will repair or change it as soon as possible accordingly.

Notice

Handling: since the instrument and packing box are heavy, it shall be handled by two person at the same time, and placed with care.

2) Model confirmation

Table 3.1 List of articles provided together with S6362D

Name	Quantity	Function
Mainframe:		
S6362D	1	—
Standard Configuration:		
3-core power cord	1	—
Product Certificate of Conformity	1	—

3.1.1.2 Environmental Requirements

The operation sites of S6362D optical spectrum analyzer should meet the following environmental requirements:

1) Operating environment

The operating environment should meet the following requirements:

Table 3.2 Operating environment requirements of S6362D optical spectrum analyzer

Temperature	10°C~40°C
Temperature range during error adjustment	23°C ±5°C (allowable temperature deviation during error adjustment < 1 ° C)
Humidity	Hygrometer measurement range at <+29 °C: 20% ~ 80% (non-condensed)
Elevation	0-2000 meters (0-6561 feet)
Vibration	Max. 0.21 G, 5 Hz ~ 500 Hz

Notice

The above environmental requirements are only applicable to the operating environment factors of the instrument, and are not with the scope of technical indicators.

2) Heat dissipation requirements

In order to ensure that the working environment temperature of the instrument is within the temperature range required by the operating environment, the following heat dissipation space requirements of the instrument shall be met:

Table 3.3 Heat dissipation requirements of S6362D optical spectrum analyzer

Instrument part	Heat dissipation distance
Back	≥180 mm
Left and right sides	≥60 mm

3) Electrostatic protection

Static electricity is extremely destructive to electronic components and equipment. Usually we take two anti-static measures: conductive table mat and wrist strap; Conductive floor mat and ankle strap. Using the above two anti-static measurements at the same time can provide good antistatic protection. If using one of them, only the former can provide antistatic protection. 1MΩ earth isolation resistor must be provided for the antistatic components at least for ensuring user safety.

Correctly take the following antistatic measures to techniques to reduce electrostatic damages:

- Ensure all instruments are grounded properly, so as to avoid any static electricity;
- Let the internal/external conductor of the cable contact the ground shortly before connecting the coaxial cable with the instrument;
- Operators must wear anti-static wrist straps or take other antistatic measures before touching the joints, core or conducting any assembly.

Warning

Voltage range

The above-mentioned anti-static measures cannot be applied when the voltage exceeds 500V.

3.1.1.3 Power ON/OFF

1) Precautions before power on

Pay attention to the following when turning on the power of the instrument:

a) Confirming power supply parameters

The internal power module of S6362D optical spectrum analyzer is equipped with 220V AC power module. Please carefully check the power supply requirements of the rear panel of the instrument before using the optical spectrum analyzer.

Table 3.4 shows the external power supply requirement for normal operation of the optical spectrum analyzer.

Table 3.4 Working power parameter requirements of S6362D optical spectrum analyzer

Power supply parameter	Applications
Voltage, frequency	220V±10%, 50 ~ 60Hz
Rated output current	>3A
Power consumption	100W

b) Confirm and connect the power cord

The S6362D optical spectrum analyzer adopts three-core power cord interfaces, which conform to national safety standards. Before powering on the optical spectrum analyzer, it is necessary to confirm **reliable grounding of the ground wire of the** optical spectrum analyze power line. Either floating ground or poor grounding may cause damage to the analyzer and even cause injury to operators. Using a power cord without protective grounding is strictly prohibited. When the instrument is connected to a suitable power outlet, the power cord connects the housing of the instrument to the ground. The rated voltage value of the power cord should be greater than or equal to 250V, and the rated current should be greater than or equal to 6A.

When connecting the instrument to the power supply:

Step 1. Confirm that the working power cord is not damaged;

Step 2. Connect the power plug of the rear panel of the instrument to a well-grounded three-core power socket with the power cord.

Warning

Grounding

Poor or wrong grounding may cause damage of the instrument or personal injury. Before turning on the power of the spectrum analyzer, make sure that the ground wire is in good contact with the ground wire of the power supply.

Please use a power outlet with grounding protection. Do not use any external cable, power line or autotransformer without any protective grounding as the protective grounding line. If an auto-transformer is necessary, it is required to connect the common terminal to the protective grounding of the power connector.

2) Initial power-on

Precautions for turning on/off the power of the instrument are as follows:

a) Connecting the power supply

Please confirm the power supply parameters and the power cord before power-on for the first time. For details, please refer to the section "3.1.1.3 Precautions before Turning on the Power" in the user manual.

Step 1. Connect the power cord: Connect one end of the power cord matched with the optical spectrum analyzer in the package or a three-core power cord that meets the requirements to the power socket of the rear panel of the optical spectrum analyzer (as shown in Figure 3-1). The required voltage parameter of the optical spectrum analyzer is marked beside the power socket to remind the user that the voltage used should meet the requirement. The other end of the power cord is connected to a compliant AC power source;

Step 2. Turn on the power switch on the rear panel: as shown in Figure 3-2, observe whether the

standby indicator above the power switch on the front panel (as shown in Figure 3-3) turns on in yellow.

Step 3. Turn on the power switch on the front panel: do not connect any equipment to the optical spectrum analyzer before startup as shown in Figure 3-3. If everything is normal, the instrument can be turned on, and then the indicator above the power switch on the front panel will turn green.

Figure3-1 Power Socket

Figure3-2 Rear Panel Power Switch

Figure3-3 6 Front panel power ON/OFF

b) Turning on/off the power

i. Start up

Step 1. Turn on the power of the front panel ("**|**").

Step 2. Turn on the power switch in the lower left corner of the front panel (as indicated by the icon ⏏). At this time, the color of the power indicator above the power switch changes from yellow to green.

Step 3. The user interface of the front panel of the optical spectrum analyzer will gradually display relevant information of the starting process of the instrument: first, brief information

about the manufacturer is displayed, and then enter the operating system menu. There are two options in the menu, in normal

use, users need not operate these menus. Windows will start automatically when the timer counts down to 0.

Step 4. After Windows is started successfully, the system automatically initializes the optical spectrum analyzer and performs power on self-test. After the self-test is completed, the main operation interface of the optical spectrum analyzer is displayed.

The instrument is in the operable status.

Tips

Wavelength calibration

Please perform wavelength calibration before the measurement starts (preheating for 1 hour before measurement). Without wavelength calibration, the wavelength accuracy of the instrument cannot be guaranteed.

Notice

System Startup

This instrument adopts the control platform of Windows+x86 computers. During BIOS self-check and Windows loading, users do not need to intervene and should not cut off the power midway or modify the BIOS settings.

ii. Shutdown

Step 1. Turn on the power switch in the lower left corner of the front panel (as indicated by the icon ⏻). At this time, the instrument enters the shutdown process (the software and hardware need to go through some processing before the power is turned off). After more than ten seconds, the instrument is powered off, when the color of the power indicator above the power switch changes from green to yellow;

Step 2. Turn off the power switch on the rear panel ("O") or disconnect the power supply of the instrument.

The instrument is turned off.

Notice

Power cut of the instrument

When the instrument is in normal operation, it can only be shut down by operating the power switch on the front panel. **Do not directly operate the power switch of the rear panel or directly disconnect the power connection with the instrument**. Otherwise, the instrument cannot enter the normal shutdown state, which may cause damage to instrument or loss of the current instrument status/measurement data. Please shut down the instrument with the correct method.

c) Power cut

In case of emergency, the optical spectrum analyzer needs to be powered off immediately to avoid personal injury. In this case, just pull up the power cord (from the AC outlet or from the power outlet on the rear panel of the instrument). Therefore, sufficient operating space should be reserved when operating the instrument to facilitate direct shutdown when necessary.

3.1.1.4 Proper Use of Fiber Optic Patch Cables

Fiber optic patch cables are used in various tests of the optical spectrum analyzer. Although the test optical fibers are designed and manufactured according to the highest standards, the service life of all these fiber optic patch cables is limited. Due to the inevitable wear and tear during normal use, the performance indicators of the fiber optic patch cables will decrease or even be unable to meet the measurement requirements. Therefore, correct maintenance and measurement connection of the connectors can not only ensure accurate and repeatable measurement results, but also prolong the service life of the fiber optic patch cables and reduce the measurement costs. In actual use, the following aspects should be paid attention to:

1) Inspection of fiber optic patch cables

When checking the fiber optic patch cables, you should handle them with care and do not bend the optical fibers. It is recommended to use a magnifier to check the following items:

a) Whether the electroplated surface is worn or not and whether there are deep scratches;

b) Whether the thread is deformed;

c) Whether there are metal particles on the threads and the joint plane of the connector;

d) Whether the internal optical fiber head is clean and broken;

e) Whether the screw sleeve of the connector rotates improperly.

Caution

Check the fiber optic patch cables to prevent damaging ports of the instrument

Any damaged fiber optic patch cable may damage the good fiber optic patch cable connected with it even when it is connected for the first measurement. In order to protect each interface of the optical spectrum analyzer itself, the fiber optic patch cables must be checked before operating them.

2) Connection method

Before measurement and connection, the fiber optic patch cables should be checked and cleaned to ensure that the optical fiber head of the fiber optic patch cable is clean and undamaged. Handle with care when connecting. The correct connection method and steps are as follows:

Step 1: as shown in Figure 3-4, align the axes of the two interconnecting devices to ensure that the pin of the male connector slides concentrically into the socket of the female connector.

Figure 3--4 Axes of interconnected devices in a straight line

Step 2: as shown in Figure 3-5, move the two connectors leveled together so that they can be smoothly engaged. Rotate the screw sleeve of the connector (note, not the rotating connector itself) until it is tightened, and there can be no relative rotational movement between the connectors during the connection.

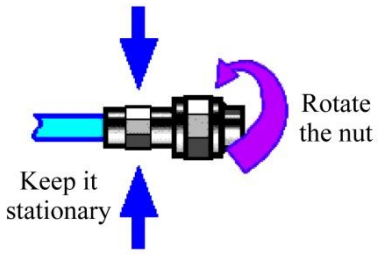


Figure 3-5 Connection method

3) Disconnection method

Step 1: support the fiber optic patch cable connectors to prevent any connector from being twisted, shaken or bent;

Step 2: rotate the screw sleeve of the connector by hand to complete the disconnection;

Step 3: pull the two connectors levelly apart.

4) Use and storage of optical fiber patch cables

a) The optical fiber head of optical fiber patch cable should be covered by protective sleeve when not in use;

b) Do not mix various optical fiber patch cables, connectors, air lines and standard calibration pieces in a box because this is one of the most common causes of connector damage.

c) Do not touch the joint plane of the connectors because the grease and dust particles on the skin are difficult to be removed from the joint plane;

d) Do not put the contact surface of a connector downward on a hard table surface. Contact with any hard surface may damage the electroplated layer and the surface of the optical fiber mirror.

5) Connector cleaning

Clean the optical fiber patch cables as follows:

a) Remove loose particles on the thread and joint plane of the optical fiber patch cable connectors with clean low-pressure air, and thoroughly inspect the connectors. If further cleaning treatment is required, proceed as follows:

b) Soak (but not thoroughly soak) a lint-free cotton swab with isopropyl alcohol;

c) Remove the dirt and debris from the joint plane and threads of the connectors with cotton swabs. When cleaning the inner surface of a connector, be careful not to apply external force to the central inner conductor and not to leave the fibers of cotton swabs on the central conductor of the connector.

d) Let the alcohol volatilize, then blow the surface clean with compressed air;

e) Check the connector to make sure that it is free of particles and residues;

f) If any defects of the optical fiber patch cable connector is still obvious after cleaning, it indicates that the optical fiber patch cable connector may have been damaged and should not be used again. Make clear the cause of the optical fiber patch cable connector damage before connection.

3.1.1.5 User Check

After the S6362D optical spectrum analyzer is powered on for the first time, it will automatically check whether the instrument works normally and initialize the software before entering the operation interface for subsequent measurement operations.

Tips

Description of front panel hardkeys and softkeys on menus

The description form of the front panel hardkeys and menu softkeys is as follows:

1) Description form of hard keys: [XXX], XXX is the name of the hard key;

2) Description form of soft keys: [XXX], XXX is the name of the soft key.

If the key corresponds to multiple states, an state with the font color of the selected value changed and the background color darkened is valid. For example: [SwpTM Rept Auto] indicates that the sweep time manual option is enabled.

3.1.2 Operating System Configuration

This section introduces the operating system of the S6362D optical spectrum analyzer as well as its configuration and maintenance. In order to ensure the normal operation of the software function of the

3.1 Get Prepared

instrument, please refer to the following precautions regarding the optical spectrum analyzer operating system:

3.1.2.1 Instrument Software Description

The host software of S6362D optical spectrum analyzer runs on Windows 7, which has been installed and configured according to the characteristic requirements of the optical spectrum analyzer. The host software of S6362D optical spectrum analyzer is based on Windows 7 operating system, which has been installed before shipment of the instrument.

3.1.2.2 Windows 7 Usage

The following operations are available with the administrator account:

- Installing third-party software;
- Configuring the network and printers;
- Reading and writing any file on the hard disk;
- Adding and deleting user accounts and passwords;
- Reconfiguring Windows settings;
- Running other applications.

Notice

Third party software affects instrument performance

The S6362D optical spectrum analyzer adopts an open Windows environment. Installing third-party software may affect the performance of the optical spectrum analyzer. Only software tested by the manufacturer and compatible with the host software can be run.

3.1.2.3 Windows 7 Configuration

Before shipment of the S6362D optical spectrum analyzer, its operating system has been configured to the best state, and any change in the operating system settings may cause the measurement performance of the instrument to decline. Normally, no changes are required to the settings of the Windows operating system.

Notice

Altering system configuration may cause problems

Once there is a problem with the use of the instrument or a system crash due to any change of the system configuration, the operating system and application software can be recovered by using the system recovery tool of the instrument, or you may contact our service consultation center with the service hotline provided in the foreword of this manual, and we will help you resolve it as soon as possible.

Notice

BIOS settings cannot be modified

The optical spectrum analyzer has been specifically set in BIOS. Users should not modify the settings in BIOS, otherwise it will cause abnormal startup and operation of the instrument.

However, in order to facilitate the measurement report generation and system integration, users may change the items listed below as required.

1) Configuring USB Devices

Both the front panel and rear panel of the S6362D optical spectrum analyzer provide USB interfaces for direct connection with USB devices. If the number of ports is insufficient, USB hubs can be externally connected through the USB interface to meet the demand. USB devices that can be connected to the optical spectrum analyzer include:

- USB storages that are directly connected to or removed from the computer to facilitate data updating;
- CD-ROM drives for easy installation of firmware programs;
- Keyboards and mouses to facilitate data edition and instrument operation;
- Printers, to facilitate exporting measurement results;

The Windows 7 operating system supports plug-and-play devices, so it is very convenient to install USB devices. When a device is connected to a USB port, Windows 7 will automatically search for a matching device driver. If it is not found, the system will prompt you to find the driver directory to complete the installation.

If the USB device is removed from the USB port, Windows 7 will automatically detect the hardware configuration change and uninstall the relevant driver. The connection and removal of USB devices does not affect the working state of the optical spectrum analyzer.

The method to connect USB devices is as follows:

a) Connecting storages or CD-ROM drives

If the storage or CD-ROM drive is successfully installed, Windows 7 will prompt: "Device is successfully installed and can be used" and automatically display the path name and prompt (e.g., "D:").

3.1 Get Prepared

b) Connecting the keyboard

Windows 7 system will automatically detect the USB keyboard connected to the instrument. The default input language is "Chinese (China)-Simplified Chinese-American Keyboard". Keyboard properties can be configured through "Start >Settings> Control Panel >Region and Language >Text Services and Input Languages".

c) Connecting the mouse

Windows 7 system will automatically detect the mouse connected to the instrument, and the mouse properties can be configured through "Start >Settings> Control Panel >Mouses".

d) Connecting the printer

You can configure the printer using the Windows control panel. Using an external USB mouse and keyboard can make printer configuration easier. If a new printer needs to be installed, only the driver of the printer needs to be installed. The manufacturer of the printer will provide the driver for the printer. The driver can be installed via an external USB CD-ROM device.

2) Configuring Network

a) Renaming the host

The host name (computer name) of each S6362D optical spectrum analyzer has been preset as " S6362D optical spectrum analyzer" before leaving the factory. In order to avoid duplicate names in the network, the user can change the host name by himself when a network is connected to more than one S6362D optical spectrum analyzer. The specific steps for changing the host name are as follows: (or you can refer to the Help document of Microsoft Windows 7.)

Step 1. Press [SYS] [RmtPtConfig>>] [NetSet] to enter the Remote Port Configuration page, which displays the current LAN "Local Name".

Step 2. Edit and type in the new name of the host and close the current dialog box.

b) Configuring IP address, subnet mask, and default gateway

The LAN Properties section of the Remote Port Configuration page provides input boxes for: Local IP Address, Subnet Mask and Default Gateway, all of which can be changed manually. The IP address, subnet mask and default gateway can be changed with reference to the steps in "a) Renaming the host" above for details.

c) Changing system firewall settings

A firewall is used to prevent unauthorized users from operating the instrument remotely. Therefore, the manufacturer suggests you to enable the firewall protection. The S6362D optical spectrum analyzer has enabled the firewall protection for the system and all port connections related to remote operation at the factory.

The administrator has the sole permission to change the firewall settings.

3.1.2.4 Security and Maintenance of Windows 7 System

1) Anti-virus software

Installing anti-virus software may have some negative effects on the performance of the instrument. It is strongly recommended that users do not use the instrument as a common computer for browsing web pages or transferring files, so as not to be infected with viruses.

Before using various USB mobile storage devices, these mobile devices should first be disinfected with a computer installed with the latest anti-virus software to ensure that they will not become virus carriers.

Once the optical spectrum analyzer system platform is infected with virus, it will bring negative impact on its operation and the use of the instrument. In such case, users are recommended to perform system recovery. Please refer to “2) System Maintenance” in this section for system recovery operations.

2) System maintenance

a) Windows 7 backup

Regularly system backup is recommended for users. The "System Recovery Tool" of this instrument can completely backup the data and system of the instrument. Please refer to “3.1.2.5 System Backup and Recovery" for specific operations.

It is suggested that before the instrument is used for other purposes, such as long-term access to the Internet and installation of third-party software, etc., in order to avoid accidental infection with virus and other harmful operation of the instrument system, the instrument needs to be backed up.

Windows 7 operating system also has a data backup function, which can backup all data on the instrument and create a system disk that can be used to restore Windows in the event of a serious failure. You can refer to the help document and reference of Windows 7 for more information. Third-party backup software can also be used, but it is necessary to ensure that the third-party backup software does not conflict with the system software of the instrument . It is recommended to back up the system data on an external device, such as a network hard disk or a USB hard disk.

b) Windows 7 system recovery

Windows 7 has a system recovery function, which can restore the system to its previous state at a certain time. However, the system backup recovery built in Windows does not always succeed, so this backup option is not recommended.

3) Hard disk partition and use

The hard disk is divided into two partitions: "C:" and "D:".

The Disk C includes windows 7 operating system and instrument application program. Third-party software can also be installed to Disk C. Disk C is the only drive for backup programs and recovery.

The disk D is used for storage of data including. the software data stored by the user and the disk C system backup. The backup data on Disk D can be copied to external storage media, so even if the hard disk needs to be replaced, only the backup data needs to be restored to the new hard disk.

3.1.2.5 System Backup and Recovery

1) Hard disk OS or data recovery

The hard disk recovery system of the optical spectrum analyzer is used to fix errors on Disk C (which may be caused by the loss of system files or data) or to recover the original factory data.

Restoring the original factory data will affect the following items:

- User-defined Windows 7 settings. Such as a newly added user account. After the system is restored, these new configurations need to be reset.
- Other third-party software installed by users need to be reinstalled after the system is restored.

The user data generated during the measurement process should be stored on Disk D, and it is recommended that users periodically transfer the data to the computer or other storage media for storage via the LAN connection.

2) How to recovery programs with the instrument

Step 1. Confirm that the instrument is turned off.

Step 2. Insert a standard keyboard to the PS/2 interface on the rear panel of the instrument.

Step 3. Turn on the instrument. After the manufacturer information is displayed, the operating system menu with timer will appear:

Microsoft Windows 7 Professional

Before the timer reaches 0, highlight and select "System Recovery Tool" with the up and down arrow keys on the standard keyboard, and press the OK key after selection.

Step 4. After entering the recovery program interface, perform the recovery operation according to the following steps:

1) Select to run GHOST 8.2 wizard and wait to enter the next operation prompt interface;

2) Select item 5 to start the manual operation of GHOST 8.2, wait to enter the operation interface of GHOST 8.2, and press Enter when a dialog box with OK button appears.

3) Select Local→Partition→From Image; in the Open File dialog box, press Tab to activate the "File name" input box and enter d: \ system.gho.

4) In the pop-up dialog box for selecting source partition selection file, use Tab key to switch, tap OK and enter. In the dialog box that pops up after that, use Tab to switch, tap OK and enter. In the dialog box for selecting destination partition that pops up later, select the first partition, use Tab to switch, tap OK and enter.

5) Select Yes and enter in the warning and confirmation dialog box.

6) Wait till the system recovery progress is complete, and select reboot according to the prompt.

Step 5. After the recovery is completed and the instrument is restarted, the system enters the system state of the last backup.

3.1.3 Routine Maintenance

This section introduces the routine maintenance of the S6362D optical spectrum analyzer.

3.1.3.1 Cleaning

1) Cleaning instrument surface

Please follow the steps below when cleaning the surface of the instrument:

Step 1: shut down the instrument and disconnect the power cord connected to it;

Step 2: wipe the surface gently with dry or slightly wet soft cloth, and do not wipe the inside of the instrument.

Step 3: do not use chemical cleaners, such as alcohol, acetone or dilutable cleaners.

2) Cleaning the display

After a period of use, the LCD display needs to be cleaned. Please follow the steps below:

Step 1: shut down the instrument and disconnect the power cord connected to it;

Step 2: dip a piece of clean and soft cotton cloth into the cleaner and then gently wipe the display panel;

Step 3: dry the display with a piece of clean and soft cotton cloth;

Step 4. Connect the power cord only after the cleaner is completely dried.

Notice

Display cleaning

There is an antistatic coating on the surface of the display. Do not use cleaners containing fluoride, acid and alkaline. Do not spray the cleaner directly onto the display panel, otherwise it may penetrate into the instrument and damage the instrument.

3.1.3.2 Test Port Maintenance

The S6362D optical spectrum analyzer has a fiber optic connector (female head) on the front panel. Damage to the connector or the presence of dust inside the connector will affect the spectral test results. Please maintain such kind of connectors as follows:

- The connectors should be kept away from dust and kept clean;
- To prevent contamination of the connectors, do not directly contact the connector surface;
- Do not use damaged connectors;
- Please use an air blower to clean the connectors instead of using tools such as sandpaper to grind the surface of the connector.

3.2 Front and Real Panels

This section introduces the composition and functions of the front and rear panels as well as operation interface elements of S6362D optical spectrum analyzer.

3.2.1 Front Panel Description

This section introduces the composition and functions of the front panel of S6362D optical spectrum analyzer. The front panel is shown below (Figure 3-6), and the items are described in Table 3.5:

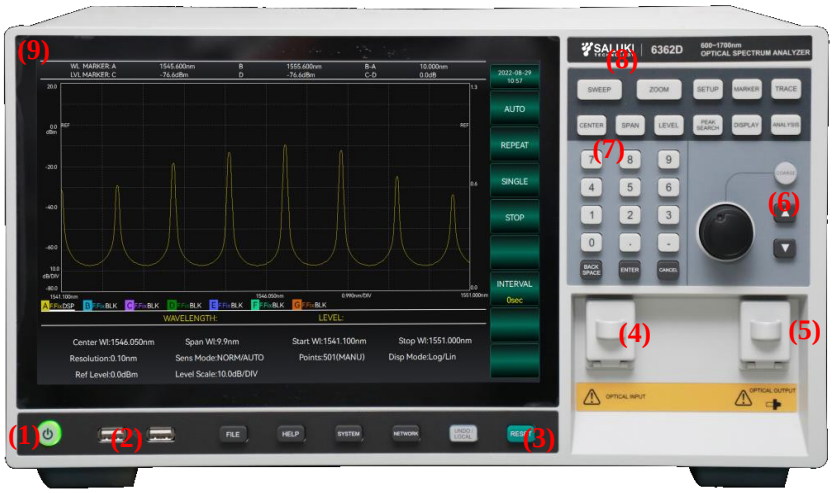


Figure 3-6 Front panel of S6362D optical spectrum analyzer

1. Power key
2. USB interface
3. System function zone
4. Optical fiber interface (input)
5. Optical fiber interface (output)
6. Knob
7. Number keypad
8. Function menu keypad
9. Display screen

Table 3.5 Front panel description

No.	Name	Description
1	Power key	Used for the startup and shutdown of the instrument.
2	USB interface	Used to connect USB devices such as mouse, keyboard and U disk.
3	System function zone	Used for system reset, file save and other system functions.
4	Optical fiber interface (input)	Used to measure the input function of light.
5	Optical fiber interface (output)	Used for self-calibration of the optical spectrum analyzer.
6	Knob	Used for value input and mark adjustment.
7	Number keypad	Used for the input, modification and confirmation of values.
8	Function menu keypad	Used for selection of screen menus.
9	Display screen	Used to display measurement information and perform touch-screen operation.

3.2.2 Rear Panel Description

This section introduces the composition and functions of the rear panel of S6362D optical spectrum analyzer. The rear panel is shown below (Figure 3-7), and the items are described in Table 3.6:

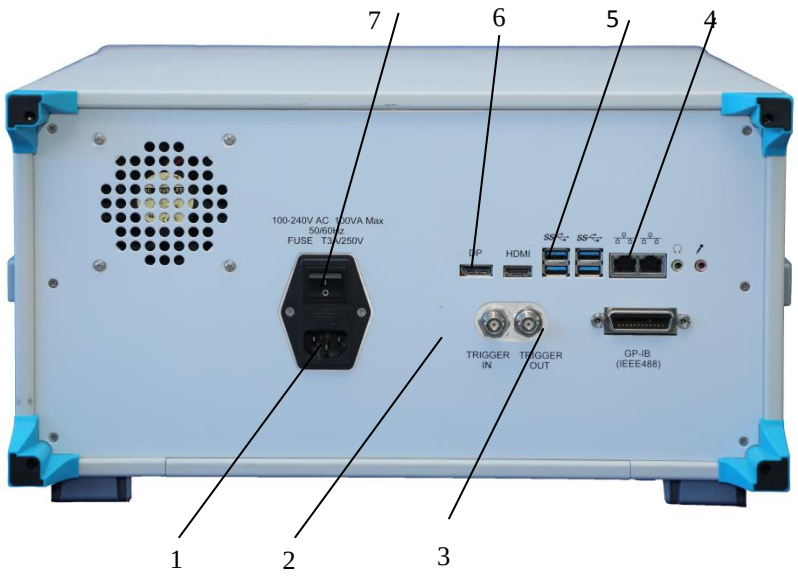


Figure 3-7 Real panel of S6362D optical spectrum analyzer

Table 3.6 Rear panel description

No.	Name	Description
1	Power interface	For power cord access to the power supply.
2	External trigger input interface	Not used yet
3	GPIB interface	GPIB can be used to connect and control the instrument.
4	LAN Interface	Network cable can be used to connect the instrument to the network or directly connect with other computers.
5	USB interface	It is used to access USB devices such as USB keyboard, USB mouse and U disk.
6	DP interface	DP line can be used to connect the display device.
7	Power switch	The switch used to control the power supply.

3.3 Basic measurement methods

This section introduces the basic settings and measurement methods of the S6362D optical spectrum analyzer, including:

3.3.1 Basic Settings

This section introduces the main features and basic measurement and setting methods for the user interface of the S6362D optical spectrum analyzer, which will be used in different subsequent measurement tasks. This section includes:

3.3.1.1 Main Features of the Operation Interface

Adopting a novel intuitive graphical user interface, the S6362D optical spectrum analyzer can clearly display the whole process of spectral output. The whole instrument operation interface is divided into different areas according to the function modules, and multiple function modules can be operated at the same time. The right side of the screen is the instrument menu display area, which can be operated by

3.3 Basic measurement methods

the user via mouse, front panel keys or touch screen. This section mainly introduces the partitions and functions of the user operation interface of the optical spectrum analyzer. The operation interface is shown in the following figure (Figure 3-8), and the items are described in Table 3.7:

Figure 3-8 Operation interface of S6362D optical spectrum analyzer

Table 3.7 Operation interface description

No.	Name	Description
1	Marker display area	This area displays the measured values corresponding to the marker lines A, B, C and D. Where A and B correspond to wavelength values, and C and D correspond to power values. It also shows the difference between the corresponding values of the two marker lines in the same unit, i.e. B-A and C-D.
2	Waveform display area	This area displays the spectral waveform information measured by the S6362D optical spectrum analyzer, including spectral waveform, coordinate scale and track selection. The horizontal axis is the spectral wavelength axis in nm, the left vertical axis is the spectral power axis in dBm, and the right vertical axis is the sub-power axis in dB to indicate the difference of spectral power.
3	Track state display area	This area displays the track state set by the S6362D optical spectrum analyzer, including the current selection curve, the display state of the track, the curve state of the track and other information.
4	Parameter display area	This area displays the measurement conditions set by the S6362D optical spectrum analyzer and the waveform analysis results.
5	Free marker area	This area displays the spectral measurements at the location of the free marker of the S6362D optical spectrum analyzer. The wavelength shows the spectral wavelength information corresponding to the marker, and the power shows the spectral power information corresponding to the marker.
6	Function menu area	This area displays the function menus contained in the S6362D optical spectrum analyzer function keypad. By pressing the corresponding key in

		the function keypad, the primary menu of operable functions contained under the function key will be displayed in this area. By clicking the corresponding menu option, there will be three kinds of execution results: (1) making the instrument immediately execute the corresponding functions; (2) popping up the input box and making the instrument execute the corresponding operation after the corresponding parameters are input via the numeric keypad or the adjustment knob; and (3) popping up the secondary menu and making the instrument execute the corresponding operation after the corresponding function is selected.

3.3.1.2 Common measurement and setting methods

Tips

Touch screen and front panel operations

The graphical user interface of S6362D optical spectrum analyzer supports operation on the touch screen and on the front panel of the instrument. The following describes several common settings of the optical spectrum analyzer.

1) [Sgl Swp] Operation

1. Press the [Swp] soft key to display the sweep menu.

2. Select [Sgl Swp] to start sweeping. The sweep is completed as shown in Figure 3-9.

3. Select [Stop] to finish sweeping.

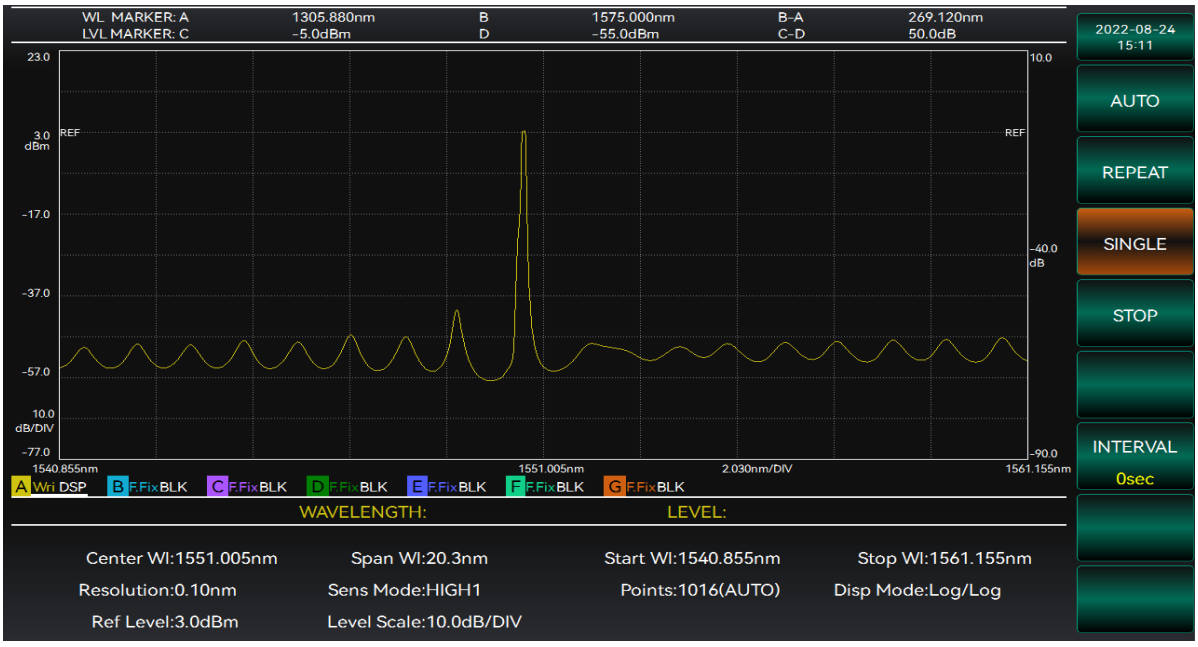


Figure 3-9 Single sweep result diagram

Instruction!

ngle sweep, the tracks in different modes will produce different responses, and only the play state will be displayed on the screen.

- During a single sweep, the instrument will perform a sweep measurement from the start wavelength to the end wavelength and display the swept waveform signal in the waveform display area, and the

sweeping progress will be displayed in the upper left corner of the screen.

- Changing the test conditions during the test will re-sweep from the start wavelength.

2) Repeated Sweep

1. Press the [Swp] soft key to display the sweep menu.

2. Select [Rept Swp] to start sweeping. The sweep is completed as shown in Figure 3-10.

3. Select [Stop] to finish sweeping.

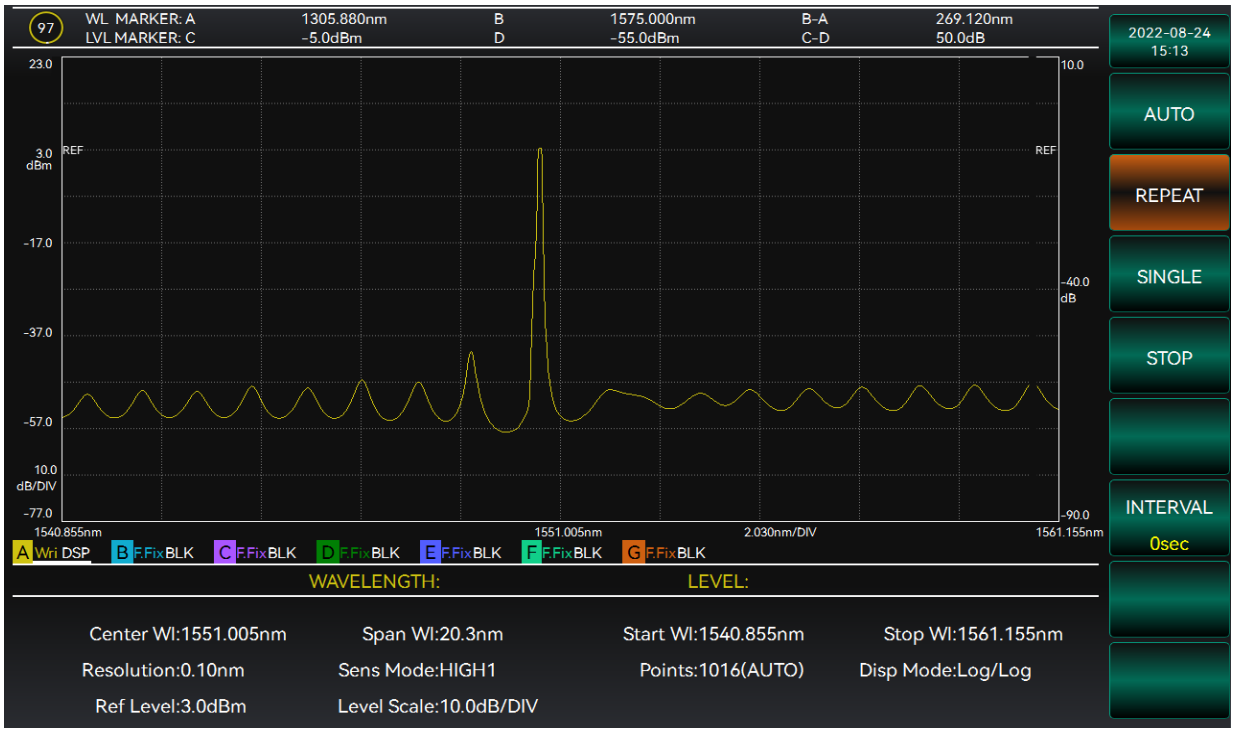


Figure 3-10 Repeated sweep result diagram

Instruction!

- During a repeated sweep, the tracks in different modes will produce different responses, and only the tracks in the display state will be displayed on the screen.

- The instrument will perform repeated sweep measurements from the starting measurement wavelength to the ending measurement wavelength, and continuously update the swept wavelength signal in the waveform display area, and the sweeping progress will be displayed in the upper left corner of the screen.

3) Stop

When the system is in the process of single sweep or repeated sweep, if you want to stop the sweeping process, select [Stop] in the sweep menu, and the system will stop the sweeping.

Tips

Configuring module color flags

The color of the function button of the configuration window identifies whether its corresponding function module is valid. When the function button is operative, the button color is orange, and when it is inoperative, the button color is green.

4) Auto Sweep

1. Press the [Swp] soft key to display the sweep menu.

2. Select [Auto Swp] to start sweeping. Figure 3-11 below shows the display results after the first full-band range sweep of the auto-sweep, and Figure 3-12 shows the display after the end of the auto-sweep.

3. Select [Stop] to finish sweeping.

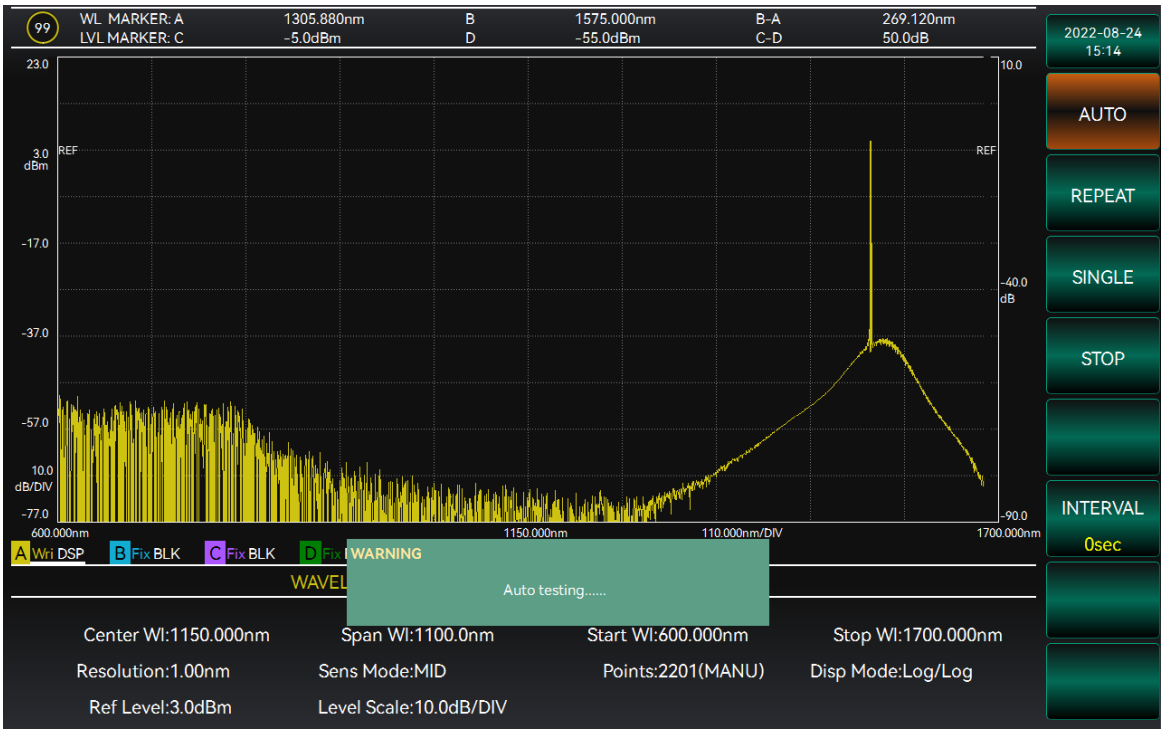


Figure 3-11 Auto-sweep start

3.3 Basic measurement methods

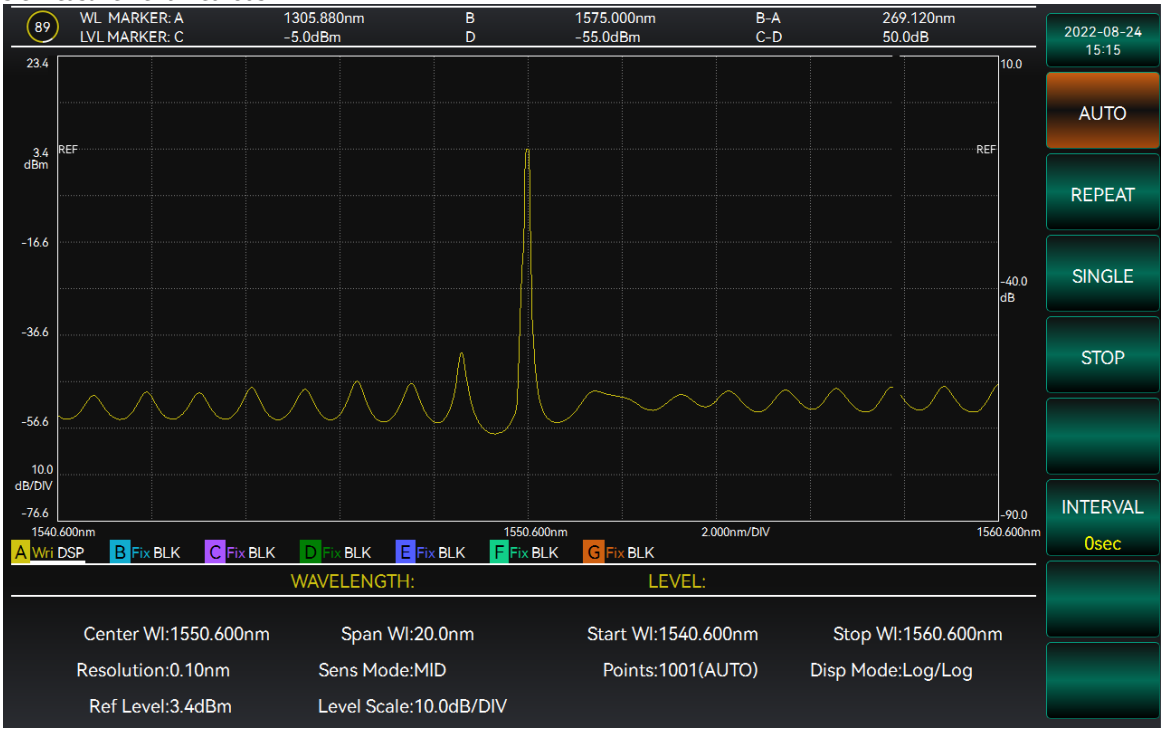


Figure 3-12 Auto-sweep end

When the instrument performs automatic measurement, other menus are not available. After the function is implemented, the input light in the wavelength range of 600nm~1700nm will be automatically measured, and the center wavelength and other parameters will be set according to the measured waveform.

Instruction!

- When automatic measurement is performed, the input light in the wavelength range of 600nm-1700nm will be automatically measured, and the parameters such as the center wavelength will be automatically set according to the measured waveform. After the setting is completed, the sweep will be repeated.

- When automatic measurement is performed, only the curves of the current track will be measured, while the curves of other tracks will be reset to the default state of "Fix" and "Blank".

5) Parameter Setting

The measurement parameters that can be set by the user include: center wavelength, sweep width, start wavelength, end wavelength, resolution, sensitivity, sampling points, and sampling interval.

a) Center wavelength: The wavelength value at the center of the measurement range is called the center wavelength.

The center wavelength is the center wavelength value of the sweep. After clicking the [WL] function button, click the center wavelength in the menu on the right, and then enter the center wavelength value in the pop-up box via the knob or number key to modify it directly, or select the center wavelength value quickly according to the measured waveform.

Setting via Sweep Width menu and Center Wavelength menu

1. Press the [SwpW]/[CWL] soft key to display the corresponding menu.

2. Select [CWL] / [SWL] / [EWL] and enter the wavelength value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-13.

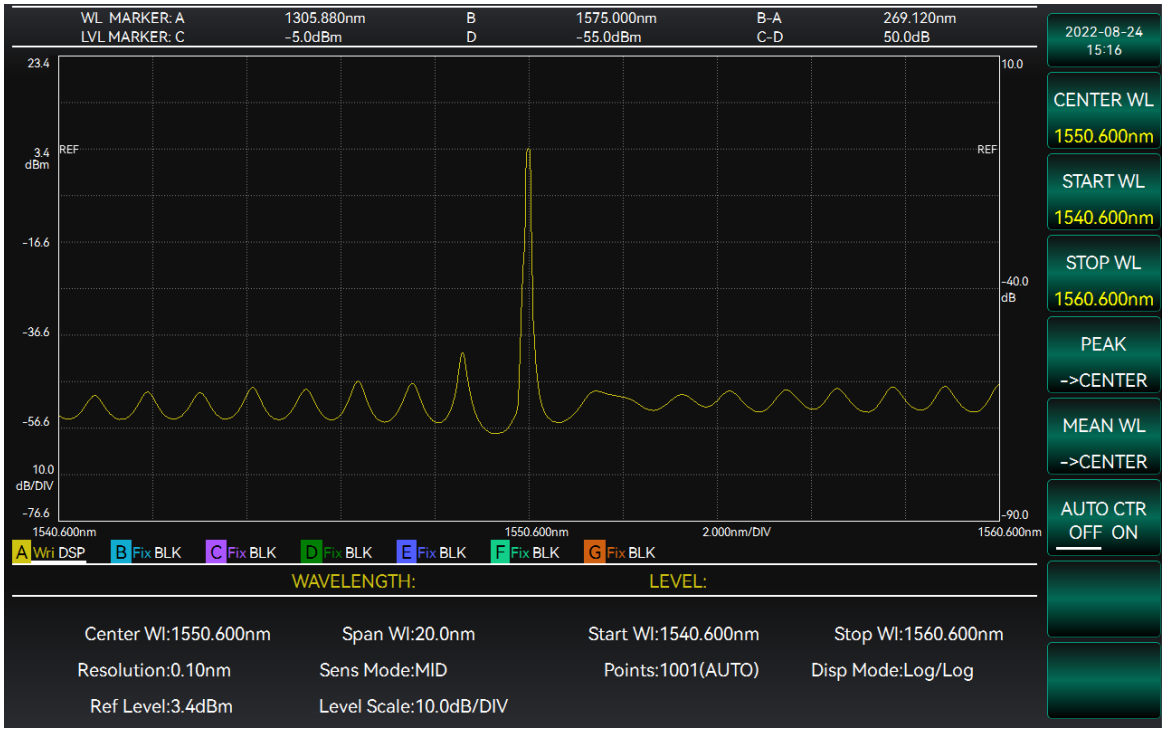


Figure 3-13 Setting center wavelength interface

Setting by shortcut keys

1. Press the [CWL] soft key to display the menu and select [Peak->Cntr] to set the peak point as the center wavelength.

2. Press the [CWL] softkey to display the menu and select [AWL -> Cntr] to average the two wavelengths from the peak of the active curve waveform down to the threshold (3dB) and set the result as the center wavelength.

3. Press the [CWL] soft key to display the menu and select [AutoCntr] as ON to automatically find out the peak from the waveform of the active curve in each sweep and set it as the center wavelength.

4. Press the [Mkr] soft key to display the menu and select [Mkr->Cntr] to set the position of the free marker point as the center wavelength.

b) Sweep width: The range of wavelengths measured in the horizontal axis is called the sweep width.

Sweep width is the width of the wavelength displayed on the horizontal axis of the screen, which can be set via the Sweep Width menu and Center Wavelength menu, or directly via the shortcut keys.

Setting via Sweep Width menu and Center Wavelength menu

1. Press the [SwpW]/[CWL] soft key to display the corresponding menu.

2. Select [SwpW] / [SWL] / [EWL] and enter the wavelength value via the knob or number keys to complete the setting.

Setting by shortcut keys

1. Press the [SwpW] soft key to display the menu.

2. Select [VIEW->MEAS] to set the current axis range as the sweep width.

c) Start wavelength: The wavelength value on the leftmost side of the horizontal axis measurement range is called the start wavelength.

The start wavelength is the wavelength value at the beginning of the sweep, which can be set via the

3.3 Basic measurement methods

[SwpW]/[CWL] menu.

1. Press the [SwpW]/[CWL] soft key to display the corresponding menu.

2. Select [CWL] / [SWL] / [SwpW] and enter the wavelength value via the knob or number keys to complete the setting.

d) End wavelength: The wavelength value on the rightmost side of the horizontal axis measurement range is called the end wavelength.

The end wavelength is the wavelength value at the end of the sweep, which can be End via the [SwpW]/[CWL] menu.

1. Press the [SwpW]/[CWL] soft key to display the corresponding menu.

2. Select [CWL] / [EWL] / [SwpW] and enter the wavelength value via the knob or number keys to complete the setting.

Instruction!

- When the center wavelength and the sweep width are changed at different times within the allowable measurement range of the instrument, the start wavelength and the end wavelength will change automatically according to the change of the center wavelength.

- The wavelength value can be fine-tuned at a unit accuracy of 0.1 using the knob.

- The range of center wavelength/start wavelength/end wavelength can only be set between 600~1700nm, and the range of sweep width can only be set between 0. 2-1100nm or 0nm, and the instrument will display an error message if the measurement range is exceeded. The settable precision is three decimal places.

- When [Mkr->Cntr] is used, the free marker needs to be set to "Display". See Chapter 6 for the setting of free marker.

- The lower limit of the sampling interval is 0.004 nm, and the upper limit varies according to the number of sampling points and the sweep bandwidth.

e) Resolution: Resolution of the spectrum.

1. Press the [Parameter] soft key to display the menu.

2. Press the [Resolution] key to enter the submenu.

3. Select the resolution and complete the settings.

Instruction!

- When the spectral width of the input light is narrow (such as LD, etc.), a smaller resolution needs to be set. On the contrary, when the spectral width of the measured input light is wide (such as LED, etc.), it is necessary to set a larger resolution so that the measurement can have a better signal-to-noise ratio.

- The input window for resolution is a drop-down window, where the resolution can be set to the values of 0.02nm, 0.05nm, 0.1nm, 0.2nm, 0.5nm and 1nm.

- While the resolution of 0.05 nm can be set over the full wavelength range, the actual resolution is closer to 0.1 nm in the short wavelength band. At room temperature, the actual resolution is only close to 0.05 nm at 1500 nm or longer wavelengths.

f) Sensitivity: Sensitivity of the instrument.

1. Press the [Parameter] soft key to display the menu.

2. Press [Sensitivity] key to enter the submenu.

3. Select the sensitivity and complete the settings.

Instruction!

- When the sensitivity is set very low, the measurement will run at high speed. On the contrary, when the sensitivity is set very high, the sweep speed may be slow, but the additional noise can be improved.
- The input window for sensitivity is a drop-down window, where the sensitivity can be set to option of NORMAL/HOLD, NORMAL/AUTO, NORMAL, MID, HIGH1, HIGH2 and HIGH3.

g) Sampling mode: Automatic or manual setting of spectral sampling.

1. Press the [Parameter] soft key to display the menu.

2. Press the [Sample Mode] button to switch to Auto.

Instruction!

- When sampling points and sampling interval are changed manually, the sampling mode is changed to Manual.
- When the sampling mode is set to Auto, the instrument will automatically select the appropriate number of sampling points and sampling interval according to the resolution.

h) Sampling points: The number of sampling points of the spectrum.

1. Press the [Parameter] soft key to display the menu.

2. Select [Sample Point] and enter the value via the knob or number keys to complete the setting.

Instruction!

- When the number of sampling points is small, the measurement will run at high speed. However, if the sweep width is wide and the resolution is low, the number of sampling points must be set larger. The number of sampling points is related to the sweep width and resolution.
- When the sampling mode is set to Manual, the value of sampling points is in the range of 101-10001; when the sampling mode is set to Auto, the value of sampling points is in the range of 501-10001.

i) Sampling interval: The sampling interval of the spectrum.

1. Press the [Parameter] soft key to display the menu.

2. Select [Sample Interval] and enter the value via the knob or number keys to complete the setting.

Instruction!

- The sampling interval and the number of sampling points are related. When the sweep bandwidth is fixed, the changes of the two are inversely proportional.

3.4 Data Management

This section introduces the save/load working state, measurement result data input/output, and printing/staving screenshots for S6362D optical spectrum analyzer.

3.4.1 Save/Load Working Status

3.4.1.1 Resetting Instrument State

The S6362D optical spectrum analyzer provides the user with the option of resetting state upon power-on

as the initial state during power-on measurement. Usually, when there is an error in the instrument measurement, the initial state of the instrument during normal operation is restored by resetting the instrument state. The reset state of the optical spectrum analyzer is set as follows:

Click the green [Reset] soft key below the optical spectrum analyzer to restore the optical spectrum analyzer to its initial state.

3.4.2 File Management

The S6362D optical spectrum analyzer has the file management function, providing such operations as file input/output, file browsing, and copying, cutting, pasting and deletion of directory (file). Data files can be accessed through front panel keys, mouse or remote control (refer to the Program Control Manual of S6362D Optical Spectrum Analyzer for details).

3.4.2.1 Measurement Data Type

Select the [Save Type] option under the [File] menu to choose the type of save, which are Curve, All Curve, Picture and Analysis Result. The specific steps are as follows:

1. Select the [Save Type] option to enter the Type Selection interface, as shown in Figure 3-14.

2. Select the type of files to be saved.

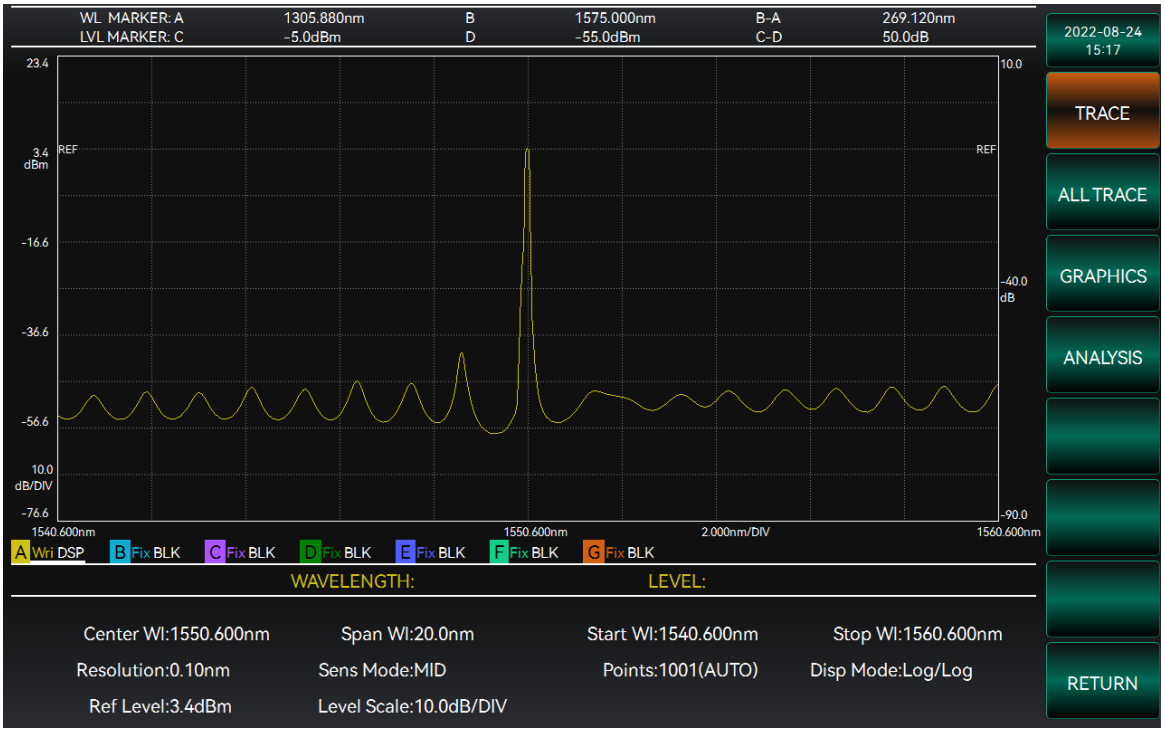


Figure 3-14 Save type selection interface diagram

Instruction!

- The readable file type for both curves and all curves is .osd. When the save type is Picture and Analysis Result, the read operation is not supported.

- After analyzing the curve, switch to the [File] menu and select Save Analysis Results to save the current analysis results.

3.4.2.2 File Input/Output Methods

The S6362D optical spectrum analyzer provides data file input/output functions. File input refers to opening the selected data file, refreshing the display information of control (list, etc.) parameters, and facilitating user observation and evaluation. File output refers to storing the measurement data into the file according to the agreed format (e.g. txt, *.osd).

Depending on the type of information and how it is managed, the optical spectrum analyzer provides two types of file input/output: analysis result information files and spectral data files. Users only need to enter the corresponding menu to pop up the dialog box, and select the corresponding keys or menu items realize file operations. The details are as follows:

1) Reading Files

Select the [Read] option under the [File] menu to open the saved file. The specific steps are as follows:

1. When the [Read] option is selected, the system will enter the file processing interface, as shown in Figure 3-15.

2. Select the internal or external storage area of the instrument on the right side.

3. Select the file to be opened on the left.

4. Click the [Read to] option and select which curve this file is to be opened to.

5. Select the [EXEC] option in the right menu bar to complete the file opening operation.

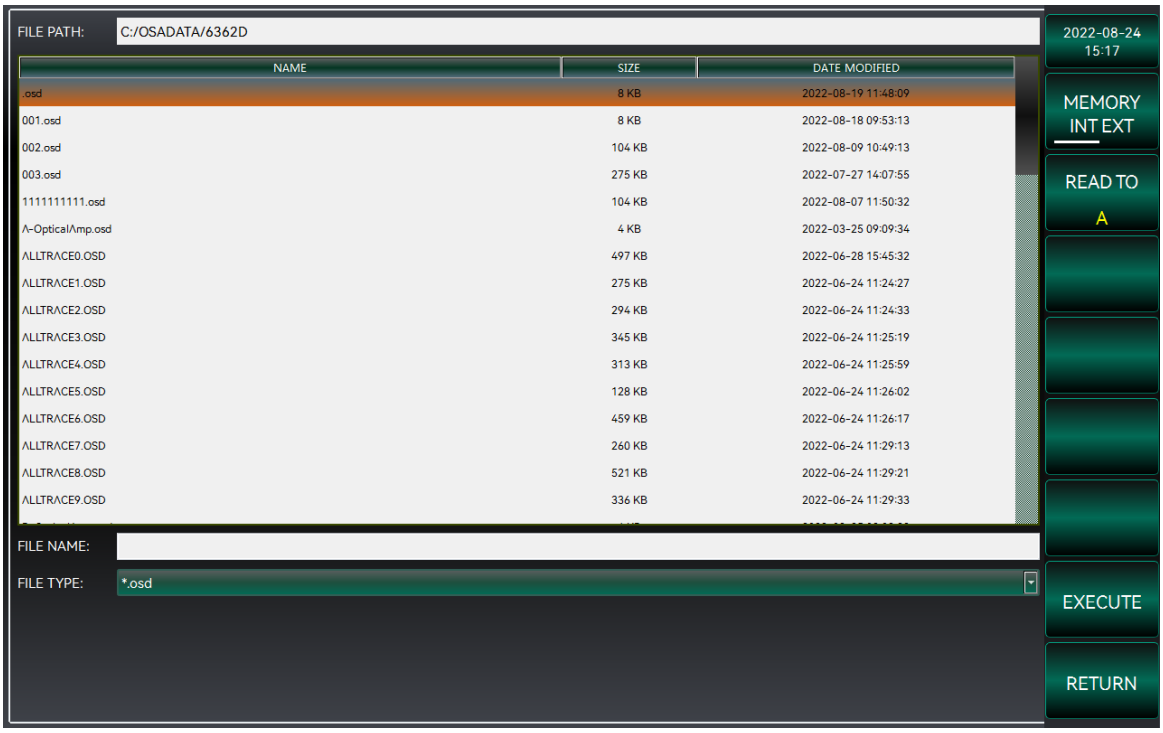


Figure 3-15 File open interface diagram

Instruction!

- The address index and file path are displayed at the top of the interface, making it easy to locate the file.

- The currently selected file/folder name and file type are displayed at the bottom of the interface.

3.4 Data Management

- Click [Back] in the right menu bar to go back to the previous operation screen.

2) Save file

Select the [Save] option under the [File] menu to save the current waveform information. The specific steps are as follows:

1. When the [Save] option is selected, the system will enter the file processing interface, as shown in Figure 3-16.

2. Select the internal or external storage area of the instrument on the right side of the interface.

3. Click the [Save Curve] option to select the curve to be saved.

4. Enter the name and file type of the saved file in the File Name input box below. The file can be saved as osd, txt or csv.

5. When the [EXEC] option in the right menu bar is selected to save the file, the system will resume the waveform display interface.

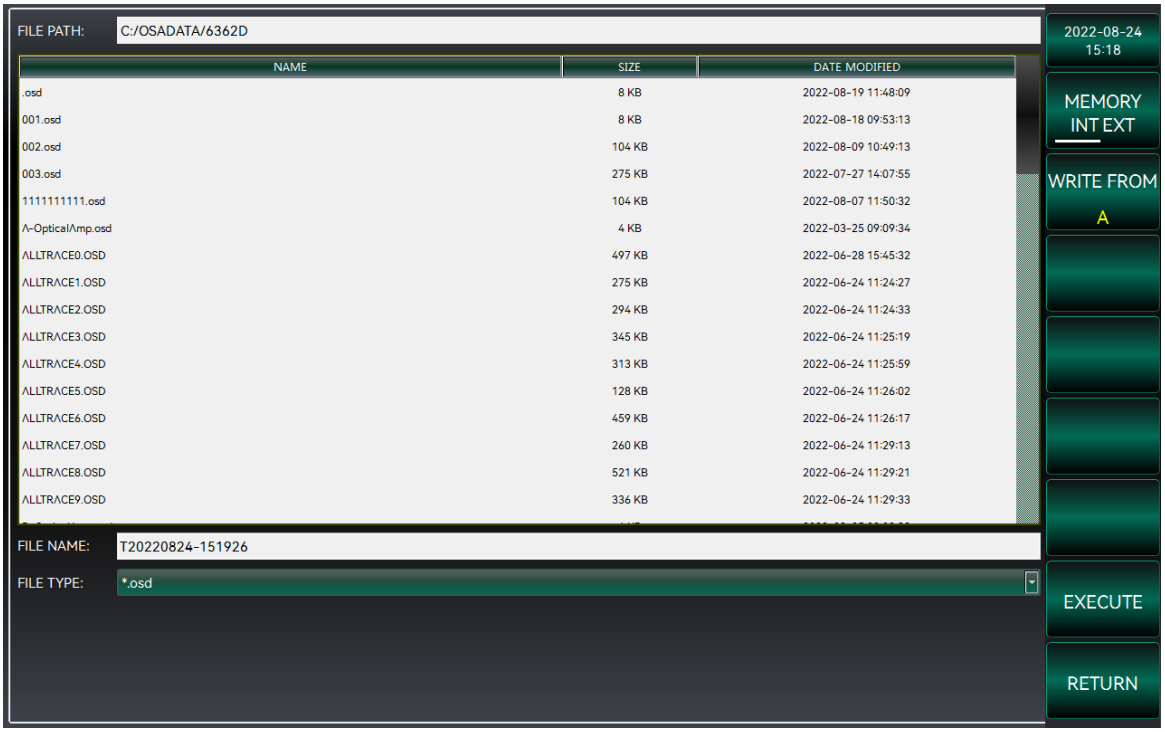


Figure 3-16 File save interface diagram

Instruction!

- If there is already a file with the same name in the folder when you save the file, select the [OK] option and the system will pop up a window prompting "The file to be saved already exists, do you want to overwrite it?". Select [Confirm] to overwrite the existing file, and select [Abort] to modify the file name and continue to save.

- The [Save Curve] option is only available when the save type is Curve or Picture.

3.4.2.2 File Directory Management

The S6362D optical spectrum analyzer provides a Windows Explorer-like function that allows users to easily browse files and perform file operations such as Copy, Cut, Paste and Delete.

Select the [FileOper] option under the [File] menu to operate on the currently saved file. The file operation interface is shown in Figure 3-17.

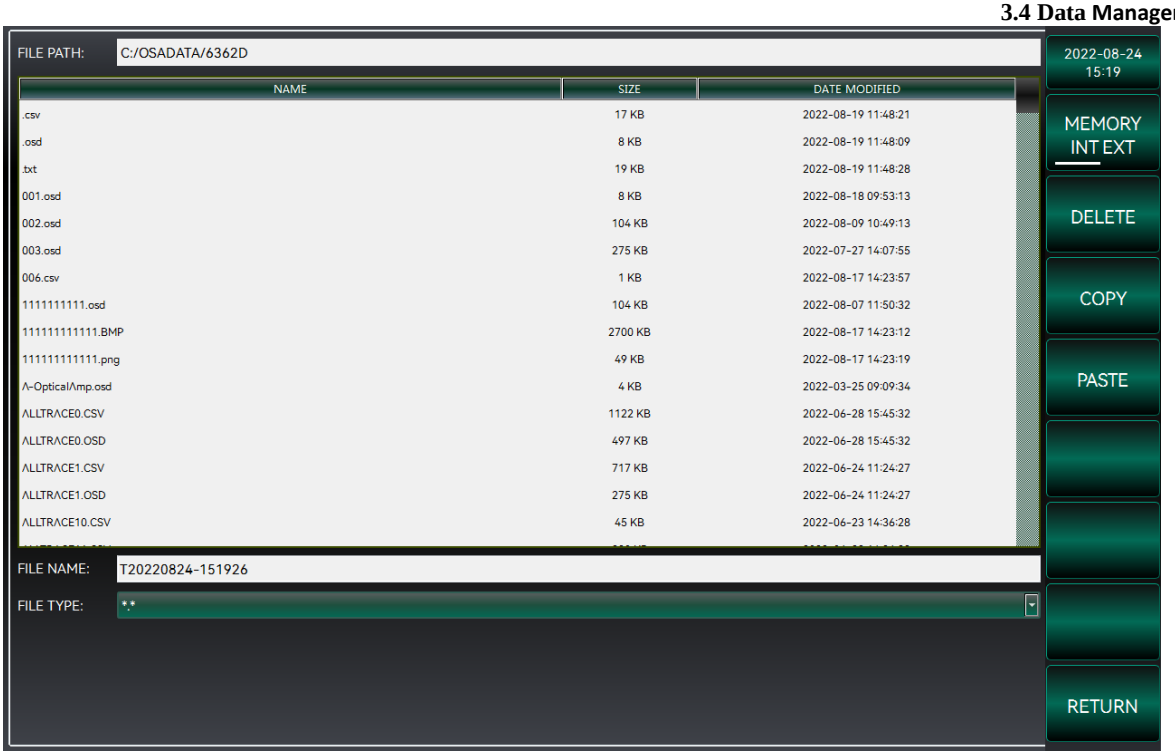


Figure 3-17 File transfer interface diagram

The file operation interface is described as follows:

1. Select the internal or external storage area of the instrument on the right side of the interface.

2. Click [Delete] to delete the currently selected file in the left file area.

3. Click [Copy] to copy the currently selected file in the left file area.

4. Click [Paste] to paste the copied file. If a file with the same name appears it will prompt whether to overwrite it or not.

3.4.3 Printing/Saving Screenshots

The S6362D optical spectrum analyzer provides such functions as storing snapshots to graphics files (bmp or jpg) and printing screenshots.

3.4.3.1 Saving Screen (to File)

Step 1:  .

➢ Pop up the "Save As" dialog box, enter the name of the snapshot image file (*.bmp), and click Save to complete saving the screenshot to file.

Tips

Saving screenshots to clipboard

3.5 Display and Analysis

Press the Save Screenshot button on the front panel to save the screenshot to the clipboard, which will be emptied after the printing/storage is completed.

3.4.3.2 Print screen

Tips

Installing Printer Driver

Supporting printer driver needs to be installed for the S6362D optical spectrum analyzer before it can print.

Select the [Print] option under the [SYS] menu or select the [Print] key in the system function panel to enter the Print interface, as shown in Figure 3-18. This function can be used to measure the printing operation of the spectrum.

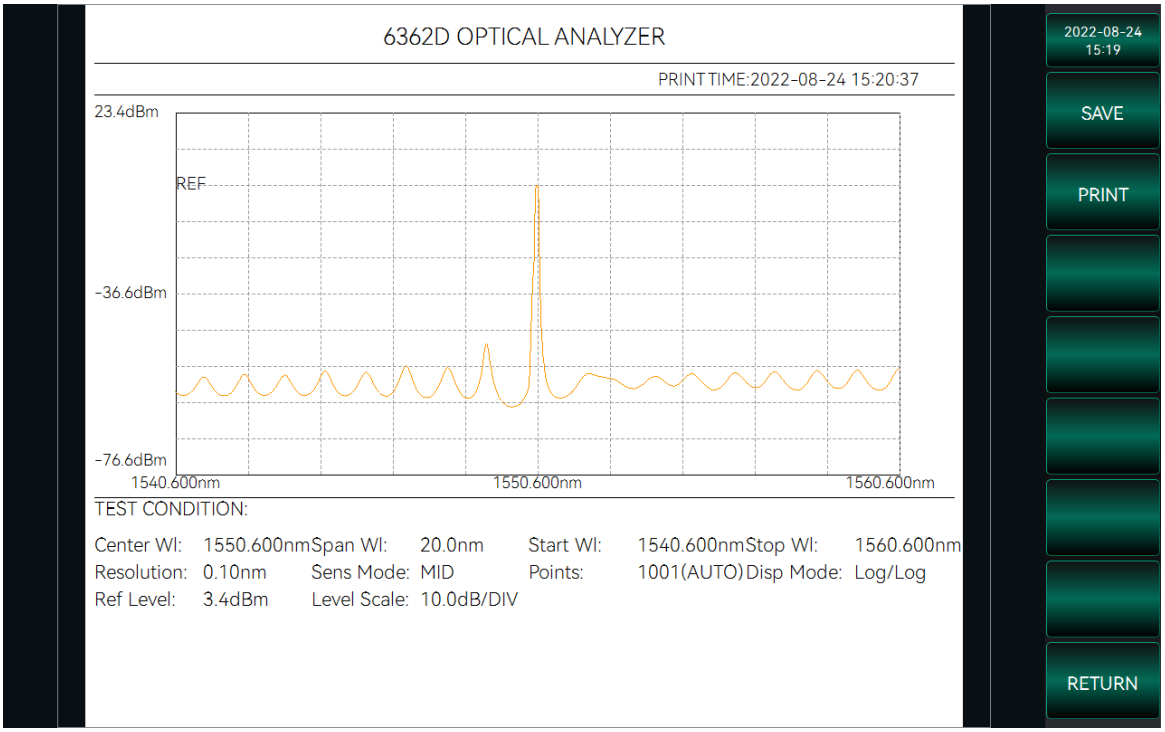


Figure 3-18 Print interface diagram

The print interface shows a print preview of the current spectrum, including the spectrum waveform, print time and measurement parameters. The right menu bar contains [Save], [Print] and [Back] options.

[Save]: The information displayed in the print interface can be saved in the instrument in the form of a file, which can be exported via U disk and other means.

[Print]: The preview information can be printed out in paper form.

[Back]: Return to the previous operation interface.

3.5 Display and Analysis

3.5.1 Energy Level Display

Press the Energy Level in the instrument keypad to enter the Energy Level menu. The energy level menu allows you to adjust the power display range of the curve, including the primary axis on the left side of the plotting area and the sub-axis on the right side, where the sub-axes are only for the calculated curve, as described in detail in Chapter 5. The first page of the function menu on the right side of the instrument interface is used to set the display related to the primary axis, including [RefEngLvl], [LogScale], [LinScale], [LinEngLvl], [Peak->Ref], [Auto Ref], and the second page is used to set the display related to the sub-axis, including [SubScale Auto], [LogScale], [LinScale], [SubRefEngLvl], [SubScale], [Y-axisSet], where [Y-axisSet] is the menu button and the next level menu includes [Y-axis Grid] and [RefPos].

[RefEngLvl]: The reference value of the primary axis.

[LogScale]: The display scale value when the primary axis is displayed logarithmically.

[LinScale]: The primary axis is switched to linear display.

[LinEngLvl]: The base energy level when the primary axis is displayed linearly.

[Peak->Ref]: The peak of the current curve is set as the reference.

[AutoRef]: Execute Peak->Reference automatically after sweeping.

[SubScale Auto]: Set the scale of sub-axis automatically after sweeping.

[LogScale]: The sub-axis is switched to logarithmic display, and the scale value is set at the same time.

[LinScale]: The sub-axis is switched to linear display, and the scale value is set at the same time.

[SubRefEngLvl]: The reference value of the sub-axis.

[SubScale]: The scale of the sub-axis.

[Y-axis Grid]: The number of grids on the vertical axis.

[RefPos]: The position of the grid point where the reference energy level of the primary axis is located.

3.5.1.1 Setting reference energy level

The reference energy level is the reference value of the vertical axis, which can be set via the energy level menu or directly via the shortcut keys.

Setting via the energy level menu

1. Press the [EngLvl] soft key to display the corresponding menu.

3.5 Display and Analysis

2. Select [RefEngLvl] and enter the energy level value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-19.

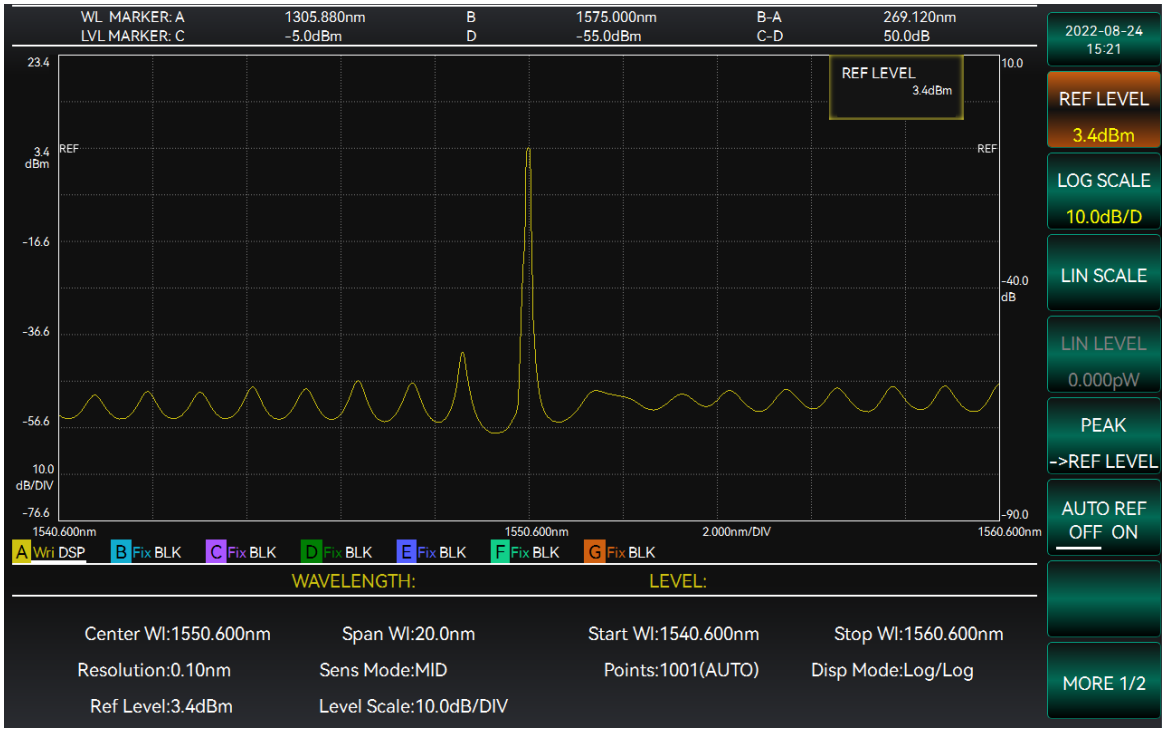


Figure 3-19 Energy level menu interface

Setting by shortcut keys

1. Press the [EngLvl] soft key to display the menu and select [Peak->Ref] to set the peak point as the reference energy level.

2. Press the [EngLvl] soft key to display the menu and select [AutoRef] as ON to automatically find out the peak from the waveform of the active curve in each sweep and set it as the reference energy level.

Instruction!

- The reference energy level works only for the left primary axis and corresponds to the power value at the "REF" mark on the axis.
- The reference value can be fine-tuned at a unit accuracy of 0.1 using the knob.
- When switching to linear display, the reference position defaults to the maximum value of the vertical axis. When the current setting value is greater than 1000, the power units are automatically advanced, and the order of advancement is pW, nW, μW, mW and W.

3.5.1.2 Setting Logarithmic Display

The vertical axis can be set to logarithmic display and linear display. It can be set via the [EngLvl] menu.

1. Press the [EngLvl] soft key to display the corresponding menu.

2. Select [LogDisp] and enter the logarithmic scale value via the knob or number keys to complete the setting, as shown in Figure 3-20.

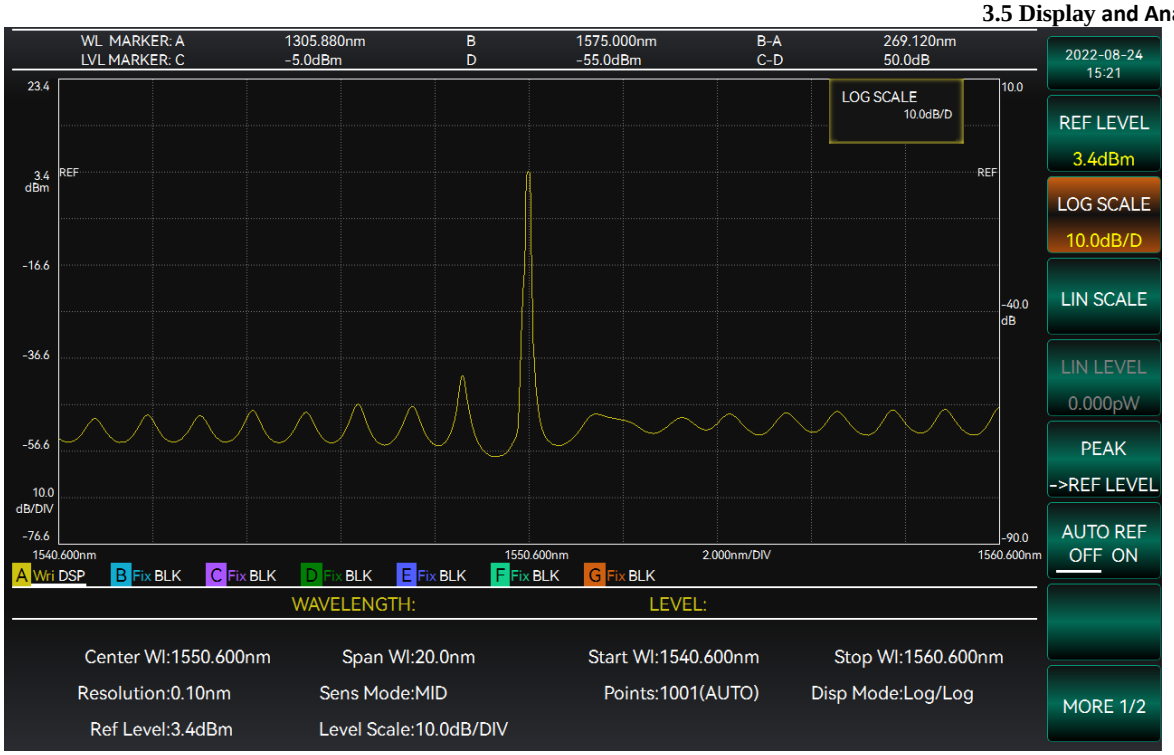


Figure 3-20 Setting logarithmic scale interface

3.5.1.3 Setting Linear Display

The vertical axis can be set to logarithmic display and linear display. It can be set via the [EngLvl] menu.

1. Press the [EngLvl] soft key to display the corresponding menu.

2. Select [LinDisp] and enter the linear scale value via the knob or number keys to complete the setting, as shown in Figure 3-21.

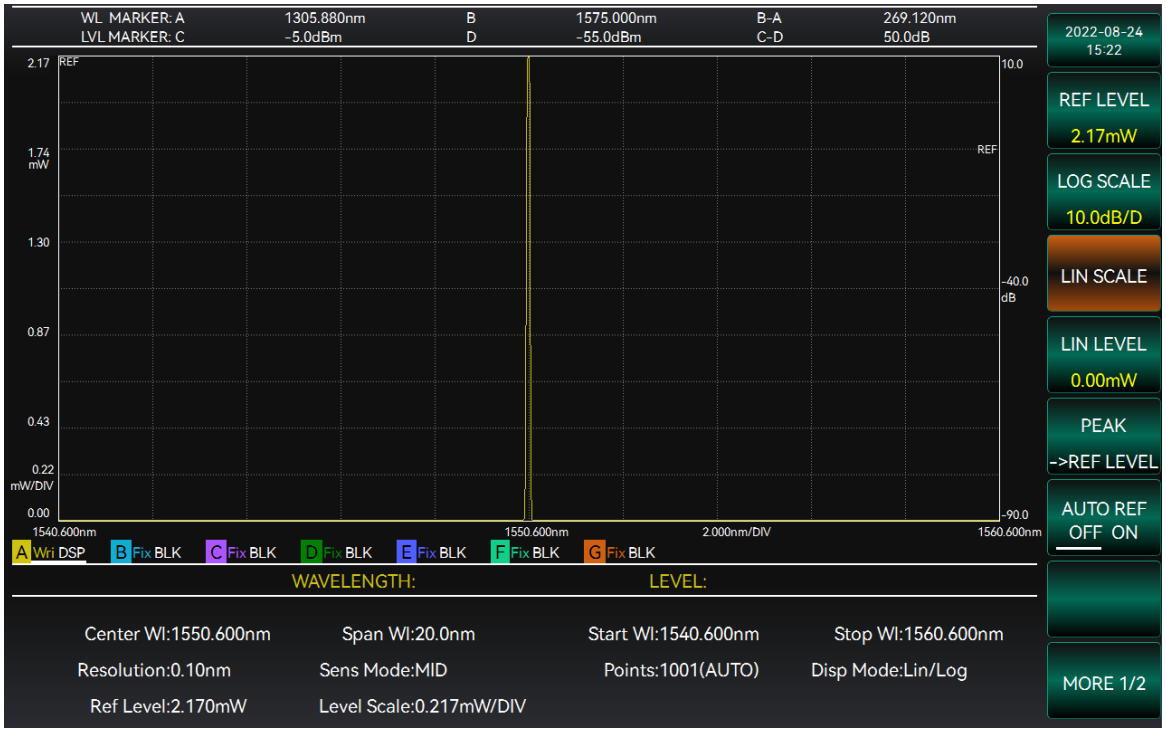


Figure 3-21 Setting linear scale interface

3.5 Display and Analysis

Instruction!

- The logarithmic/linear display works only for the left primary axis and has no effect on the calculated curve.
- The value can be fine-tuned at a unit accuracy of 0.1 using the knob.
- When switching the logarithmic/linear display, "Logarithmic/Logarithmic" is displayed in the parameter display area, where Logarithmic before "/" indicates the display state of the primary axis and Logarithmic after "/" indicates the display state of the secondary axis.

3.5.1.4 Setting Sub-reference

The sub-reference is the reference energy level position of the secondary axis, which can be set via the Energy Level menu or directly via the shortcut keys.

Setting via the energy level menu

1. Press the [EngLvl] soft key to display the corresponding menu.

2. Select [SubRef], enter the sub-reference value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-22.

Setting by shortcut keys

1. Press the [EngLvl] soft key to display the menu, select the Next Page, and select the [SubRef Auto ON] to automatically find out the peak from the waveform of the active curve in each sweep and set it as the sub-reference energy level.

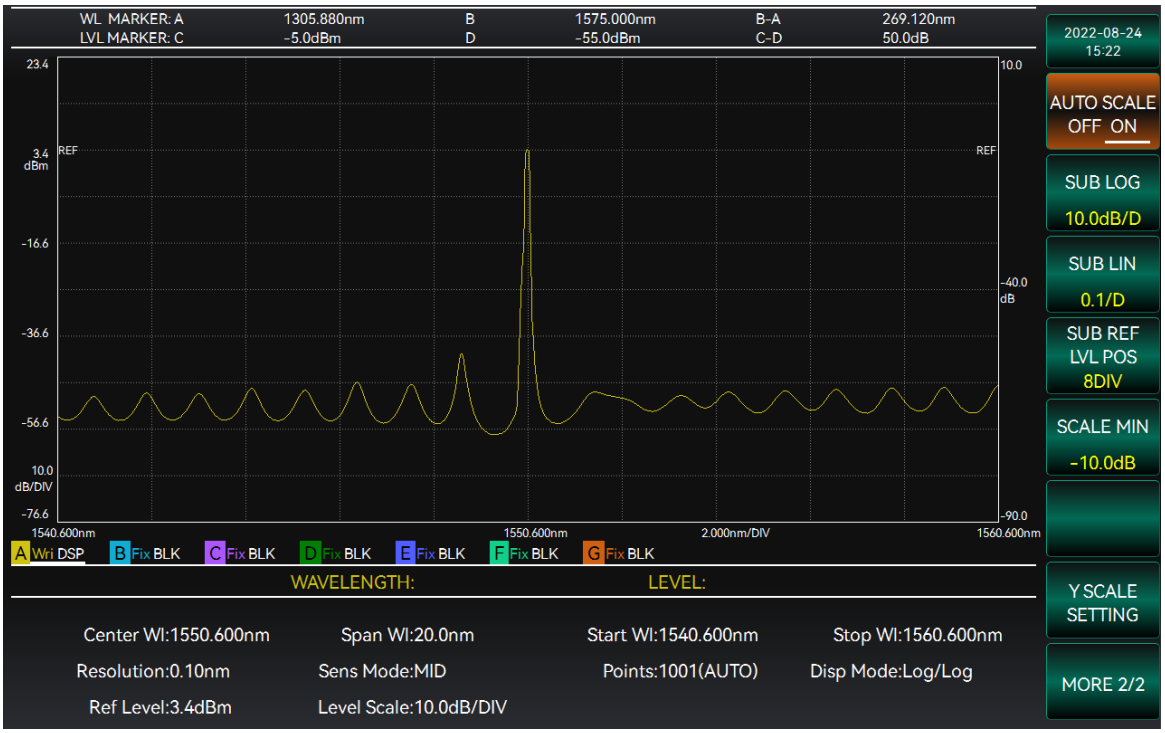


Figure 3-22 Setting sub-reference energy level interface

3.5.1.5 Setting Logarithmic Display of Sub-axis

The sub-axis can be set to logarithmic display and linear display. It can be set via the [EngLvl] menu.

1. Press the [EngLvl] soft key and select [Next Page] to display the corresponding menu.

2. Select [LogDisp] and enter the logarithmic scale value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-23.

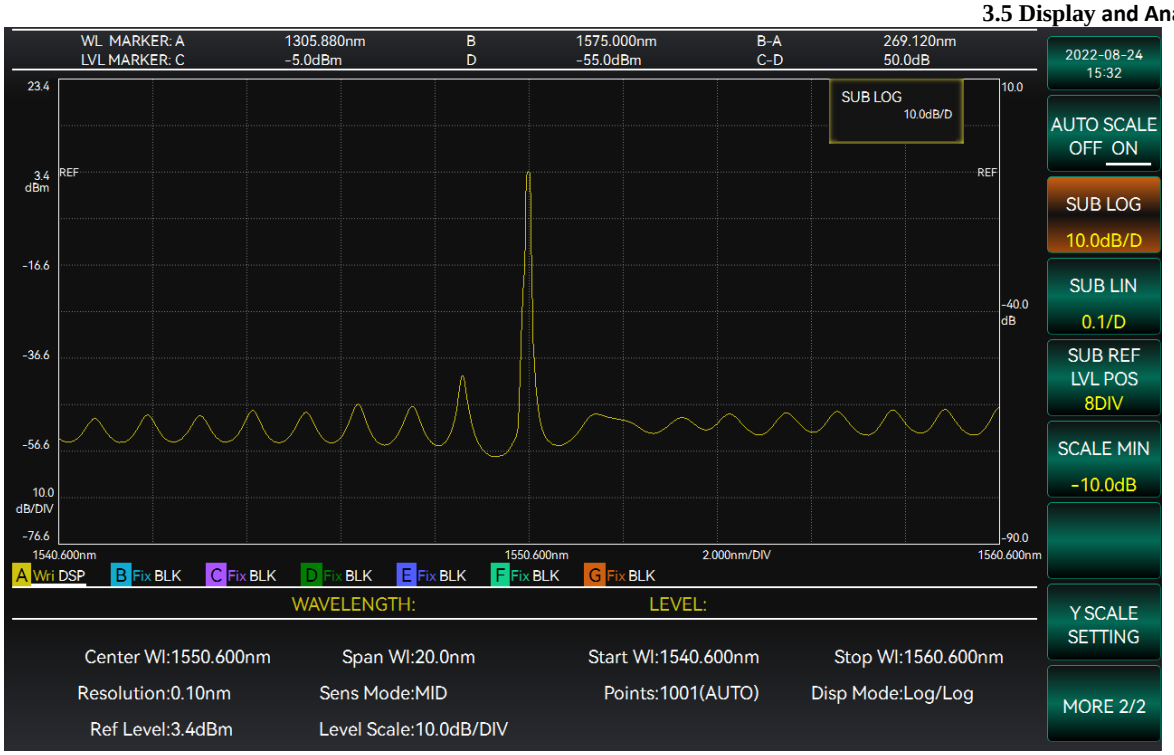


Figure 3-23 Setting sub-reference logarithmic scale interface

3.5.1.6 Setting Linear Display of Sub-axis

The vertical axis can be set to logarithmic display and linear display. It can be set via the [EngLvl] menu.

1. Press the [EngLvl] soft key and select [Nxt Pg] to display the corresponding menu.

2. Select [LinDisp] and enter the linear scale value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-24.

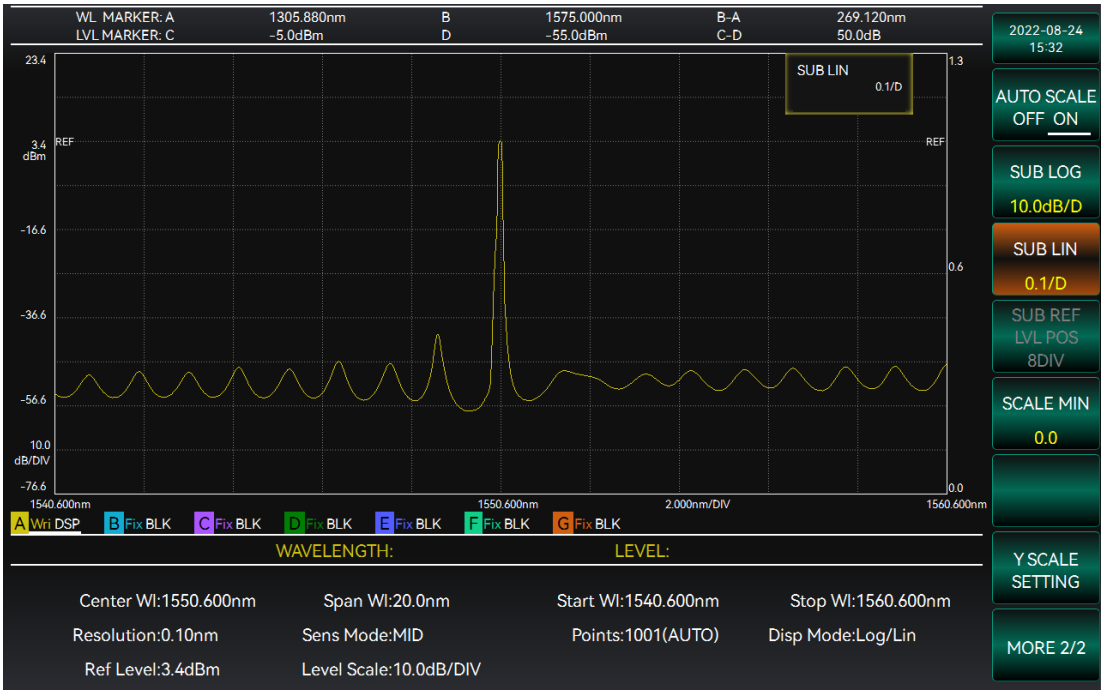


Figure 3-24 Setting sub-reference linear display interface

Instruction!

- Sub-reference, sub-axis logarithmic display, and sub-axis linear display work only for the right sub-axis.
- The value can be fine-tuned at a unit accuracy of 0.1 using the knob.

3.5.1.7 Y-axis Setting

Y-axis Setting can be used to set the number of display grids of the vertical axis and the reference energy level position of the primary axis, which can be set via the Energy Level menu.

1. Press [EngLvl] software, select [Nxt Pg], and select [Y-axis Setting] to display the corresponding menu.

2. Select [Y-axis Grid] or [RefPos] to set the corresponding function respectively. The operation interface is shown in Figure 3-25.

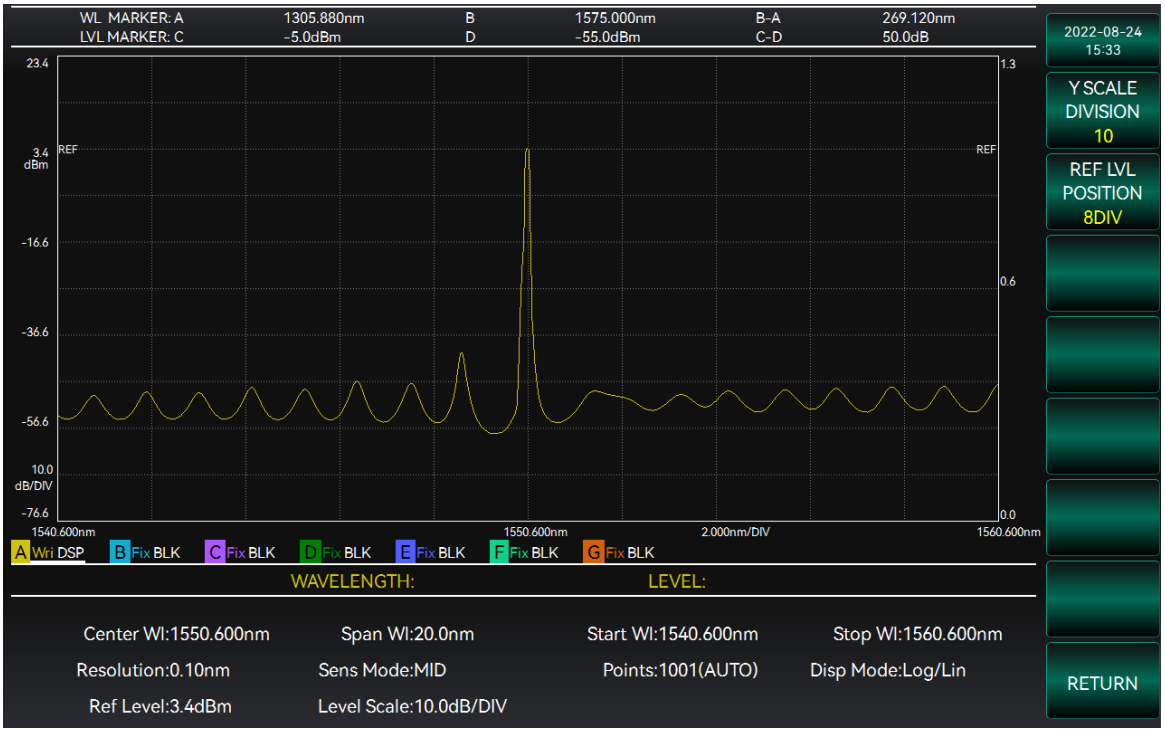


Figure 3-25 Y-axis setting interface

3.5.1.8 Noise Masking

Noise Masking masks the noise region waveform by setting the threshold value, which is set via the Display menu.

1. Press the [DISP] soft key to display the corresponding menu.

2. Select [Noise Mask] and enter the threshold value via the knob or number keys to complete the setting. The operation interface is shown in Figure 3-26.

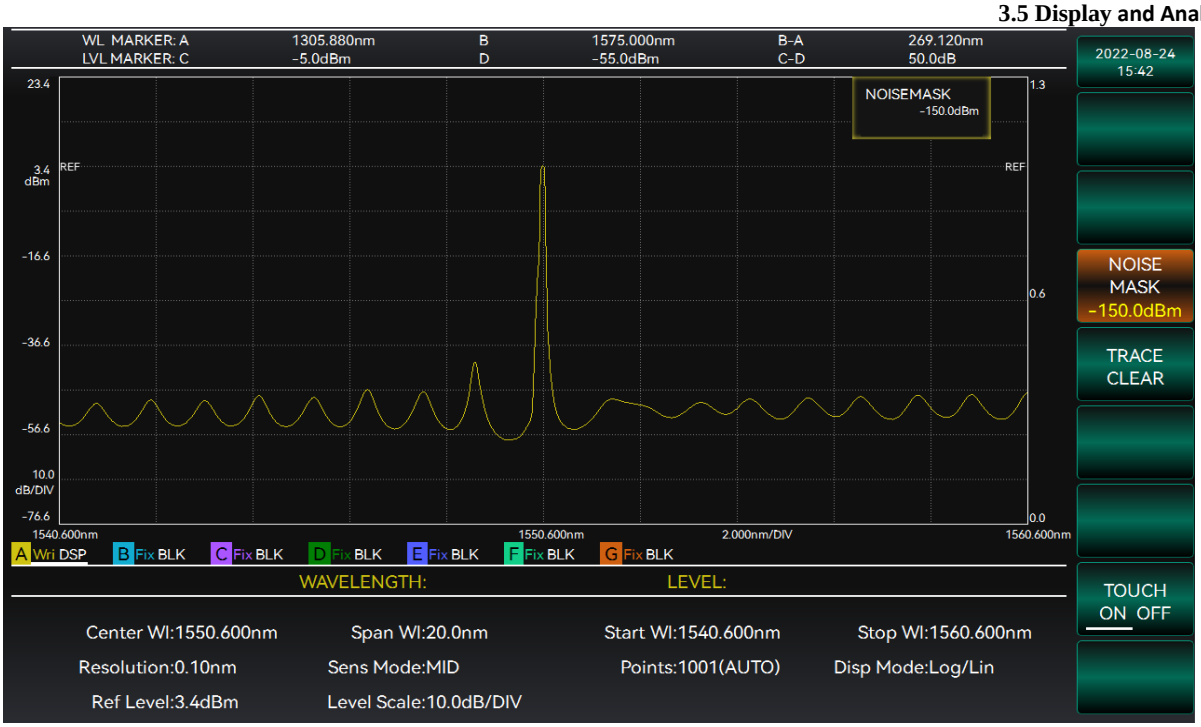


Figure 3-26 Setting noise masking interface

3.5.2 ZOOM Display

Press [ZOOM] in the instrument keypad to enter the ZOOM menu. The ZOOM menu interface of the S6362D optical spectrum analyzer is shown in Figure 3-27.

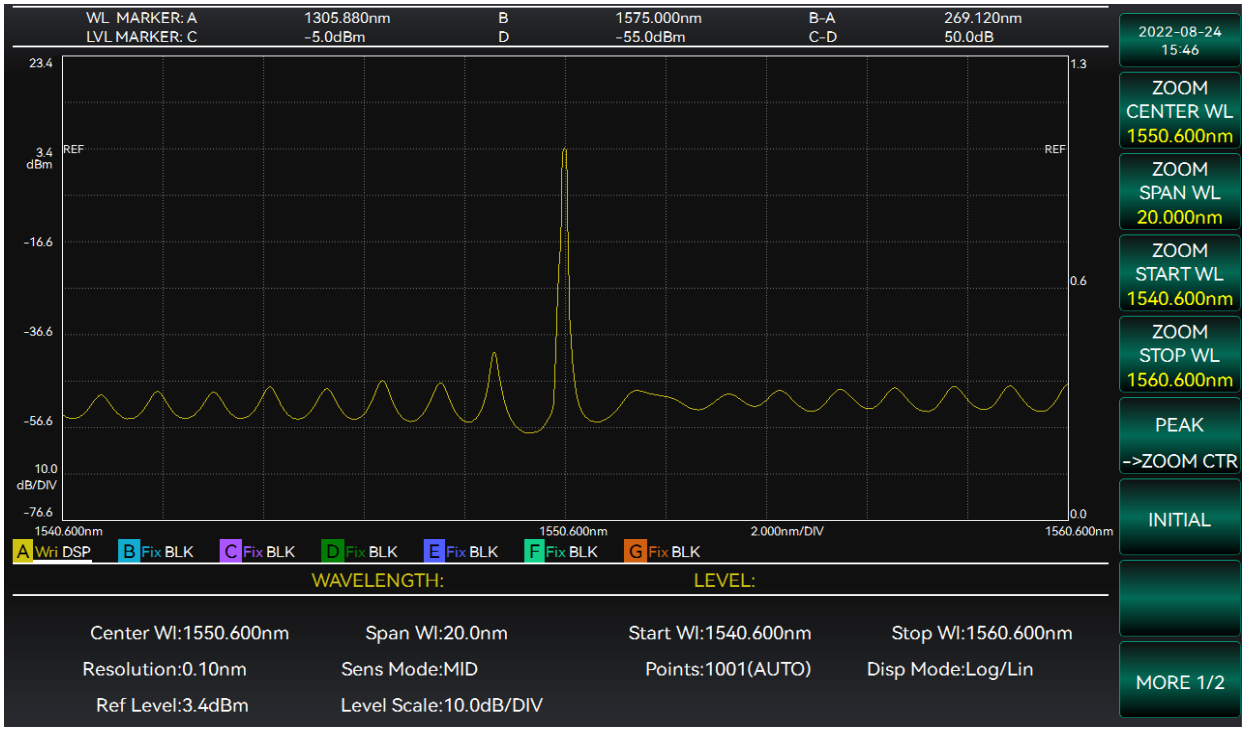


Figure 3-27 ZOOM menu interface

3.5.2.1 Setting ZOOM Center Wavelength

ZOOM Center Wavelength is the displayed center wavelength value, which can be set via the ZOOM menu, or whose display range can be set directly via the measured waveform.

3.5 Display and Analysis

Setting through ZOOM menu

1. Press the [ZOOM] key to display the corresponding menu.

2. Select [ZOOM CWL] / [ZOOM SWL] / [ZOOM EWL] and enter the wavelength value via the knob or number keys to complete the setting. The operation interface is shown in Figure 4-9.

Setting through shortcut keys

1. Press the ZOOM Center Wavelength button to display the menu and select [Peak->ZOOM Cntr] to set the wavelength value of the peak point as the ZOOM center wavelength.

2. Select [Initialize] to display the spectral curve when the ZOOM function is not performed.

3.5.2.2 Setting ZOOM Start Wavelength

ZOOM Start Wavelength is the displayed start wavelength value, which can be set via the ZOOM menu.

1. Press the [ZOOM] key to display the corresponding menu.

2. Select [ZOOM SWL] and enter the wavelength value via the knob or number keys to complete the setting.

3.5.2.3 Setting ZOOM End Wavelength

ZOOM End Wavelength is the displayed end wavelength value, which can be set via the ZOOM menu.

1. Press the [ZOOM] key to display the corresponding menu.

2. Select [ZOOM EWL] and enter the wavelength value via the knob or number keys to complete the setting.

3.5.2.4 Setting ZOOM Wavelength Bandwidth

ZOOM Wavelength Range is the displayed wavelength range value, which can be set via the ZOOM menu.

1. Press the [ZOOM] key to display the corresponding menu.

2. Select [ZOOM WLR] and enter the wavelength value via the knob or number keys to complete the setting.

3.5.2.5 Setting ZOOM Display Properties

The ZOOM menu allows you to set or not to set the display of thumbnails as well as the position, size and transparency of the display. The setting interface is shown in Figure 4-10.

1. Press the [ZOOM] key to display the corresponding menu.

2. Select [PreViewWin], which has two states: ON and OFF to switch whether to display thumbnails.

3. Select [PreViewSize], which has two states: Large and Small to switch the size of the thumbnails.

4. Select [PreViewPos], which has two states: Left and Right to switch the left and right position of the thumbnails.

5. Select [WinTrsPare], which has two states: ON and OFF to switch the background transparency of the thumbnails.

Instruction!

- When the window display is switched from ON to OFF, the instrument will no longer display the thumbnails when the range of the waveform display area is changed.
- The wavelength range of the thumbnail is the curve display range after the last test.

3.5.2.6 ZOOM Movement

In addition to the above methods of setting ZOOM parameters, the instrument also supports the operation of the waveform display area and thumbnails by dragging the mouse or touching the screen directly with your fingers.

Drag the mouse in the waveform display area to enlarge the range of the waveform display area. When the thumbnail is displayed, drag the edge of the selection line or the selection box within the thumbnail range to adjust the display area of the waveform display area.

3.5.3 Track Function

Under the main function menu on the main operation interface, press [TRK] software to enter the track function interface. The track interface of the S6362D optical spectrum analyzer is shown in Figure 3-28.

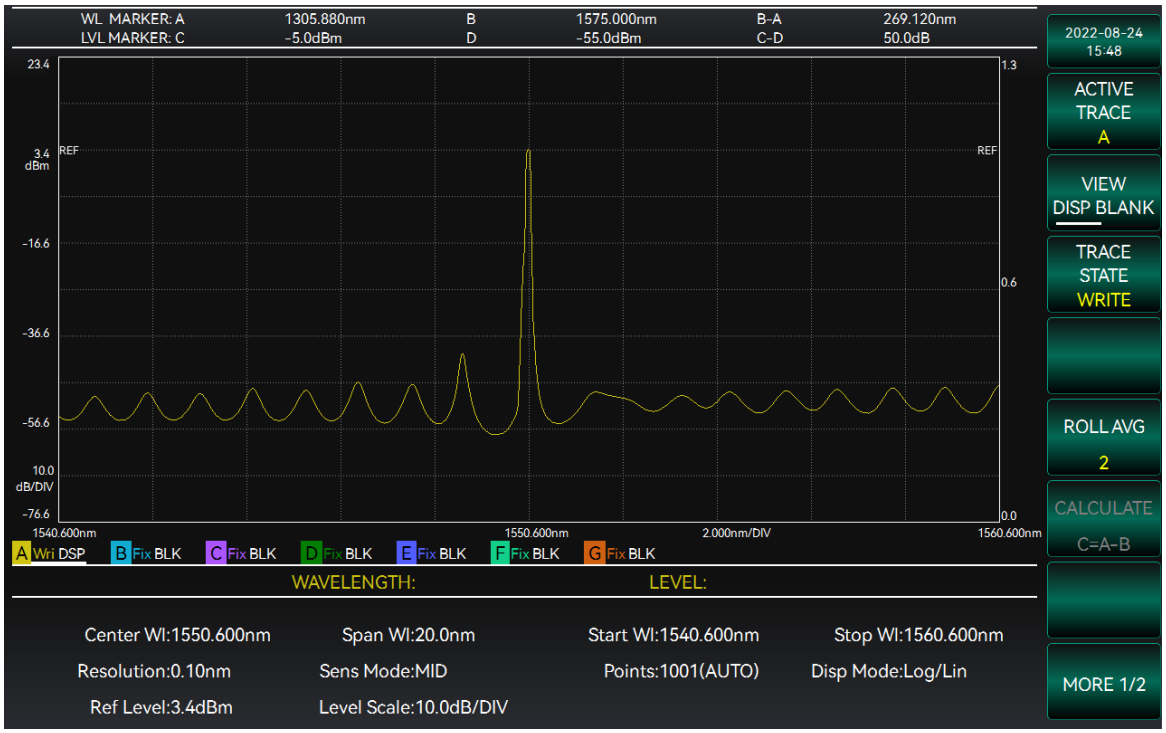


Figure 3-28 Track interface diagram

The track function interface can be used for track selection and mode switching of spectrum. The right function menu includes [CurCurve], [DISP], [CurvMode], [WAVG], [CALC], [CurvList], [CopyCurv] and [ClearCurv].

[CurCurve]: Switch the current active track.

[DISP]: Change the display state of the track.

[Curve mode]: Change the processing mode of current track.

[WAVG]: Set the number of weighted averages for the current curve.

[CALC]: Set the calculation type of the calculation curve, which can be set as C, F and G.

[CurvList]: View the state information and measurement parameters of all tracks, etc.

[CopyCurv]: Perform the copy operation between curves.

[ClearCurv]: Clear all curve data.

3.5.3.1 Current Curve

Select the [CurCurve] option under the [TRK] menu to enter the selection function of different track curves. There are up to seven tracks, numbered sequentially from [A] to [G], and each track has a different color display curve for easy observation and measurement. Multiple curve information can be displayed in the screen, but only one curve is currently selected. The curve name, corresponding color and mode will be marked below the display of the waveform curve, as shown in Figure 3-29.

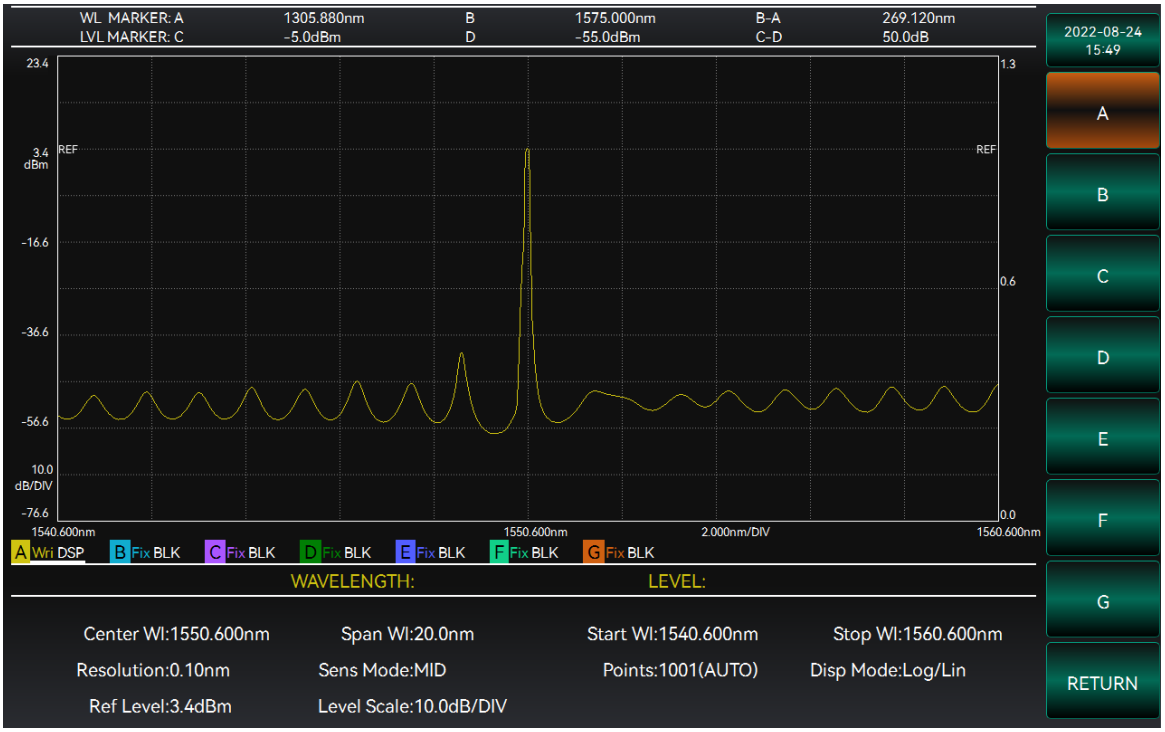


Figure 3-29 Current curve selection diagram

The basic steps for current curve selection are as follows:

1. Press the [TRK] soft key and select [CurCurve] to enter the Track List.

2. Select the name of the current track to be selected to complete the selection and switching of different tracks.

3.5.3.2 Display

There are two display states of curves. The measurement curves of different tracks can be displayed at the same time. The display state of the curve will be marked on the right side of the track label, "DSP" indicates the "Display" state, and "BLK" indicates the "Blank" state. Select the [DISP] option under the [TRK] menu, and click "Display" or "Blank" below it to switch the display state of the current track curve.

In the "Display" state, the curve information of the current track will be displayed on the screen; in the "Blank" state, the curve information of the current track will be hidden.

3.5.3.3 Curve Mode

Select the [CurvMode] option under the [TRK] menu to select the processing mode of the current track curve, as shown in Figure 3-30. The options menu on the right side includes [Write], [Fix], [Max], [Min],

[WAVG] and [OPER]. The descriptive information for several options is as follows:

[Write]: The current track curve enters Write mode.

[Fix]: The current track curve enters Fix mode.

[Max]: The current track curve enters Max Hold mode.

[Min]: The current track curve enters Min Hold mode.

[WAVG]: The current track curve enters Weighted Average mode.

[OPER]: The current track curve enters Operate mode.

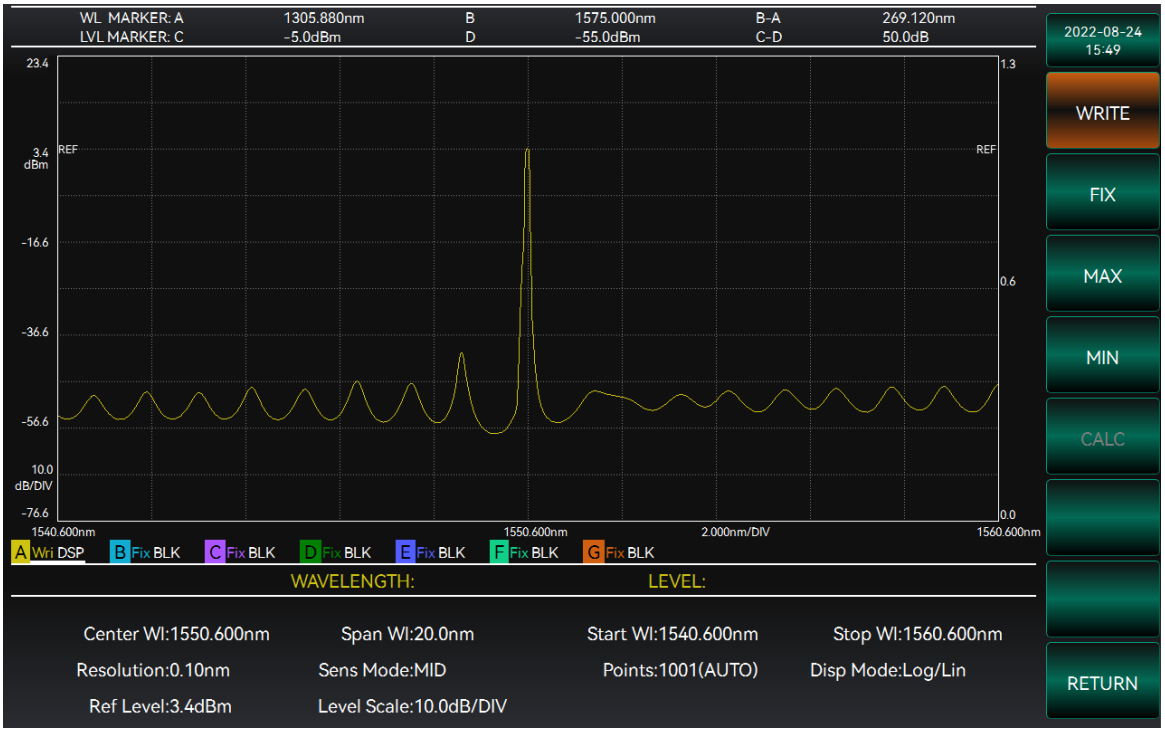


Figure 3-30 Curve mode interface diagram

1) Write

When [Write] option is selected, the current track will enter "Write" mode. In "Write" mode, the current track can freely measure and analyze the input data. The "Write" mode is marked on the right side of the track label, indicated by "Wri". The curve is shown in Figure 3-31.

When [Sgl Swp], [Rept Swp] or [Auto Swp] is executed, all tracks in the "Write" state will be measured and the waveform curve will be updated.

3.5 Display and Analysis

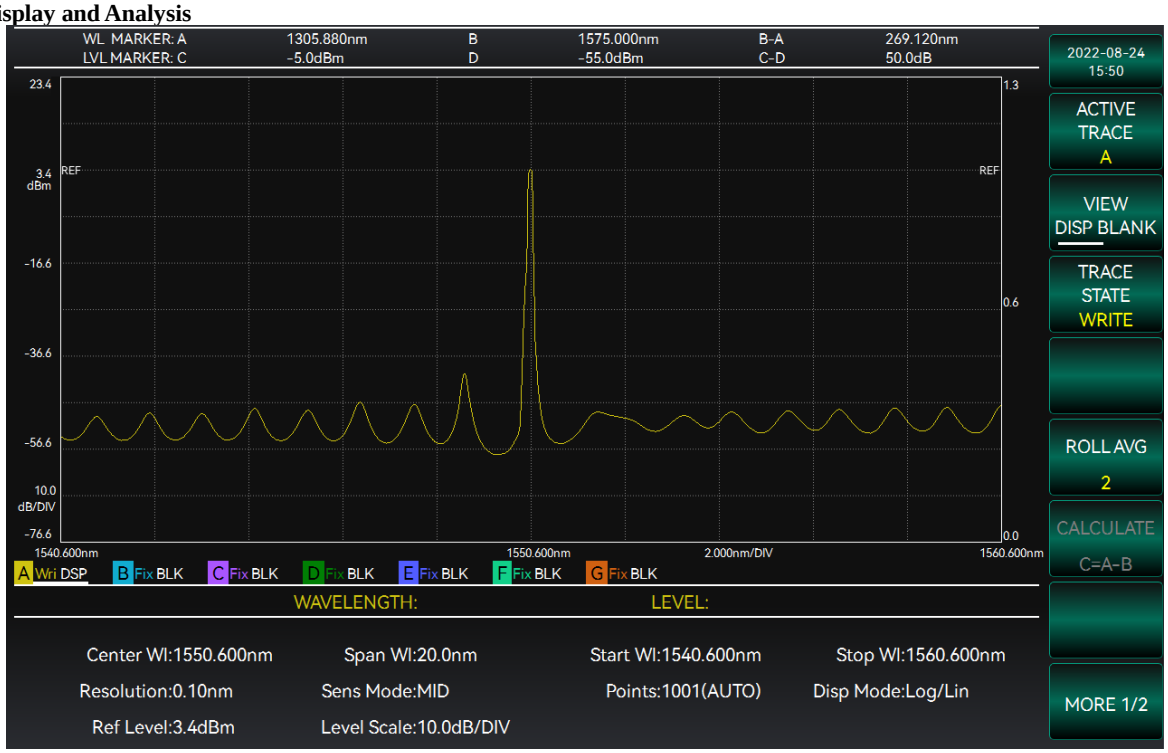


Figure 3-31 "Write" mode curve diagram

The main operations for setting the track curve to "Write" mode are as follows:

1. Press the [TRK] soft key, select [CurCurve], and select the curve whose mode is desired to be changed.

2. Select the [CurvMode] option and select the Write option so that the mode of the current track will be set to "Write".

2) Fix

When [Fix] option is selected, the current track will enter "Fix" mode. In "Fix" mode, the curve of the current track will be fixed, i.e., the displayed curve waveform will not be modified, and operations such as "Single Sweep" or "Repeated Sweep" to change the waveform will not work for the current track. “Fix" mode is marked on the right side of the track label, indicated by "Fix", as in curve B in Figure 3-31.

When all tracks are set to "Fix", the functions such as "Single Sweep" or "Repeated Sweep" will not be available, and an error message will be displayed if these functions are selected.

The main operations for setting the track curve to “Fix" mode are as follows:

1. Press the [TRK] soft key, select [CurCurve], and select the curve whose mode is desired to be changed.

2. Select the [CurvMode] option and select the Fix option so that the mode of the current track will be set to Fix.

3) Hold

The curve hold condition is divided into "maximum" and "minimum", as shown in Figure 3-32. Selecting different options will cause the curve to be held by different conditions.

Figure 3-32 Curve hold condition diagram

When the curve hold condition is selected as [Max], the curve mode of the current track is "Max Hold", and it will be marked with "Max" on the right side of the track label. Sweep and measure the curve in this mode. If the power value of the measured data is less than the previously displayed measured value, the curve will remain unchanged; If the power value of the measured data is greater than the previously displayed measured value, the waveform data will be updated, that is, the maximum value measured will be maintained.

When the curve hold condition is selected as [Min], the curve mode of the current track is "Min Hold", and it will be marked with "Min" on the right side of the track label. Sweep and measure the curve in this mode. If the power value of the measured data is greater than the previously displayed measured value,

the curve will remain unchanged; If the power value of the measured data is less than the previously displayed measured value, the waveform data will be updated, that is, the minimum value measured will be maintained.

When the [Sgl Swp] is executed, the track curve in the "Hold" mode will be written directly to a measurement without holding the curve, which is equivalent to the "Write" mode. When [Rept Swp] is executed, all tracks in the "Hold" state will be measured and the waveform curve will be updated.

The main operations for setting the track curve to “Hold" are as follows:

1. Press the [TRK] soft key, select [CurCurve], and select the curve whose mode is desired to be changed.

2. Select [CurvMode] option, select [Max] or [Min] option so that the mode of the current track will be set to "Max Hold" or "Min Hold".

4) Weighted Average

When the [WAVG] option is selected, you can enter the desired number of weighted averages in the pop-up input box, as shown in Figure 3-33.

Instruction!

- The number of weighted averages is set to an integer within the range of 2~1000.
- When the curve is set to Weighted Average mode, the average calculation is carried out only when a repeated sweep is performed.

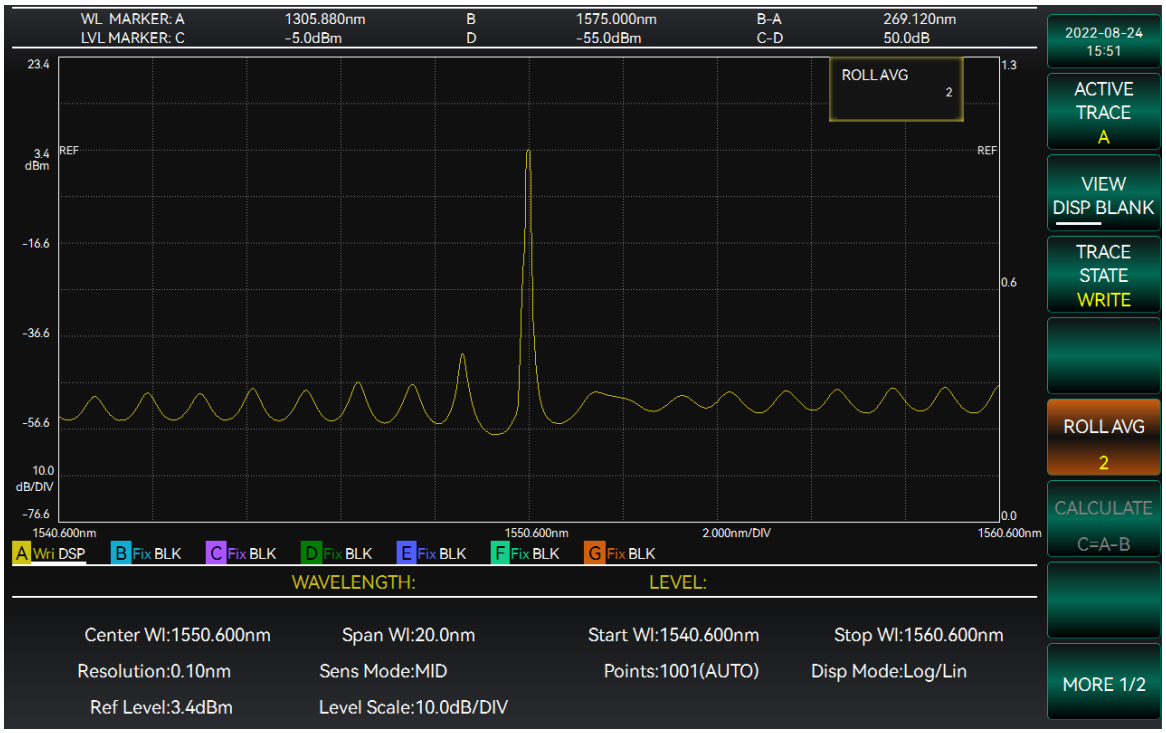


Figure 3-33 Setting curve weighted average diagram

The equation for averaging n measurements of the curve is as follows:

$$\mathcal{L}_i(i) = \frac{(i-1)\mathcal{L}_{i-1}(i) + \mathcal{L}'_i(i)}{i}, \qquad i = 2 \cdots n$$

$\mathcal{L}_i(i)$: Waveform displayed after the $i-$ th measurement

$\mathcal{L}_{i-1}(i)$: Waveform displayed after the $(i-1)$th measurement

$\mathcal{L}_i'(i)$：The waveform actually measured for the i − th time, when i = 1, L_i^′ (i) is L_i (i)

n：add average times

When the [Sgl Swp] is executed, the track curve in the "Weighted Average" mode will be written directly to a measurement without averaging process, which is equivalent to "Write" mode. When the "Repeated Sweep" is executed, the track curve in the "Weighted Average" mode will be repeatedly swept n times (n is the number of weighted averages), and the waveform curve displayed in each sweep will be weighted average.

5) Operate

When [OPER] option is selected, the current track curve will enter "Operate" mode. In "Operate" mode, the current track displays the results of mutual operation of spectral waveforms of other tracks. It should be noted that only the curves of Track C, Track F and Track G can be set to “Operate" mode.

When the track curve is selected as the Operate mode, it is also necessary to select the operation content of the curve. Different operation tracks can carry out different operation contents. See Table 3.8 for details.

Table 3.8

Track name	Selectable operation contents
C	C = A − B C = B − A
F	F = C − D,F = D − C F = D − E,F = E − D
G	G = C − F G = F − C

Take track curve C as an example. Enter the Operate mode, and select the operation content in the function menu bar, as shown in Figure 3-34. When the curve mode of Track C is selected to Operate and the operation content is “C = A − B”, Track C will display the operation difference between Track A and Track B curves. The operation content is marked on the right side of the track label as "A-B".

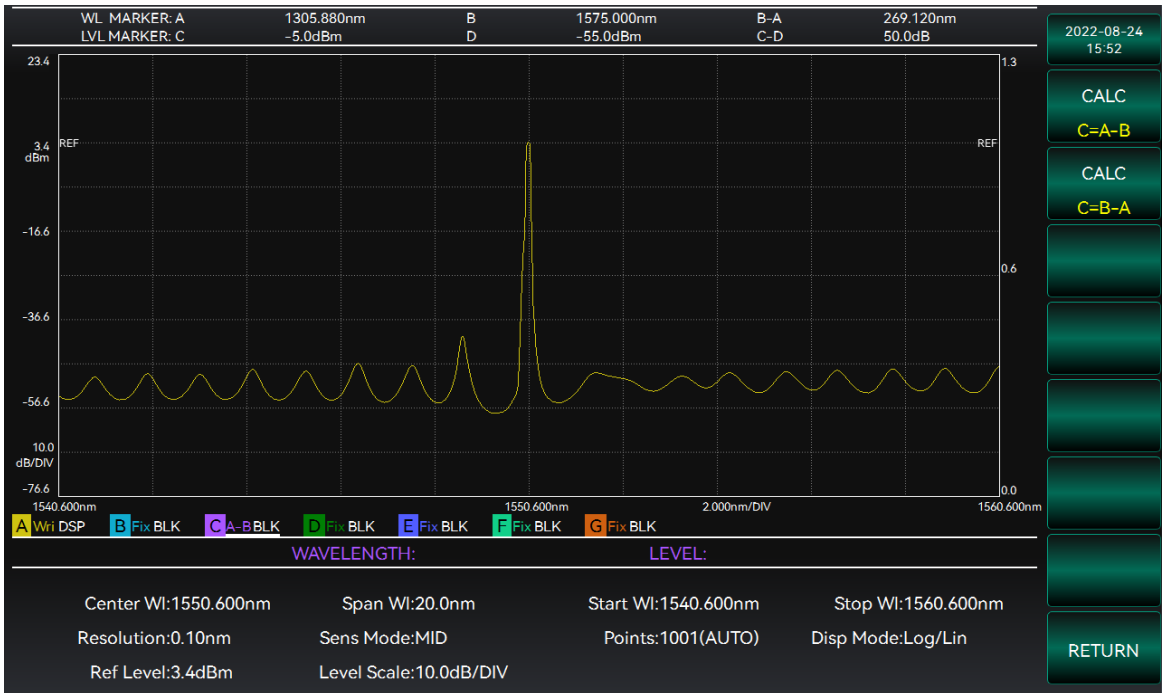


Figure 3-34 C-curve "Operate" mode diagram

3.5 Display and Analysis

The main operations for setting the track curve to Operate are as follows:

1. Press the [TRK] soft key, select [CurCurve], and select a track that can perform the operation function.

2. Select [CurvMode] option, select [OPER] option, and select the operation content of the track curve, so that the current track curve will be set to "Operate" mode.

Instruction!

- The spectral power value is in dBm, and the value corresponds to the left vertical axis; the operation result of subtracting two waveform curves is in dB, and the value corresponds to the right vertical axis. To adjust the position of the operation result curve, the parameter value of the sub-reference position or sub-logarithmic scale should be changed.

3.5.3.4 Curve List

When the [CurvList] option under the [TRK] menu is selected, the system will display the setting parameters and curve state of all track curves for an easy overview of the track. as shown in Figure 3--35.

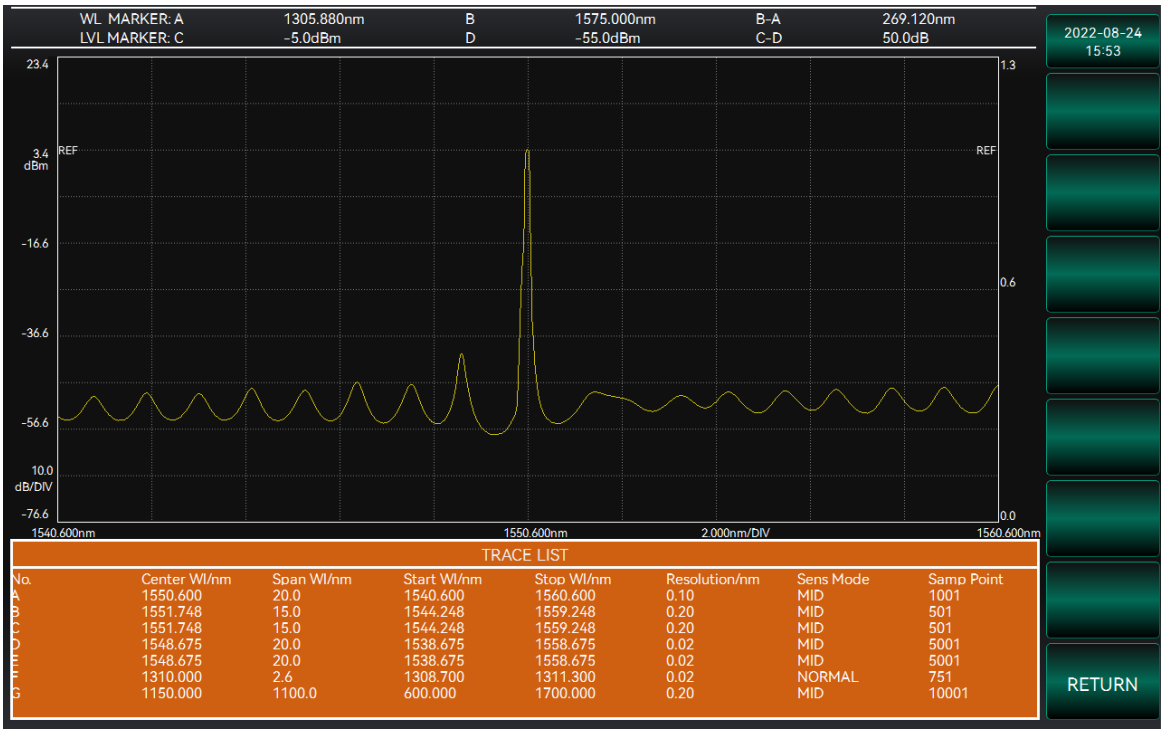


Figure 3-35 Curve list diagram

Information about the curve list is displayed in the parameter display area at the bottom of the interface, including: track, center wavelength, sweep bandwidth, reference power, power scale, resolution, sampling points, sensitivity and curve state. "Track" shows the track name; "Curve Status" shows the curve mode of the corresponding track; the other items show the test parameters set for the corresponding curve.

3.5.4 Marker Function

Under the main function menu on the main operation interface, press [Mkr] soft key to enter the Marker function interface. The marker interface of the S6362D optical spectrum analyzer is shown in Figure 3-36.

Figure 3-36 Marker interface diagram

The Marker Function interface allows you to set marker lines to measure the spectral waveform. The main functions on the right side include [Free Mkr], [Mkr A], [Mkr B], [Mkr C], [Mkr D], and [Clear Mkr].

[Free Mkr]: Set a free marker line to measure the wavelength and power information of the spectral waveform.

[Mkr A]: Set a vertical marker line A to measure the wavelength information of the spectral waveform.

[Mkr B]: Set a vertical marker line B to measure the wavelength information of the spectral waveform.

[Mkr C]: Set a horizontal marker line C to measure the power information of the spectral waveform.

[Mkr D]: Set a horizontal marker line D to measure the power information of the spectral waveform.

[Clear Mkr]: Clear all marker lines on the screen.

Instruction!

- All marker lines are set to "Clear" by default, i.e. they are not displayed on the interface.

The marker functions described in this section include:

3.5 Display and Analysis

3.5.4.1 Free Marker

Select the [Free Mkr] option under the [Mkr] menu to switch the marker line from "Clear" to "Display", and then set the free marker line. The free marker line is a vertical line. After setting the free marker, the marker line will intersect with the spectral waveform curve at a point, and the wavelength and power information of this intersection point will be displayed below the waveform.

The specific steps are as follows:

1. Press the [Mkr] key to enter the Marker menu.

2. Select [Free Mkr] and switch to "Display". At the same time, information about the current marker line position is displayed at the top right of the interface.

3. Use the knob to adjust the position of the free marker line, or use the number keys to directly enter the wavelength value at the desired marker position.

4. If you want the marker line to stop being displayed, you can select the [Free Mkr] option again and the marker line state will be switched to "Clear". The setting of the free marker line is shown in Figure 3-37.

Figure 3-37 Setting free marker diagram

3.5.4.2 Markers A and B

Select the [Mkr A] or [Mkr B] option under the [Mkr] menu to switch the marker line from "Clear" to "Display", and then set the free marker line A or B. Marker lines A and B are a vertical line for wavelength marking. The wavelength information of this marker will be displayed in the marker display area at the top of the interface.

Using marker A as an example, the steps are as follows:

1. Enter the [Mkr] menu and select [Mkr A] to make the marker line in the "Display" state. At the same time, information about the current marker line position is displayed at the top right of the interface.

2. Use the knob to adjust the position of the marker line, or use the number keys to directly enter the wavelength value at the desired marker position, which can only be within the display range.

3. If you want the marker line to stop being displayed, you can select the [Mkr A] option again and the

marker line state will be switched to "Clear".

To set Marker B, you only need to select [Mkr B], and other operations are basically the same as Marker A. Markers A and B are marked below the marker line for distinction. The setting of markers A and B is shown in Figure 3-38.

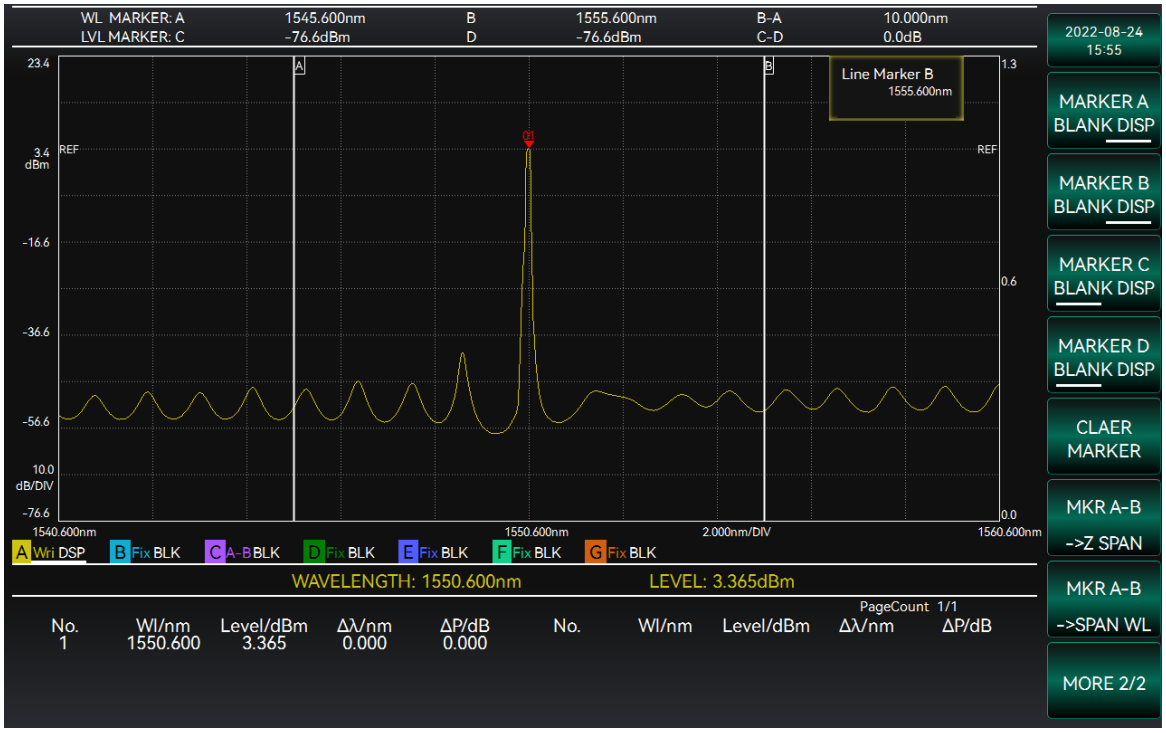


Figure 3-38 Setting markers A and B diagram

3.5.4.3 Markers C and D

Select the [Mkr C] or [Mkr D] option under the [Mkr] menu to switch the marker line from "Clear" to "Display", and then set the marker line C or D. Marker lines C and D are a horizontal line for power marking. The power information of this marker will be displayed in the marker display area at the top of the interface.

Using marker C as an example, the steps are as follows:

1. Enter the [Mkr] function and select [Mkr C] to make the marker line in the "Display" state. At the same time, information about the current marker line position is displayed at the top right of the interface.

2. Use the knob to adjust the position of the marker line, or use the number keys to directly enter the power value at the desired marker position, which can only be within the display range.

3. If you want the marker line to stop being displayed, you can select the [Mkr C] option again and the marker line state will be switched to "Clear".

To set Marker D, you only need to select [Mkr D], and other operations are basically the same as marker C. Markers C and D are marked on the left side of the marker line for distinction. The setting of markers C and D is shown in Figure 3-39.

3.5 Display and Analysis

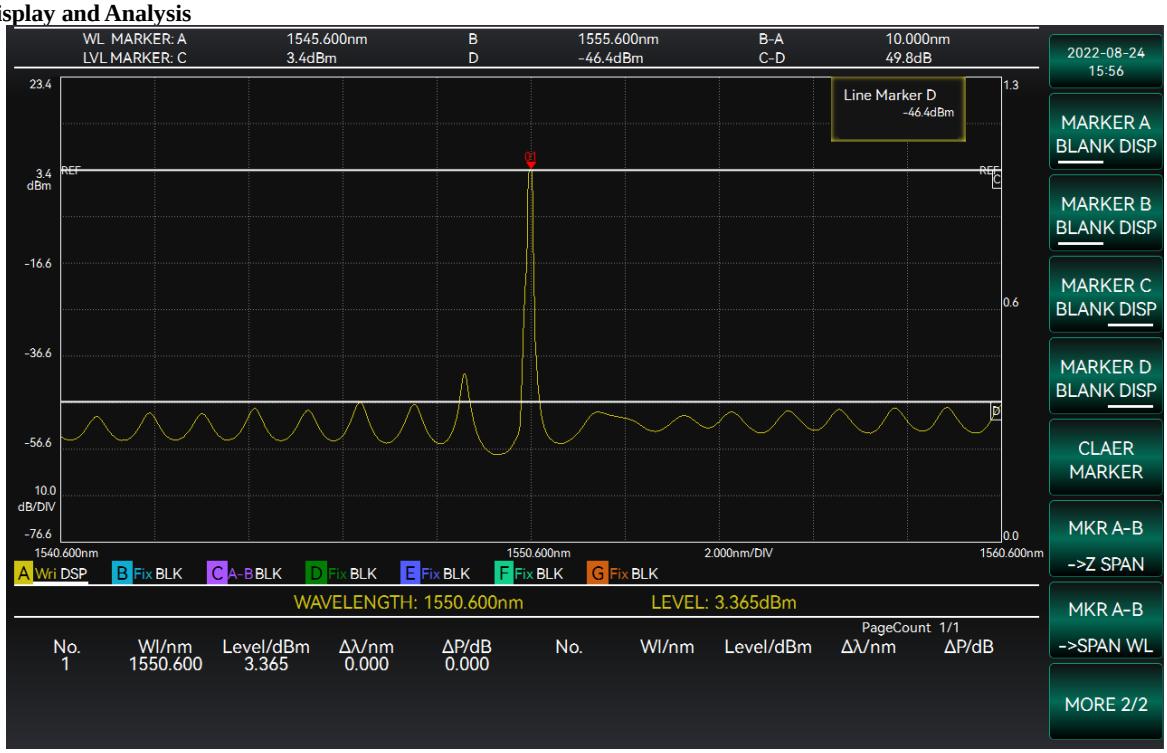


Figure 3-39 Setting markers C and D diagram

3.5.4.4 Marker Switching and Movement

Line markers support mouse dragging. Move the mouse over the marker and drag the mouse to move the marker.

The markers can also be moved using the knob on the instrument panel. Turning the knob counterclockwise moves the free marker point and marker lines A and B to the left, or moves marker lines C and D upward; turning the knob clockwise moves the free marker point and marker lines A and B to the right, or moves marker lines C and D downward. There are two positions to move the marker line using the knob, "small range movement" and "large range movement", which can be switched between them by pressing the quick button.

3.5.4.5 Marker Information Calculation

When the setting of markers A, B, C and D is completed, the system not only displays the numerical information corresponding to each marker, but also calculates the difference between the information measured by two markers in the same direction, so that the waveform can be better observed and processed. This marker information is displayed in the marker display area above, as shown in Figure 3-40.

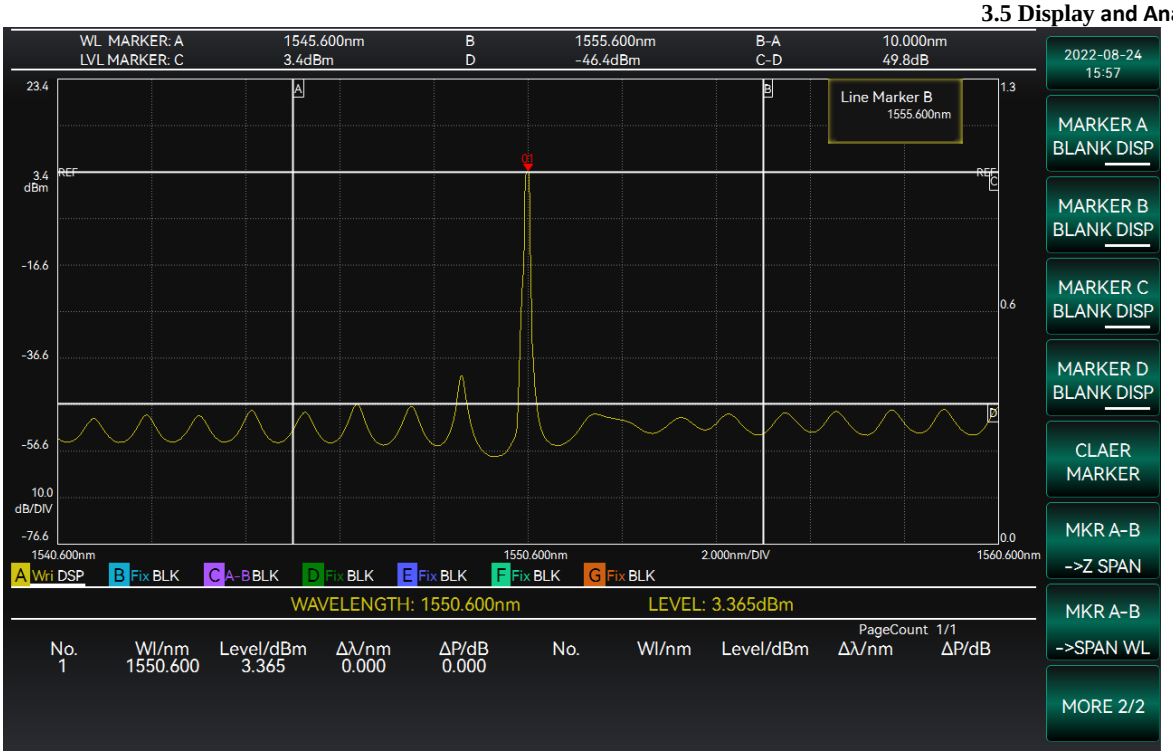


Figure 3-40 Displaying marker information diagram

3.5.4.6 Clear Marker

Under the [Mkr] menu, press the [Clear Mkr] option on page 1/2 to clear all marker points for records except free markers; press the [Clear Mkr] option on page 2/2 to clear all displayed line markers.

3.5.5 Analysis Function

This section describes spectral analysis methods, including

3.5.5.1 Peak Analysis

Press the [Srch Peak] soft key in the instrument keypad to enter the Peak Analysis interface. The analysis interface of the S6362D optical spectrum analyzer is shown in Figure 3-41.

3.5 Display and Analysis

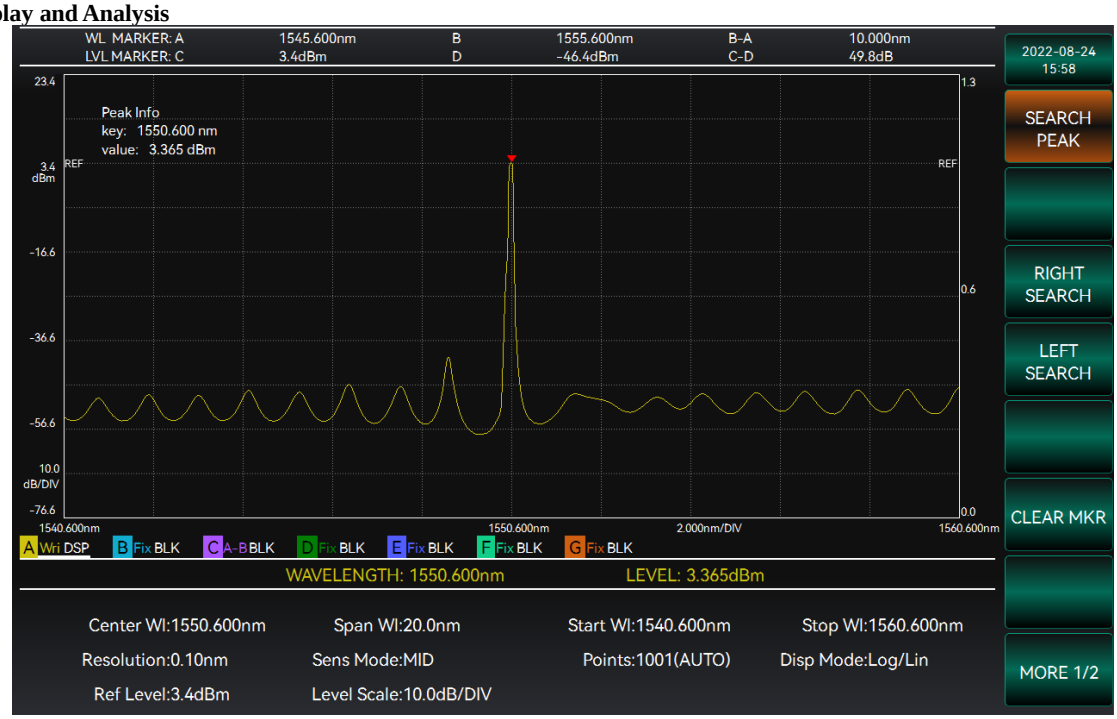


Figure 3-41 Analysis interface diagram

[Srch Peak] menu allows you to perform waveform analysis of the spectrum. Press the [Srch Peak] key in the keypad to enter the function menu. The function menu on the right has two pages in total. Page 1/2 includes [Srch Peak], [Srch Trough], [Srch Right], [Srch Left] and [Clear Mkr]; Page 2/2 includes [Auto Srch], [Srch A-B] and [Srch ZOOM].

[Srch Peak]: Peak search, to find the peak of the waveform.

[Srch Trough]: Trough search, to find the trough of the waveform.

[Srch Right]: Search for the next peak/trough to the right of the current position based on the selected peak search/trough search.

[Srch Left]: Search for the next peak/trough to the left of the current position based on the selected peak search/trough search.

[Clear Mkr]: Clear all analysis results and markers of search peak or trough.

[Auto Srch]: If auto search is turned on, it will automatically search for peaks or troughs after each sweep measurement; if it is turned off, it will not search for peaks or troughs.

[Srch A-B]: If Search A-B is enabled, it will search the peak/valley between line marker A and line marker B. If it is disabled, it will not set to search the peak/valley between line marker A and line marker B, but search the peak/valley between the start wavelength and the end wavelength.

[Srch ZOOM]: If Search ZOOM is enabled, it will search the peak/valley between the start wavelength and the end wavelength displayed in the current interface. If it is disabled, it will search the peak/valley between the start wavelength and the end wavelength of the sweep.

Instruction!

- When executing the function under the [Analyze] menu, only the curve of the current track will participate in the analysis operation, and the curve information displayed in other tracks will not participate in the analysis.

1) Peak Search

When the [Peak Srch] option under the [Srch Peak] menu is selected, the system will automatically

search for the peak value of the waveform curve displayed on the screen. When the peak search is completed, the peak-to-peak value of the measured waveform will be marked and the wavelength and power information of the marked point will be displayed in the upper left of the waveform display area. For peak-to-trough search, you only need to select [Peak-to-Trough Srch], and other operations are basically the same as Peak Search. The peak search function is shown in Figure 3-42.

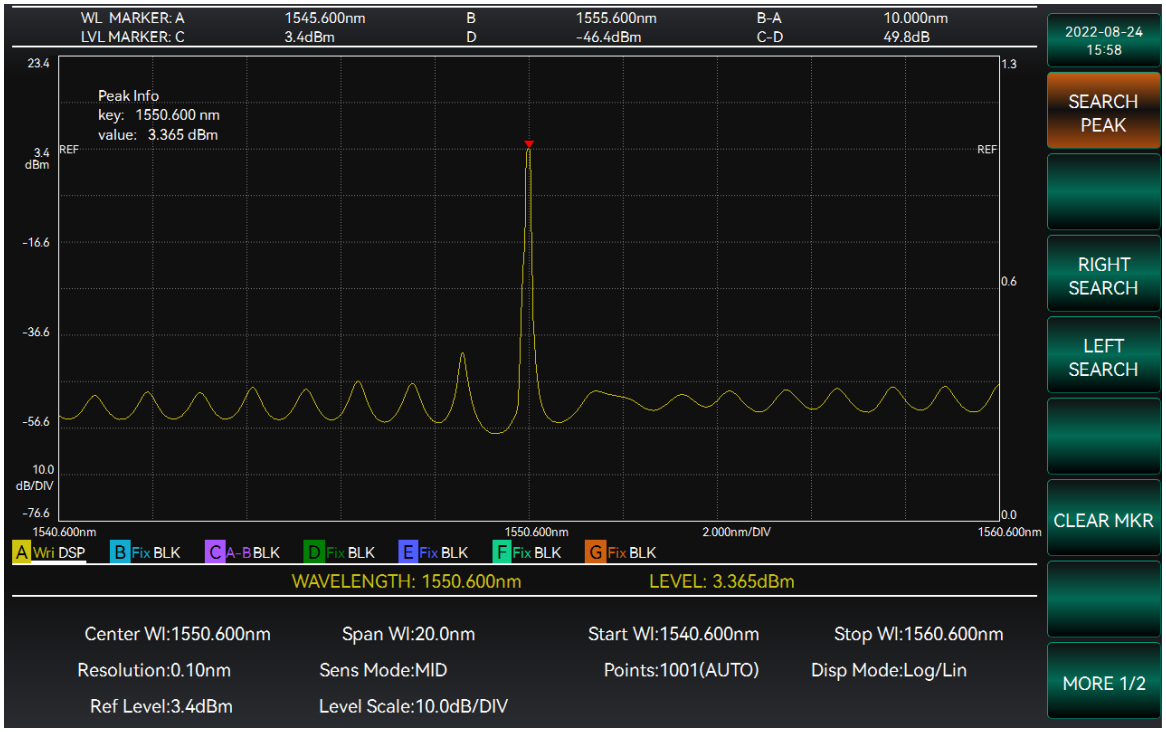


Figure 3-42 Peak search diagram

The operation steps are as follows:

1. Input optical signals.

2. Select [Sgl Swp], [Rept Swp] or [Auto MEAS] under the [Swp] menu to display the measured spectral waveform.

3. When the [Peak Srch] function is selected, the system will search and mark the peak-to-peak position.

2) Search Left/Right Peak

When the waveform curve has multiple peaks, you can use the Search Left/Right function if you want to get wavelength and power information of multiple different peaks. Under the [Srch Peak] menu, first select [Srch Peak] or [Srch Trough], then select [Srch Left] / [Srch Right] option. The system marker will move from the current peak to the adjacent peak on the left/right side, and display the wavelength and power information of the peak after marker movement. The function for searching the left/right peak is shown in Figure 3-43.

3.5 Display and Analysis

Figure 3-43 Search right peak diagram

The operation steps are as follows:

1. Input optical signals.

2. Select [Sgl Swp], [Rept Swp] or [Auto MEAS] under the [Swp] menu to display the measured spectral waveform.

3. When the [Peak Srch] function is selected, the system will search and mark the peak-to-peak position.

4. When the [Srch Right] option is selected, the system will mark the right wave position of the peak.

3) Clear Marker

Select [Clear Mkr] under the [Srch Peak] menu to clear the wavelength and power information and markers associated with the searched peak/trough.

3.5.5.2 Waveform Analysis

Click the [WFA] option under the [Analyze] menu to enter the waveform analysis function interface. The waveform analysis interface is shown in Figure 3-44.

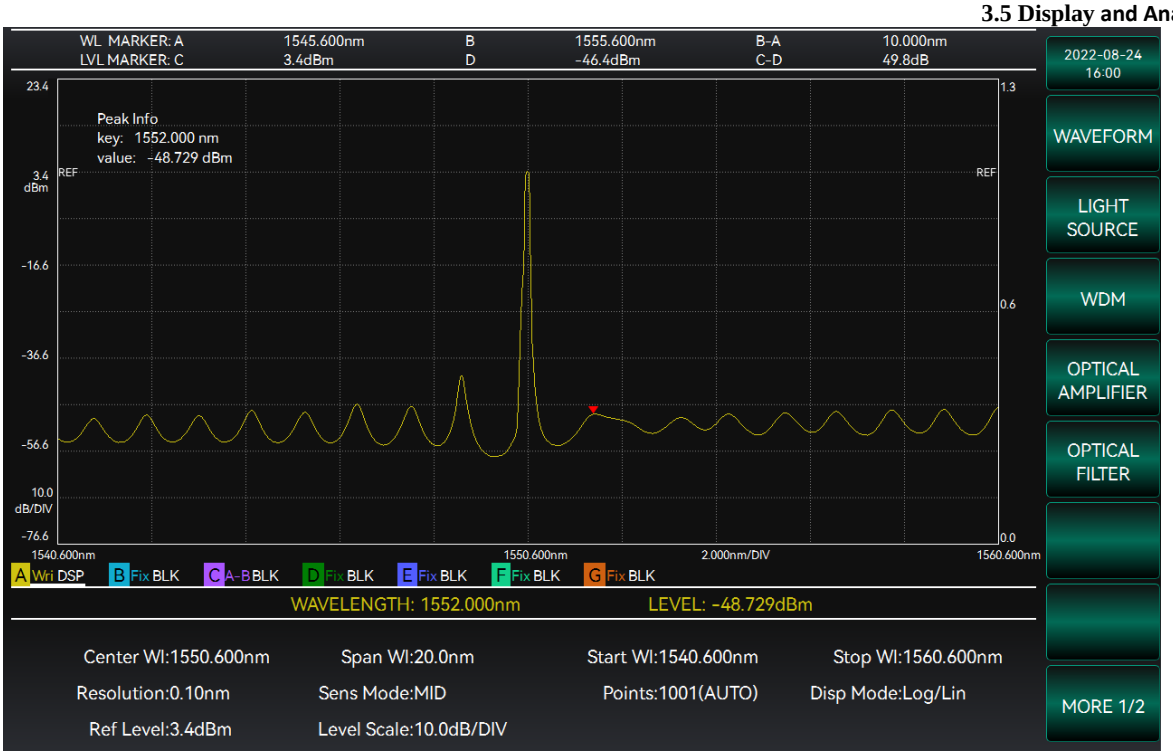


Figure 3-44 Waveform analysis interface diagram

The functions that can be performed in the menu on the right side of the waveform analysis interface are: [THOLD], [ndB Loss], [SMSR], [ENV], [RMS], [OP] and [Trap]. These analysis functions are mainly described as follows:

[THOLD]: Select the threshold function, and then set the parameter value to execute the threshold analysis.

[ndB Loss]: Select the ndB loss function, and then set the parameter value to execute the ndB loss analysis.

[SMSR]: Select the SMSR function, and then set the side mode position to execute the SMSR analysis.

[ENV]: Select the envelope function, and then set the parameter value to execute the envelope analysis.

[RMS]: Select the root-mean-square function, and then set the parameter value to execute the root-mean-square analysis.

[OP]: Select the optical power function to calculate the integral optical power of the spectrum.

[Trap]: Select the trap function and calculate the threshold value of trap.

1) Threshold Analysis

Click the [THOLD] option under the [WFA] menu to perform the threshold analysis function. Threshold analysis is useful for detecting the half-peak width of the spectrum. The threshold analysis is shown in Figure 3-45.

3.5 Display and Analysis

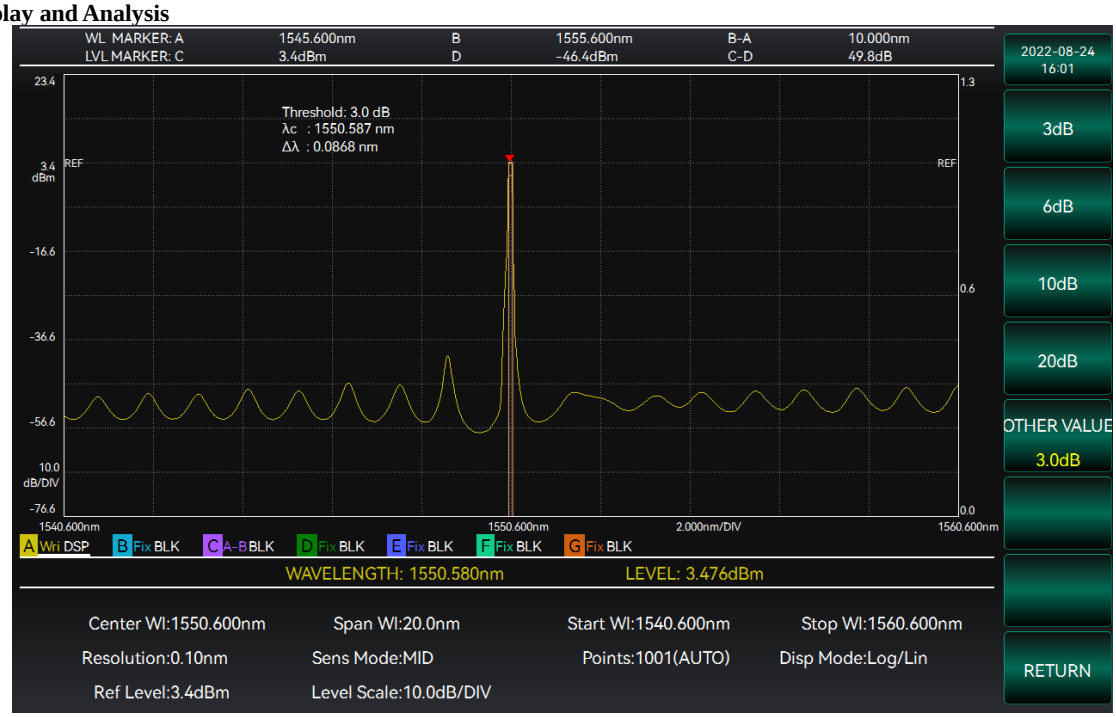


Figure 3-45 Threshold analysis interface diagram

When calculating and processing the threshold analysis, the system will complete the following steps. Firstly, search the peak point of the spectral waveform and use it as the reference point of the intercepted power; then mark the intercepted power, and mark the intersection of the intercepted power and the waveform. The intercepted power is located at ndB under the peak power; display the wavelength width and center wavelength of the intersection.

The meanings of several symbols are defined as follows:

λMkr A: The wavelength of the intercepted power point on the left side of the peak;

λMkr B: The wavelength of the intercepted power point on the right side of the peak;

$\mathcal{L}$Mkr C: Peak point power;

$\mathcal{L}$Mkr D: Power at the intercepted power;

$\mathcal{L}_n$: Intercepted power, including $\mathcal{L}_n = \mathcal{L}\text{Mkr C} - \mathcal{L}\text{Mkr D}$.

Different intercepted power values can be set via the menu on the right side of the interface. The menu bar options are [3dB], [6dB], [10dB] and [20dB], or select the [Other VAL] option and use the number keys and knob to enter the intercepted power value required for the analysis.

After completing the threshold analysis function, the system will display the analysis result at the top left of the waveform display interface. The threshold analysis shows results in terms of center wavelength λ_c and intercepted bandwidth Δλ, as described below:

Λ_c: center wavelength λ_c= (λMkr B+λMkr A)/2.

Δλ: Intercept bandwidth, the spectral bandwidth at the intercepted power, Δλ = λMkr B - λMkr A.

Instruction!

- During the threshold analysis, the intercepted power value is set in the range of 0.1dB~50.0dB. If the input data exceeds the specified range, the system will display an error message.

2) ndB Loss Analysis

Click the [ndB Loss] option under the [WFA] menu to perform the ndB loss analysis function. ndB loss

analysis is applicable to the analysis of multi-mode spectra. If the analysis target is single-mode spectrum, its analysis result is consistent with the result of threshold analysis. The ndB loss analysis is shown in Figure 3-46.

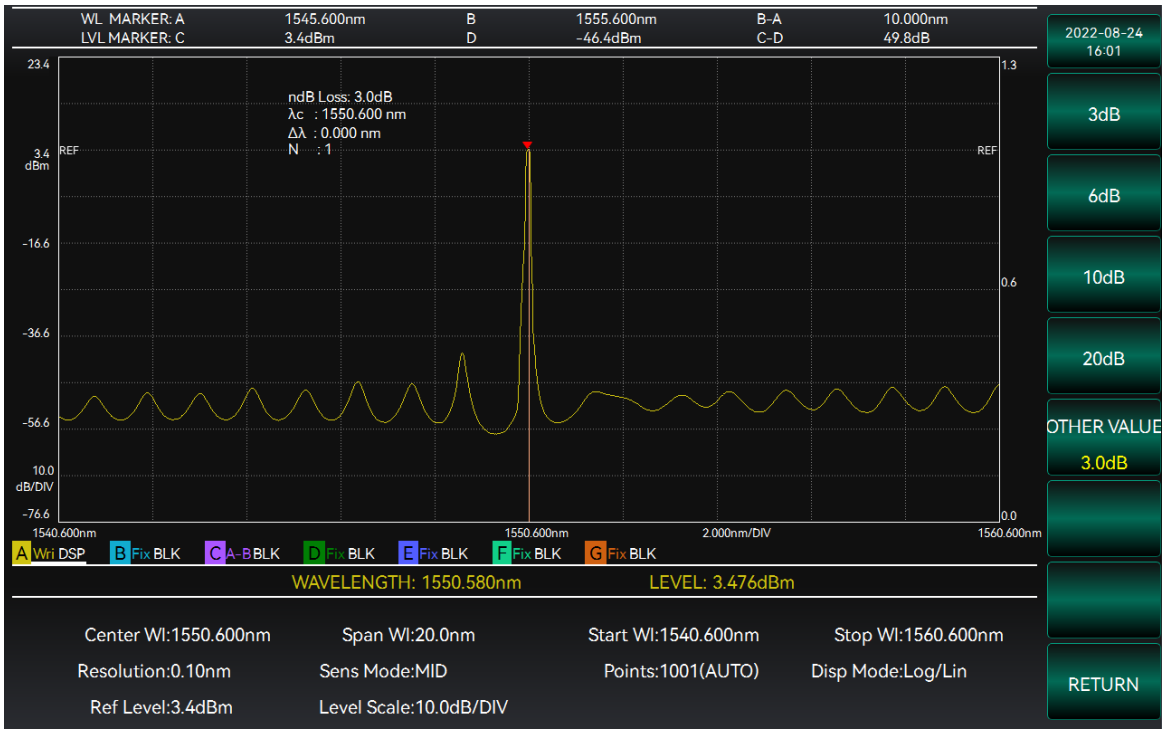


Figure 3-46 ndB loss analysis interface diagram

When calculating and processing the ndB loss analysis, the system will complete the following steps. Firstly, search the peak point of the spectral waveform and use it as the reference point of the intercepted power; then mark the intercepted power and mark the intersection point between the intercepted power and the waveform. The intercepted power is located at ndB below the peak power; the analysis is limited to all the spectra above the intercepted power. Mark the spectral wavelength farthest from the peak point and display the analysis result.

The meanings of several symbols are defined as follows:

λMkr A: The wavelength of the farthest intercepted power point on the left side of the peak;

λMkr B: The wavelength of the farthest intercepted power point on the right side of the peak;

$\mathcal{L}$Mkr C: Peak point power;

$\mathcal{L}$Mkr D: Power at the intercepted power;

$\mathcal{L}_n$: Intercepted power, including $\mathcal{L}_n = \mathcal{L}\text{Mkr C} - \mathcal{L}\text{Mkr D}$.

Different intercepted power values can be set via the menu on the right side of the interface. The menu bar options are [3dB], [6dB], [10dB] and [20dB], or select the [Other VAL] option and use the number keys and knob to enter the intercepted power value required for the analysis.

Instruction!

During the ndB loss analysis, the intercepted power valve is set in the range of 0.1dB~50.0dB. If the input data exceeds the specified range, the system will display an error message.

After completing the ndB loss analysis function, the system will display the analysis result at the top left of the waveform display interface. The ndB loss analysis shows the results in terms of center

3.5 Display and Analysis

wavelengthλ_c, intercepted bandwidth $\Delta\lambda$and modulus$\mathrm{N}$, as described below:

λ_c: Center wavelength, $\lambda_c = (\lambda\mathrm{Mkr\ B} + \lambda\mathrm{Mkr\ A})/2$.

$\Delta\lambda$: Intercept bandwidth, the spectral bandwidth at the intercepted power, $\Delta\lambda = \lambda\mathrm{Mkr\ B} - \lambda\mathrm{Mkr\ A}$.

N: Modulus, that is, the number of separated peaks higher than the intercepted power.

3) SMSR analysis

Click the [SMSR] option under the [WFA] menu to perform the Side Mode Suppression Ratio (SMSR) analysis function. The secondary peak smaller than the peak (which may be to the left or right of the peak) is defined as the side mode. The SMSR analysis is shown in Figure 3-47.

Figure 3-47 SMSR analysis interface diagram

When calculating and processing the SMSR, the system will search the peak of the spectrum, search the secondary peak, that is, the side mode, and then mark the peak value of the waveform as well as the power and wavelength of the side mode.

The meanings of several symbols are defined as follows:

λ_1: Peak wavelength;

λ_2: Side-mode wavelength;

$\mathcal{L}_{\max}$: Peak point power;

$\mathcal{L}_{\mathrm{side}}$: Side-mode power

In the right menu bar, select [SEC Peak], [LSM] and [RSM] options to select different side-mode modes. Select [SEC Peak] option, the system will select the secondary peak of the spectrum as the side mode; select [LSM] option, the system will select the peak to the left of the peak of the spectrum as the side mode; select [RSM] option, the system will select the peak to the right of the peak of the spectrum as the side mode.

After selecting the side-mode mode, the system will display the analysis results at the top left of the interface. The analysis shows the results in terms of side-mode bandwidth$\Delta\lambda$and SMSR$\Delta\mathrm{l}$. The

side-mode bandwidth can be calculated by the following equation:

$$\Delta\lambda = |\lambda_1 - \lambda_2|$$

The SMSR can be calculated by the following equation:

$$\Delta \mathrm{l} = \mathcal{L}_{\max} - \mathcal{L}_{\mathrm{side}}[\mathrm{dB}]$$

4) Envelope Analysis

Click the [ENV] option under the [WFA] menu to perform the envelope analysis function. Envelope analysis can be used to find the envelope of multiple spectral peak points and display the measurement results. The envelope analysis is shown in Figure 3-48.

Figure 3-48 Envelope analysis interface diagram

When calculating and processing the envelope analysis, the system will search the peak point of the spectrum and use it as a reference point of the intercepted power, which is located at ndB below the peak power. The envelope analysis will generate an envelope line connecting all the wave peaks. The intercepted power intersects the envelope at two points. The two intersections are marked and the results of the envelope analysis are displayed.

The meanings of several symbols are defined as follows:

$\lambda\mathrm{Mkr\ A}$: The wavelength of the intercepted power point on the left side of the peak;

$\lambda\mathrm{Mkr\ B}$: The wavelength of the intercepted power point on the right side of the peak;

$\mathcal{L}\mathrm{Mkr\ C}$: Peak point power;

$\mathcal{L}\mathrm{Mkr\ D}$: Power at the intercepted power;

$\mathcal{L}_n$: Intercepted power, including $\mathcal{L}_n = \mathcal{L}\mathrm{Mkr\ C} - \mathcal{L}\mathrm{Mkr\ D}$.

Different intercepted power values can be set via the menu on the right side of the interface. The menu bar options are [3dB], [6dB], [10dB] and [20dB], or select the [Other VAL] option and use the number keys and knob to enter the intercepted power value required for the analysis.

Instruction!

3.5 Display and Analysis

- During the envelope analysis, the intercepted power Bag set in the range of 0.1dB~20.0dB. If the input data exceeds the specified range, the system will display an error message.

After completing the envelope analysis function, the system will display the analysis result at the top left of the waveform display interface. The envelope analysis shows results in terms of center wavelength$\lambda_c$and intercepted bandwidth$\Delta\lambda$, as described below:

λ_c: Center wavelength, $\lambda_c = (\lambda\mathrm{Mkr\ B} + \lambda\mathrm{Mkr\ A})/2$.

$\Delta\lambda$: Intercept bandwidth, the spectral bandwidth at the intercepted power, $\Delta\lambda = \lambda\mathrm{Mkr\ B} - \lambda\mathrm{Mkr\ A}$.

5) RMS Analysis

Click the [RMS] option under the [WFA] menu to perform the root mean square (RMS) analysis function. RMS analysis is used for the analysis of multi-mode spectra. The RMS analysis is shown in Figure 3-49.

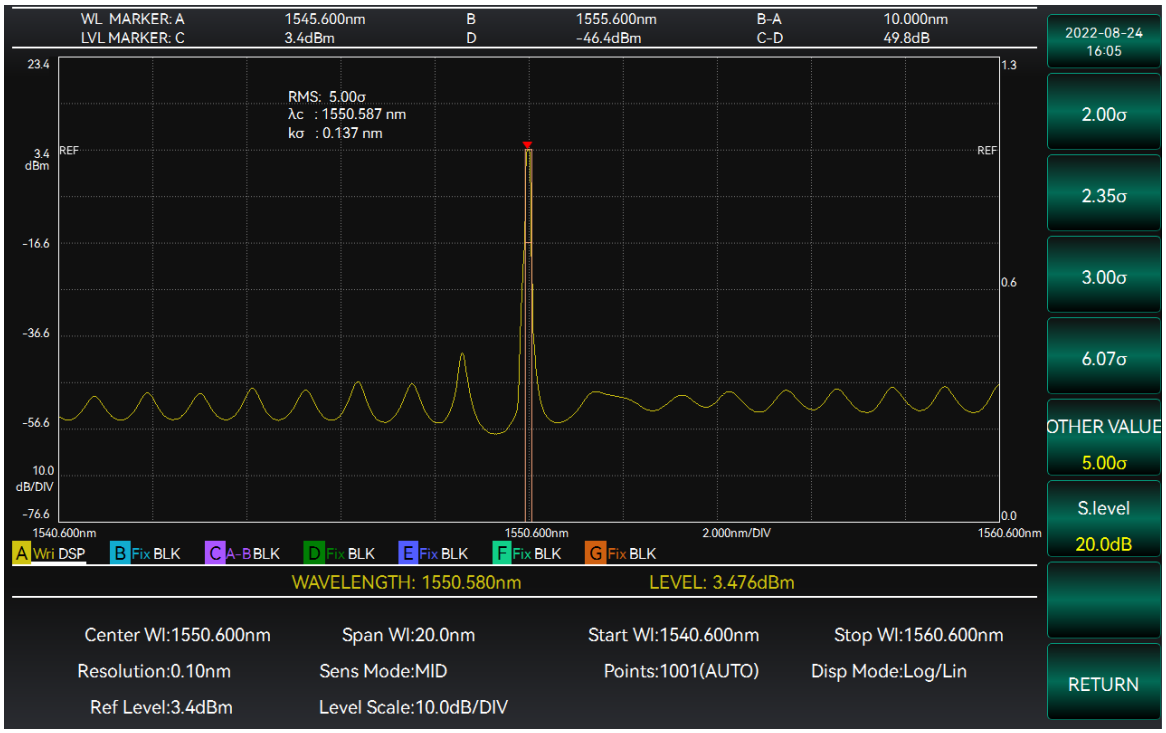


Figure 3-49 RMS analysis interface diagram

Select Spectral WidthKσand Intercepted Power$\mathcal{L}_n$ in the right menu bar. Select [**2σ**], [**2.35σ**], [**3σ**] or [**6.07σ**] to set the spectrum width to a different value, or select [Other VAL] and use the number keys or knob to enter the desired value. Select the [S.level] option to pop up the Intercepted Power input box, and use the number keys to enter the desired intercepted power value.

Instruction!

- During the RMS analysis, the spectral width factor K is set in the range of 1~10; the intercepted power value is set in the range of 0.1dB~50.0dB. If the input data exceeds the specified range, the system will display an error message.

After completing the RMS analysis function, the system will display the analysis result at the top left of the waveform display interface. Let the power and wavelength of the wave crest between the intercepted power and the peak power of the spectrum areA_n and λ_n $(\mathrm{n} = 1,2,3 \ldots \mathrm{i})$, respectively. The root mean square analysis shows the results in terms of center wavelength $\lambda_c$and spectral widthKσ, calculated as follows:

$$\lambda_c = \frac{\sum(A_n \cdot \lambda_n)}{\sum A_n} = \frac{A_1\lambda_1 + A_2\lambda_2 + \cdots + A_i\lambda_i}{A_1 + A_2 + \cdots + A_i}$$

$$\sigma = \sqrt{\frac{\sum A_n \cdot \lambda_n^2}{\sum A_n} - \lambda_c^2}$$

6) Optical Power Analysis

Click the [OP] option under the [WFA] menu to perform the spectral power analysis function. The optical power function can be used to calculate the total optical power of a spectrum or the optical power within a wavelength. The spectral power analysis is shown in Figure 3-50.

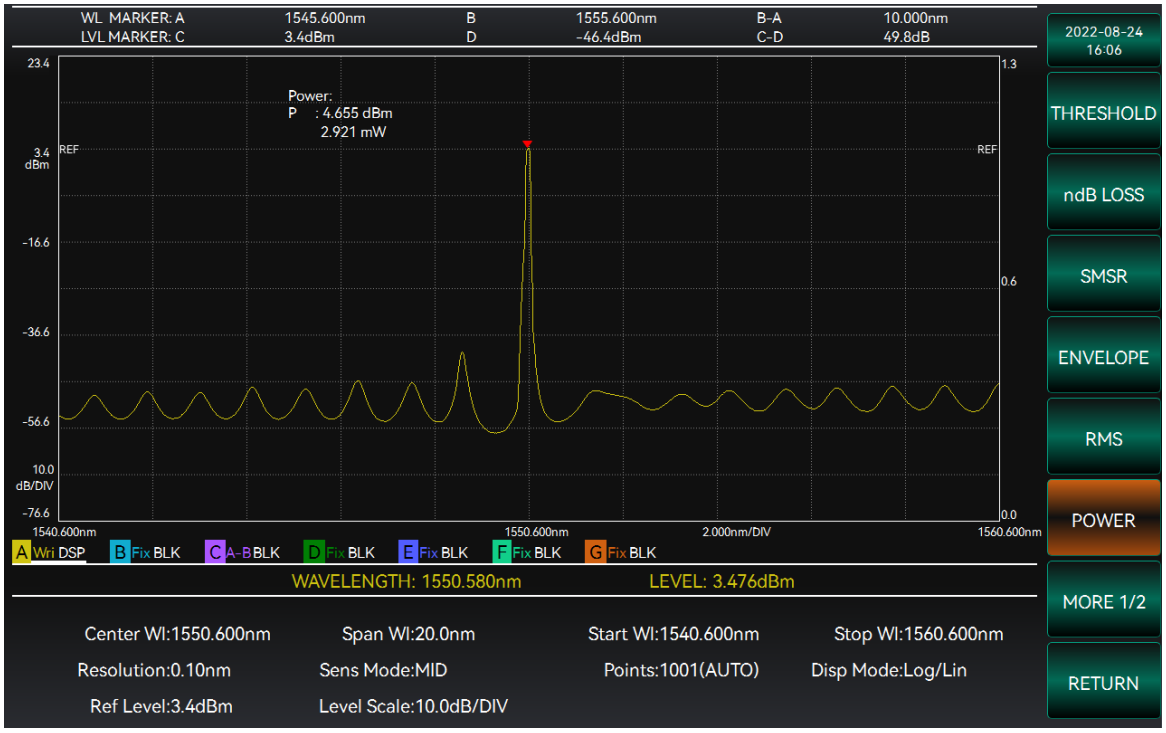


Figure 3-50 Spectral power analysis interface diagram

When the [OP] option is clicked, the system will automatically collect the spectral information and display the analysis result on the top left of the waveform. The analysis results include the center wavelength$\lambda_c$and optical power$\mathrm{Pow}$of the spectra in the range of markers A to B, as well as the center wavelength $\lambda_c$and total optical power$\mathrm{Pow}$of the spectra in the entire display area.

The meanings of several symbols are defined as follows:

λ_k: Measurement point wavelength;

$\mathcal{L}_k$: Measurement point power;

α: Dependent on the correction factor of the slit;

Res: Actual resolution;

$\Delta\lambda$: Sampling wavelength interval.

The center wavelength and spectral power are calculated according to the formula below:

$$\lambda_c = \frac{\sum \lambda_k \cdot \mathcal{L}_k}{\sum \mathcal{L}_k}$$

$$\mathrm{Pow} = \frac{\alpha \Delta\lambda}{\mathrm{Res}} \sum \mathcal{L}_k$$

3.5 Display and Analysis

7) Trap Analysis

Click the [Trap] option under the [WFA] menu to perform the trap analysis function. The trap function can be used to calculate the threshold bandwidth at the trough or peak and is often used for trough analysis. The trap analysis is shown in Figure 3-51.

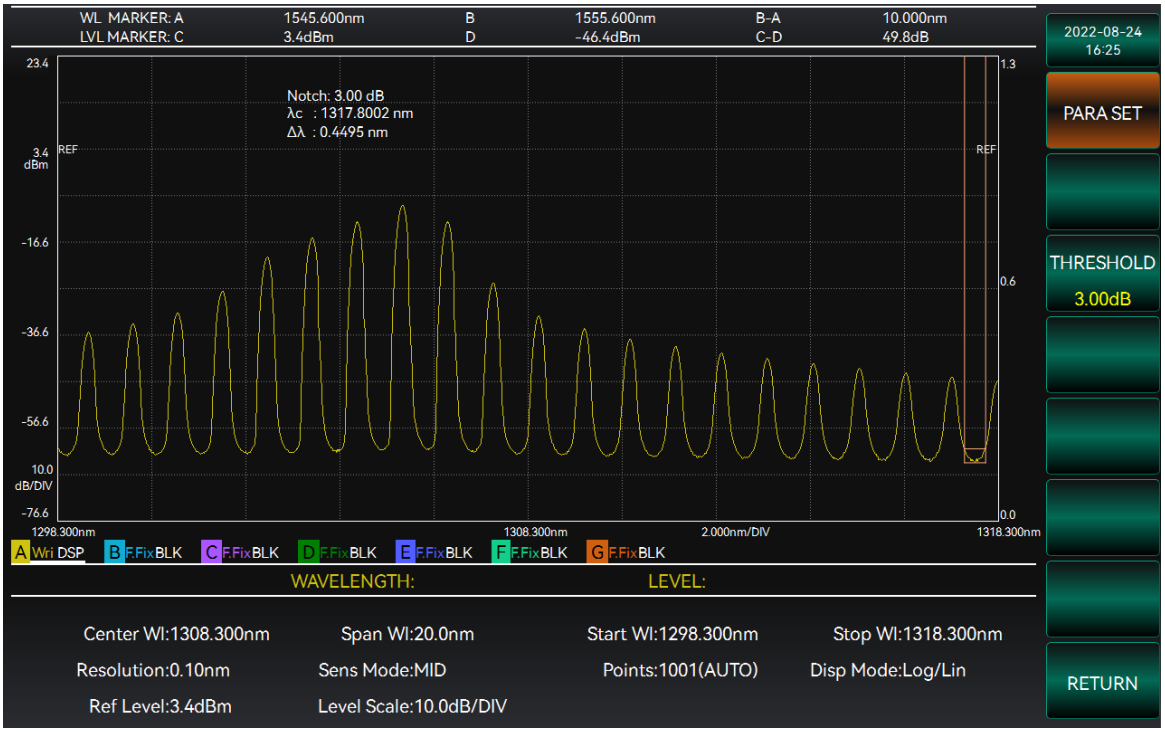
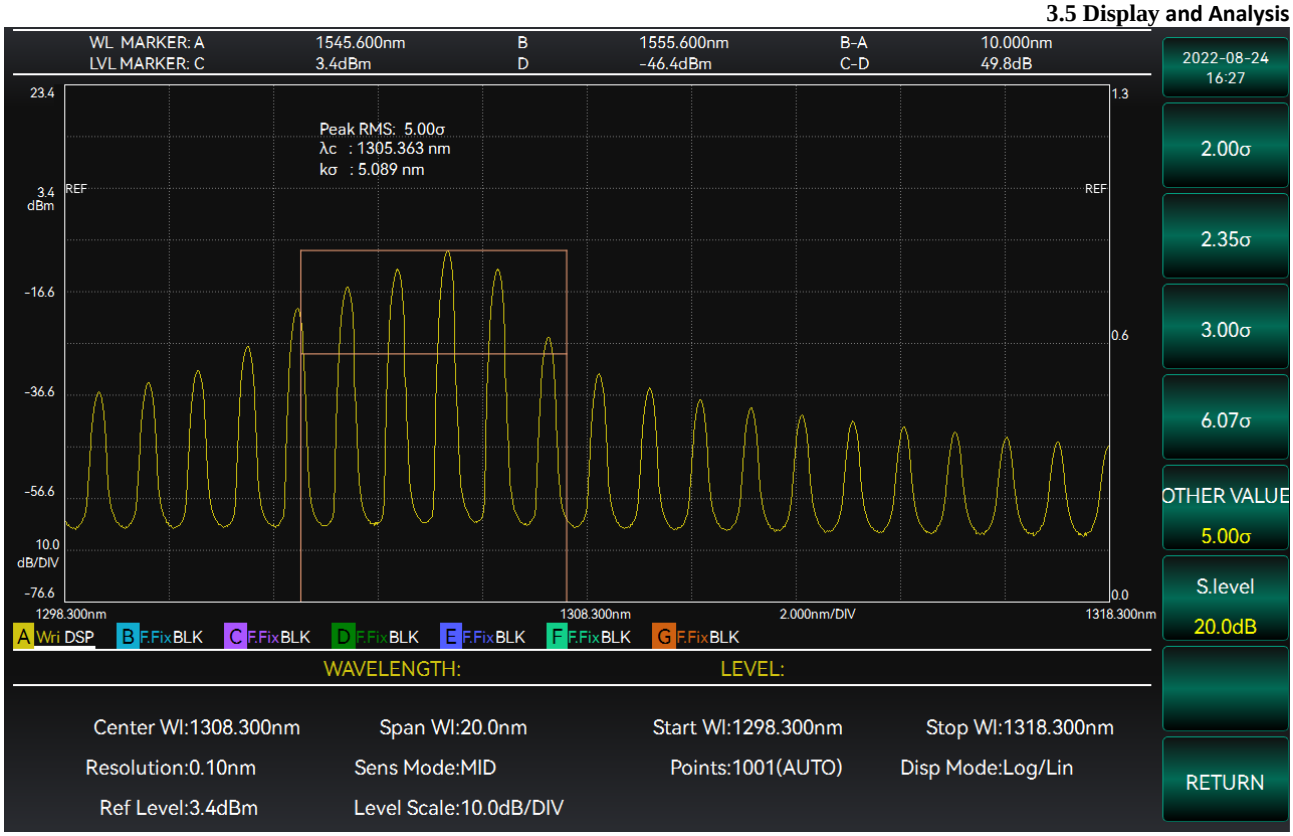
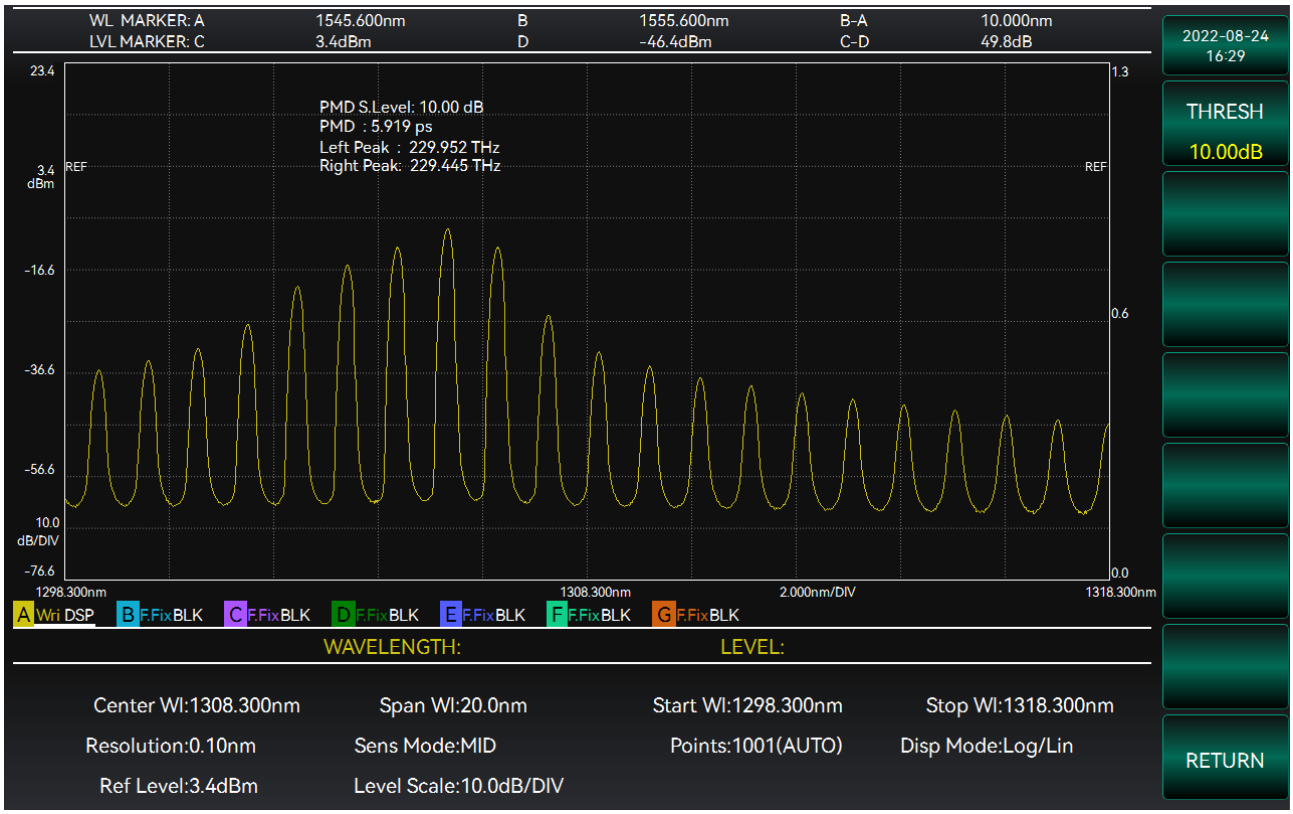


Figure 3-51 Trap analysis interface diagram

Click the [Trap] option, which includes Parameter Setting and Analysis. In the Parameter Setting, the test type, K value and cut-off power can be set. The test type can be selected as peak and trough. If the peak is selected, the peak will be used as the reference point to find the intersection with the spectral curve at the downward cut-off power; If the trough is selected, the trough will be used as the reference point to find the intersection with the spectral curve at the upper cut-off power. The value of K represents the product coefficient, and the cut-off power is the cut-off point found. When the [Analyze] in the menu is clicked, the system will automatically analyze the trap and display the analysis result on the top left of the waveform. The analysis results include the center wavelength λ_c and the intercepted bandwidth Δλ, which have the same meaning as the threshold analysis.



PEAK RMS



Polarization mode dispersion

3.5 Display and Analysis

8) Analysis Mode

Switch to the second page in the [Analyze] menu to change the analysis range. The available options are "ZOOM Analysis" and "A-B Analysis". If both are OFF, it is global analysis by default. In "A-B Analysis" mode, the system will only analyze the waveform information between marker lines A and B. To perform this function, it is necessary to set marker lines A and B. See section 3.5.4 for details on how to set marker lines. In "ZOOM Analysis" mode, the system will only analyze the waveform information between the ZOOM wavelength range. See section 3.5.2 for details on how to set ZOOM wavelength. The analysis mode selection interface is shown in Figure 3-52.

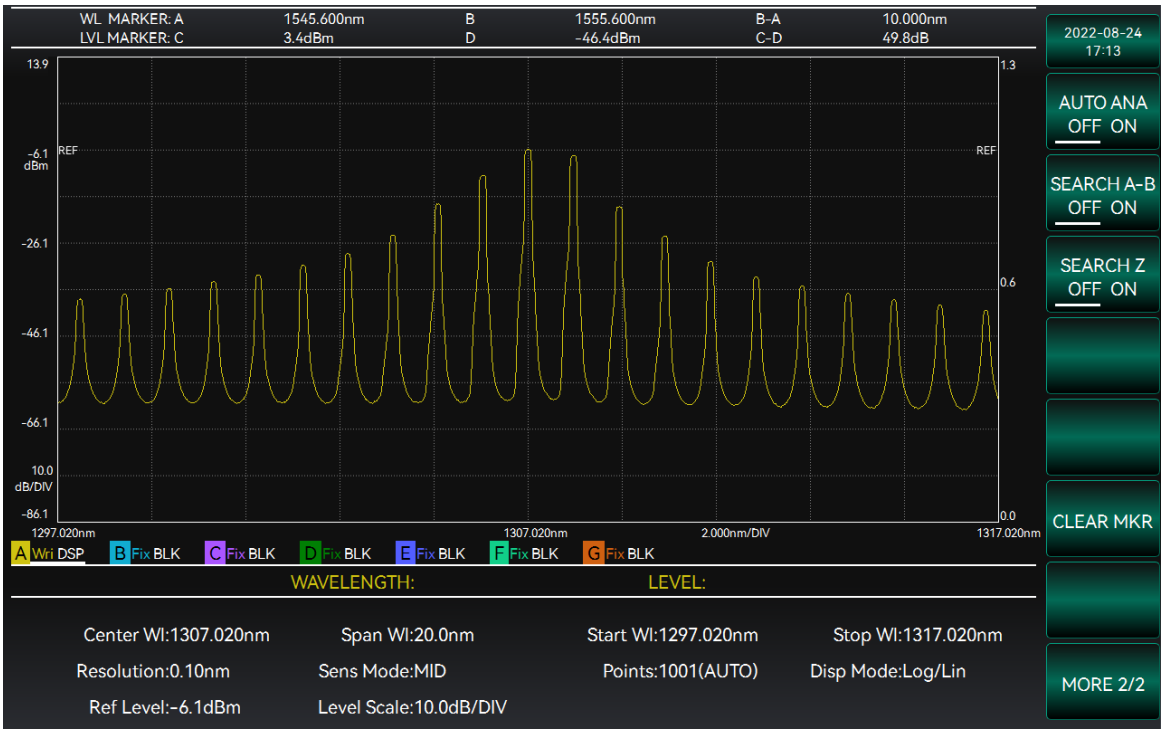


Figure 3-52 Analysis mode selection interface

3.5.5.3 Light Source Test

Select the [Light Source Analysis] option under [WFA] to enter the Light Source Test function. The Light Source Test function interface is shown in Figure 3-53.

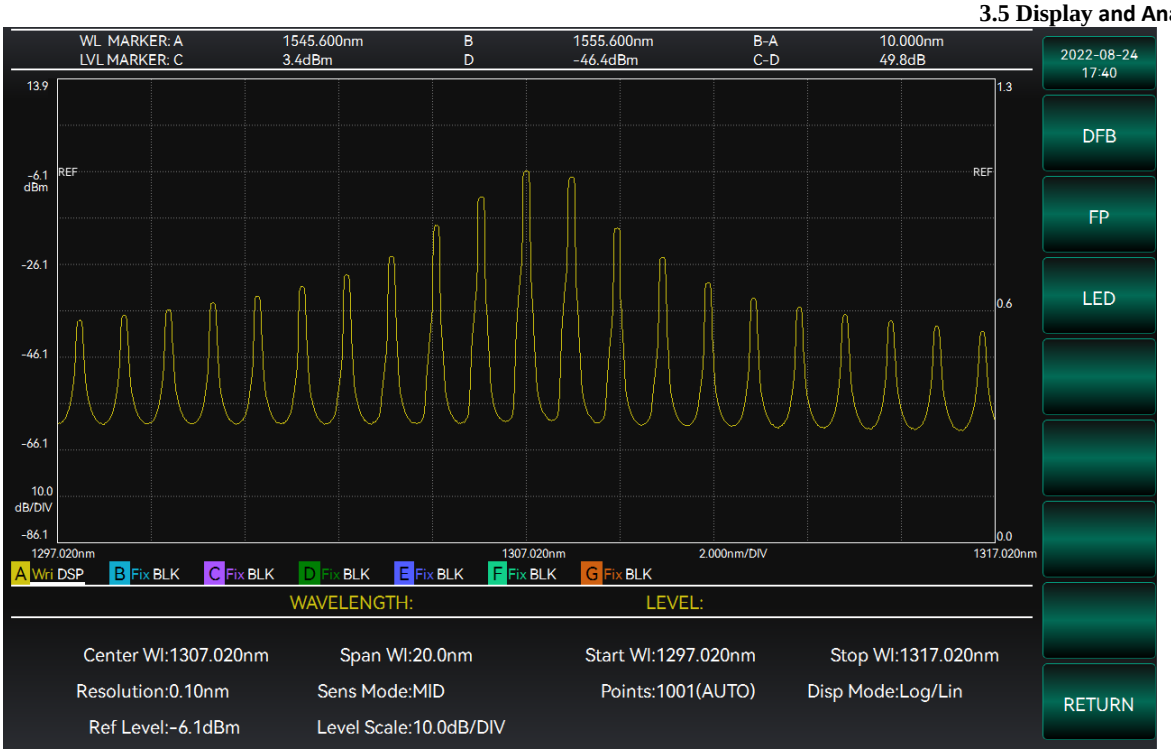


Figure 3-53 Light source test interface diagram

Under the Light Source Test function, select the light source type to test the parameters of different light sources. The options in the right menu bar are [DFB], [FP] and [LED].

[DFB]: Enter the DFB-LD test function.

[FP]: Enter the FP-LD test function.

[LED]: Enter the LED test function.

1) DFB-LD test

Click the [DFB] option under the Light Source Test function to enter the DFB-LD test function. This function is used to test the Side Mode Suppression Ratio (SMSR), spectral width (ndB bandwidth), cutoff bandwidth, mode offset, and center wavelength of the DFB-LD. The operation interface is shown in Figure 3-54. See the Advanced Operation Guide for specific operations and settings.

3.5 Display and Analysis

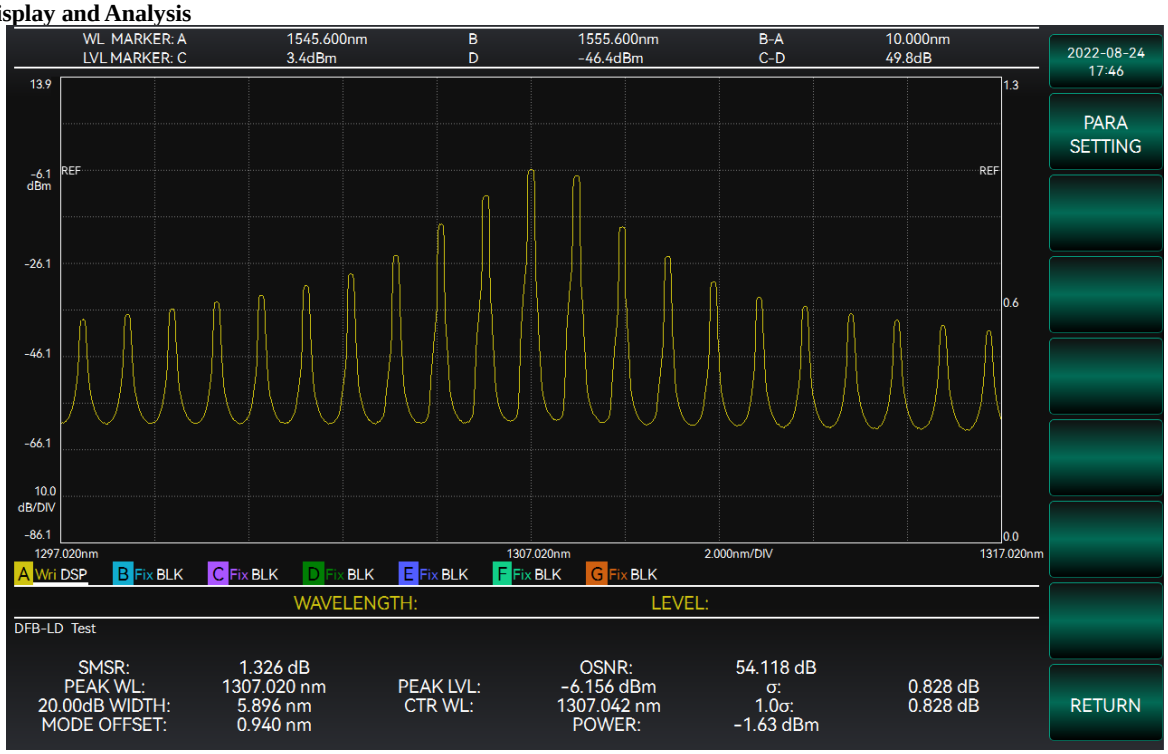


Figure 3-54 DFB-LD test interface diagram

2) FP-LD test

Click the [FP] option under the Light Source Test function to enter the FP-LD test function. This function is used to test the peak value, longitudinal mode number, longitudinal mode interval and total power of FP-LD. The operation interface is shown in Figure 3-55. See the Advanced Operation Guide for specific operations and settings.

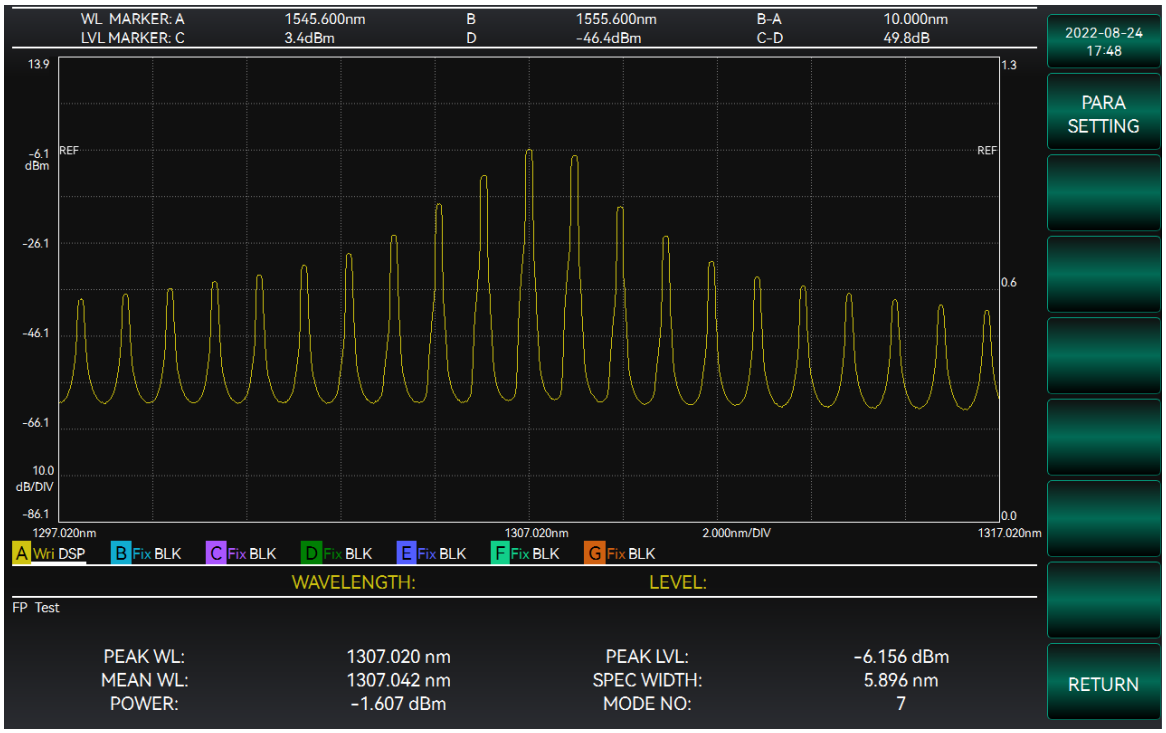


Figure 3-55 FP-LD test interface diagram

3) LED test

Click the [LED] option under the Light Source Test function to enter LED test function. This function is used to test the center wavelength, spectral width, total power and functional density of LEDs. The operation interface is shown in Figure 3-56. See the Advanced Operation Guide for specific operations and settings.

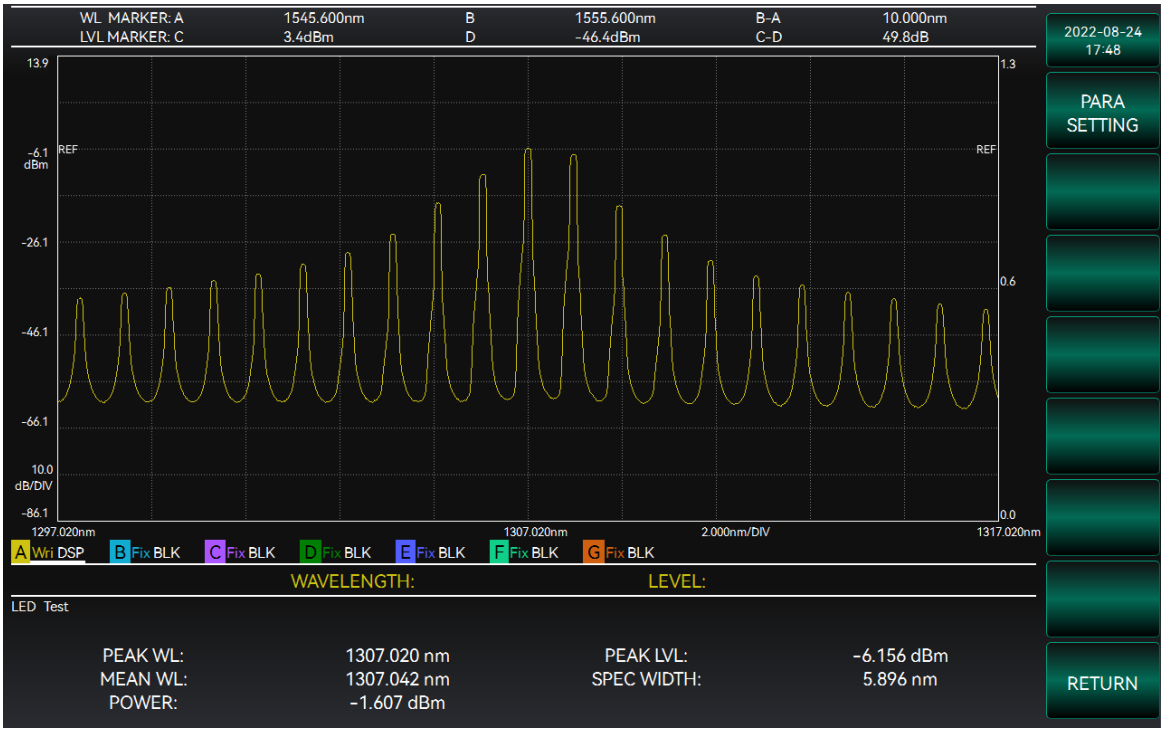
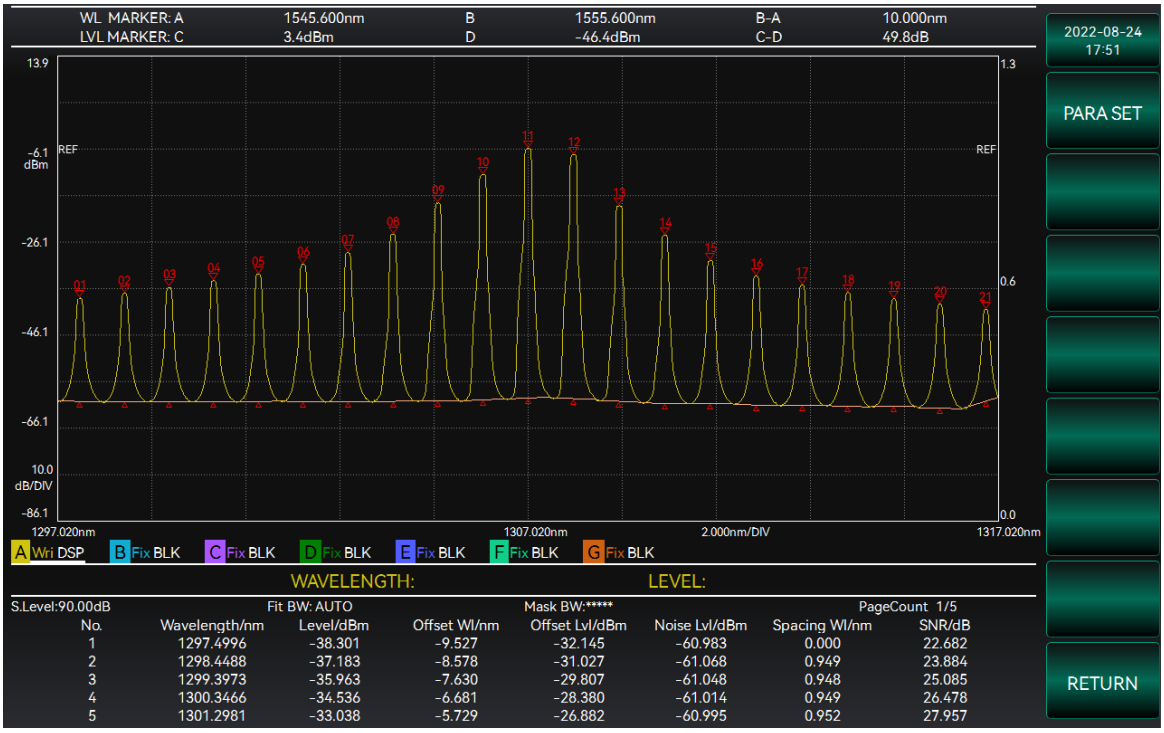


Figure 3-56 LED test interface diagram

3.5.5.4 Wavelength Division Multiplexing Test

Select the [WDM] option under [WFA] to enter the WDM test function. Wavelength Division Multiplexing (WDM) is a technology that couples multiple wavelengths of optical signals into the same fiber for transmission, and it is a method used to enhance fiber optic communication capabilities. The WDM test interface is shown in Figure 3-57. See the Advanced Operation Guide for specific operations and settings.



No.	Wavelength/nm	Level/dBm	Offset Wl/nm	Offset Lvl/dBm	Noise Lvl/dBm	Spacing Wl/nm	SNR/dB
1	1297.4996	-38.301	-9.527	-32.145	-60.983	0.000	22.682
2	1298.4488	-37.183	-8.578	-31.027	-61.068	0.949	23.884
3	1299.3973	-35.963	-7.630	-29.807	-61.048	0.948	25.085
4	1300.3466	-34.536	-6.681	-28.380	-61.014	0.949	26.478
5	1301.2981	-33.038	-5.729	-26.882	-60.995	0.952	27.957

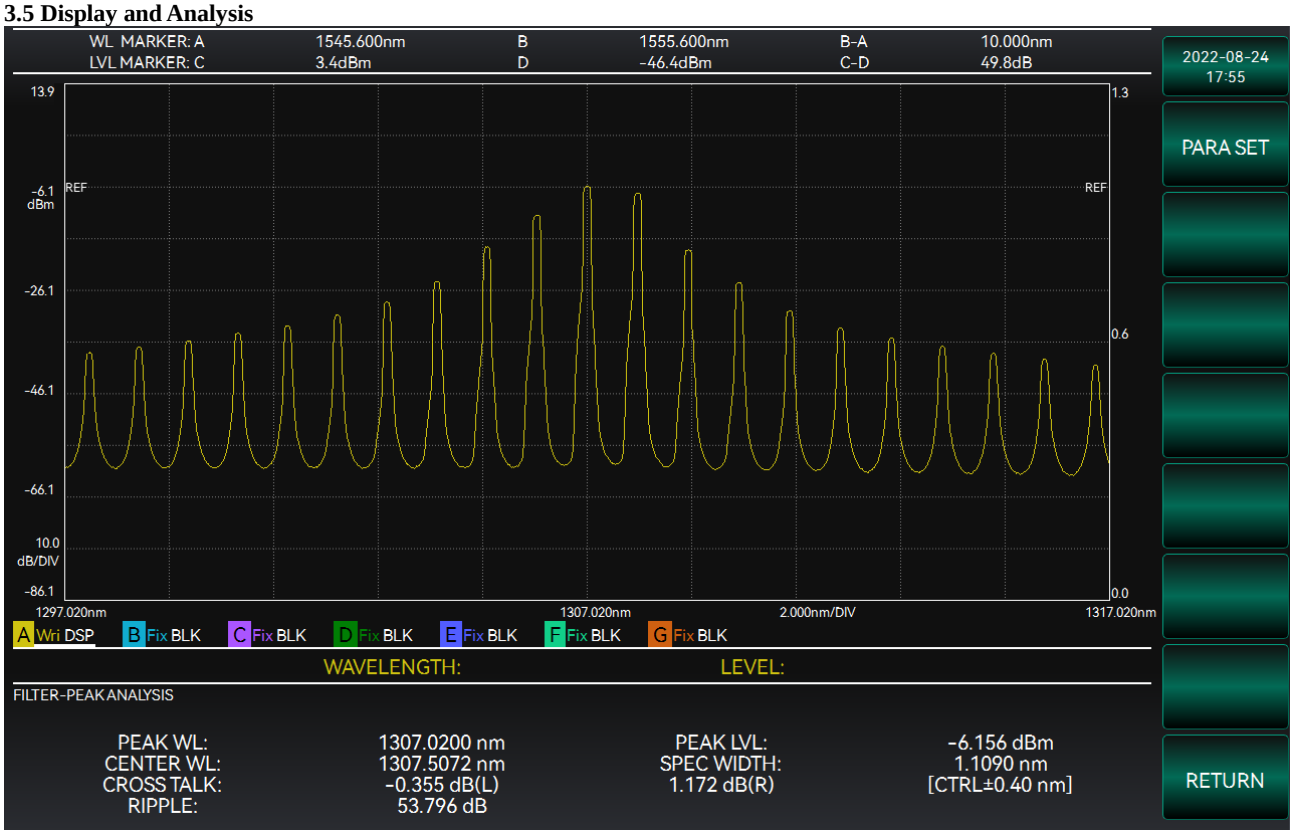
Figure 3-57 WDM interface diagram

3.5.5.5 Optical Amplifier Test

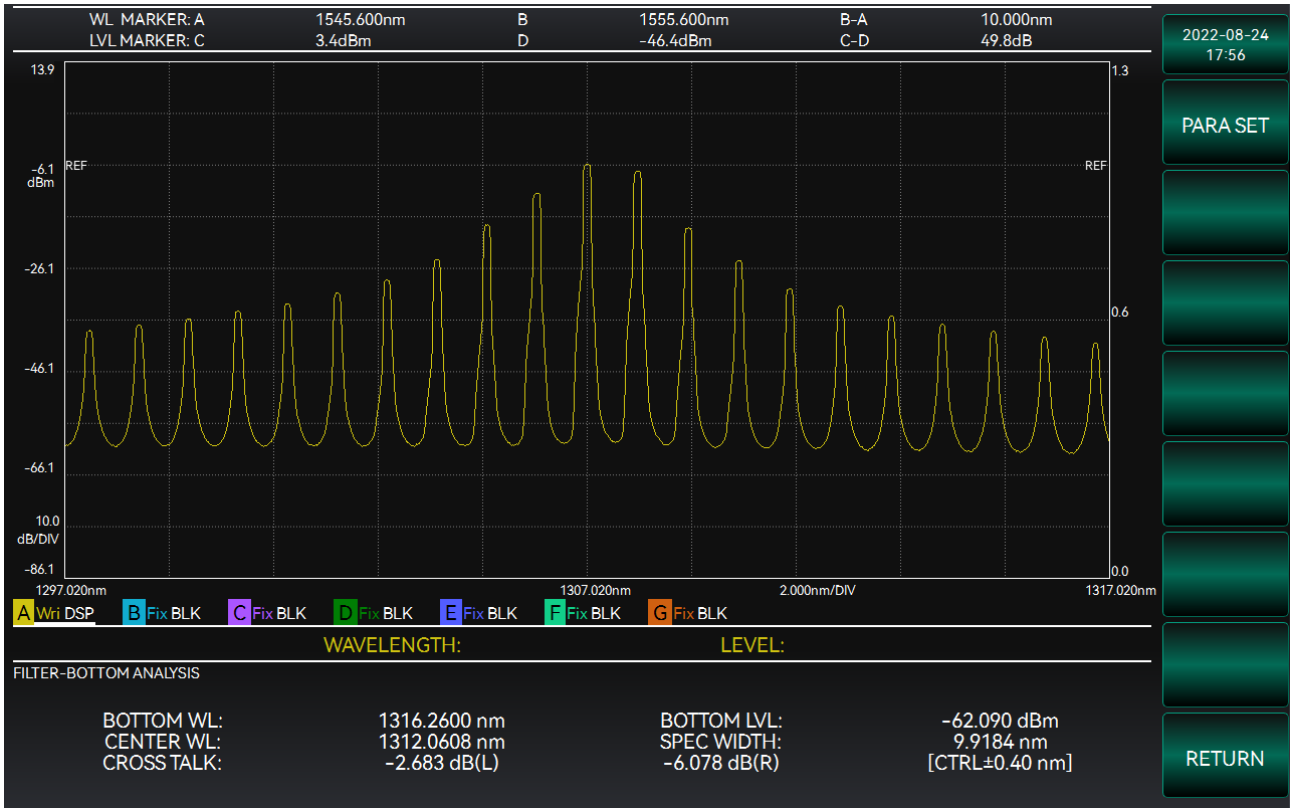
Click the [OMT] function to enter the optical amplifier test function. This function allows you to analyze the optical amplification effect by comparing the original waveform with the amplified waveform. See the Advanced Operation Guide for specific operations and settings.

3.5.5.6 Optical filter

3.5 Display and Analysis

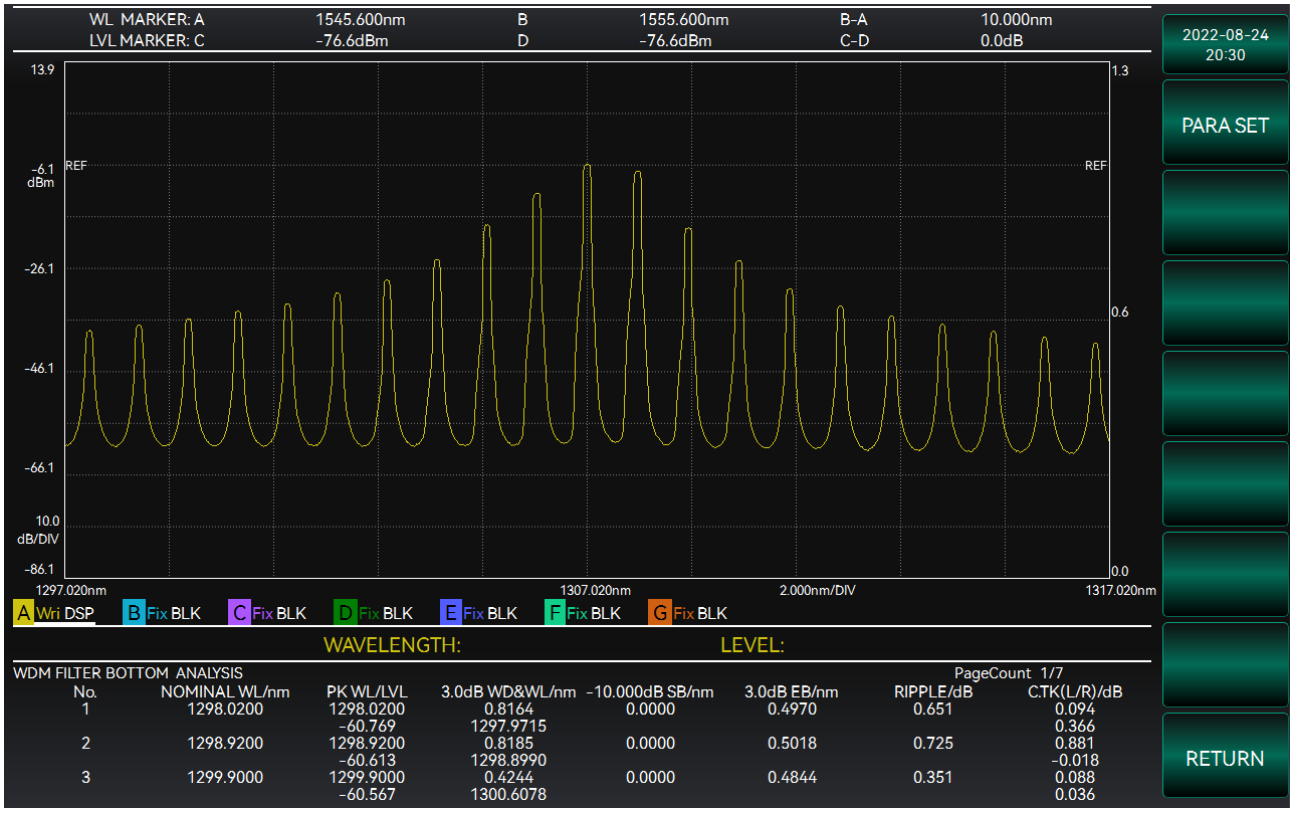


FILTER PEAK



FILTER BOTTOM

WDM—FILTER PEAK



WDM—FILTER BOTTOM

3.6 Advanced Operation Guide

This section describes the parameter settings, operating procedures and test results for the relatively more complex measurement and analysis of the S6362D optical spectrum analyzer.

3.6.1 DFB-LD Test

3.6.1.1 Parameter setting

You can select some test parameters by clicking on the menu bar on the right of the interface, and then enter and modify them by using numeric keys or knobs, as shown in Figure 3-58.

Figure 3-58 DFB-LD test interface diagram

The options are described below:

[Threshold Power]: Click this option to change the threshold power of the waveform. The ranges can be set to 0.1 50.0dB.

[Side Mode]: Click this option to change the selection of side mode of waveform. The ranges can be set to [Sub Peak], [Left Mode], [Right Mode].

[Loss Power]: Click this option to change the loss power of the waveform. The ranges can be set to 0.1~50.0dB.

[Product factor K]: Click this option to change the product factor of spectrum width. The ranges can be set to 1 ~ 10.

[Side mode resolution]: Click this option to change the side mode resolution of the waveform. The range can be set to 0.1~10.0dB.

3.6.1.2 Operation steps:

The specific test steps are as follows:

1. Input optical signals.

2. Set appropriate test parameters for spectrum testing.

3. Enter the Analysis menu and select [Optical Source Analysis] for test.

4. Select the [DFB] option to enter this function, and the test results will be displayed.

5. According to the requirements, the threshold power, side mode, product factor and other parameters are set respectively to test the optical source.

3.6.1.3 Test result

The analysis result of optical source will be displayed at the bottom of the interface, including the following contents:

- Peak: The wavelength and power of the peak point of the waveform;
- Sub-peak/left mode/right mode: wavelength and power of sub-peak side mode/left mode/right mode;
- σ - Standard deviation;
- Kσ: Spectral width;
- Side mode suppression ratio: spectral side mode suppression ratio (SMSR);
- Mode offset: wavelength difference between peak and side mode;
- Stop bandwidth: wavelength difference between modes on both sides of peak point;
- Threshold power: The threshold power set.
- ndB loss bandwidth: spectral width at ndB at peak value;
- Side mode resolution: The side mode resolution set;
- Center offset: The difference between the peak wavelength and the mean WL calculated by the two modes.

Let the power and wavelength of the wave crest between the intercepted power and the peak power of the spectrum areA_n and λ_n $(\mathrm{n} = 1,2,3 \cdots \mathrm{i})$, respectively. In the displayed results, the mean WL and standard deviation are calculated as follows:λ_cσ

$$\lambda_c = \frac{\sum(A_n \cdot \lambda_n)}{\sum A_n} = \frac{A_1\lambda_1 + A_2\lambda_2 + \cdots + A_i\lambda_i}{A_1 + A_2 + \cdots + A_i}$$

$$\sigma = \sqrt{\frac{\sum A_n \cdot \lambda_n^2}{\sum A_n} - \lambda_c^2}$$

Mode offset, Stop Band, and Center offset can be calculated as follows:

$$\text{Mode Offset} = \lambda_{\text{side}} - \lambda_{\max}$$

$$\text{Stop Band} = \lambda_{\text{right}} - \lambda_{\text{left}}$$

$$\text{Center Offset} = \lambda_{max} - \frac{\lambda_{left+}\lambda_{right}}{2}$$

Where, λ_{max} represents the wavelength value of the peak value, λ_{left} represents the wavelength value of the side mode to the left of the peak value, λ_{right} represents the wavelength value of the side mode to the right of the peak value, and λ_{side} represents the wavelength value of the side mode. as shown in Figure 3--59.

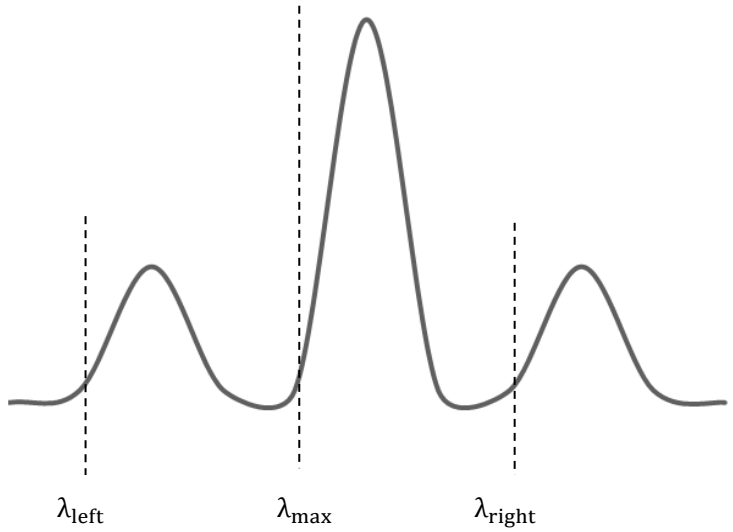


Figure 3-59 Schematic diagram of side mode wavelength symbols

3.6.2 FP-LD test

3.6.2.1 Parameter setting

You can select the [Threshold Power] parameter by clicking on the menu bar on the right of the interface, and then enter and change the parameter by using digital keys or knobs. The range of the parameter can be 0.15~0.0dB, as shown in Figure 3-60.

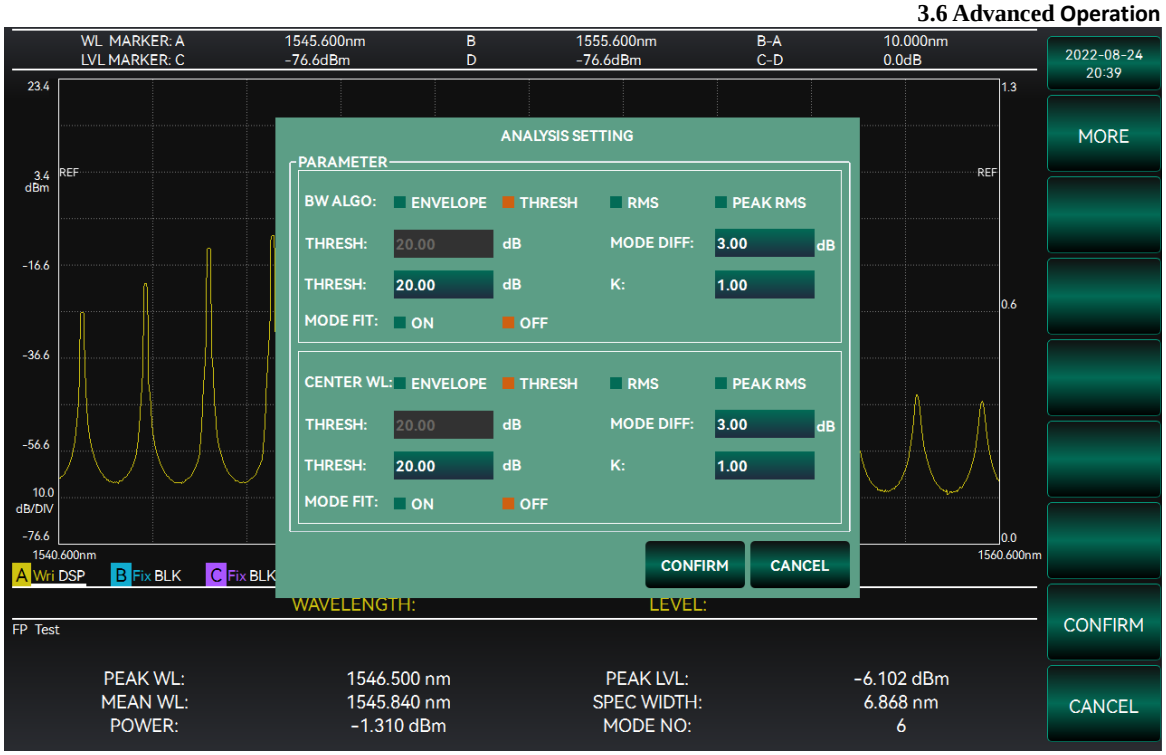


Figure 3-60 FP-LD test interface diagram

3.6.2.2 Operation steps:

The specific test steps are as follows:

1. Input optical signals.

2. Set appropriate test parameters for spectrum testing.

3. Enter the Analysis menu and select [Optical Source Analysis] for test.

4. Select the [FP-LD] option to enter this function, and the test results will be displayed.

5. According to the requirements, the threshold power, side mode, product factor and other parameters are set respectively to test the optical source.

3.6.2.3 Test result

The analysis result of optical source will be displayed at the bottom of the interface, including the following contents:

- Peak: The wavelength and power of the peak point of the waveform;
- Mean WL: The mean WL calculated by RMS analysis;
- Half-width (2.35σ): spectral width calculated by RMS analysis;
- Total power: total spectral power;
- Number of longitudinal modes: Number of modes exceeding the intercepted power of the mode;
- Longitudinal mode spacing: spacing of longitudinal modes;
- σ: Standard deviation of RMS analysis.

During calculation and processing, the spectral peak is searched and used as a reference for the intercepted power of the mode. The intercepted power of the mode is located at ndB below the peak value. Search for and identify all modes that exceed the intercepted power, set the wavelength of these

modules to λ_i, and power to $\mathcal{L}_i$, as shown in Figure 3-61.

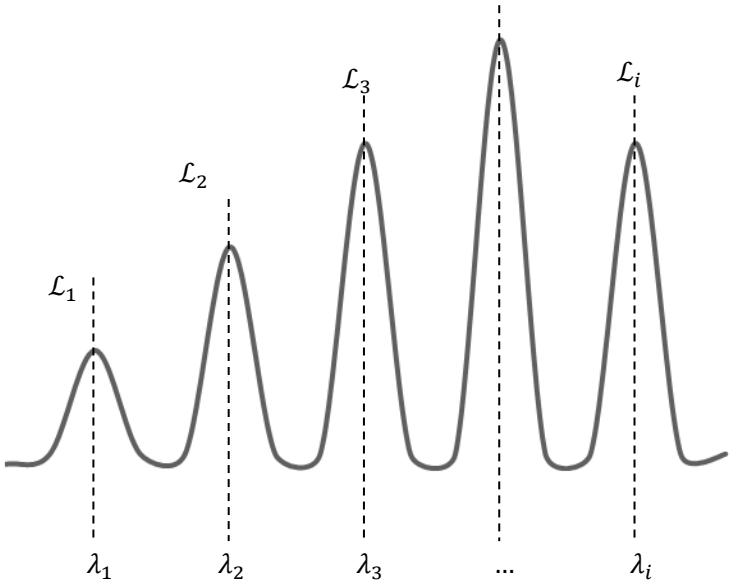


Figure 3-61 Wavelength and power used for calculation

Then the mean WL can be calculated as follows:

$$\lambda_c = \frac{\sum(\lambda_i \cdot \mathcal{L}_i)}{\sum \mathcal{L}_i}$$

The FWHM can be calculated by the following formula:

$$\Delta\lambda = 2.35\sigma = 2.35\sqrt{\frac{\sum \mathcal{L}_i \cdot \lambda_i^2}{\sum \mathcal{L}_i} - \lambda_c^2[\mathrm{FWHM}]}$$

The formula for calculating the total power is:

$$\mathrm{Pow} = \sum \mathcal{L}_i$$

3.6.3 LED test

3.6.3.1 Parameter setting

You can select some test parameters by clicking on the menu bar on the right of the interface, and then enter and modify them by using numeric keys or knobs, as shown in Figure 3-62.

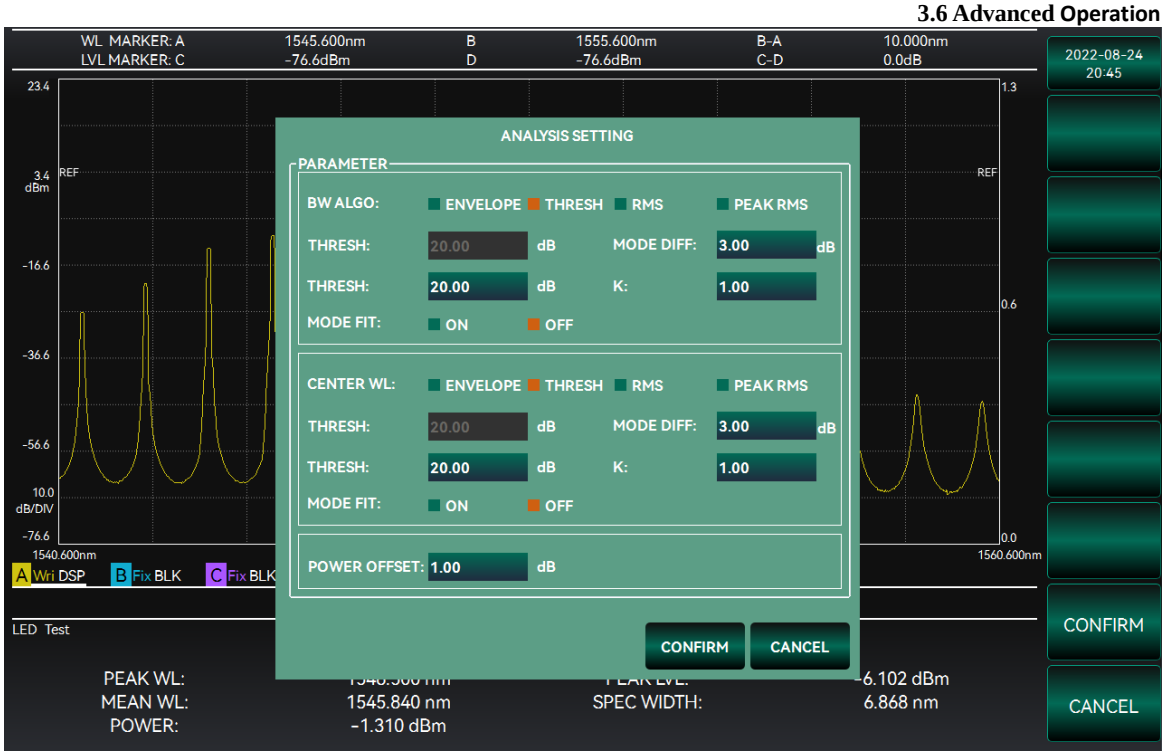


Figure 3-62 Schematic diagram of LED test interface

The options are described below:

[Intercepted Power]: Click this option to change the intercepted power of the waveform. The range can be set to 0.1~50.0dB.

[Calibration Factor]: Click this option to change the power calibration factor of the waveform. The range can be set to -10~10dB.

[Product factor K]: Click this option to change the product factor of spectrum width. The range can be set to 1 ~ 10.

3.6.3.2 Operation steps:

The specific test steps are as follows:

1. Input optical signals.
2. Set appropriate test parameters for spectrum testing.
3. Enter the [Analysis] menu and select [Optical Source Analysis] for test.
4. Select the [LED] option to enter this function, and the test results will be displayed.
5. According to the requirements, the threshold power, side mode, product factor and other parameters are set respectively to test the optical source.

3.6.3.3 Test result

The analysis result of optical source will be displayed at the bottom of the interface, including the following contents:

- Peak: The wavelength and power of the peak point of the waveform;
- Mean WL (ndB): the mean WL obtained by ndB loss analysis method;
- Mean WL (FWHM): mean WL of the half-width spectrum;

3.6 Advanced Operation Guide

- NdB loss bandwidth: spectral width obtained by using the ndB loss method;
- FWHM (2.35σ) : spectral width obtained by RMS analysis method;
- Maximum spectral density (/1nm) : peak power per nm;
- Total power: overall total power of the spectrum;
- Kσ: Spectral width of RMS analysis method;
- σ: Standard deviation of RMS analysis method.

Set λ_a、λ_b to the wavelength at which the intercepted power intersects with the spectral waveform, as shown in Figure 3-63.

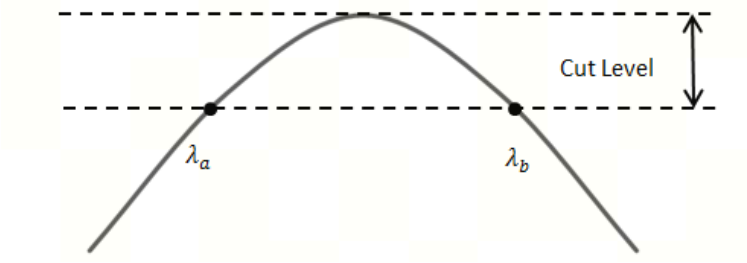


Figure 3-63 Schematic diagram of λ_a、λ_b

Then the mean WL (ndB) and the ndB loss bandwidth can be calculated by the following formula:

$$\lambda_c[\mathrm{ndB}] = \frac{\lambda_a + \lambda_b}{2}$$

$$\Delta\lambda[\mathrm{ndB}] = \lambda_b - \lambda_a$$

Search and identify all modes that exceed the intercepted power, let the wavelength of all modes that exceed the intercepted power be λ_i, and the power be $\mathcal{L}_i$. Then the mean WL (FWHM) can be calculated by the following formula:

$$\lambda_c[\mathrm{FWHM}] = \frac{\sum(\lambda_i \cdot \mathcal{L}_i)}{\sum \mathcal{L}_i}$$

FWHM:

$$\Delta\lambda[\mathrm{FWHM}] = 2.35\sigma = 2.35\sqrt{\frac{\sum \mathcal{L}_i \cdot \lambda_i^2}{\sum \mathcal{L}_i} - \lambda_c^2[\mathrm{FWHM}]}$$

Total power:

$$\mathrm{Pow} = \mathrm{Powercal} \cdot \frac{\mathit{S}\mathrm{pan}}{(\mathit{S}\mathrm{ampl} - 1)} \cdot \frac{\alpha}{\mathit{A}\mathrm{ctRes}} \cdot \sum \mathcal{L}_i$$

$\mathrm{Powercal}$：Calibration factor

$\mathit{S}\mathrm{pan}$：Mode span

$\mathit{S}\mathrm{ampl}$：Sampling point

$\mathit{A}\mathrm{ctRes}$：Resolution

α：Depends on the correction factor of the equipment

Maximum spectral density:

$$\text{Pk Dens}(/1\text{nm}) = \text{Powercal} \cdot \frac{Span}{(Sampl-1)} \cdot \frac{\alpha}{ActRes} \cdot \sum_{\lambda_{p-0.5}}^{\lambda_{p+0.5}} \mathcal{L}_i$$

Standard deviation:

$$\sigma = \sqrt{\frac{\sum A_n \cdot \lambda_n^2}{\sum A_n} - \lambda_c^2}$$

3.6.4 WDM test

3.6.4.1 Parameter setting

Various parameters can be set in different modes of WDM function. Parameter setting falls into two categories: signal parameter setting and noise parameter setting.

Figure 3-64 Signal parameter setting window

Parameters that can be set in the signal parameter setting window are as follows:

- Intercepted power

Intercepted power: It represents the intercepted power. Peaks within a range of intercepted power below peak power will be detected as analysis signals for WDM tests. The intercepted power can be set within 0.1dB~50dB.

- Power

Test type: indicate the test type of signal power. You can select “Point” or “Power”, as shown in Figure 3-65.

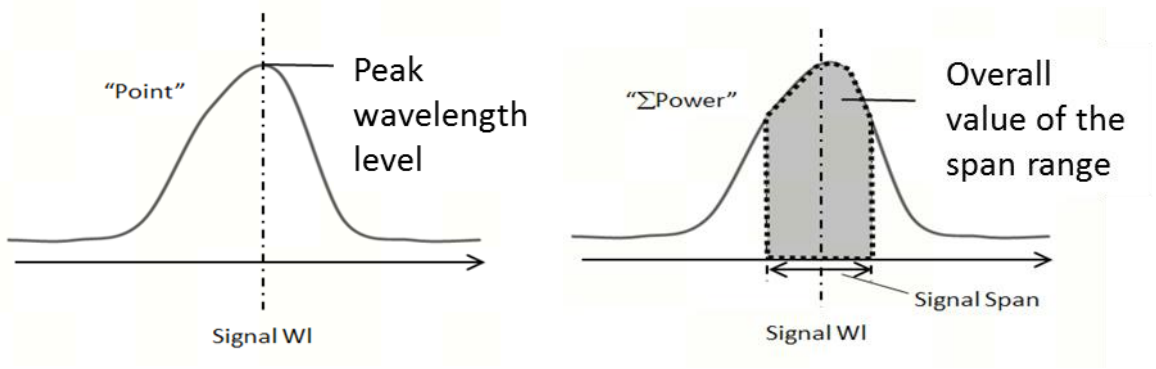
Point: indicates the peak power of the signal.

Power: indicates the total power within the range of signal intervals.

3.6 Advanced Operation Guide

- Power

Power bandwidth: indicates the signal interval. It can be set only when “Power” is selected. The range can be set to 0.01nm~1.00nm.



(a) Point (b) ∑Power

Figure 3-65 Schematic diagram of signal power measurement method

- Reference channel: Used to select peaks as reference signals.

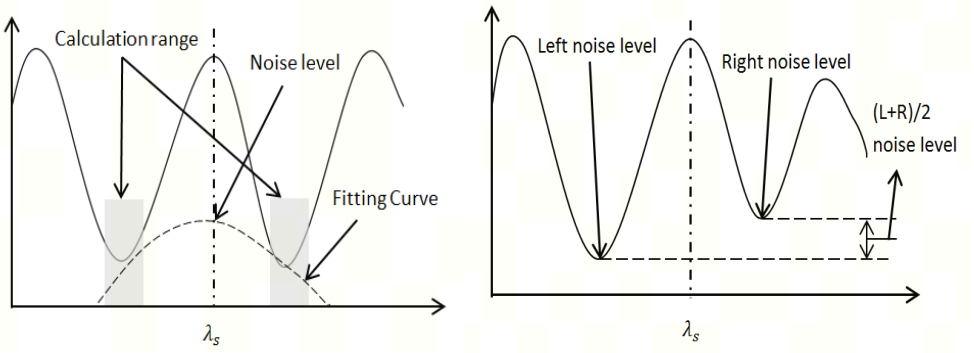
Figure 3-66 Window of setting noise parameters

Parameters that can be set in the noise parameter setting window are as follows:

- Normalized noise bandwidth: Bandwidth used for noise calculations.
- Detection Type: Detection method of noise power, as shown in Figure 3-67.

Point: Noise signals are obtained by measuring noise points. When “Point” is selected, the noise power detection can be set by “Point” below.

Area: The noise signal is obtained from the calculated fitting curve. If “Area” is selected, the noise power detection can be set by “Area” below.



(a) Area (b) Point

Figure 3-67 Schematic diagram of detecting noise power

- Point

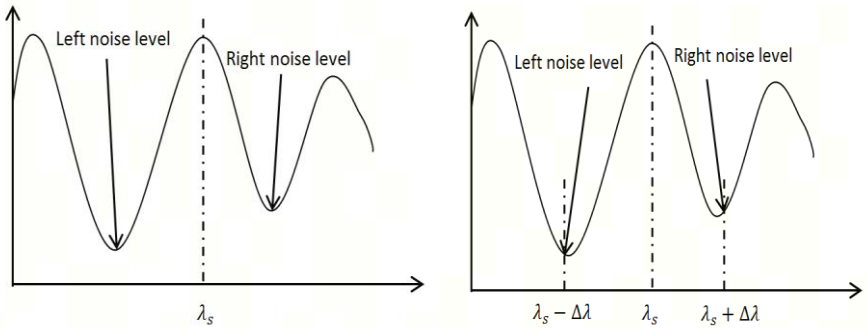
Higher: The noise point is selected on the side with higher noise power.

Left: The noise point is taken to the left of the signal.

Right: The noise point is taken to the right of the signal.

((L+R)/2): The noise point takes the average power of the left and right sides of the signal.

- Point Location: The location of the noise point, as shown in Figure 3-68.



(a) OFF (b) ON

Figure 3-68 Location of noise points

ON: Enables the detected noise signal to offset one wavelength value on the optical signal wavelength. When the noise detection method Point is set to "Left", the noise location will shift one wavelength difference $\Delta\lambda$ to the short-wave direction at the signal wavelength λ_s. When the noise detection method Point is set to "Right", the noise location will shift one wavelength difference $\Delta\lambda$ to the long wave direction at the signal wavelength λ_s. When the noise detection method Point is set to “Higher”, the noise is selected to the left or right of the signal wavelength λ_s, and the power is Higher after a wavelength difference $\Delta\lambda$. When the noise detection method Point is set to “(L+R)/2”, the noise is selected in the direction to the left and right of the signal wavelength λ_s, offset by a wavelength difference $\Delta\lambda$ of the mean power.

OFF: Make the detected noise signal at the trough point of the waveform.

- NoiseOffsetWl: The noise point deviation wavelength value. The range can be set to 0.1nm~1.0nm.
- Area
- Fitting Curve: The form of the fitting curve.

Linear: linear fitting for noise signal, such as $f(\lambda) = a\lambda + b$.

Gauss: quadratic fitting for noise signal, such as $f(\lambda) = a\lambda^2 + b\lambda + c$.

Cubic polynomial: cubic term fitting for noise signal, such as $f(\lambda) = a\lambda^3 + b\lambda^2 + c\lambda + d$.

Quartic polynomial: quartic term fitting for noise signal, such as $f(\lambda) = a\lambda^4 + b\lambda^3 + c\lambda^2 + d\lambda + e$.

Quintic polynomial: quintic term fitting for noise signal, such as $f(\lambda) = a\lambda^5 + b\lambda^4 + c\lambda^3 + d\lambda^2 + e\lambda + f$.

- Fitting Curve Display: Display settings for fitting curves.

  ON: Display the fitting curve on the screen.

  OFF: Do not display the fitting curve.

- Area Type: Set method for calculation fitting curve, as shown in Figure 3-69.

  Channel: The fitting curve range is all parts of the wavelength.

  User Specify: The fitting curve range is specified by the user.

- Channel: Set parameters in “Channel” mode.

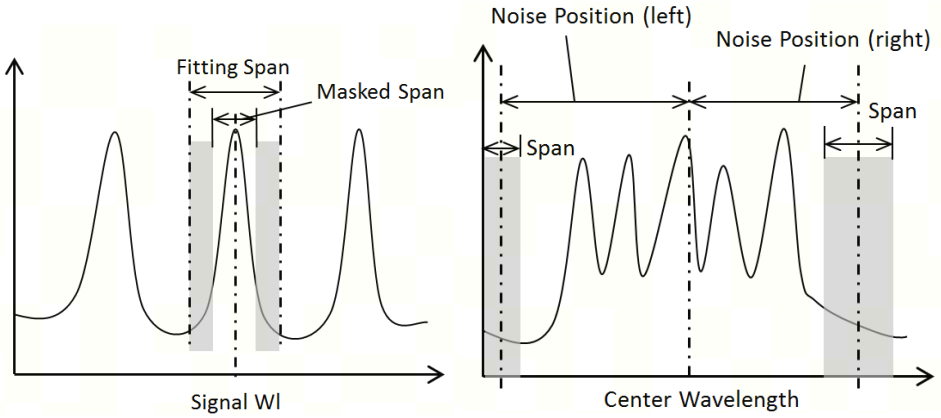
  Fitting Span: Used to calculate the wavelength range of the fitting curve; set the range to 0.01nm~20.00nm.

Masked Span: The wavelength range except for those used for calculating the fitting curve. The range can be set to 0.01nm~20.00nm.

- User Specify: Set parameters in “User Specify” mode

Noise Position: The difference between the mean WL of the screen and the mean WL used to calculate the region. The range can be set to 0.01nm~100.00nm.

Span: Specify the wavelength range of the computation region. The range can be set to 0.01nm~100.00nm.



(a) Channel (b) User Specify

Figure 3-69 Fitting curve setting method

3.6.4.2 Operation steps:

The specific steps of WDM test are as follows:

1. Input optical signals.

2.Set appropriate test parameters for spectrum testing.

3.Enter the Analysis menu and select [WDM] test.

4.Set signal parameters or noise parameters.

5.Click [OK] to update parameters and test results, and click [Previous Page] or [Next Page] for more test information.

3.6.4.3 Test result

Different modes show different parameters for the test analysis. The WDM optical source contains a variety of optical signals, so the following parameters will be measured simultaneously in WDM tests, as shown in Table 3.9.

Table 3.9

Test parameters	Description
No	Number of test signal
Signal Wl (nm)/Wl (nm)	Wavelength
Signal Frq(THz)	Signal frequency
Level (dBm)	Power
Gain Vari	Power difference between the maximum peak and the minimum peak
SNR	Signal to noise ratio
L/R	Selection type of noise. L=left, indicating that noise signal is selected to the left; R=right, indicating that the noise signal is selected to the right.
Spacing (nm)/Spacing Wl(nm)	Interval between wave peaks
Spacing Frq (GHz)	Frequency interval between wave peaks
Wl-Ref (nm)	Difference in wavelength with respect to the reference signal
Lvl-Ref (dB)	Power difference with respect to the reference signal
Peak Count	Number of wave peaks detected

SNR can be calculated by the following formula:

$$\mathrm{SNR} = 10\log\left(\frac{L_{S,Lin}}{N(\lambda_{sig})}\right)\ (\mathrm{dB})$$

Where,$L_{S,Lin}$ is the linear value of signal power and $N(\lambda_{sig})$ is the linear value of noise power.

When the power detection mode is set to "Point", the signal power can be calculated by the following formula:

$$L_{S,Lin} = \mathrm{P}(\lambda_{sig}) - \mathrm{N}(\lambda_{sig})\ (\mathrm{W})$$

$\mathrm{P}(\lambda_{sig})$: The power value corresponding to the spectral wavelength

When the power detection mode is set to “∑ Power", the signal power can be calculated by the following formula:

$$L_{S,Lin} = \sum_{i=1}^{n}\{P(i) - \mathrm{N}(\lambda_{sig})\}\cdot\frac{\mathrm{Span}}{(\mathrm{Sampl}-1)}\cdot\frac{\alpha}{\mathrm{ActRes(i)}}\ (W)$$

$$\mathrm{n}: \text{Amount of data within the signal range}$$

$$\mathrm{Span}: \ \mathrm{Span(nm)}$$

$$\mathrm{Sampl}: \text{Sampling points}$$

$$P(i): \ \text{Resolution of the i} - \text{th power}$$

$$A\mathrm{ctRes(i)}: \ \text{Resolution of the i} - \text{th data}$$

$$\alpha: \ \text{Device} - \text{dependent correction factor}$$

When the Normalization of noise parameter Settings is set to "ON", noise power is normalized to noise power per unit resolution (1nm), and SNR is calculated from this power, that is:

$$\mathrm{SNR} = 10\log\left(\frac{L_{S,Lin}}{N'(\lambda_{sig})}\right) \ (\mathrm{dB} - \mathrm{nm})$$

$$N'(\lambda_{sig}): \textit{Normalized noise power within the noise bandwidth}(\mathrm{W/nm})$$

$$N'(\lambda_{sig}) = \frac{N(\lambda_{sig})\alpha}{A\mathrm{ctRes}(\lambda_{sig})} \cdot NBW \ (W/nm)$$

$$A\mathrm{ctRes}(\lambda_{sig}): \textit{Resolution of spectral signal wavelengths}$$

$$NBW: \ \text{Noise bandwidth}$$

3.6.5 Optical amplification test

3.6.5.1 Parameter setting

In optical amplification analysis, various parameters can be set. Parameter setting falls into two categories: signal parameter setting and noise parameter setting. Figure 3-70 shows the signal parameter setting window.

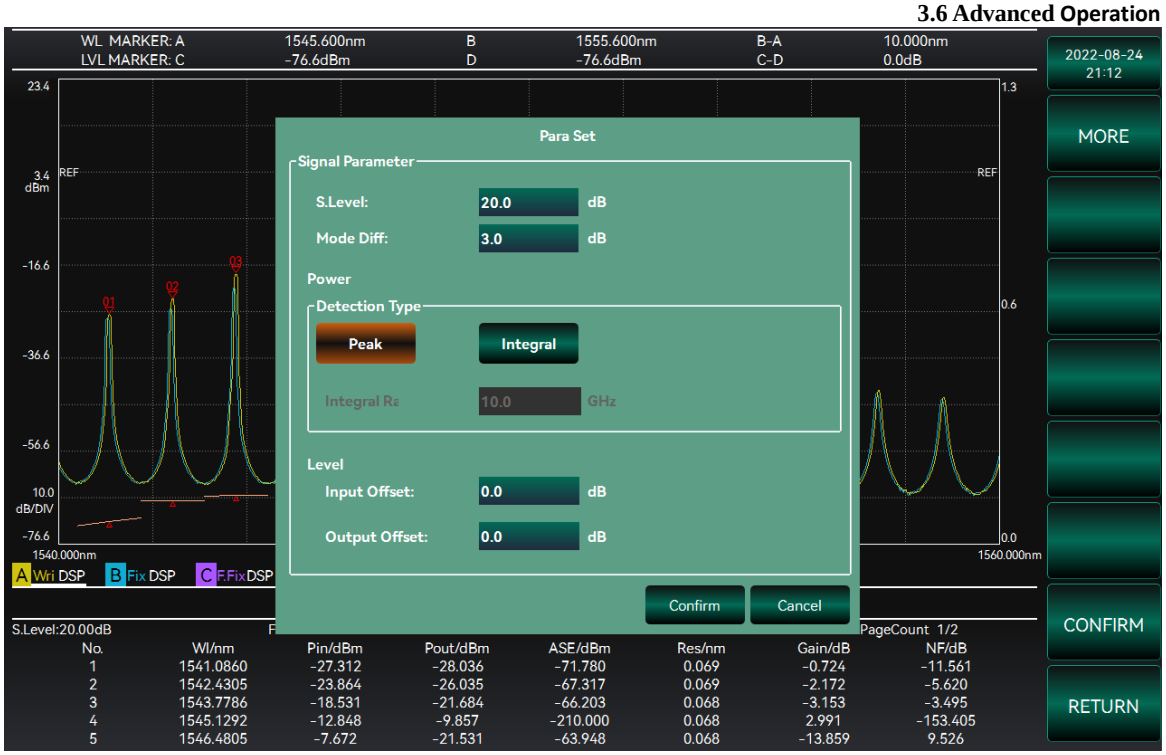


Figure 3-70 Signal parameter setting window

Parameters that can be set in the signal parameter setting window are as follows:

- Stop level:

Stop level: It represents the intercepted power. Peaks within a range of intercepted power below peak power will be detected as analysis signals for WDM tests. S.Level can be set to 0.1dB~50dB.

- Wavelength

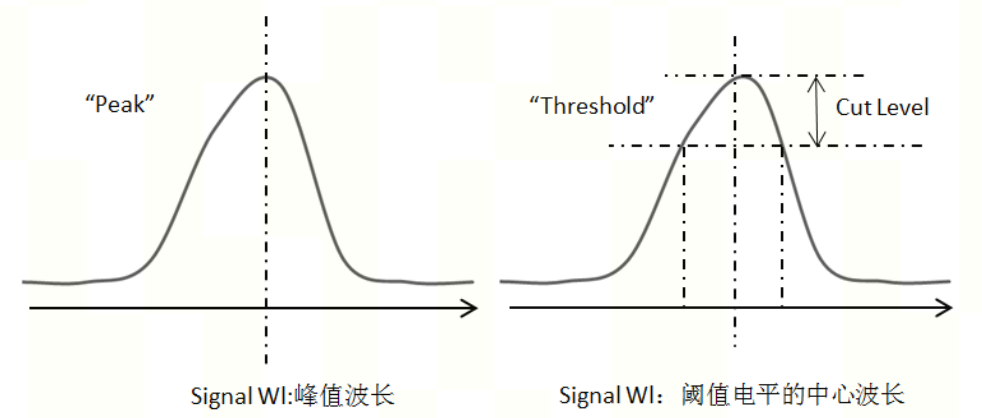
- Test type: indicates the detection mode of the signal wavelength. The value can be “Peak” or “Threshold”, as shown in Figure 3-71.

Peak: indicates the peak wavelength.

Threshold: indicates the mean WL obtained by threshold analysis.

- Threshold

Threshold power: indicates the threshold power used for threshold analysis. Threshold power can be set only when Threshold is selected. The range can be set to 0.1dB~50dB.



(a) Peak (b) Threshold

Figure 3-71 Schematic diagram of measuring signal wavelength

- Power
- Input optical power offset: Sets the offset of the input optical power.
- Output optical power offset: Sets the offset of the output optical power.

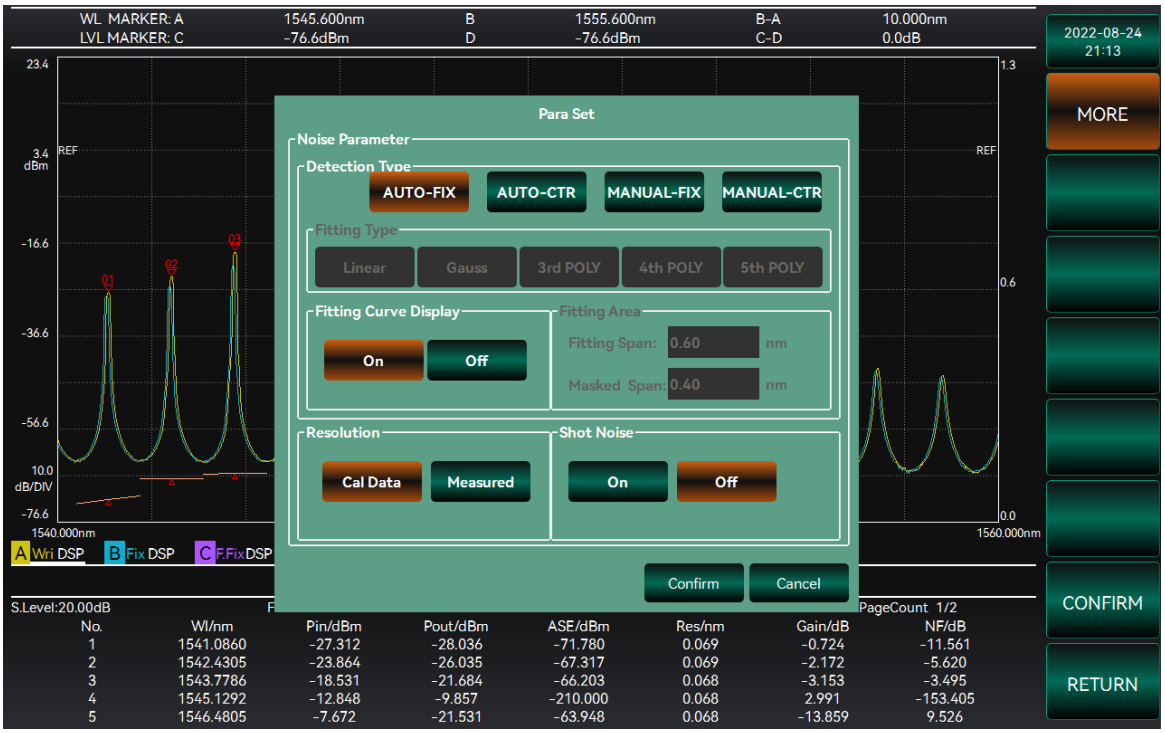


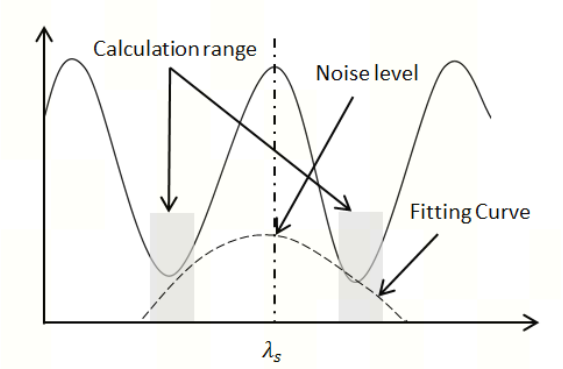
Figure 3-72 Window of setting noise parameters

Parameters that can be set in the noise parameter setting window are as follows:

- Test type: Method for detecting noise power, as shown in Figure 3-73.

Automatic: The noise signal is measured by the noise point. The default value is the noise value corresponding to the peak point.

Manual: The noise signal is obtained from the calculated fitting curve. When “Manual” is selected, the detection of noise power can be set by “Manual” below.



(a) Area

Figure 3-73 Schematic diagram of detecting noise power

- Manual
- Fitting type: the form of the fitting curve.

  Linear: linear fitting for noise signal, such as $f(\lambda) = a\lambda + b$.

  Gauss: quadratic fitting for noise signal, such as $f(\lambda) = a\lambda^2 + b\lambda + c$.

  Cubic polynomial: cubic term fitting for noise signal, such as $f(\lambda) = a\lambda^3 + b\lambda^2 + c\lambda + d$.

  Quartic polynomial: quartic term fitting for noise signal, such as $f(\lambda) = a\lambda^4 + b\lambda^3 + c\lambda^2 + d\lambda + e$.

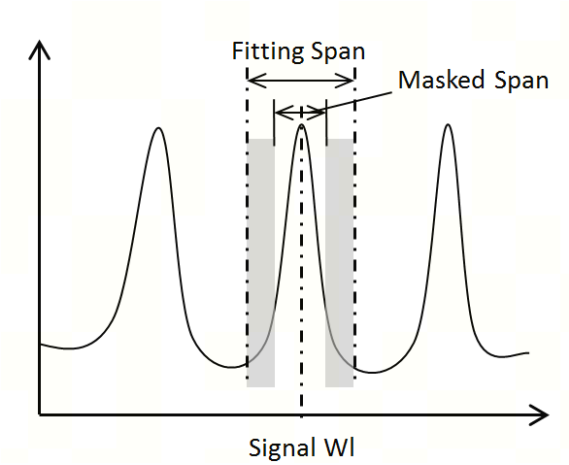
  Quintic polynomial: quintic term fitting for noise signal, such as $f(\lambda) = a\lambda^5 + b\lambda^4 + c\lambda^3 + d\lambda^2 + e\lambda + f$.
- Fitting curve: Display setting of fitting curve.

  ON: Display the fitting curve on the screen.

  OFF: Do not display the fitting curve.
- Fitting area: Set the fitting range.

Fitting bandwidth: used to calculate the wavelength range of the fitting curve, which can be set to 0.01nm ~20.00nm.

Masking bandwidth: in addition to calculating the wavelength range of the fitting curve, which can be set to 0.01nm~20.00nm.



(b) Channel

Figure 3-74 Fitting curve setting method

- Resolution: Set the method for selecting the resolution of noise
- Actual resolution: Select the instrument resolution parameter as the resolution for calculation.
- 3dB measurement resolution: Calculate 3dB bandwidth as the resolution of the calculation.
- Scattered-noise: Specifies whether to calculate scattered-noise
- ON: Calculate scatter noise.
- OFF: Does not calculate scatter noise.

3.6.5.2 Operation steps:

The specific steps of optical amplification test are as follows:

1. Input optical signals.
2. Set appropriate test parameters for spectrum testing.
3. Enter the Analysis menu and select [Optical Amplification] for test.
4. Set signal parameters or noise parameters.
5. Click [OK] to update parameters and test results.

3.6.5.3 Test result

Different modes show different parameters for the test analysis. Optical amplification contains a variety of optical signals, so the following parameters will be measured simultaneously in WDM tests, as shown in Table 3.10.

Table 3.10

Test parameters	Description
No	Number of test signal
WI /nm	Wavelength
Pin /dBm	Input optical power
Pout /dBm	Output power
ASE /dBm	ASE noise power
Res /nm	Resolution
Gain /dB	Optical amplification gain
NF /dB	Optical amplification noise figure

Gain can be calculated by the following formula:

$$G = \frac{LOUT_{Lin} - LASE_{Lin}}{LIN_{Lin}}$$

Where, $LOUT_{Lin}$ is the linear value of the output optical power, $LASE_{Lin}$ is the linear value of the noise power, and LIN_{Lin} is the linear value of the input optical power.

The noise figure NF can be calculated as follows:

$$NF = \frac{k}{hc^2} \times \frac{\lambda^2}{Res} \times \frac{LASE_{Lin}}{G}$$

Where, h is The Planck constant, k is the correction coefficient, which is usually the refractive index of light, c is the speed of light in vacuum, λ is the wavelength value, and Res is the resolution.

3.6.6 OPTICAL FILTER

3.7 Other operations

This section describes other operations of the S6362D spectrometer system. Figure 3-75 shows its operation interface.

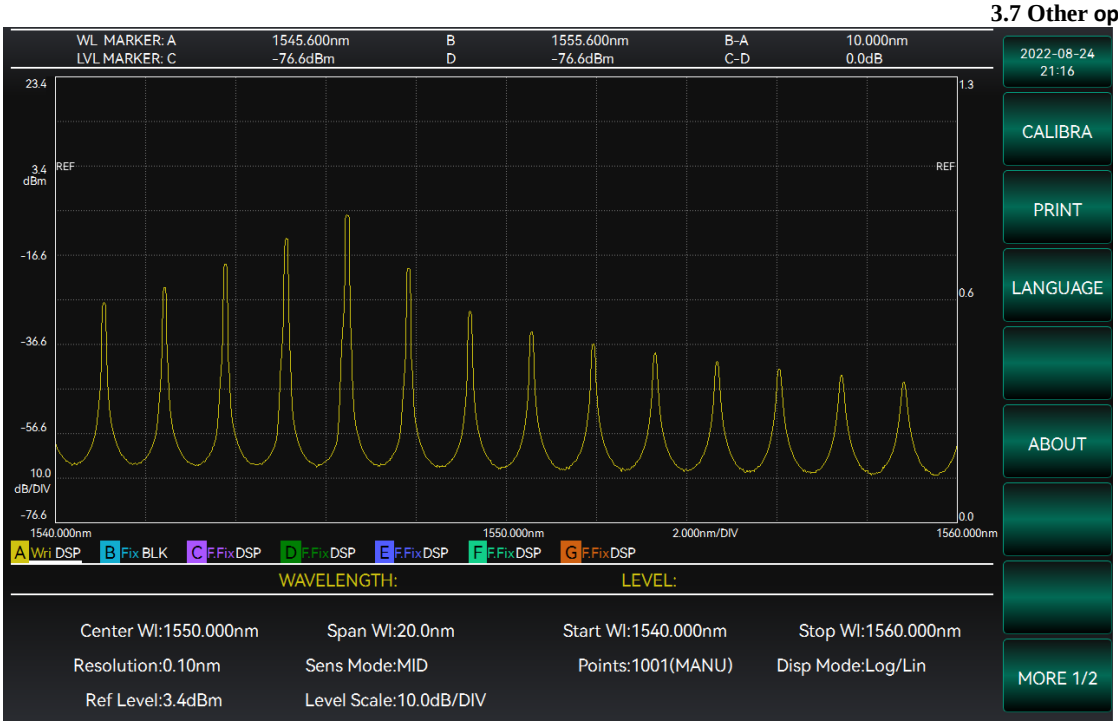


Figure 3-75 Schematic diagram of the system interface

You can configure the instrument system in the system function interface. The function menu on the right side includes [Calibration], [Print], [Language], [Upgrade], [About] and [Help].

3.7.1 Calibration

The calibration screen is displayed, and you can calibrate wavelength and power offsets, as shown in Figure 3-76.

3.7 Other operations

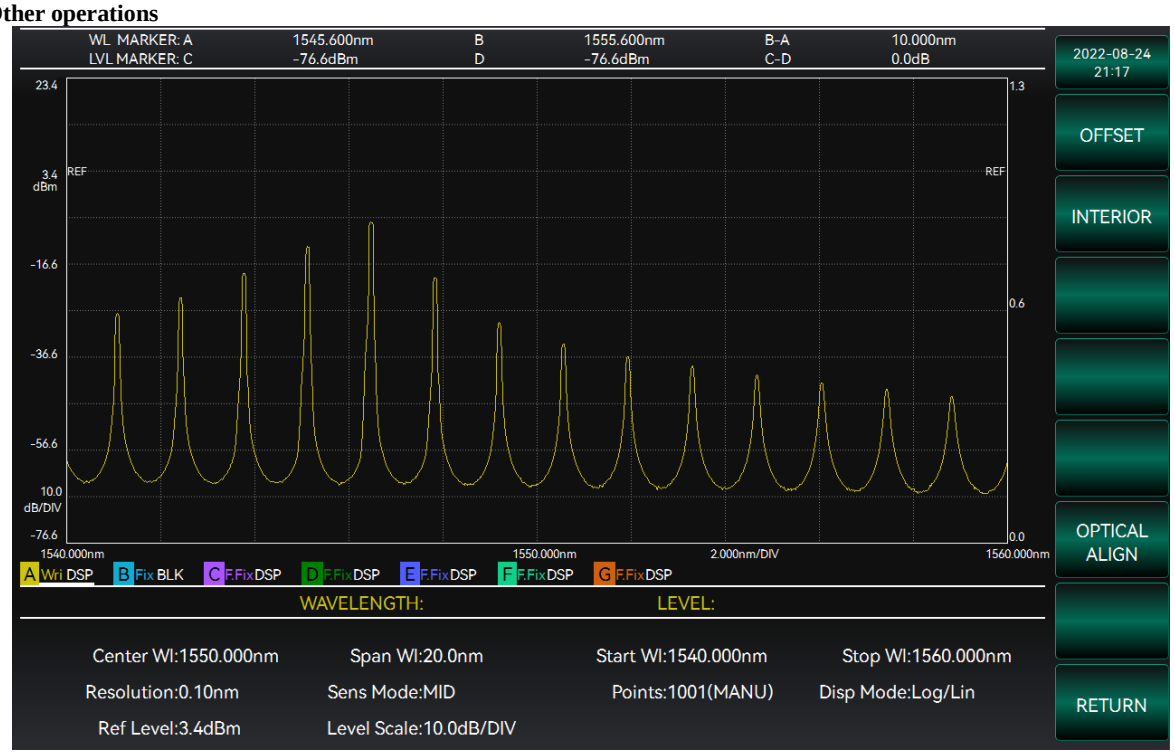


Figure 3-76 Schematic diagram of the calibration interface

Click the [Offset] option to set the offset values of wavelength and power in the input box. When a wavelength offset is entered, the spectrum is shifted horizontally to the left or right. When the wavelength offset of the input is positive, the spectrum of the subsequent measurement will shift to the long wavelength direction. Otherwise, it will move to the short wavelength direction. The range of wavelength offset can be set to -1.00nm~+1.00nm. After the power offset is entered, the spectrum will be shifted vertically up or down. When the input power offset is positive, the spectrum of subsequent measurements will move upward. If not, it will move down. The power offset can be set to -20.00dB~+20.00dB.

Click [Internal Optical Source], connect the internal optical source interface as prompted, and click [Execute] for calibration. Instrument operation will be prohibited during calibration. After calibration is complete, a prompt will be given.

Click [External Optical Source], connect the external optical source as prompted, set the calibration wavelength value, and click [Execute] for calibration. Instrument operation will be prohibited during calibration. After calibration is complete, a prompt will be given.

3.7.2 Printing

Print the current page and prompt you if the driver is not installed, as shown in Figure 3-77.

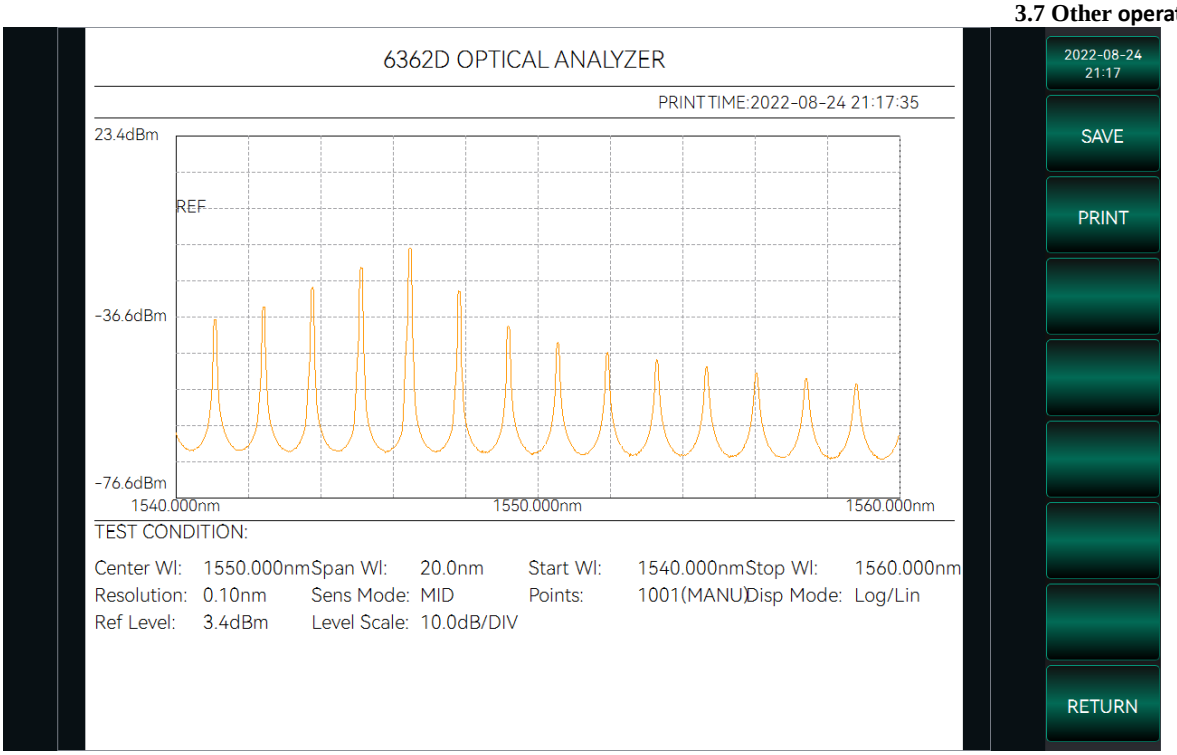


Figure 3-77 Print interface diagram

The print interface shows a print preview of the current spectrum, including the spectrum waveform, print time and measurement parameters. The right menu bar contains [Save], [Print] and [Back] options.

[Save]: The information displayed in the print interface can be saved in the instrument in the form of a file, which can be exported via U disk and other means.

[Print]: The preview information can be printed out in paper form.

[Back]: Return to the previous operation interface.

Instruction!

- To use the printing function, you need to install the printing driver and device correctly.

3.7.3 Language

The language switch screen is displayed for switching between Chinese and English, as shown in Figure 3-78.

3.7 Other operations

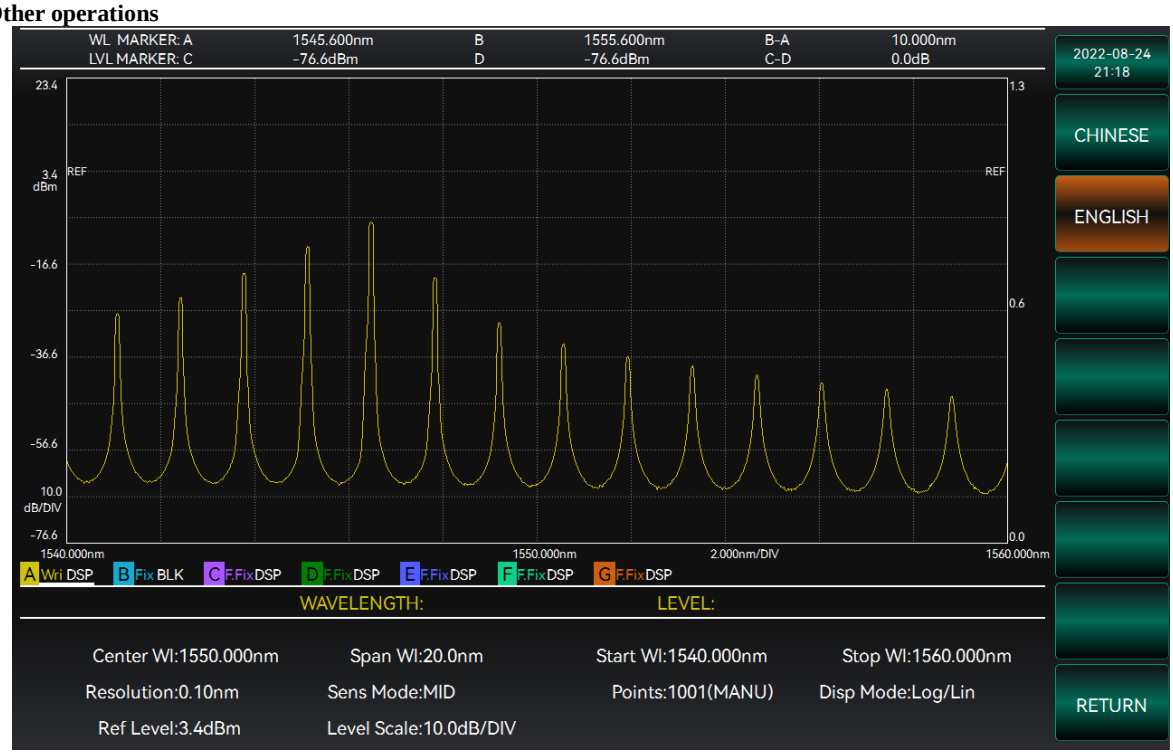


Figure 3-78 Schematic diagram of the language interface

3.7.4 Upgrading

Upgrade the software or shut down the device.

Click [Upgrade] to update the existing software version of the instrument. The [Upgrade] function requires the USB storage device to transfer the new version of software in the software directory. For details, please contact the customer service personnel. Click [Shutdown] option and a prompt box will pop up to choose whether to close the instrument.

3.7.5 About

The About screen is displayed with About information, as shown in Figure 3-80.

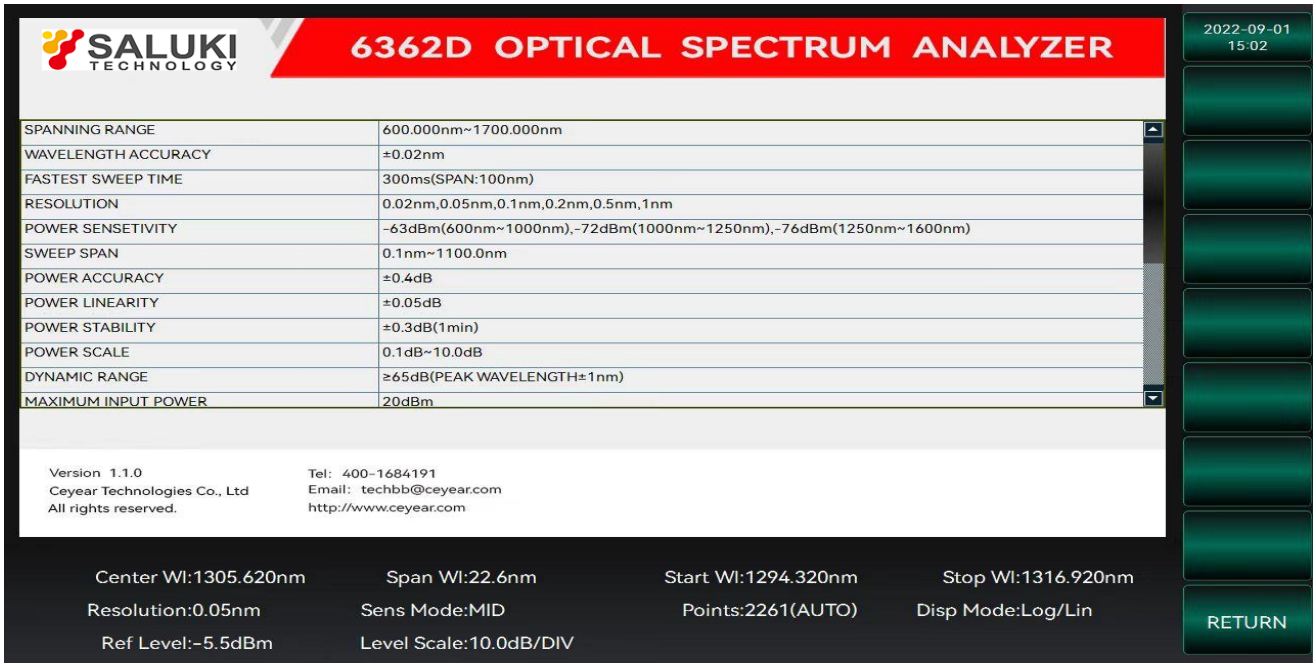


Figure 3-80 Schematic diagram of the About interface

The contents displayed on the interface include the instrument model and name, the technical parameters of the instrument (including wavelength range and accuracy, which can be viewed by pulling down the slider), the contact number and email address of the manufacturer, etc. Use the [Back] key to return to the previous operation interface.

3.7.6 Help

The help page is displayed with Help information, as shown in Figure 3-81.

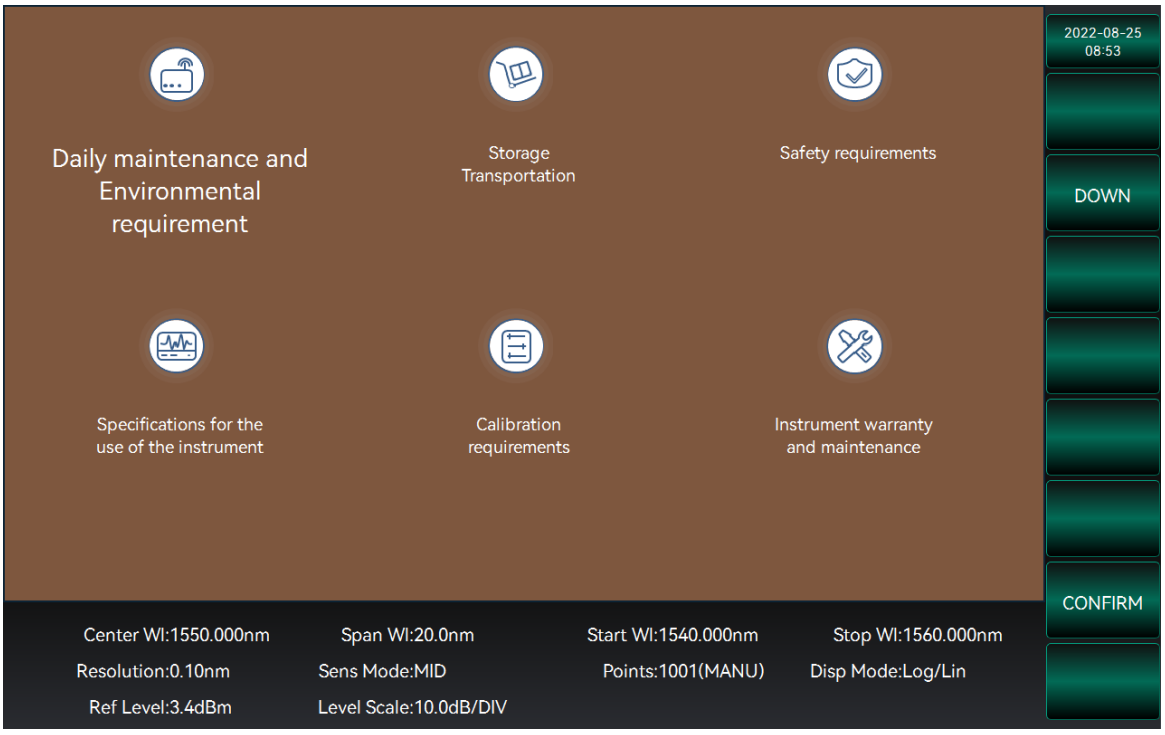


Figure 3-81 Schematic diagram of the Help interface

3.7 Other operations

The help information used by the instrument includes: routine maintenance and service, storage and transportation, safety requirements, operating conditions, instrument usage specifications, calibration requirements and instrument warranty and repair. Use the [Previous] and [Next] buttons to select different information, use the [OK] button to view information, select the [Back] button to return to the previous operation menu.

3.7.7 Network setting

Choose [Network Setting[under system Functions to enter the network menu, as shown in Figure 3-82. This function can be used to set the network port.

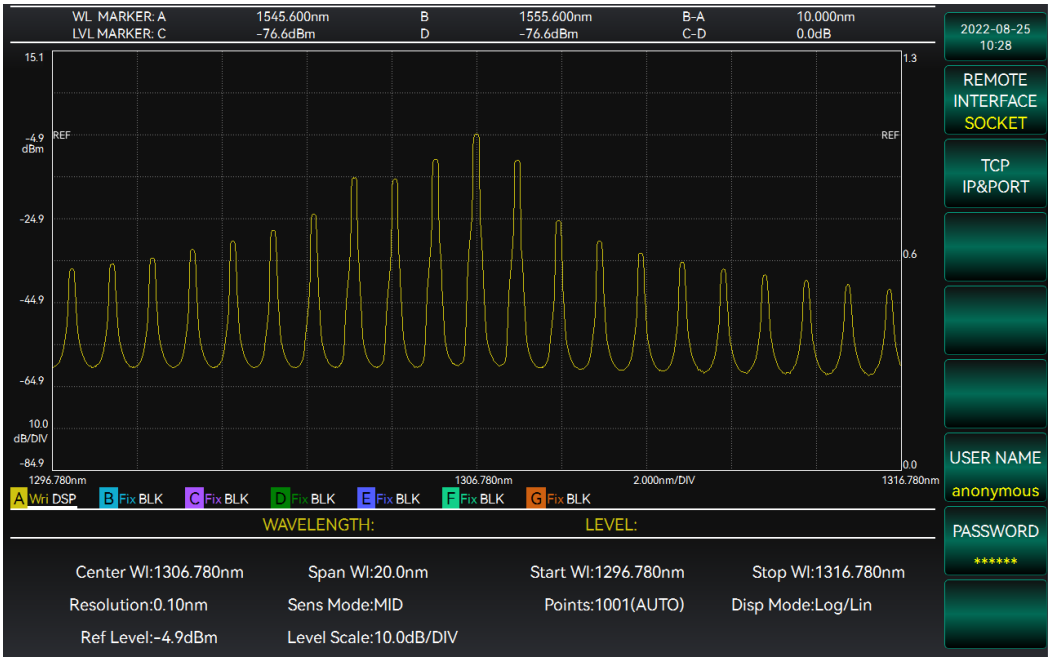


Figure 3--82 Schematic diagram of network setup interface

Select [TCP] to set TCP communication parameters, including IP address, subnet mask, gateway, and port. Select [OK] to complete the setting, and Select [Exit] to cancel the setting.

3.7.8 Time setting

Choose [Time Setting[from the system Menu to enter the time screen, as shown in Figure 3-83. This function can set the time of the instrument.

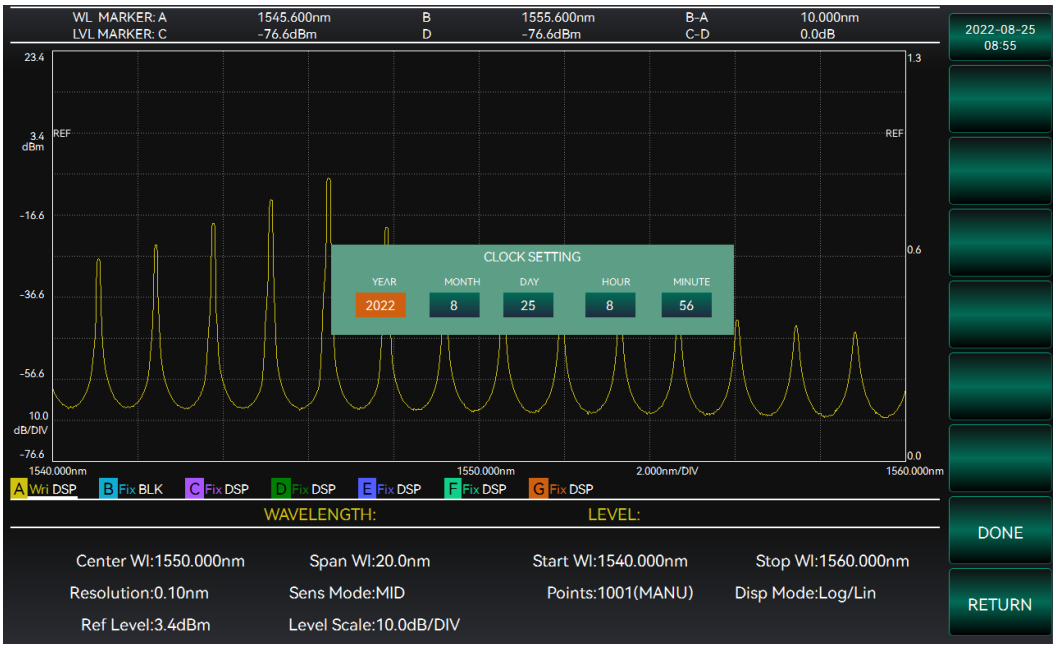
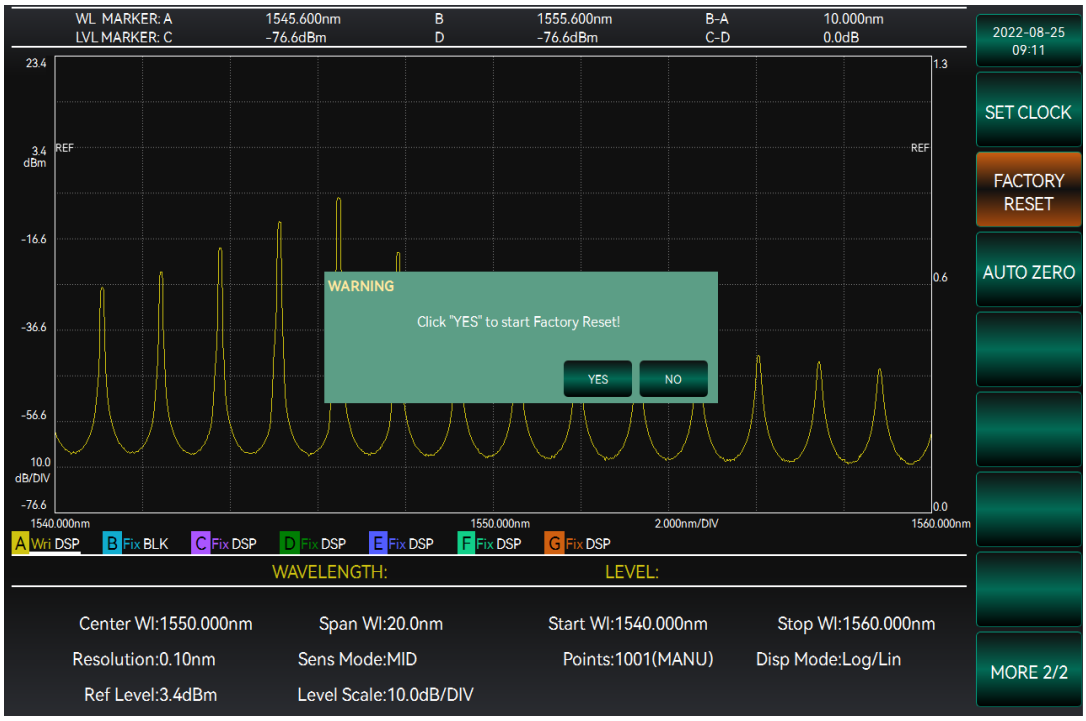


Figure 3-83 Schematic diagram of time setting interface

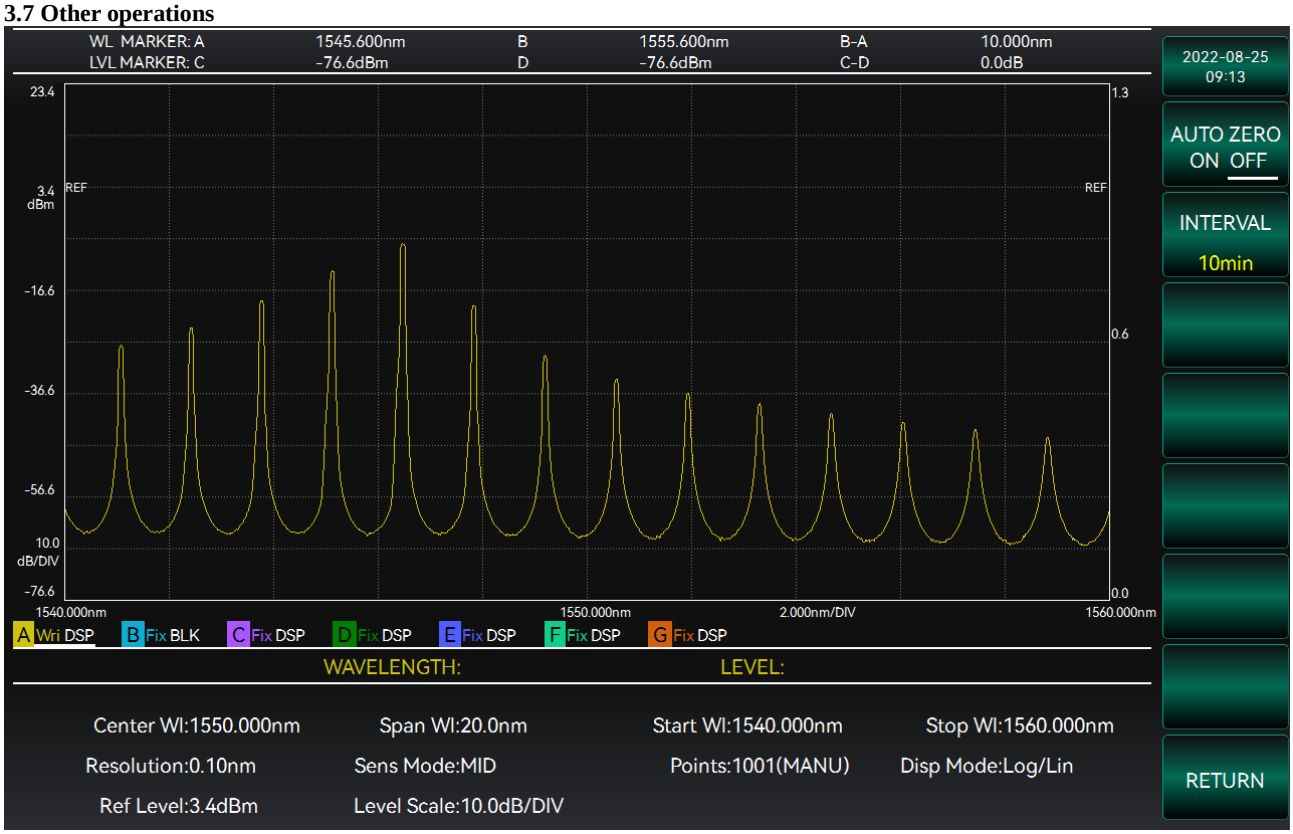
Select [OK] to complete the setting and [Exit] to cancel the setting.

3.7.8 FACTORY RESET



3.7.9 AUTO ZERO

3.7 Other operations



4 Troubleshooting and after-sales services

This chapter will show you how to find problems and accept after-sales service, It also indicates the error information of the spectrum analyzer.

If you encounter any problem when operating the S6362D spectrum analyzer or want to buy relevant components or accessories, we can provide you with complete after-sales services.

Generally, causes of problems include hardware, software or user maloperation. In case of any problem, please contact us in time. If the spectrum analyzer is within the warranty period, we will repair it for free as per the provisions specified in the warranty bill. Otherwise, we will charge maintenance costs as per the contract requirement.

4.1 Working Principles

The section introduces the basic working principle and hardware function block diagram of the S6362D spectral analyzer, so as to facilitate users' understanding on functions of the spectral analyzer and solving problems encountered during operation.

4.1.1 Working principles of the analyzer

After the beam enters into the splitter unit through the optical fiber interface, the grating splitter module of the splitter unit is used to complete the splitter function of the monochromator, and the spectral data is detected through the back-end detector, and finally the spectrum line is drawn and analyzed after being uploaded through the bus interface.

S6362D spectrum analyzer is mainly composed of data acquisition subsystem, data measurement subsystem and data processing, analysis and display subsystem. The incident light enters into the data acquisition subsystem of the instrument through the optical fiber, and is converted into electrical signals by grating monochromator, detector module, analog-to-digital conversion unit, etc. The electrical signals are processed, analyzed and displayed through the measurement module, PCIE module, motor and motor driver module of the data measurement subsystem. The subsystem includes computer main control module, waveform calculation and analysis module, external interface module, data storage and output module, mouse and keyboard module and LCD display module, etc. Figure 4-1 shows the hardware scheme.

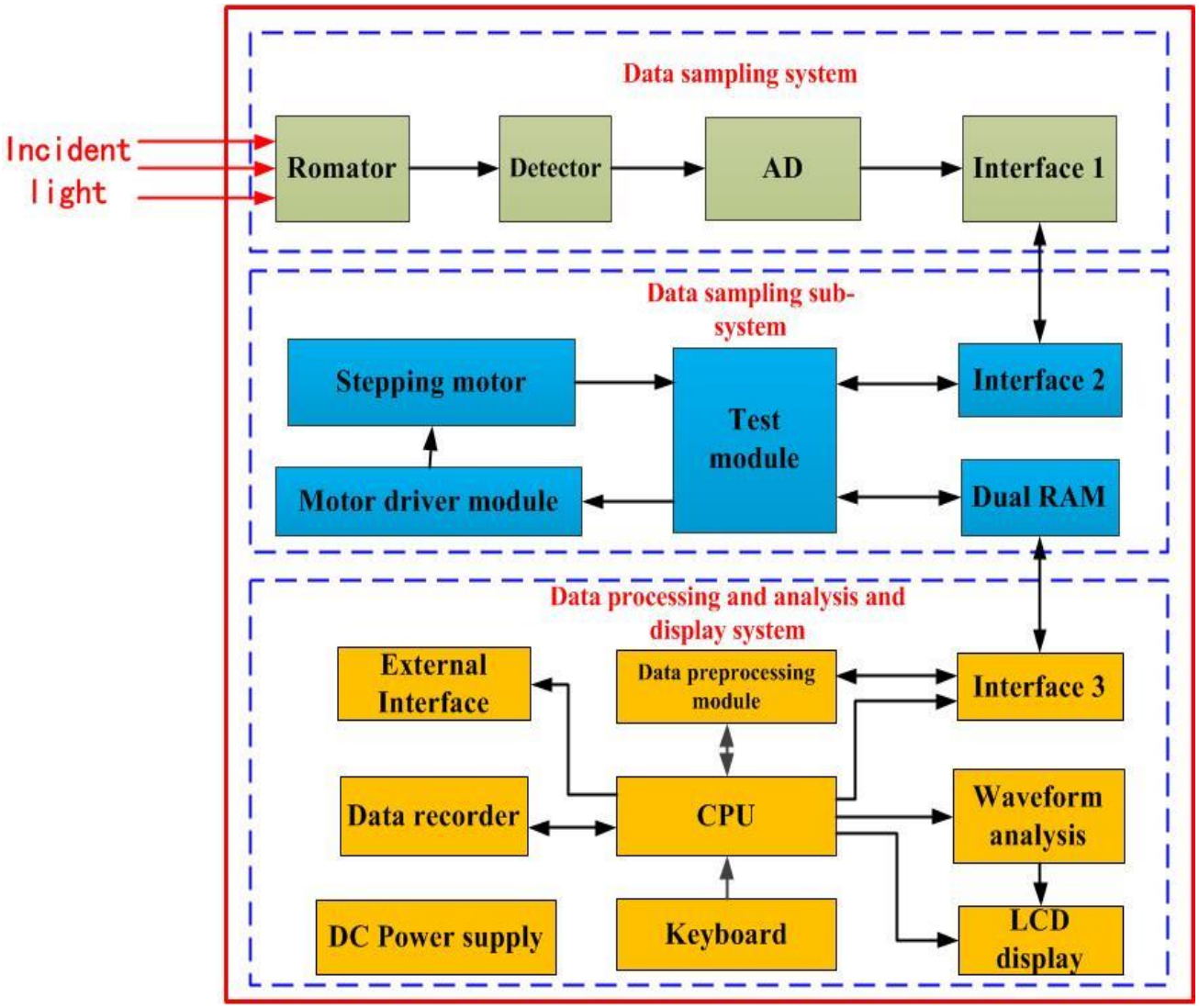


Figure 4-1 Block diagram of overall analyzer scheme

4.2 Troubleshooting and debugging

Tips

Troubleshooting and instructions

This section introduces the way on how to judge and handle failures (if any) of the S6362D spectral analyzer, and feed them back to the manufacturer as accurately as possible if necessary for quick solution.

The following failures and debugging methods are listed as per function types.

4.2.1 System problem

4.2.1.1 Standby lamp not on

Check whether the 220V AC input (with max. allowable deviation of 220V±10%) of the spectrum analyzer is normal, which cannot be too high or too low. Otherwise, the instrument will run abnormally. If it is abnormal, check the external lines for any failure. After troubleshooting, power on the instrument again and start it. If 220V AC input is normal, check the instrument fuse. If it has to be replaced, refer to Section 4 fuse in Chapter I. If the failure is caused by the power supply of the instrument itself, send the product back to the manufacturer for repairing or power supply replacement.

4.2.1.2 No fan rotation after startup

In case of no fan rotation after startup, check the fan for any obstacle or too much dust. In this case, shut down the instrument, and remove the obstacle or clean the fan. After that, power it on. If the fan still does not rotate, send it back to the manufacturer for repairing or fan replacement.

4.2.2 Self-check status problems

4.2.2.1 Abnormal self-check status

If the self-check fails or the reset fails after the user starts the program, and the system still fails to run properly after the user restarts, return to the manufacturer for repair.

4.2.3 Key problem

4.2.3.1 Keys do not respond

The possible causes of this problem are as follows: 1. One key is always pressed. Ensure that other keys are not pressed. 2. The soft keyboard on the screen is in the pop-up state. If it is in the pop-up state, please close the soft keyboard. If the fault persists, contact the manufacturer in time.

4.2.4 Sweep failure

4.2.4.1 Wrong path selection

If no spectrum is displayed after sweeping, check the sweeping progress bar or check whether there is an error. If there is an error, change the sweeping condition according to the error. For example, check whether the selected track is displayed. If no, select the display status. If no waveform is displayed, check whether the reference level of the current curve is within the appropriate value range. If no spectrum is displayed, record the operation process and symptoms, and contact the manufacturer for feedback.

4.2.5 Accuracy problem

4.2.5.1 The spectral test results were not accurate

There are three possible influencing factors when there is a large deviation in test results:

1 Wavelength not calibrated or analyzer not sufficiently heated. Spectral analyzer is a precision optical, mechanical and electrical three-in-one instrument, in which the optical device is easily affected by the environment, if knocked in the process of use or after shutdown, it is easy to cause internal changes to it. Therefore, it is recommended to fully heat up or conduct wavelength calibration after each startup, so as to obtain more accurate wavelength measurement results;

2 The end face of optical fiber is dirty; Dust and impurities on the end of the optical fiber may affect the measurement result. Therefore, you are advised to wipe the optical fiber end with special cleaning paper before the test to ensure that the optical fiber end is clean.

3 The resolution is not set properly. Improper selection of scanning resolution of spectrum analyzer will result in leakage of acquisition system and distortion of test results. You are advised to automatically set the resolution for system scanning.

4.2.6 Wavelength calibration problem

4.2.6.1 Wavelength calibration failure

When the wavelength calibration of spectrum analyzer fails, there are two possible influencing factors:

1 Optical source power is low. In this period of time when the spectrometer is just turned on and not warmed up sufficiently the power of the calibrated optical source is too low o carry out wavelength calibration, and it needs to be re-calibrated after the optical source is stable. If it still cannot perform self-calibration, contact the manufacturer.

2 The target wavelength is not set properly. During wavelength calibration, the correct target wavelength is not selected or the optical source is incorrect. Replace the target wavelength with an appropriate one.

4.3 Method to Obtain After-sales Services

4.3.1 Contact us

In case of any failure to the S6362D spectral analyzer, check and save the error message, analyze possible causes, and refer to the methods provided in “4.2 Troubleshooting and debugging” for preliminary troubleshooting. If the problem cannot be solved, contact the service and consultation center of the Company as per the contact information provided below and provide us with the error message collected. We will coordinate with you to solve the problem as soon as possible.

Contact information:

Website: **www.salukitec.com**

Email: **sales@salukitec.com**

Address: No.1-2 Section 5, Zhongxiao East Rd, Xinyi District, Taipei, Taiwan.

4.3.2 Package and mailing

In case of any failure to the spectral analyzer that is difficult to be eliminated, contact us by phone or fax. If it is confirmed that the spectral analyzer has to be returned for repairing, pack it with the original packing materials and case by following the steps below:

1) Prepare a detailed description of the failure of spectral analyzer and put it into the package along with it.
2) Pack the spectral analyzer with the original packing materials, so as to minimize possible damage.
3) Place cushions at the four corners of the outer packing carton, and place the instrument in the outer packing carton.
4) Seal the opening of the packing carton with adhesive tape and reinforce the packing carton with nylon tape.
5) Specify text like “Fragile”! Do not touch! Handel with care!” and so on.
6) Please consign it as precision instruments.
7) Keep a copy of all shipping documents.

Notice

Precautions when packing the spectral analyzer

Using other materials for packing the spectral analyzer may damage the instrument. Never use polystyrene beads as packing materials because on the one hand, they cannot provide sufficient protection on the instrument, and on the other hand, they can be sucked in to the instrument fan by the static electricity generated, resulting in instrument damage.

Tips

Instrument package and transportation

Please follow carefully the precautions described in “2.1.1 Unpacking” when transporting or handling the instrument.

5 Technical indicators and testing methods

The section introduces the technical indicators and testing methods of the S6362D spectral analyzer.

5.1 Product features

Table 5.1 Product features

General characteristics		
Remote Control	**Interface**	LAN 1000BaseT LAN interface
		RS-232
	Program control language	SCPI Version: 1997.0
Display screen		12.1” TFT LCD touch screen
Operation interface language		Chinese/English
Power supply requirement		220 VAC, 50 Hz 100 W (max.)
Working temperature range		+10°C ~ +40°C
Storage temperature range		+10°C ~ +40°C
Operating humidity (rated value)		Relative humidity of ≤90%
Elevation		0 ~ 3000 m
Storage		To store the instrument status, user data file, sweep list file, waveform sequence and other files.
		Memory space of 64GB
Self test		When resetting, the spectrum analyzer will test most of the modules automatically. Such test is not needed if the voltage at the test point of the module is normal.
Max. weight		about 19kg
Overall dimensions		Width×Height×Depth: 426mm×221mm×459mm

5.2 Technical Indicators

Table 5.2 Technical indicators

Item	Specifications
Spectrum range	600~1700nm

Sweeping span		0.2～1100Nm (Full span range), 0nm
Wavelength accuracy		±0.02Nm (1520 ～ 1620nm) , ±0.04nm (1450 ～ 1520nm) ,±0.10nm (Full wavelength range)
Wavelength linearity		±0.01nm (1520～1580nm)
Wavelength repeatability		±0.005nm (2 minutes)
Wavelength resolution setting		0.02, 0.05, 0.1, 0.2, 0.5, 1 and 2nm
Minimum sampling resolution		0.001nm
Sampling number		101～50001, AUTO
Power sensitivity setting		NORMAL, MID, HIGH1, HIGH2 and HIGH3
Power sensitivity		-90dBm (1300～1620nm) , -85dBm (1000～1300nm) , -60dBm (600～1000nm) (sensitivity: HIGH3)
Max input power		+20dBm (each channel, full wavelength range)
Maximum safe input power		+25dBm (Total input power)
Power accuracy		±0.4dB (1310/1550nm, input power: -20dbm, sensitivity: MID)
Power linearity		±0.05dB (input power: -50～+10dBm)
Power flatness		±0.1dB(1520～1580nm) , ±0.2dB(1450～1520nm, 1580～1620nm)
Polarization dependence		±0.05dB(1550nm) , ±0.08dB(1310nm)
Dynamic range	Resolution: 0.02nm	60dB(peak ±0.2nm，Typ.65dB) , 46dB(peak ±0.1nm,Typ.50dB)
	Resolution: 0.05nm	76dB(peak ±1.0nm，Typ.78dB) , 65dB(peak ±0.4nm,Typ.70dB) , 52dB(peak ±0.2nm,Typ.55dB)
	Resolution: 0.1nm	65dB(peak ±0.4nm，Typ.68dB) , 50dB(peak ±0.2nm,Typ.55dB)
Stray light suppression rate		80dB
Light return loss		35dB (When the APC connector is used)
Applicable optical fiber		SM(9.5/125um) , GI(50/125um, 62.5, 125um) , large core fiber (Max. 200um)
Optical source output option		Standard calibration optical source, DFB/FP optical source (standard 1550nm, other wavelengths optional), SLED optical source (band range optional) Other optical source accessories can be customized

Appendixes

Annex A Zoom table of SCPI commands

Table 1 Zoom table of SCPI commands (See relevant program control manual for specific instructions)

Index	Command	Function
1	*CLS	State resetting
2	*ESE	Event status enabling
3	*ESR?	Event status enabling registration
4	*IDN?	Query instrument version
5	*OPC	Operation completion command
6	*OPT?	Query definition option
7	*RST	Restart
8	*SRE	Service Request Enable
9	*STB?	Query status byte
10	*TST?	Query self-measurement result
11	*WAI	Wait
12	ABORt	Terminate all sweeping
13	:CALCulate:ANAlysis:CLEAr	Clear analysis marker
14	:CALCulate:CATegory	Sets or asks for the current type of analysis method
15	:CALCulate:DATA?	Query analysis results
16	:CALCulate:DATA:CGAin?	Query GAIN of optical amplification analysis
17	:CALCulate:DATA:CNF?	Query NF of optical amplification analysis
18	:CALCulate:DATA:CPOWers?	Query power results of WDM analysis and optical amplification analysis
19	:CALCulate:DATA:CSNR?	Query SNR results of WDM analysis and optical amplification analysis
20	:CALCulate:DATA:CWAVelengths?	Query wavelength results of WDM analysis and optical amplification analysis
21	:CALCulate:DATA:NCHannels?	Query channel number of WDM analysis and optical amplification analysis

22	:CALCulate[:IMMediate]	Perform analysis
23	:CALCulate[:IMMediate]:AUTO	Query or set whether automatic analysis is performed
24	:CALCulate:LMARKer:AOFF	Clear all line markers
25	:CALCulate:LMARKer:SRANge	Set or query whether to enable searching between line markers A&B.
26	:CALCulate:LMARKer:SSPan	Set sweeping width to be between line markers A and B
27	:CALCulate:LMARKer:SZSPan	Set the display width between line markers A and B
28	:CALCulate:LMARKer:X	Set or query the position of line markers A or B
29	:CALCulate:LMARKer:Y	Set or query the position of line markers C or D
30	:CALCulate:MARKer:AOFF	Clear all marker points
31	:CALCulate:MARKer:AUTO	Set or query auto search
32	:CALCulate:MARKer:MAXimum	Search wave peaks in the current sweep range
33	:CALCulate:MARKer:MAXimum:LEFT	Search left for the next peak
34	:CALCulate:MARKer:MAXimum:RIGHt	Search right for the next peak
35	:CALCulate:MARKer:MAXimum:SCENter	Set the wave peak value in the current sweep range to the mean wavelength of the next scan
36	:CALCulate:MARKer:MAXimum:SCENter:AUTO	Set or query whether to set the wave peak value in the current sweep range to the mean wavelength of the next scan
37	:CALCulate:MARKer:MAXimum:SRLevel	Set the energy level corresponding to the wave peak value in the current sweep range to the reference level for the next scan
38	:CALCulate:MARKer:MAXimum:SRLevel:AUTO	Set or query whether to automatically set the energy level corresponding to the wave peak value in the current sweep range as the reference level for the next scan
39	:CALCulate:MARKer:MAXimum:SZCenter	Set the energy level corresponding to the wave peak value in the current sweep range to the mean wavelength of the next sweep range
40	:CALCulate:MARKer:MINimum	Search the troughs of the sweep

Annex A Zoom table of SCPI commands

		curve and display markers at the troughs
41	:CALCulate:MARKer:MINimum:LEFT	Search left for the nearest trough
42	:CALCulate:MARKer:MINimum:RIGHt	Search right for the nearest trough
43	:CALCulate:MARKer:SCENter	Set the free marker wavelength value to the mean wavelength of the scan
44	:CALCulate:MARKer:SRLevel	Set the energy level value of the free marker point to the reference energy level of the scan
45	:CALCulate:MARKer[:STATe]	Query or set the status of a free marker point
46	:CALCulate:MARKer:SZCenter	Set the free marker to the mean wavelength of the current display interface
47	:CALCulate:MARKer:X	Set or query a marker wavelength value
48	:CALCulate:MARKer:Y?	Set the marking point power value
49	:CALCulate:MATH:TRC	Set or query calculation formula of curve C
50	:CALCulate:MATH:TRF	Set or query formula for curve F
51	:CALCulate:MATH:TRG	Set or query formula for curve G
52	:CALCulate:PARameter[:CATegory]:DFBLd	Set or query parameters for analysis of DFB-LD optical source
53	:CALCulate:PARameter[:CATegory]:FPLD	Set or query parameters for analysis of FP-LD optical source
54	:CALCulate:PARameter[:CATegory]:LED	Set or query parameters for analysis of LED optical source
55	:CALCulate:PARameter[:CATegory]:NF:AALGo	Set or query parameters of ASE optical amplification analysis algorithm
56	:CALCulate:PARameter[:CATegory]:NF:FALGo	Set or query type of fitting algorithm applied to ASE optical amplification analysis algorithm
57	:CALCulate:PARameter[:CATegory]:NF:FARea	Set or query fitting bandwidth for light amplification analysis algorithm
58	:CALCulate:PARameter[:CATegory]:NF:FITCurve	Set or query whether or not to display curves applied to light amplification analysis algorithms

59	:CALCulate:PARameter[:CATegory]:NF:IOFFset	Set or query input optical power migration applied to optical amplification analysis algorithm
60	:CALCulate:PARameter[:CATegory]:NF:MAREa	Set or query masking bandwidth applied to light amplification analysis algorithm
61	:CALCulate:PARameter[:CATegory]:NF:OOFFset	Set or query input optical power migration applied to optical amplification analysis algorithm
62	:CALCulate:PARameter[:CATegory]:NF:TH	Set or query power threshold of optical amplification analysis algorithm detection channel
63	:CALCulate:PARameter[:CATegory]:NF:RBWidth	Set or query optical amplification analysis algorithm resolution
64	:CALCulate:PARameter[:CATegory]:NOTCh:K	Set or query K value in notch analysis
65	:CALCulate:PARameter[:CATegory]:NOTCh:TH	Set or query threshold in notch analysis
66	:CALCulate:PARameter[:CATegory]:NOTCh:TYPE	Set or query types of tests in notch analysis
67	:CALCulate:PARameter[:CATegory]:SMSR:MODE	Set or query side mode rejection ratio test type
68	:CALCulate:PARameter[:CATegory]:SWENvelope:TH	Set or query threshold in envelope analysis
69	:CALCulate:PARameter[:CATegory]:SWNdb:TH	Set or query threshold in NdB loss
70	:CALCulate:PARameter[:CATegory]:SWPKrms:K	Set or query K value in root mean square analysis
71	:CALCulate:PARameter[:CATegory]:SWPKrms:TH	Set or query threshold value in root mean square analysis
72	:CALCulate:PARameter[:CATegory]:SWTHresh:TH	Set or query threshold in threshold analysis
73	:CALCulate:PARameter[:CATegory]:WDM:FALGo	Set or query fitting types in WDM analysis
74	:CALCulate:PARameter[:CATegory]:WDM:IRANge	Set or query power integral range in WDM analysis
75	:CALCulate:PARameter[:CATegory]:WDM:MAREa	Set or query masking bandwidth in WDM analysis
76	:CALCulate:PARameter[:CATegory]:WDM:NALGo	Set or query types of noise algorithms in WDM analysis
77	:CALCulate:PARameter[:CATegory]:WDM:NAREa	Set or query noise bandwidth in WDM analysis
78	:CALCulate:PARameter[:CATegory]:WDM:OSLope	Set or query whether curves are displayed in WDM analysis

Annex A Zoom table of SCPI commands

79	:CALCulate:PARameter[:CATegory]:WDM:RCH	Set or query reference peak index in WDM analysis
80	:CALCulate:PARameter[:CATegory]:WDM:SPOWer	Set or query types of power tests in WDM analysis
81	:CALCulate:PARameter[:CATegory]:WDM:TH	Set or query intercepted power in WDM analysis
82	:CALCulate:PMARker:AOFF	Clear all peak search tags
83	:CALCulate:PMARker:LEVel?	Query the power corresponding to the peak value after the search
84	:CALCulate:PMARker:WAVelength?	Query the wavelength corresponding to the peak value after the search
85	:DISPlay[:WINDow]:OVIew:POSition	Set or query relative position of the thumbnail box
86	:DISPlay[:WINDow]:OVIew:SIZE	Set or query relative size of thumbnail box
87	:DISPlay[:WINDow]:OVIew:SWITch	Set or query whether the thumbnail box is displayed
88	:DISPlay[:WINDow]:TRACe:X[:SCALe]:CENTer	Set or query whether to display the mean wavelength in the X direction of the interface
89	:DISPlay[:WINDow]:TRACe:X[:SCALe]:INITialize	Set the display to its original unscaled state
90	:DISPlay[:WINDow]:TRACe:X[:SCALe]:SMSCale	Set the display interface to the state of next scan
91	:DISPlay[:WINDow]:TRACe:X[:SCALe]:SPAN	Set or query display bandwidth
92	:DISPlay[:WINDow]:TRACe:X[:SCALe]:SRANge	Set or query whether to enable search in the display range
93	:DISPlay[:WINDow]:TRACe:X[:SCALe]:STARt	Set or query whether to display the initial wavelength of the interface
94	:DISPlay[:WINDow]:TRACe:X[:SCALe]:STOP	Set or query whether the end wavelength of the interface is displayed
95	:DISPlay[:WINDow]:TRACe:Y:NMASk	Set or query noise masking value
96	:DISPlay[:WINDow]:TRACe:Y[:SCALe]:DNUMber	Set or query number of cells in the current Y direction
97	:DISPlay[:WINDow]:TRACe:Y1[:SCALe]:BLEVel	Set or query current basic energy level when the principal coordinate is the energy level represented by the linear coordinate
98	:DISPlay[:WINDow]:TRACe:Y1[:SCALe]:PDIVision	Set or query indexing value of

		the principal coordinates
99	:DISPlay[:WINDow]:TRACe:Y1[:SCALe]:RLEVel	Set or query reference energy level of the principal coordinate
100	:DISPlay[:WINDow]:TRACe:Y1[:SCALe]:RPOSition	Set or query position of the reference energy level in the principal coordinates (specific scale line)
101	:DISPlay[:WINDow]:TRACe:Y1[:SCALe]:SPACing	Set or query metrological mode of the master coordinate system
102	:DISPlay[:WINDow]:TRACe:Y2[:SCALe]:AUTO	Set or query whether energy level of the subscale is automatically adjusted
103	:DISPlay[:WINDow]:TRACe:Y2[:SCALe]:OLEVel	Set or query reference value of a subscale
104	:DISPlay[:WINDow]:TRACe:Y2[:SCALe]:PDIVision	Set or query scale value of a subscale coordinate
105	:DISPlay[:WINDow]:TRACe:Y2[:SCALe]:RPOSition	Set or query position of the subscale coordinate reference energy level
106	:INITiate[:IMMediate]	Run sweeping
107	:INITiate:SMODe	Set or query sweeping mode
108	:MMEMory:CATalog?	Query a comma-separated list of filenames in the specified path under the specified folder
109	:MMEMory:CDIRectory	Set or query save path (S6362D does not support path changing)
110	:MMEMory:CDRive	Set or query saved drive
111	:MMEMory:COPY	Copy the specified file
112	:MMEMory:DATA?	Query the contents of a specified file
113	:MMEMory:DELete	Delete the specified file
114	:MMEMory:LOAD:ATRace	Read the specified waveform file into all curves
115	:MMEMory:LOAD:TRACe	Read the specified waveform file into the specified curve
116	:MMEMory:STORe:ARESult	Save the analysis results to the specified file
117	:MMEMory:STORe:ATRace	Save all curve data to the specified file
118	:MMEMory:STORe:GRAPhics	Save the interface image to the specified file
119	:MMEMory:STORe:TRACe	Save the specified curve to the specified file
120	:SENSe:BANDwidth|:BWIDth[:RESolution]	Set or query resolution

Annex B

121	:SENSe:CORRection:RVELocity:MEDium	Set or query Wavelength mode
122	:SENSe:SENSe	Set or query sensitivity
123	:SENSe:SWEep:POINts	Set or query number of sweep sampling points
124	:SENSe:SWEep:POINts:AUTO	Set or query whether to set number of sweep sampling points automatically
125	:SENSe:SWEep:STEP	Set or query sampling interval for sweep tests
126	:SENSe:SWEep:TIME:INTerval	Set or query sampling interval between two sweep tests
127	:SENSe:WAVelength:CENTer	Set or query mean wavelength value of the sweep test
128	:SENSe:WAVelength:SPAN	Set or query sweep bandwidth of the sweep test
129	:SENSe:WAVelength:STARt	Set or query start wavelength of the sweep test
130	:SENSe:WAVelength:STOP	Set or query stop wavelength of the sweep test
131	:SYSTem:DISPlay[:WINDow]:TRANsparent	Set or query whether the thumbnail box is displayed
132	:TRACe:ACTive	Set or query currently selected trace curve
133	:TRACe:ATTRibute[:<trace name>]	Set or query state of a trace curve
134	:TRACe:ATTRibute:RAVG[:<trace name>]	Set or query trace curve plus the average
135	:TRACe:COPY	Copy the selected curve data to another curve
136	:TRACe[:DATA]:SNUMber?	Query the number of sampling points for the selected trace curve
137	:TRACe[:DATA]:X?	Query data on the horizontal axis of the selected trace curve
138	:TRACe[:DATA]:Y?	Query data on the vertical axis of the selected trace curve
139	:TRACe:DELete:ALL	Clear all curve data
140	:TRACe:LIST	Display list of curves
141	:TRACe:STATe	Set or query display status of the selected trace curve

Annex B