Spectral testing and analysis software

SPECTRAL TEST AND ANALYSIS

User handbook

directory

1 About this manual

1.1 Chapter description

This chapter describes the purpose of the manual and provides information on the specifications and rules of use of spectral testing and analysis software.

1.2 Getting Started

Read this section to understand the purpose and conventions of this manual, as well as to clarify the requirements you must meet before using spectral testing and analysis software.

1.2.1 Overview

The purpose of this manual is to provide easy and quick system guidance for users who have no or only partial experience with spectral testing and analysis software. The workflow is represented by actual instructions on how to use the software and equipment. These notes form a basic framework, and this user handbook includes the following topics:

- Drive installation
- Basic operations

- Application of three modes
- Accessibility features
- System settings

For maximum results, follow this manual exactly.

1.2.2 Prerequisites

In order to operate in accordance with this manual and use the software in the prescribed manner, you must:

• Have a general understanding of how computers and window systems work

• Understand the concepts related to optics

• Read and understand the chapter "1.3 Instructions and Precautions for the Safe Use of Spectrometers" in the manual

1.2.3 Uses

Spectral testing and analysis software is a set of optical software that integrates spectral acquisition and spectral analysis. The software can be used to connect FLA series spectrometers and complete the acquisition and analysis of various functions, and up to 8 spectrometers can be connected and controlled simultaneously to analyze the characteristics of various spectra based on spectral characteristics.

1.2.4 Layout conventions

Software items in the text are indicated in bold italics, and menu levels are separated by colons; For example, ***Document: New*** refers to the new command in the file menu.

Hardware items in the text are indicated in bold, for example, a **spectrometer refers to a software-connected** optical instrument.

1.3 Instructions and precautions for the safe use of the spectrometer

introduce

This chapter describes how to safely use the hardware spectrometer that comes with the software, as well as precautions.

1.3.1 Safety precautions

- Do not use in explosive atmospheres

  Do not use the instrument in places where flammable and explosive materials are placed.

  Using any circuit instrument in this environment has the potential to cause safety harm.

- Do not use in humid environments

  Do not use the instrument in a damp place.

  In this environment, it may cause corrosion of the circuit and pollution of the optical path.

- Prevent electromagnetic interference

  Use USB data cables with magnetic rings as much as possible to prevent electromagnetic interference from high-power devices, and the longer the data cable, the more likely it is to be subjected to various interferences.

- Do not use high-power laser direct light into the light port

  Do not directly test the high-power laser to avoid irreparable damage caused by laser irradiation inside the instrument, if you need to test, please scatter or attenuate the high-power laser.

1.3.2 Precautions

• After plugging in the USB cable, wait 5~10 seconds before opening the software.

• After abnormal communication, you can unplug the USB cable, stop the test and plug it back in, and wait for 5~10 seconds to ***scan the spectrometer***.

2 Install the driver

2.1 Chapter description

This chapter describes how to install the spectrometer's drive.

2.2 Precautions

- When to install the driver

  Generally, it needs to be installed when the computer is connected to the spectrometer for the first time, and there is no need to install it again after installing it once, and the driver needs to be reinstalled in the following situations:

  (1) Replace the USB port of the computer host for connection

  (2) The computer reinstalled the system

- Installation is not supported

  (1) Tablets are not supported

  (2) Installing drivers in discs is not supported

  (3) Spectrometers before 2016 (including some spectrometers from 2016) are not supported,if these years of spectrometers need to be installed with a driver, please contact our after-sales personnel to guide you to install and use correctly

2.3 Installation Steps

2.3.1 Automatic Installation

Open the software installation directory, locate and double-click the "SetupDriver.exe" executable file:

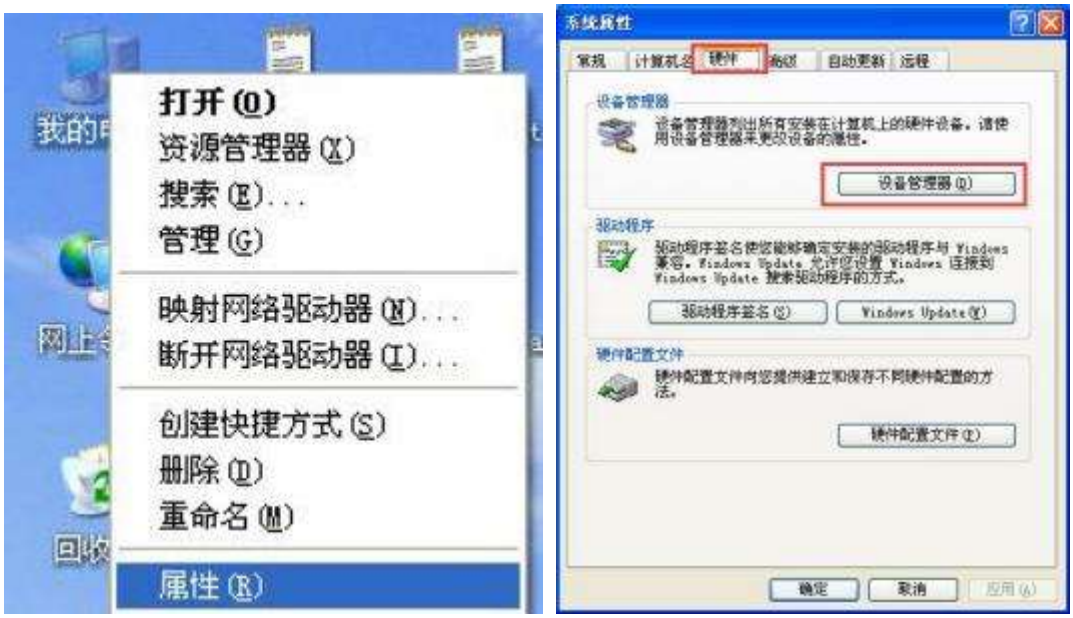
Follow the wizard for automatic installation:

2.3.2 Manual installation

2.3.2.1 Install the driver on Windows XP

The following is an example of a spectrometer with a "FLA5000" model:

(1) Right-click "My Computer" - "Properties" - "Hardware" - "Device Manager"



(2) Plug in the USB cable and connect the spectrometer to the computer, and the uninstalled USB device with a yellow question mark or exclamation mark (or display the name "USB Device") will be displayed in the device manager,right-click the device name - "Update Driver" to enter the hardware update wizard;

(3) Select "Install from the list or specified location" - "Browse" to point to the driver directory (select \Flight_WHQL\x86)click "Next" to install until the installation is successful.

2.3.2.2 Install the driver on Windows 7

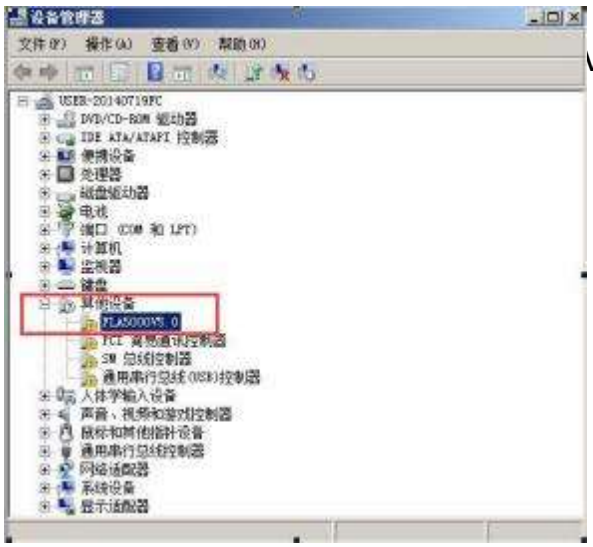
The following is an example of a spectrometer with a "FLA5000" model:

(1) Right-click "Computer" - "Properties", confirm whether it is a 32-bit or 64-bit system, and then click

Open Device Manager;

(2) Plug in the USB cable and connect the spectrometer to the computer, and it will automatically be displayed in the device manager

Display an uninstalled USB device with a yellow question mark or exclamation mark (or display name "



vice name, and select "Update

(3) Enter the update driver wizard interface, select "Browse computer to find driver program software", click "Browse", point to the corresponding driver directory (32-bit selection \Flight_WHQL\x86, 64-bit selection \Flight_WHQL\x64) according to the 32-bit or 64-bit displayed in the attributes

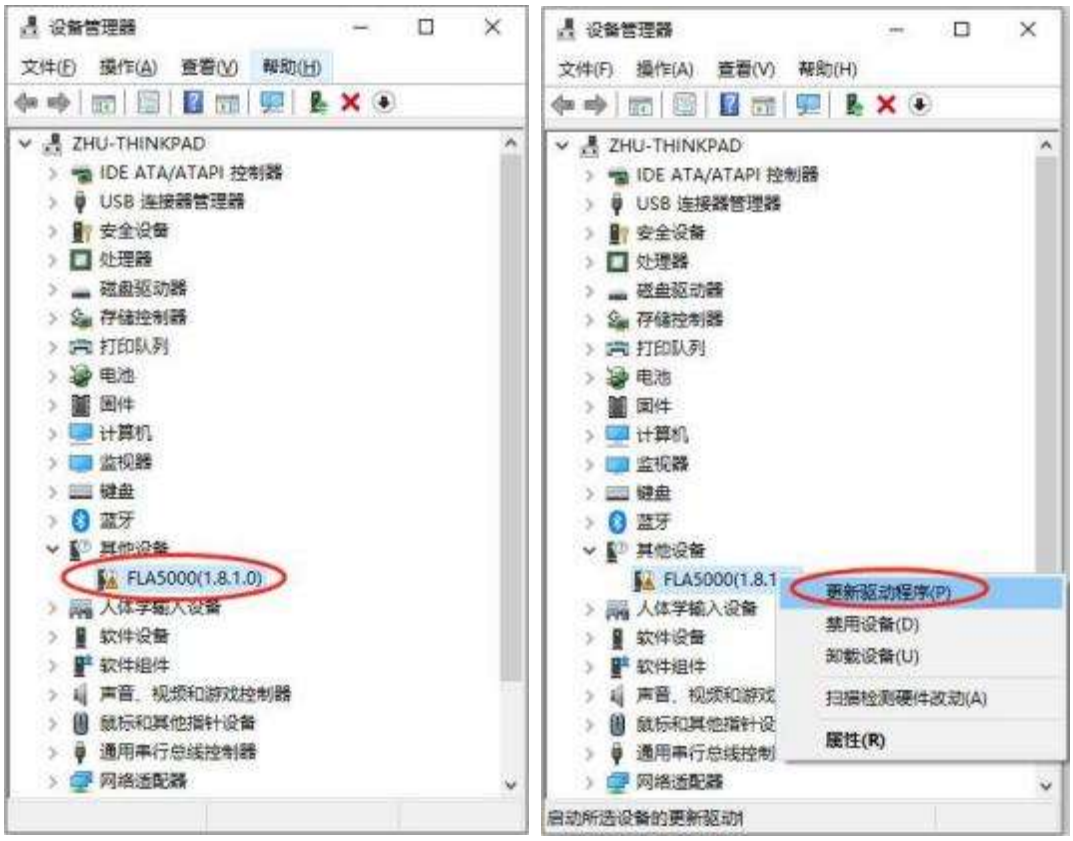
nstall until installation Succeed.

2.3.2.3 Installing the driver on Windows 10

The following is an example of a spectrometer with a "FLA5000" model:

(1) Right-click "This PC" - "Properties", confirm whether it is a 32-bit or 64-bit system, and click Open "Device Manager";

(2) Plug in the USB cable and connect the spectrometer to the computer, the uninstalled USB device with a yellow question mark or exclamation mark (or display name "USB Device") will be displayed in the device manager, right-click the device name, and select "Update Driver";



(3) Enter the update driver wizard interface, select "Browse computer to find driver software", click "Browse", point to the corresponding drive catalog (32-bit selection \Flight_WHQL\x86, 64-bit selection \Flight_WHQL\x64) according to the 32-bit or 64-bit display in the attributes in point (1), click "Nex is successful.

3 Start

3.1 Chapter description

This chapter describes how to launch the software.

3.2 Launch the software

Double-click the shortcut icon for the app on your desktop, or right-click the icon and click Open.

Find the Spectral test and analysis directory in the lower left corner of the desktop - Start - Applications list, and click the Spectral test and analysis icon in the directory.


Spectral test and analysis
最近添加
DriverSetup
最近添加
Spectral test and analysis
最近添加
Uninstall

3.3 Log in to the software

After starting the software, the login status will be displayed, including:

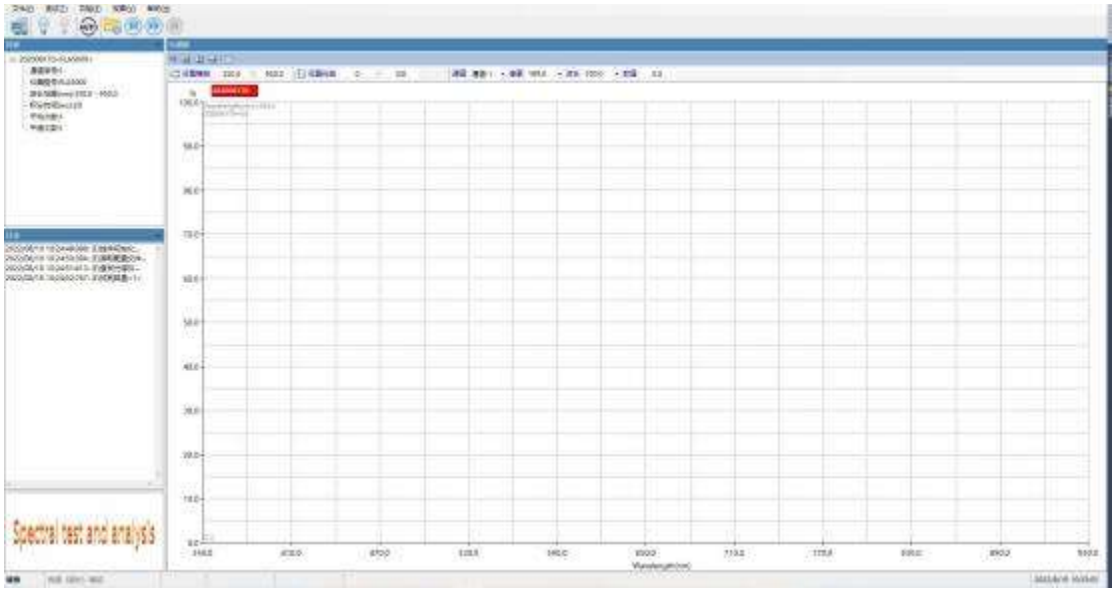
• Control initialization

• Read the configuration file

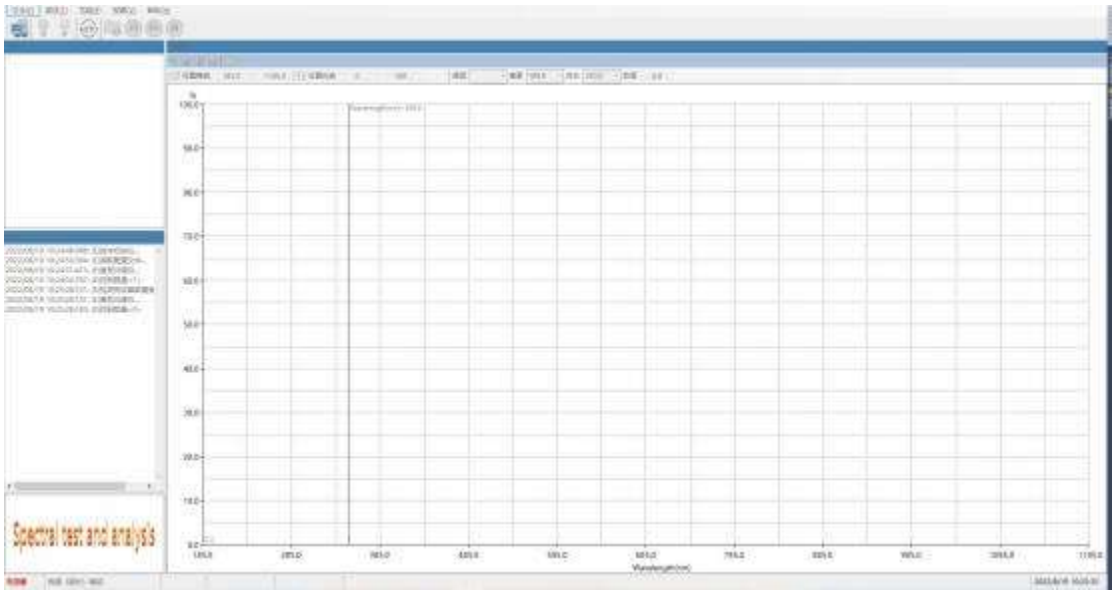
• Find a spectrometer

•countdown

The spectrometer will be displayed in the list on the left side of the software, and the status bar in the lower left corner will show that it is ready, as shown in the figure below:



If the spectrometer is not found, the status bar in the lower left corner will show the unconnected device in red font, as shown in the figure below:



3.4 Exclusion of Login Exceptions

• Login status stuck on finding spectrometer

The reason for this abnormality may be that the underlying hardware of the spectrometer is not ready after plugging in the USB data cable, and the communication jam caused by the software starting too quickly cannot be ruled out. Please carefully read and understand Chapter 1.3 Instructions and Precautions for the Safe Use of Spectrometers in the manual, and eliminate the possible causes one by one. You can open the task manager - select the software process - end the process, and restart the software after excluding relevant factors.

• Channel number 0 detected

The reason for this exception is that some old machines do not set the default channel before leaving the factory

Show the instrument to set a default channel number, operation procedure:

Click System: Instrument Properties ***- General Properties - Channel Serial Number on the software menu bar***, change 0 to 1 (if you connect multiple units, please set them in order, do not set duplicate serial numbers) and then click OK, restart the software or re-find the spectrometer to eliminate abnormalities.

- Spectrometers with the same channel number detected

The reason for this anomaly is that two spectrometers with the same channel number are connected, and the two spectrometers can be set to different channel numbers according to the suggestion, and the operation procedure is the same as above.

4 Basic operation

4.1 Section description

This chapter summarizes the basic operation functions of the software for spectral data acquisition.

4.2 Overview

This section will introduce the operation of some basic functions in the process of using the software, mastering these basic functions can use the software normally and perform some basic tests and analysis of the spectrum, this section is divided into the following 6 units:

• How is data collected?

• How do I set the acquisition conditions (integration time, average number of times, number of smoothing times)?

• How do I adjust the range of the horizontal and vertical axes?

• What if you look at the spectral intensity for a certain wavelength?

• How to view and export spectral data?

• How do I remove dark noise backgrounds?

• How do I switch languages?

Next, we detail the above 7 units.

4.3 Functions

4.3.1 How to collect data

This section describes how to collect spectral data in software.

4.3.1.1 Single test

A single test means that only one acquisition is carried out and the data is displayed on the map and data sheet.

• In the menu bar, Test ***(T): Single Test (S).***

• In the toolbar, click the icon

• Press the shortcut F5

4.3.1.2 Continuous testing

Continuous testing refers to the continuous cycle of data collection until the click stops the test, and the real-time refresh of each data is displayed on the graph and data table. If you want to perform continuous testing at intervals, you can ***set the continuous test interval in*** the menu bar, Test (T): Test Options (O), see 6.2 Test Options.

• In the menu bar, ***Test (T): Continuous Test (C).***

- In the toolbar, click  the icon
- Press the shortcut F6

4.3.2 How to Set Acquisition Conditions (Integration Time, Average Times, Smoothing Times)

This section describes how to set the conditions for collecting spectral data in the software, including setting the integration time, average number of times, and smoothing times.

4.3.2.1 Set the time of credit

The integration time can be understood as the exposure time, which is a manifestation of the optical signal acquisition ability of the spectrometer detector. When the light intensity is large enough, if the integration time continues to be increased, there may be saturation overflow, that is, we often say that the exposure is all white, so we should reasonably choose and set the integration time according to the incident light intensity.

Note: The integration time cannot be used as the whole of a collection cycle, and the time consumption of a collection cycle is as follows (according to the model specifications).
Related):
***•(Integration Time +3) × the average number of** times, 3 is the fixed time of the transmission • **(Integration Time +6) × the average number of times**, 6 is the fixed time of the transmission Total time error (±2ms).*

- Set by integrating time adaptively

  You can click the toolbar ***- Integration Time Adaptive*** button to automatically adjust the integration time for all channels before or during the test

Automatic adjustment of integration time for a channel spectrometer is also supported:

• Set by entering the credit time via the keyboard

Double-click the integration time under the corresponding channel in the list (as shown in the lower left figure), enter the editing state (such as the lower right figure), modify the value, and press the enter key or click the mouse at another location to complete the setting.

• Adjust the integration time without a keyboard

Select the integration time under the corresponding channel in the list (as shown in the lower left picture), and the mouse icon will change from an arrow to a scroll wheel pattern (as shown in the lower right picture), and the integration time will be modified by scrolling the mouse wheel and take effect in real time.


201407022<FLA5000>
通道序号:1
仪器型号:FLA5000
波长范围(nm):276.0 - 972.0
积分时间(ms):10
平均次数:1
平滑次数:1
202008170<FLA5000>
通道序号:2
仪器型号:FLA5000
波长范围(nm):278.0 - 972.0
积分时间(ms):10
平均次数:1
平滑次数:1
201407022<FLA5000>
通道序号:1
仪器型号:FLA5000
波长范围(nm):276.0 - 972.0
积分时间(ms):10
平均次数:1
平滑次数:1
202008170<FLA5000>
通道序号:2
仪器型号:FLA5000
波长范围(nm):278.0 - 972.0
积分时间(ms):10
平均次数:1
平滑次数:1

4.3.2.2 Set the average number of times

The average number refers to the number of spectra collected and averaged, for example, the average number is set to 10, and the average value is taken after 10 consecutive acquisitions in a single test. The larger the average time, the better the stability, but the longer the collection cycle, the average number of times should be set reasonably according to the actual situation.

- Set by typing the average number of times on the keyboard

  Double-click the average number of times under the corresponding channel in the list (as shown in the lower left figure) to enter the editing state (such as the lower right figure), modify the value, and press the enter key or click the mouse at another position to complete the setting.

- Adjust the average number of reps with no keyboard

The average number of times under the corresponding channel in the mouse selection list (as shown in the lower left figure), after selection, the mouse icon will change from an arrow to a scroll wheel pattern (as shown in the lower right figure), and the average number of times will be modified by scrolling the mouse wheel and take effect in real time.

4.3.2.3 Set the number of smoothing times

The number of smoothing times refers to the smoothing algorithm of the spectral acquisition pattern to make the noise removal glitch smoother. Because the larger the number of smoothing, the smoother the figure, so it is recommended to set it too high when detecting the feature peak, it is recommended to set it by default 1 time, otherwise the peak tip will be flattened, which will interfere with the analysis, so we should set the number of smoothing times reasonably according to the test object.

- Set by entering the number of smooths on the keyboard

Double-click the number of smoothing times under the corresponding channel in the list (as shown in the lower left picture) to enter the editing state (such as the lower right figure)

modify the value and press the enter key or click the mouse at other positions to complete the setting.

- Adjust the number of smoothing reps with no keyboard

Select the number of smoothing times under the corresponding channel in the list (as shown in the lower left figure)and the mouse icon will change from an arrow to a scroll wheel pattern (as shown in the lower right figure)and the smoothing number will be modified by scrolling the mouse wheel and take effect in real time.

4.3.3 How to adjust the range of the horizontal and vertical axes

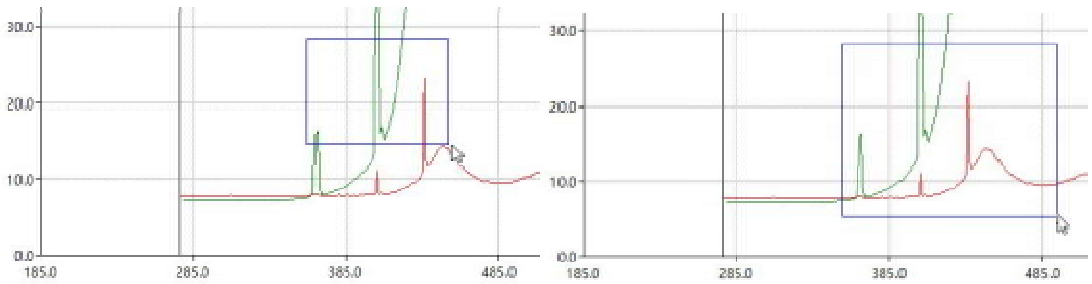
This section describes the adjustment of the horizontal and vertical axis ranges in a spectral pattern.

• Adjust by modifying the horizontal and vertical axis values on the toolbar

The toolbar, ***set the horizontal axis or set the value on the right side of the vertical axis is the corresponding display range,*** after modifying the value, click the Set Horizontal Axis or Set Vertical Axis button to take effect or press the enter key to take effect.

• Adjust the horizontal and vertical axis ranges by delimiting the range with the left mouse button

In the graphic area, hold down the left mouse button from the upper left of the target area and slide to the lower right of the target area, and the graphic will automatically be displayed as the target area after releasing the mouse. Hold down the left mouse button from anywhere in the graphics area, slide to the top left to any position, and release the mouse to automatically restore the graphics.



• Adjust the horizontal and vertical axis ranges by right-clicking the mouse button

In the graphic area, hold down the right mouse button at any position to move in any direction, and the corresponding moving range graphics are automatically displayed. Hold down the left mouse button from anywhere in the graphics area, slide to any position to the top left, and release the mouse to automatically resume the graphics.

4.3.4 How to check the spectral intensity corresponding to a certain wavelength

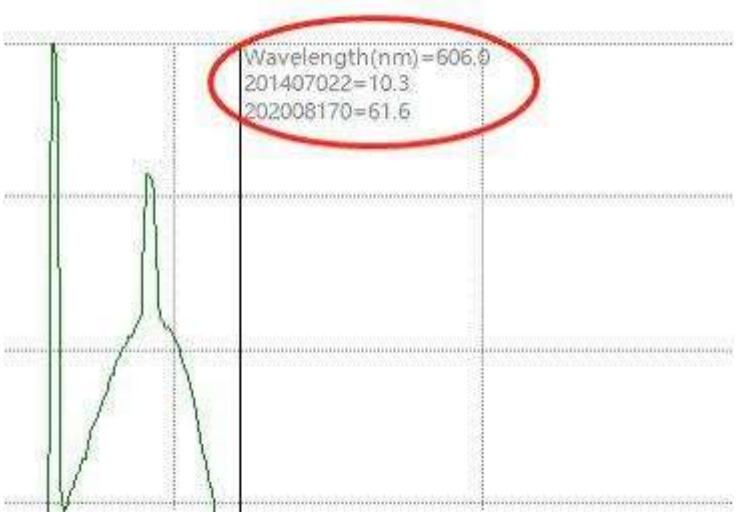
This section describes viewing the spectral intensity of a wavelength point in a spectral graph.

- View by selecting the wavelength value for the corresponding channel on the toolbar

The toolbar, select channel, select wavelength, and automatically display the spectral intensity value corresponding to the wavelength to the right of the value.

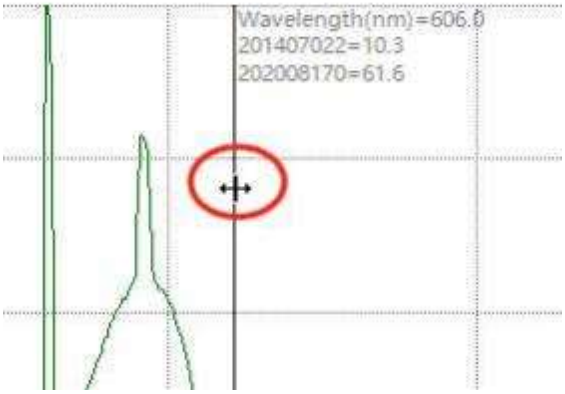
- View the graphics area by double-clicking on it with the left mouse button

In the graphics area, the left mouse button double-clicks on the corresponding wavelength position, and the spectral intensity value of the wavelength corresponding to all channels is automatically displayed above the position line.



- View by pulling the position line

Move the mouse near the position line, the mouse icon will change from an arrow to a left and right drag icon, hold down the left mouse button to pull in the left and right directions, and the wavelength value information will be automatically refreshed.



- View with the mouse wheel

  In the graphics area, scroll the scroll wheel of the mouse to see the spectral intensity values of different wavelengths.

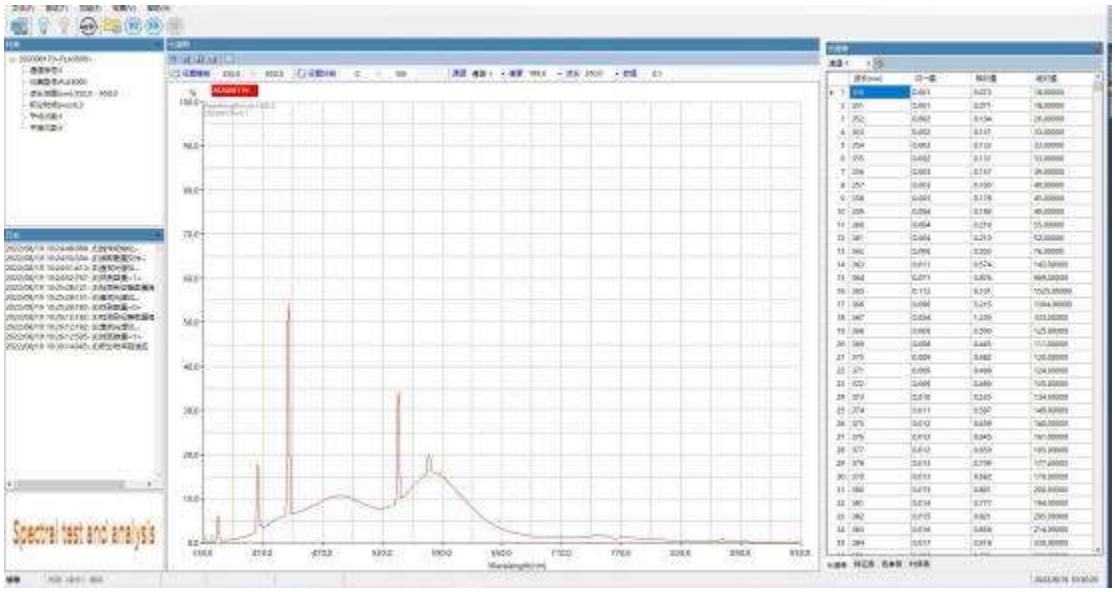
4.3.5 How to View and Export Spectral Data

This section describes viewing and exporting spectral data.

- View spectral data

In the menu bar, View ***: Spectral Table***.

The spectral data list of the corresponding channel is displayed on the right side of the spectrogram, as shown in the figure below:



Normalized value: The value calculated by normalizing the maximum value in the whole spectrum;

Relative value: the percentage relative to the set energy saturation value (spectral test mode);

Absolute value: the actual value of the full spectrum obtained (no absolute value for some modes);

• Export spectral data

In the Spectra Table toolbar, select the channel number to be exported, and click  Edit and Export to ***Excel*** to export the data of the specified channel band.

In the menu bar: ***File (F)*** ***Export Spectral Data Export all data.***

- Export spectral diagrams

In the menu bar: ***File (F)*** ***Export spectrogram Export image in JPG*** format.

4.3.6 How to remove dark noise background

This section describes the configuration for the deduction of dark noise background and the elimination of dark noise interference in spectral testing.

- Elimination by configuring test options

In the menu bar, ***Test: Test Options (O) - Advanced Options - Function Options***, tick Test in ***Automatically deduct dark noise***.


测试选项
基本选项
高级选项
积分时间
功能选项
测试中自动扣除暗噪声
始终填满横向（仅连接一台时有效）
列表区支持滚轮设置参数
显示运行耗时
禁用外触发模式切换
开启实时检测设备连接情况
测试色参相关参数
计算红色比波长范围（nm）：
595
780
计算绿色比波长范围（nm）：
490
595
计算蓝色比波长范围（nm）：
380
494
计算ASD的波长范围（nm）：
400
500
计算
辐射通量(W)
波长范围（nm）：
380
780
图谱参数（仅连接一台时自动更新）
能量饱和值:
25002
确定(O)
取消(C)

• Elimination by configuring instrument properties

In the menu bar, ***System: Instrument Properties (E),*** select Advanced Configuration under the corresponding channel, and change the ***status of Auto Deduction to Zero to On (1).***

Note: Permissions are required for the operation of instrument properties.

4.3.7 How to Switch Languages

This section introduces the display language of the switching software, and there is no need to restart the software after switching, just continue to use it, in Help:Language ***(L),*** as shown in the figure below:


文件(F)
测试(T)
功能(F)
视图(V)
帮助(H)
AUTO
用户手册(M)
语言(L)
远程协助(R)...
关于(A)...
中文(C)
English
列表
202008170<FLA5000>
通道序号:1

5 Application of the three modes

5.1 Section description

This chapter introduces the application of three modes in spectral testing, namely photocolor testing, transmission testing, and absorption testing, which cover most applications in spectrometer applications, such as LED detection, environmental water quality, food safety, and biological fields.

5.2 Overview

In the menu bar, ***Test: Test Mode (M),*** switch the corresponding mode, and display the words of each mode in the lower left corner of the status bar. The relevant applications of the three models are as follows:

• Light color testing: Light source detection that tests luminosity and chromaticity parameters, such as LED detection

• Transmission test: Tests that test transmittance or reflectance, such as thin-film lenses

• Absorption test: Tests that require absorbance testing, such as water quality, pesticide residues and nucleic acid testing

Next, we will introduce the above three modules in detail.

5.3 Three major mode applications

5.3.1 Light color test

This section describes how to detect the absolute spectrum of a light source and calculate and display the parameters of the relevant optics and colorimetry. Before the light color test, you need to switch to ***Light*** Color Test in the menu bar***, Test: Test Mode (M),*** and display the words in the lower left corner of the status bar 光色测试. This section is divided into the following 2 units:

• Spectral calibration

• Light color test

Next, we detail the above 2 units

5.3.1.1 Spectral calibration

This section introduces the function description of spectral calibration, which is not a prerequisite for the normal operation of the software, but affects the accuracy of calculating light color parameters. **There are three main situations in which spectral calibration is required:**

• Before the first use of the light color test

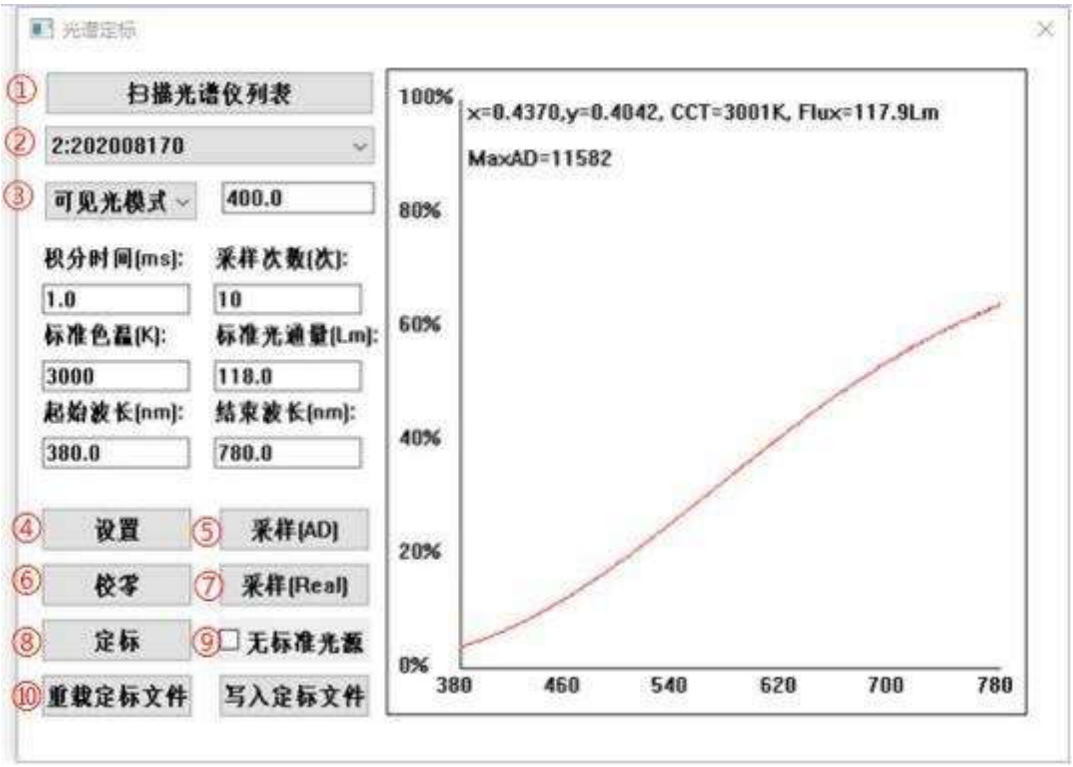
• After moving supporting devices (e.g. integrating spheres, optical fibers, etc.)

• The influence of environmental changes (such as temperature, dust in the sphere, etc.).

In a relatively constant temperature and dust-free laboratory environment, if the entire facility is not moved after one calibration, the accuracy of the light and color parameters can be maintained for three months or more, and there is no need to recalibrate during this period.

5.3.1.1.1 Procedure

This section introduces and explains the spectral calibration function by using a standard halogen light source (tungsten lamp) to calibrate the visible light band as an example.



- List of scanning spectrometers

Serial number (1), the ***scanning spectrometer list refers to the scanning search of the spectrometers currently connected to the computer***, and the channel number and number of all spectrometers will be displayed in the drop-down box below after scanning all connected spectrometers.

- Select the spectrometer to calibrate

Serial number (2), after scanning the spectrometer list, select the spectrometer in the drop-down box, for example, there are two spectrometers currently connected, the channel numbers are 1 and 2 respectively, now you want to calibrate

the spectrum for channel 1, then select ***1:*** the corresponding option in the drop-down box.

- Select the calibration mode

  Serial number (3), there are five calibration modes as follows:

  - No scaling coefficients: No coefficients
  - Visible mode: uses the visible light scaling factor
  - UV mode: uses UV light scaling coefficients

• Mixed mode and normalization at the set visible wavelength: Mix the visible light calibration coefficient and the ultraviolet light calibration coefficient, and normalize the values corresponding to the set visible wavelength in the middle

• Mixed mode and normalization by set UV wavelength: Mix the visible light calibration coefficient and the UV light calibration coefficient, and normalize the values corresponding to the set UV wavelength in the middle

•Set up

Serial number (4), fill in the standard luminous flux and standard color temperature of the standard light source into the corresponding text box, if the spectral calibration is to calibrate the visible light, then set the band range to 380nm~780nm, the number of sampling times is set 10 times, the integration time is set according to the spectral ***intensity obtained by sampling (AD), the*** spectral intensity range is required to be between 40%~95% (as long as the spectral intensity is greater in the range, the better), if it is lower than 40%, the integration time is increased, if it is higher than 95%, the integration time is reduced. All parameters need to be re-clicked ***on the Settings button to take effect after modification.***

• Sampling (AD)

Serial number (5), ***sampling (AD)*** is the collection of spectral intensity, that is, spectral data without calibration coefficient, when the calibration is not calibrated or calibrated correctly, the integration time must be adjusted by sampling (***AD),*** otherwise the user may affect the judgment when setting the integration time.

• Proofreading zero

Serial number (6), ***the calibration of zero is to deduct the dark noise,*** which must be operated under the condition of turning off the lights or opening the shutter to block the light, and theoretically should be re-calibrated after modifying the integration time, because the dark noise will also increase or decrease to varying degrees under different integration times.

• Sampling (Real)

Serial number (7), after completing the above operations, click the Sampling (***Real)*** button to collect and calibrate

The measured color temperature is within the range of standard color temperature ±6K, and the **measured luminous flux is within the range of ± 1% of the standard luminous flux**, indicating that the calibration is valid. *Note: If the scale is not determined in the integrating sphere, the measured data may have a relatively large deviation.*

- Calibration

Serial number (8), ***calibration is the operation of calibrating the software after lighting up the standard light source.*** *Note:*

The standard light source must be stable for 5~15 minutes after lighting (the stabilization time can be extended in the case of cold environment in winter) before calibration ***can be carried out.***

- No standard light source

Serial number (9), the software provides an auxiliary function that can be calibrated without a standard light source, after checking ***no standard light source, only need to modify the standard color temperature and then click calibration to complete the spectral calibration,*** during which there is no need to light up the standard light source. *Note: This function is only used in visible light mode, and the prerequisite is that the current spectrometer has been calibrated once with a standard light source on the current computer software.*

- Reload and write the bidding file

Serial number (10), after completing the spectral calibration, the calibration file content can be written to the

spectrometer memory EEPROM, and when the spectrometer is connected to other computers, the calibration file content stored in EEPROM can be re-read and overwritten in the current computer software directory. *Note: In this way, direct light color testing cannot guarantee absolute accuracy, if there are high requirements for test data, the standard light source should be re-calibrated after the installation of the whole set of instruments (including optical fibers, integrating spheres, etc.).*

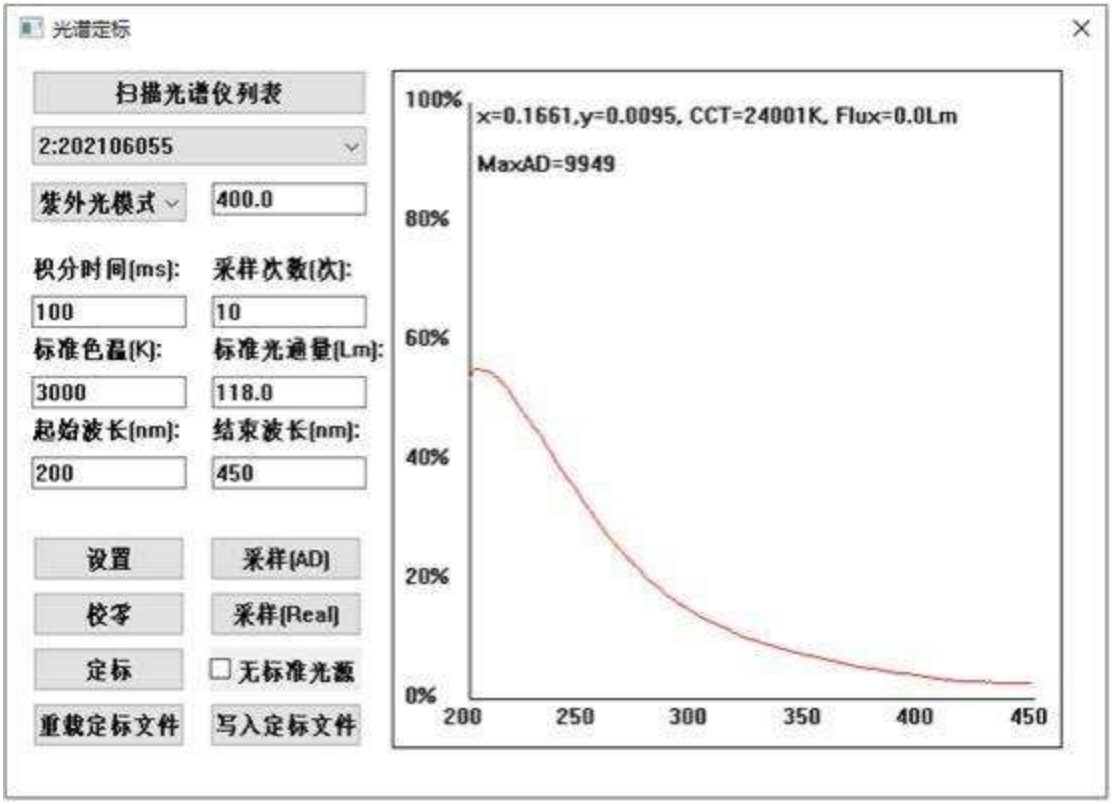
5.3.1.1.2 Ultraviolet light calibration

This section describes spectral calibration of the UV band using a deuterium lamp source. The following four points should be paid attention to when calibrating ultraviolet spectroscopy:

- The spectrometer needs to contain the 200nm~450nm band
- The calibration mode of the spectrometer needs to be switched to UV mode

• The spectral calibration interface band range needs to be set to 200 and 450

• The software spectrometer number directory must include: \Calibration\UVstd.txt



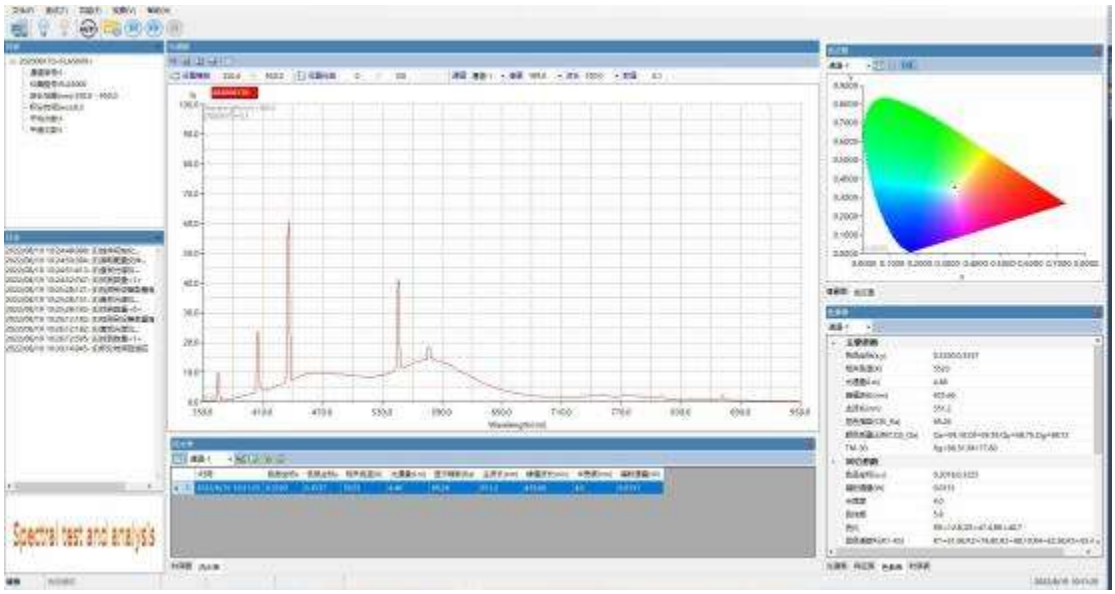
5.3.1.2 Light color test

This section describes the light color test and the definition of the corresponding light color parameters. The prerequisite for light color test is that the spectral calibration has been completed, and if the light color parameters are wrong, the spectral calibration can be considered again.

• Switch mode, in the menu bar, ***Test (T) - Test Mode (M): Light Color Test***

And in the status bar:

The software interface will display the relevant view interface, as follows:



- Single test vs. continuous test

  See 3.3.1 How to collect data.

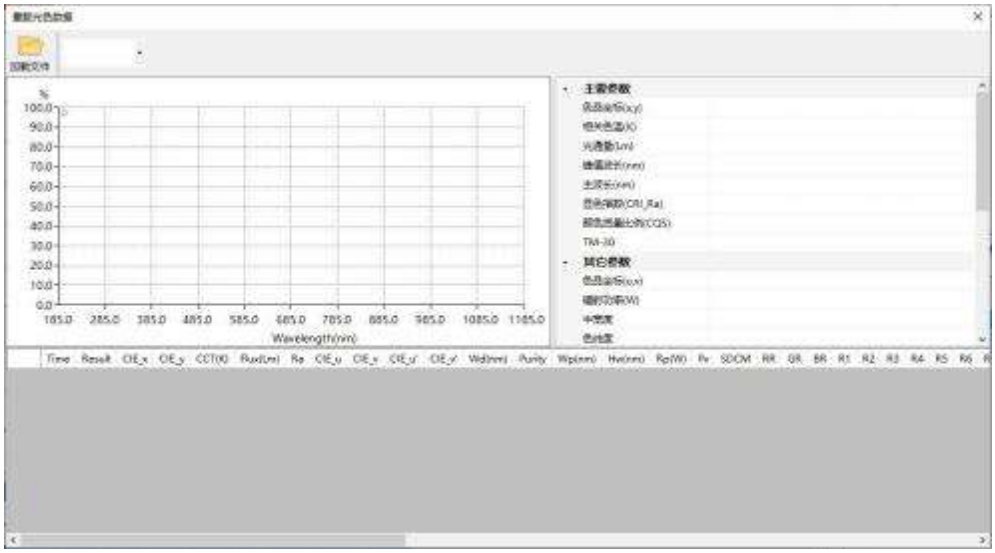
- Export the flow table and save the light color data

  Click the icon in the Schedule toolbar to export the Schedule, which contains all the light color parameters recorded for each test, and is saved in CSV format.

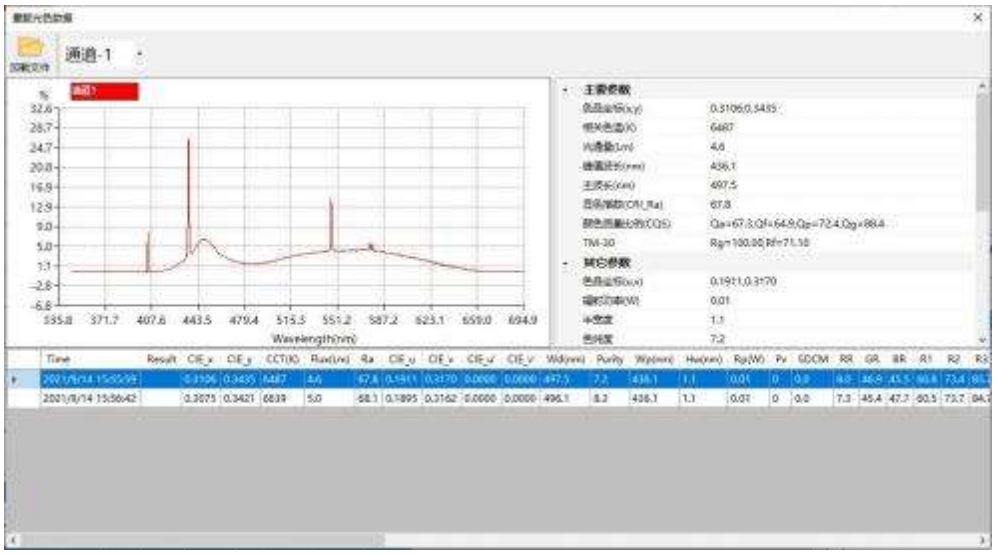
  Click Menu Bar: File ***(F) - Save Light Color Data (S) to*** save all light color parameters and spectral data, save the format as sta, and the file can be reopened through the menu bar: ***File (F) - Overload Light Color Data (L).***


文件(F)
测试(T)
功能(F)
视图(V)
帮助(H)
新建(N)
导出光谱数据(D)... Ctrl+D
导出光谱图(G)... Ctrl+G
保存光色数据(S)...
重载光色数据(L)...

The interface for overloading light color data is as follows:



Reopen the sta file by clicking on the toolbar: load file.

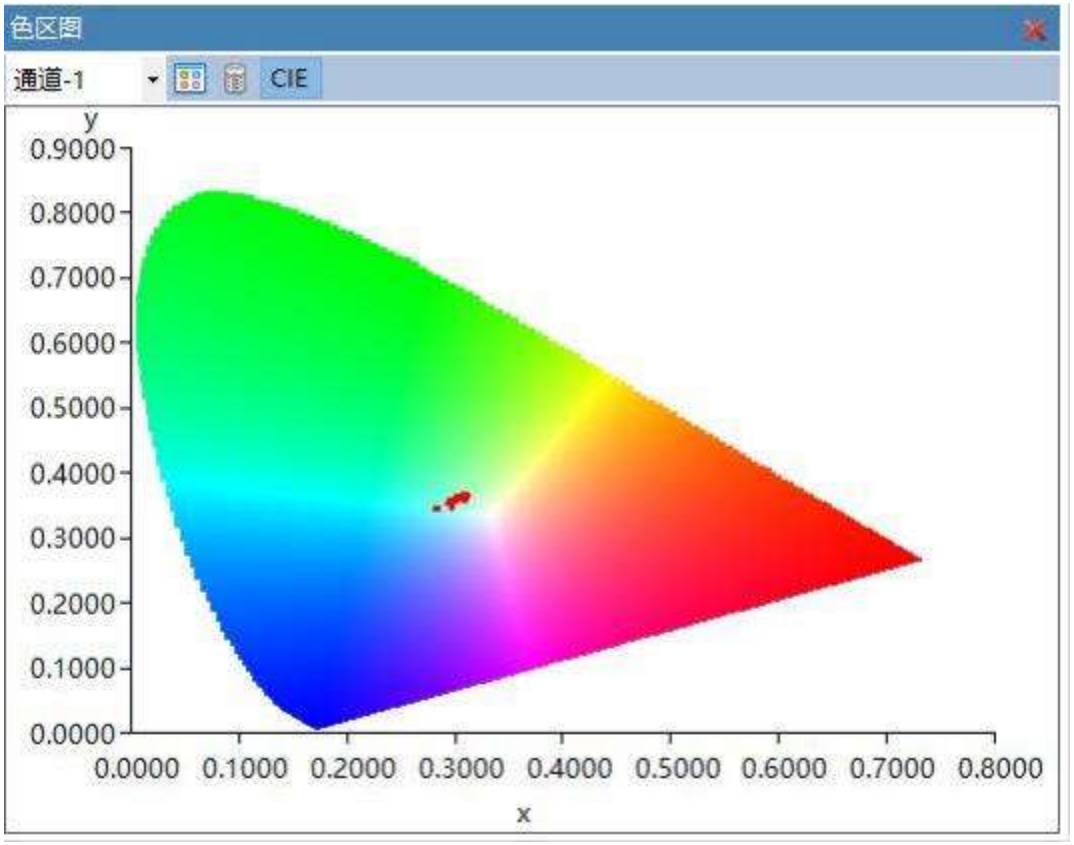


- View the color zone map

For LED light sources, especially LED white light, color coordinate xy is the most important chroma parameter, and its position can reflect the color distribution of the LED light source.

Click the icon in the color zone map toolbar CIE to display the CIE color map (CIE1931 color map)*note: when displaying the CIE color map, there will be a lag in the operation effect of the zoom color map, therefore*

For optimal operation, CIE color maps can be hidden.



- Spectral table

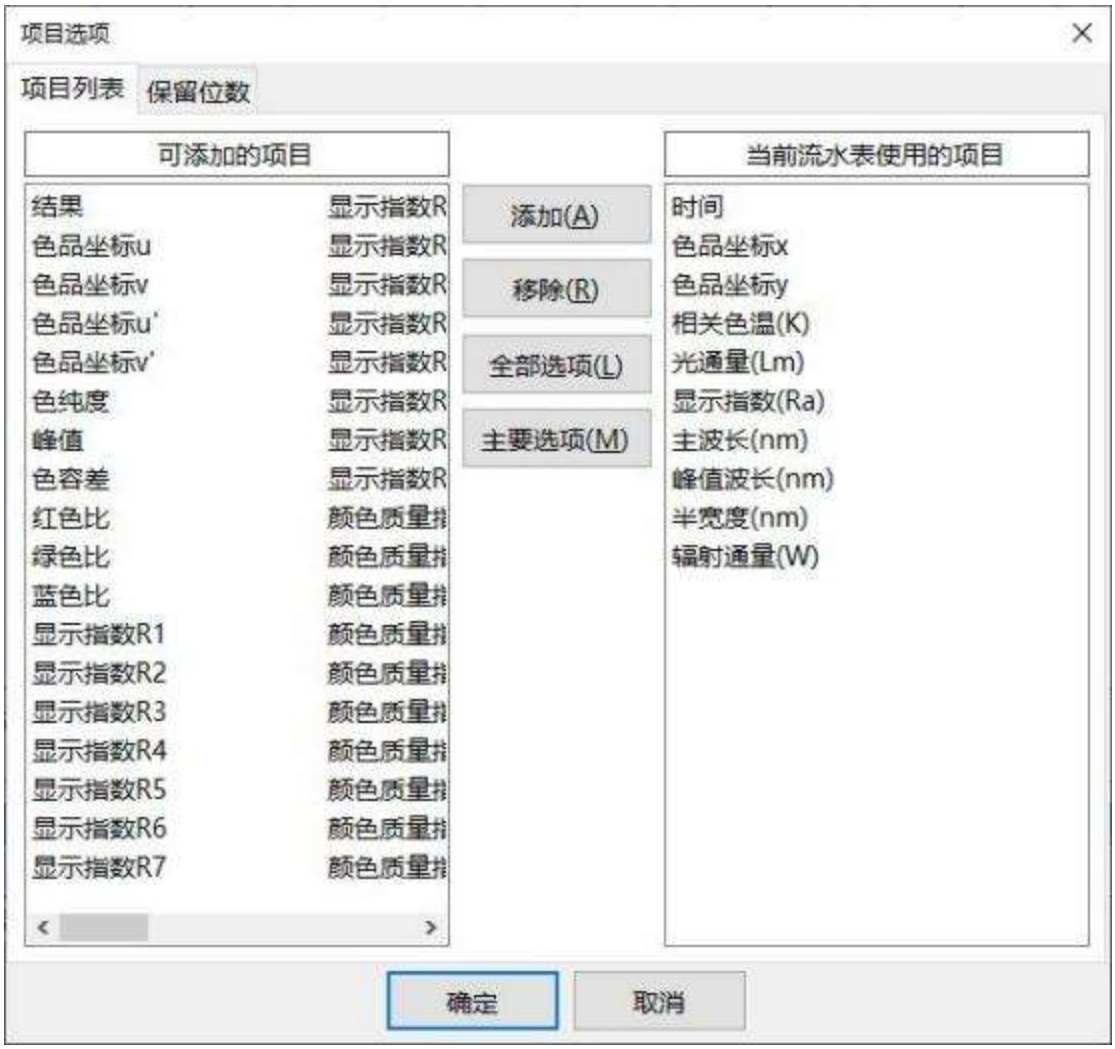
  Normalized value: The value calculated by normalizing the maximum value in the whole spectrum;

  Relative value: the percentage relative to the set energy saturation value;

  Absolute value: The obtained full-spectrum true value (can be used to calculate the chromaticity parameter);

- List of projects

  The test items in the schedule can be set to be displayed through Project Options ***- Project List, which*** opens the window ***in the Schedule Toolbar - Project Options***



Interface description:

Addable items: Indicates all project parameters that the software can test;

Items used in the current schedule: Represents the item parameters displayed in the current schedule;

Add: Add the left item to the right item;

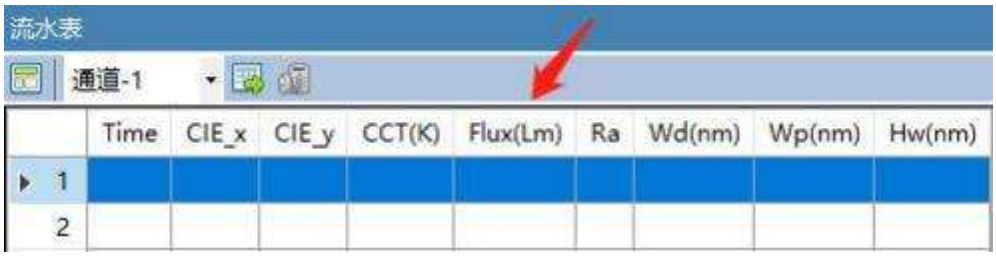
Remove: Remove the item from the list on the right;

All Options: Add all items on the left to the list on the right;

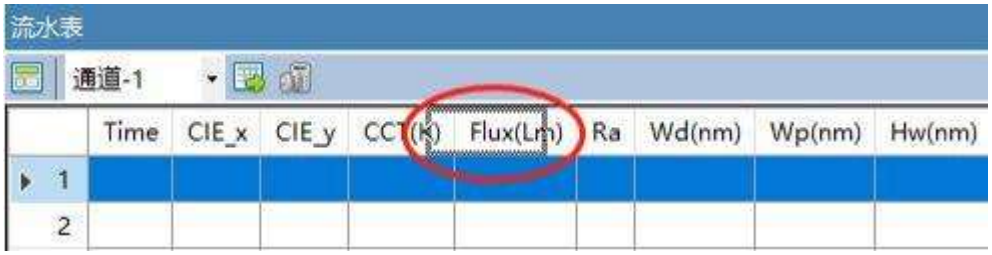
Main Options: Add the main item on the left to the list on the right;

To move an item location in a schedule:

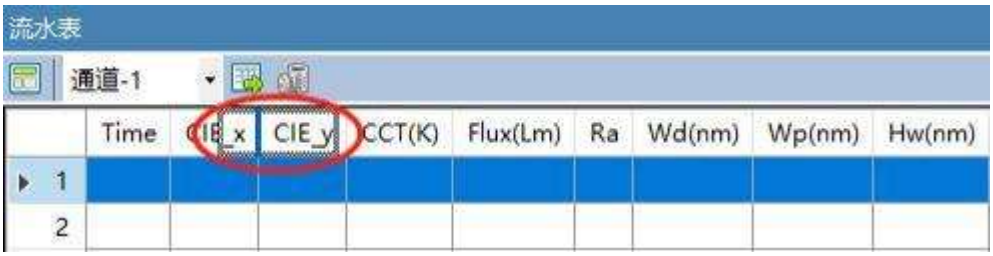
The column name of an item in the left-click flow table, for example: Flux(Lm);



When you hold down the left button to move, the mouse graphic area will turn into a light gray box.



move to the target location (a dark vertical line will appear at the location);

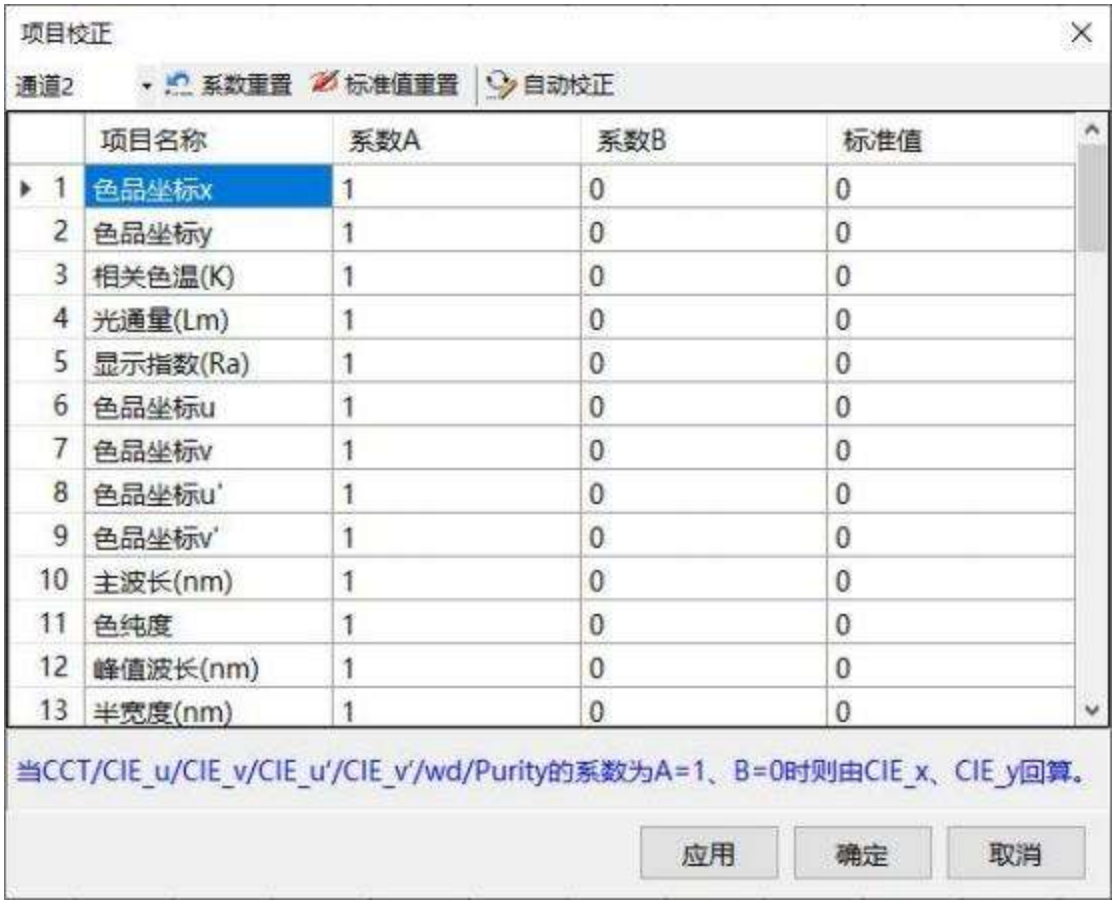


Release the mouse to complete the movement.

- Correction factor

The data of the test project can be set by the project option - ***correction coefficient to set the coefficient*** AB, the correction formula is: y=A*x+B, the default coefficient is: A=1, B=0, the software supports the color parameter correction of the multi-channel spectrometer, the coefficient can be read

or corrected by switching the channel number, there are two ways to obtain the coefficient value by manual editing and automatic correction. In the Schedule Toolbar **- *Project Correction*** opens window:



Coefficient Reset: Resets coefficient A to 1 and coefficient B to 0;

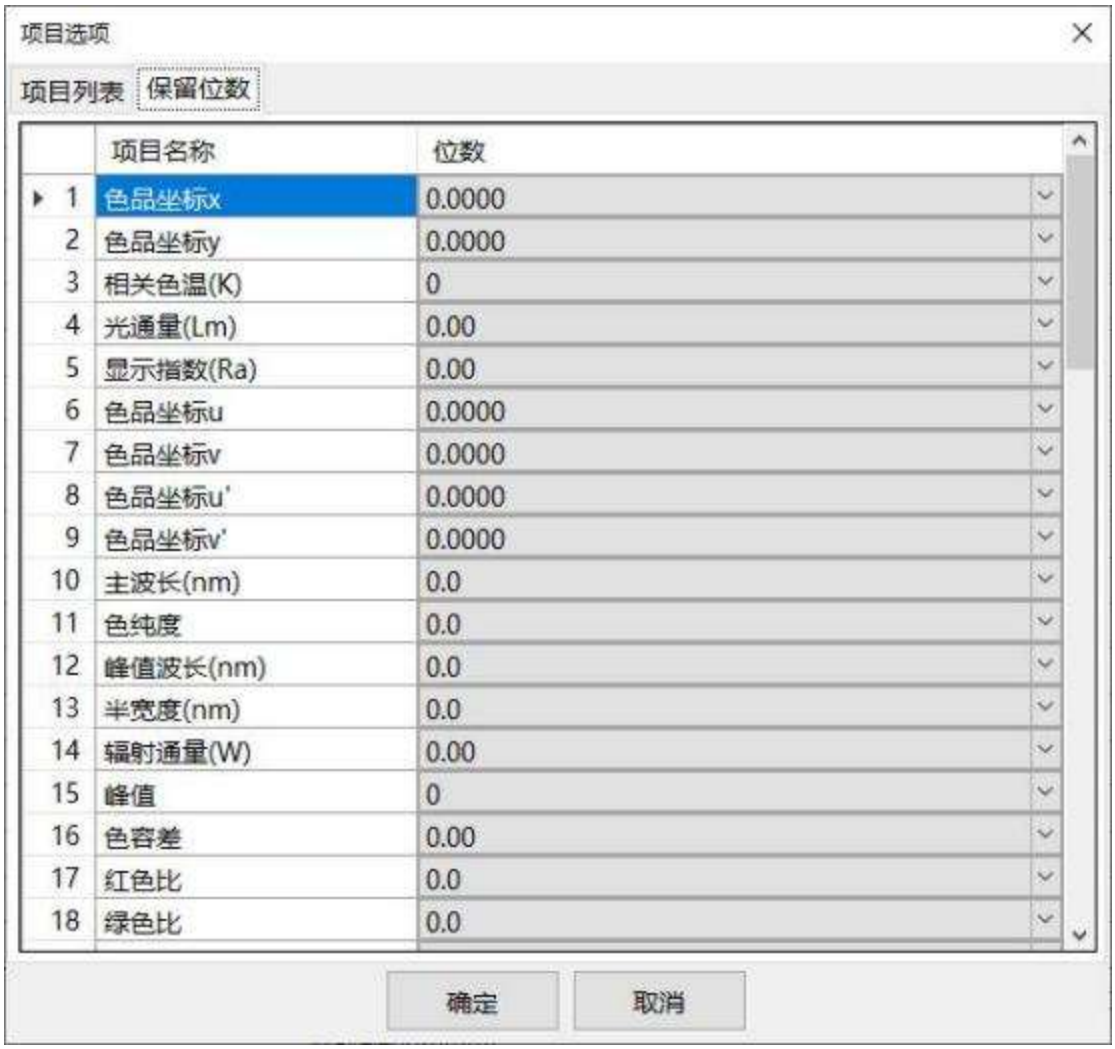
Standard Value Reset: Resets the standard value to 0;

Automatic correction: automatically collect a spectrum and calculate the color parameters, display the measured values in the main boundary, and calculate the coefficient AB according to the standard value, except for the luminous flux and radiation flux calculated by multiplication and division coefficient A, all other color parameters are calculated by addition and subtraction coefficient B, when the standard value is 0, it is not calculated;

Note: When the coefficients of CCT, CIE_u, CIE_v, CIE_u', CIE_v', Wd, and Purity are A=1, B=0, their test results are calculated by CIE_x, CIE_y.

• Number of reserved digits

The data retention position of the test project can be set through the project option ***- number of reserved digits, and the maximum support is to*** keep five decimal places after the decimal point, and open the window in the schedule toolbar ***- project options***



5.3.2 Transmission test

This section describes how to test transmittance and reflectivity. Before the test, you need to switch to ***Transmission Test in the menu bar, Test: Test Mode (M),*** and display the words in the lower left corner of the status bar 透射测试 . When the transmission test mode is selected, the data display mode is automatically switched to the relative value.

- Buckle the background and make a reference

Before the transmission test, the background must be buckled and referenced. Deducting the background refers to deducting the background light (or dark noise), and using it as a reference means putting the reference object (or air) into the reference object (or air) for 100% testing. Operate in the toolbar ***- buckle background/use as reference, buckle background can be done once before the test,*** and the reference can be repeated according to the test situation.

Note: The result of the direct test should be around 100% after using it as a reference, if not, please check ***whether the graphics or intensity of the pixel map*** *(as long as the unsaturated reference light intensity is larger, the better) is normal.*

- Single test vs. continuous test

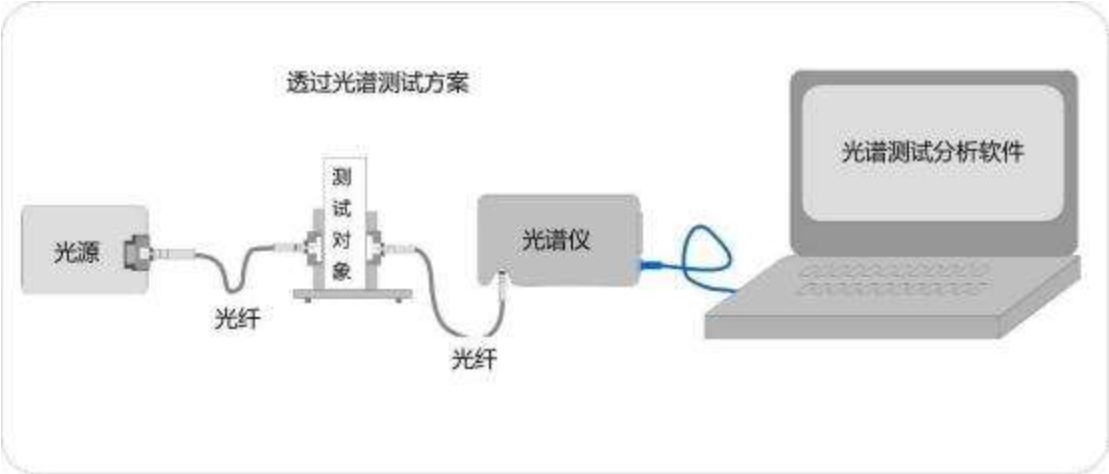
  See 3.3.1 How to collect data. The formula for transmittance and reflectance is as follows:

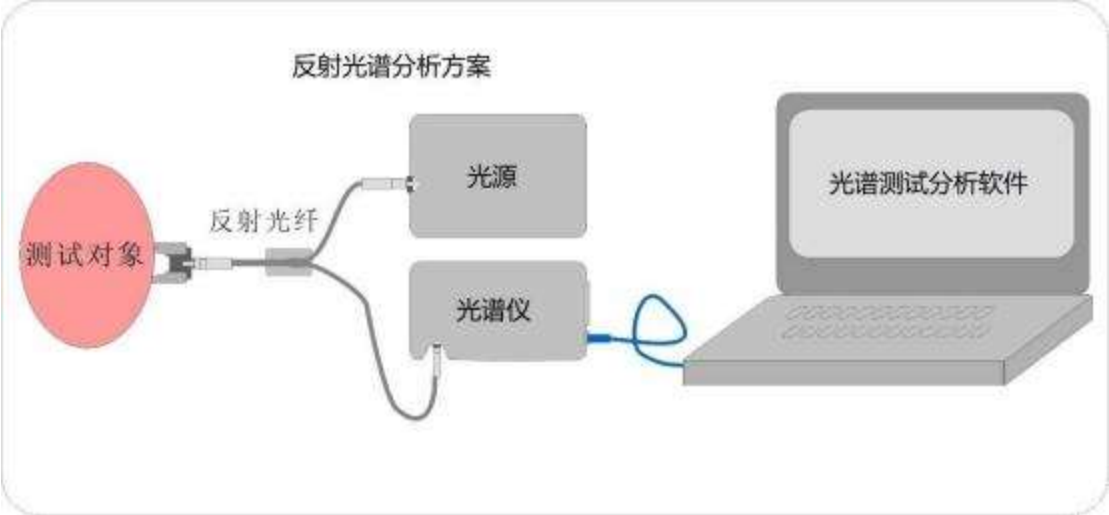
$$\%T_\lambda = \frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda} \times 100\%$$

S_λ: Indicates the sample intensity of the wavelength λ;

D_λ: Indicates the background intensity of wavelength λ;

R_λ: represents the reference strength of the wavelength λ;



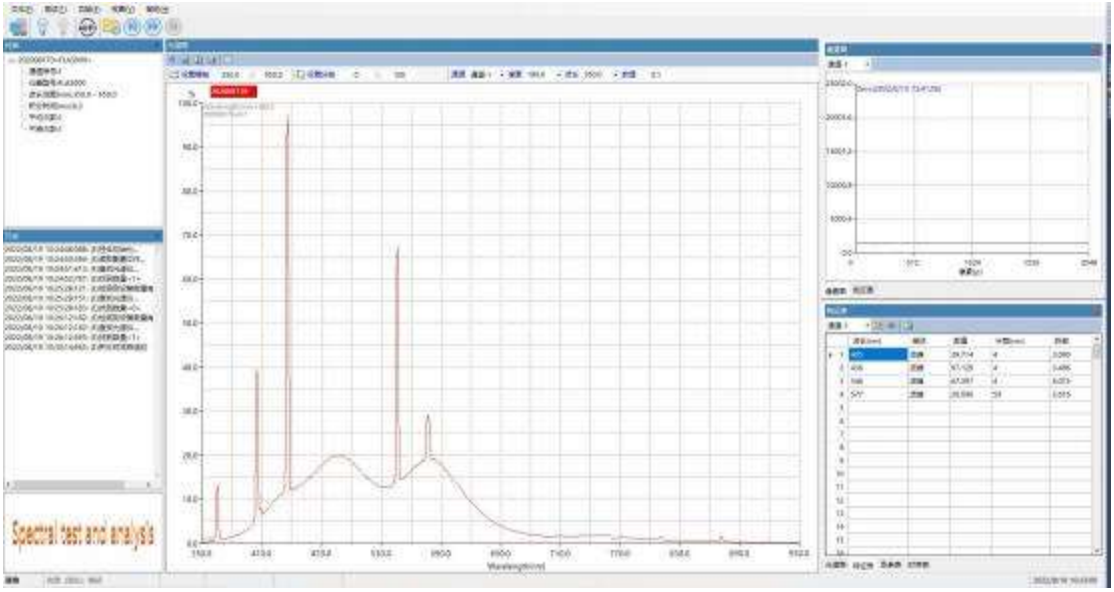


• Characterization analysis

The main features in the spectrogram are peaks and troughs, and each feature point can reflect the special composition or specific material of the sample being tested at the moment.

To display feature markers: Right-click in the spectrogram - ***Show peak and valley markers;***

To display the feature table: In the menu bar ***- View (V) - Feature table (F);***



- Feature parameters

  In the feature table toolbar - ***Feature Parameters***, set the relevant parameters of the feature analysis.

In the analysis content:

Starting wavelength: Represents the starting wavelength position of the calculated feature;

End wavelength: Represents the end wavelength position of the calculated feature;

Feature options: including peak and valley seeking;

Judge the peak and valley conditions:

Base limit: refers to the minimum limit value of peak seeking (must be greater than this value)which is only used for peak searching;

Peak-valley slope: judge the slope of the peak or trough (must be greater than this value);

- Spectral table

Normalized value: The value calculated by normalizing the maximum value in the whole spectrum;

Relative value: Transmission data obtained by relative reference;

Absolute value: None;

5.3.3 Absorption test

This section describes how to test absorbance. Before the test, you need to switch to ***Absorption Test in the menu bar, Test: Test Mode (M),*** and display the words in the lower left corner of the status bar  . When choosing

When the absorption test mode is announced, the data display mode is automatically switched to the relative value.

- Buckle the background and make a reference

  Before the absorption test, the background must be deducted and referenced. Deducting the background refers to deducting the background light (or dark noise), and the reference refers to putting in a reference solution (such as distilled water) for 100% testing. Operate in the toolbar - ***buckle background/use as reference,*** buckle background can be done once before the test, and the reference can be repeated according to the test situation.

  Note: The result of the direct test should be around 0Abs after reference, if not, please check ***whether the graphics or intensity of the pixel map*** *(as long as the unsaturated reference light intensity is larger, the better) is normal.*

- Single test vs. continuous test

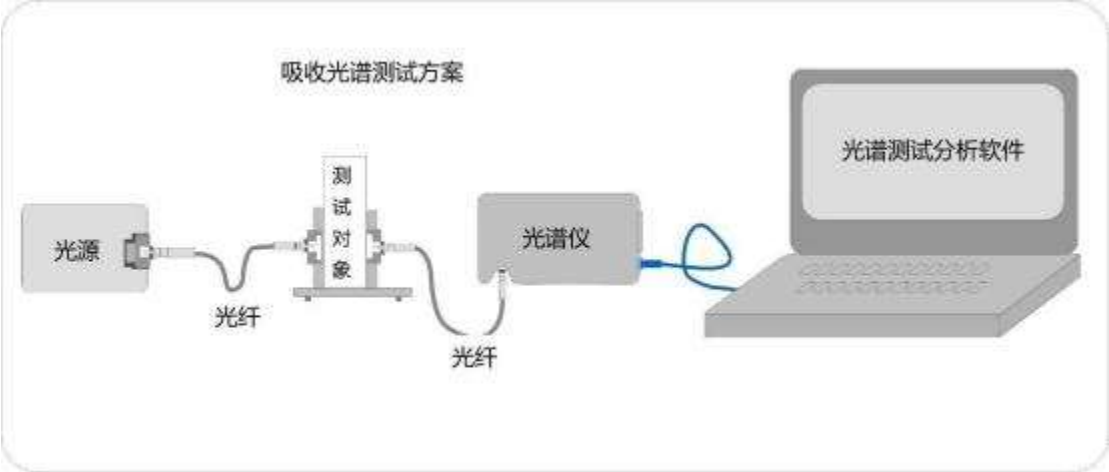
  See 3.3.1 How to collect data**.** The formula for absorbance is as follows:

$$A_\lambda = -\log_{10}\left(\frac{S_\lambda - D_\lambda}{R_\lambda - D_\lambda}\right)$$

  S_i: Indicates the intensity of the sample at wavelength λ;

D_λ: Indicates the background intensity of wavelength λ;

R_λ: represents the reference strength of the wavelength λ;



- Characterization analysis

  The main features in the spectrum are the peaks and troughs, and each feature point can react to the special components in the previously tested solution.

  To display feature markers: Right-click in the spectrogram - ***Show peak and valley markers;***

  To display the feature table: In the menu bar ***- View (V) - Feature table (F);***

- Feature parameters

  In the feature table toolbar ***- Feature Parameters***, set the relevant parameters of the feature analysis.

In the analysis content:

Starting wavelength: Represents the starting wavelength position of the calculated feature;

End wavelength: Represents the end wavelength position of the calculated feature;

Feature options: including

peak and valley seeking;

Judge the peak and

valley conditions:

Base limit: refers to the minimum limit value of peak seeking (must be greater than this value), which is only used for peak searching;

Peak-valley slope: judge the slope of the peak or trough (must be greater than this value);

- Spectral table

Normalized value: The value calculated by normalizing the maximum value in the whole spectrum;

Relative value: absorbance data obtained by relative reference;

Absolute value: None;

6 Accessibility

6.1 Timing analysis

This section describes one of the auxiliary functions in spectral test analysis, timing analysis. This function is mainly used to detect graphs that change data over time at a certain wavelength.

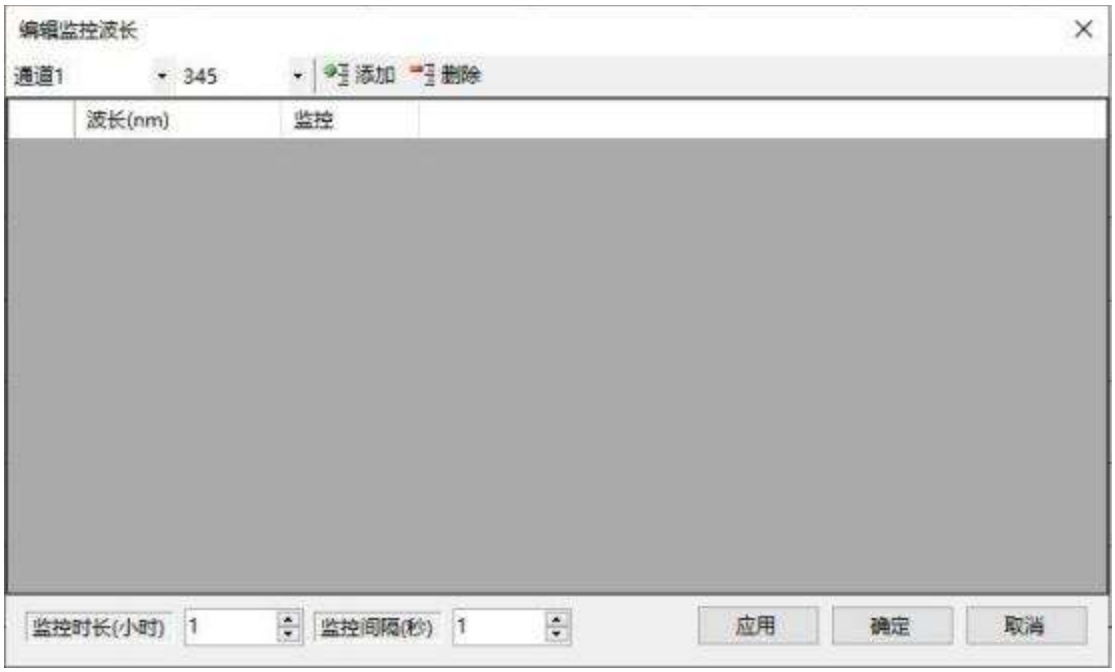
- Methods for viewing timing charts

  Right-click in the spectrogram - ***add timing wavelength (T);***

  In the menu bar - ***Function (F) - Timing Wavelength (T);***

- Edit the monitoring wavelength

  The software supports multi-channel and multi-wavelength timing monitoring, by selecting the channel, then selecting the wavelength that needs to be monitored, clicking Add, and adding to the monitoring list.

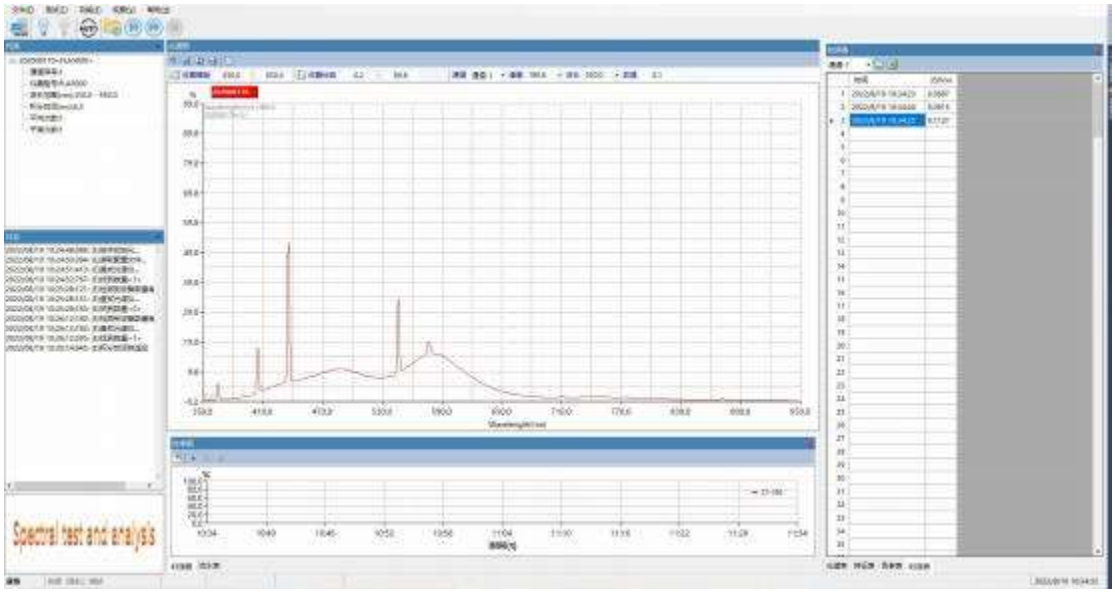


Monitoring Duration (hours): Indicates the duration of monitoring that needs to be monitored.

Monitoring interval (seconds): indicates how many seconds the interval is recorded;

- Start monitoring

After continuous testing, click the timing diagram toolbar - ***Start***, the software will automatically start recording all the data of the monitoring wavelength over time, and display the data corresponding to each interval in the timing table, and if there is a pause in the middle, a space will be displayed in the data table until you click Start to continue recording the monitoring data.



As shown in the figure below, C1-499 represents the wavelength monitored in channel 1 at 499nm; C2-534 indicates the wavelength monitored in channel 2 at 534nm;

6.2 Overlay spectra

This section describes another auxiliary feature in spectral test analysis, overlay spectra. This function is mainly used to display multiple spectral curves in the same spectral map for comparison.

- View overlay spectra

In the menu bar: ***Function (F) - Overlay Spectrum (O);*** A window showing the overlay spectrum:

- Add overlay spectra

Right-click in the spectrum: ***Add an overlay spectrum***, The current spectrum is automatically added to the Overlay Spectrum window; You can also click Add Spectrum in the Overlay Spectrum window toolbar, and the software supports multi-channel overlay.

- Modify the name of the overlay spectrum

The default name format of the overlay spectrum: spectrometer number_number, for example, 202012001_7 represents the spectrometer with the number 202012001, and the number of overlay spectra is 7. *Note: The maximum length of the name is 6 kanji or 12 numbers or 12 letters!*

- Delete overlay spectra

In the toolbar: Delete ***Spectrum***, here is the last overlay spectrum deleted;

In the Properties toolbar: ***Delete***, here is the check items of all checked actions in the Delete Properties list;

- Merge overlay spectra

  Merge overlay spectra refers to merging all selected items in the attribute list into a single spectrum. *Note: Spectral data from the same channel can only be combined!*

- High-brightness overlay spectrum

  Highlight overlay spectra refers to the highlighting of spectra corresponding to all selected items in the attribute list.

- Export overlay spectral data

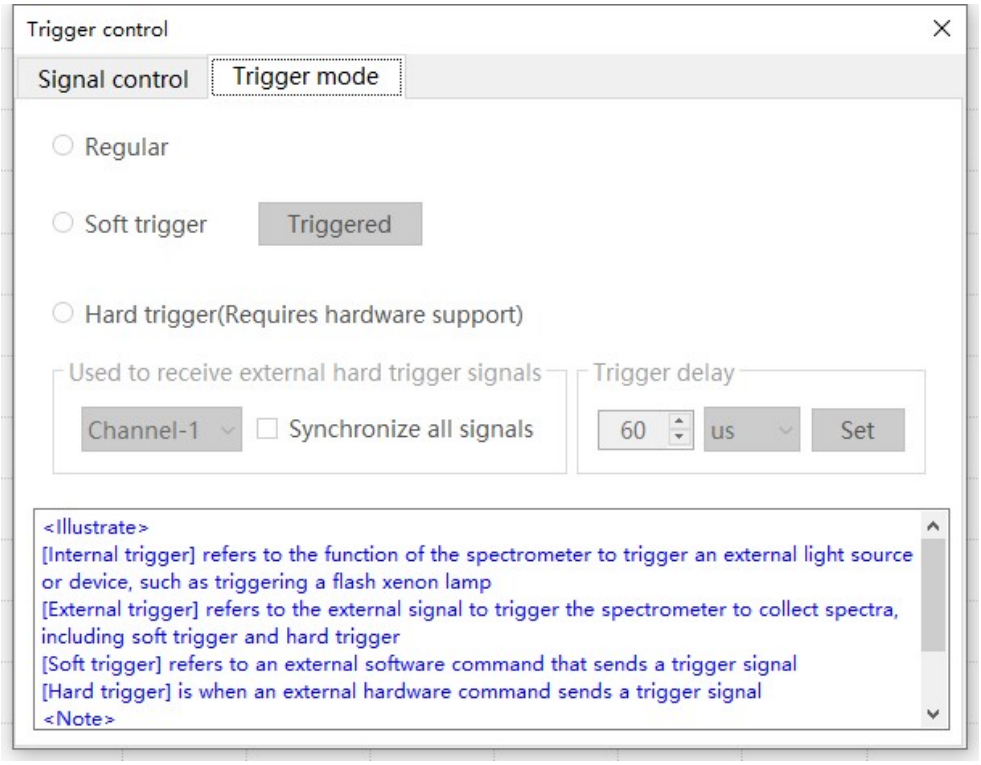
  In the toolbar: Export ***Spectra***, export all overlay spectral data to Excel.

6.3 Trigger Function

This section describes the third auxiliary function of the spectrometer, the trigger function. This function is mainly used to interact with the outside through the IO (input/output) port of the spectrometer. The trigger function is divided into internal trigger and external trigger, in the menu bar: ***function (F) - trigger control (G), the*** following details the two trigger modes.

• Internal Triggering

Internal triggering allows the spectrometer to control external devices, such as triggering a xenon flash lamp. To trigger a xenon lamp, typically enable GPIO-3 and set the integration time to 20ms or higher. In this mode, the integration time determines the flash frequency and does not control spectral intensity.



• External Triggering

External triggering allows an external signal to initiate spectral acquisition. This includes both soft triggering (software command) and hard triggering (e.g., PLC signal)

General: No trigger mode is used;

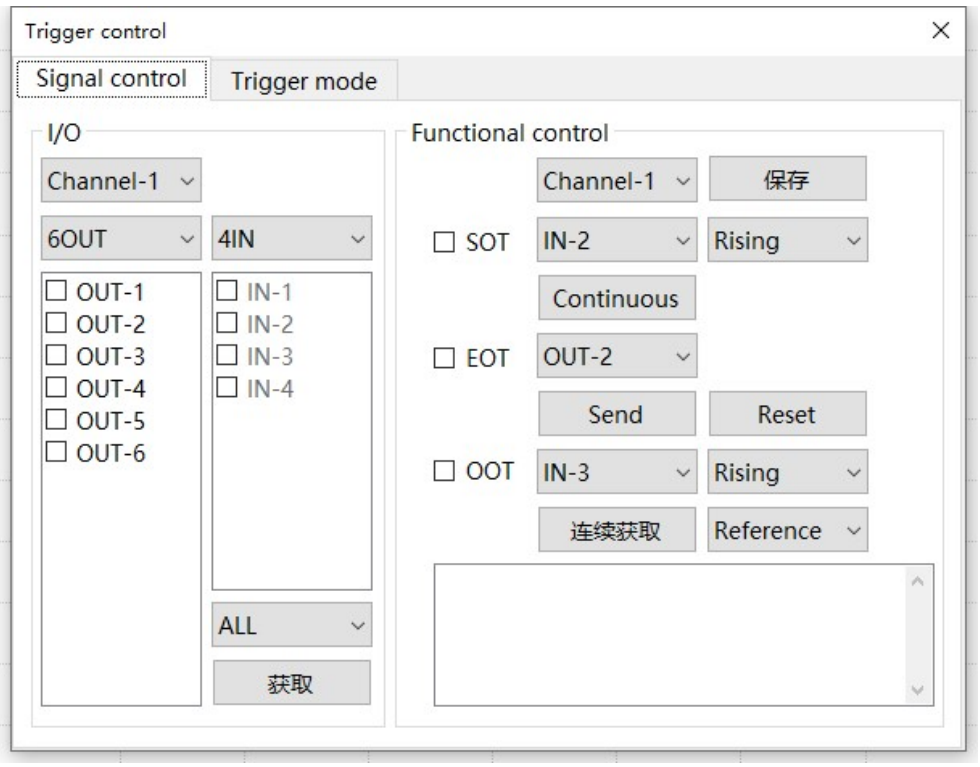
Soft trigger: The software will refresh the spectral data after receiving the soft trigger signal.

Hard trigger: The software will refresh the spectral data after receiving the hard trigger signal.

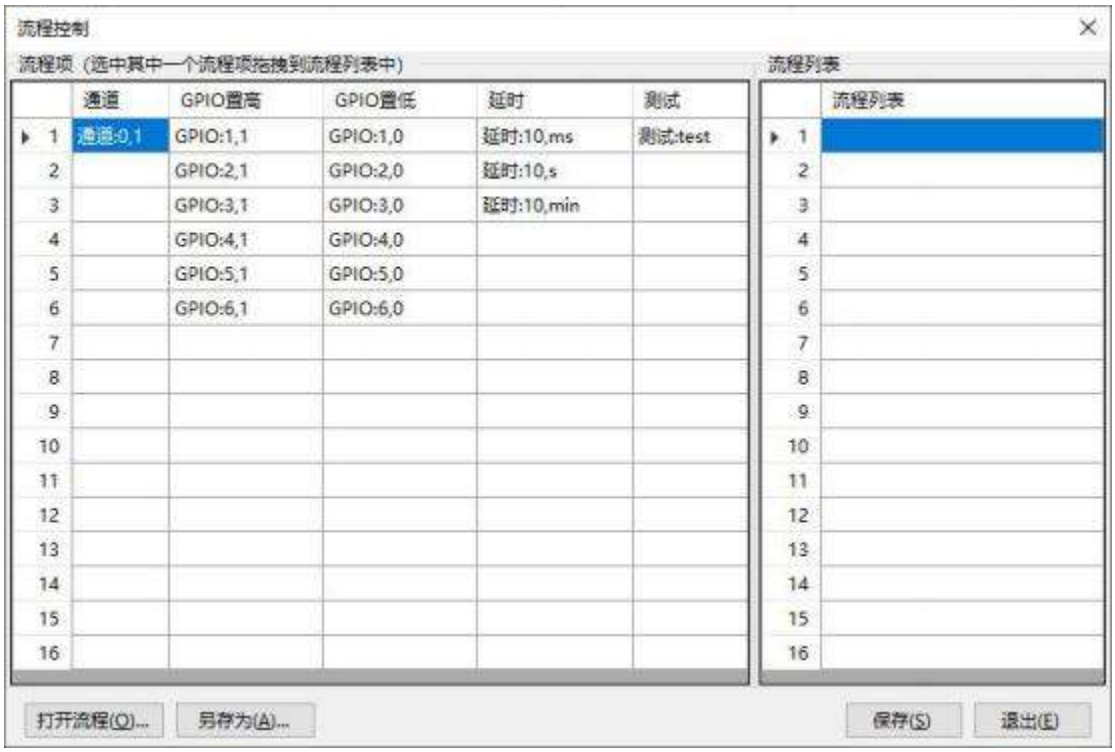
Note: The hard trigger function requires spectrometer hardware support, please confirm before use. When multiple spectrometers use the hard trigger function at the same time, connect the trigger wires of all devices in parallel to ensure that each device receives the hard trigger signal at the same time, and specify one of the channels for the software to receive the trigger signal through the software. Soft trigger or hard trigger must be triggered once and collected once, and the setting of the number of samples is invalid!

6.4 Process control

This section describes the fourth auxiliary function of spectrometers, process control. Follow the process of creation



Some simple automated controls can be completed by executing control commands in sequence. In the menu bar: Function ***(F) - Process Control (P),*** as shown in the figure below



• Methods for adding processes

In the table of process items, select the process item cells you want to add, and you can add them to the process list in the following three ways:

(1) Select the cells that need to be put in the process list, and drag and drop the process items to be added ***to the process list;***

(2) Right-click to select the process item to be added, and select Add ***(N)*** to automatically add the process item to the last position of the process list;

• Methods for modifying processes

After creating a new process list or opening a process file, there are two ways to modify the corresponding process:

(1) Right-click the selected process item to be added, and select the selected item in the replacement list

(R), automatically overriding the process item into the selected cell of the process list;

(2) In the process list, right-click to move up, ***move down, remove the current item, and empty the list***.

• Modify the method of delay

In the process item, double-click the cell in the delay column to modify the corresponding delay data.

• Methods for testing processes

In the toolbar: Load Process, select the process file you want to test, and display the path to the process file in the bottom status bar. Choose ***between a single test or a continuous test*** and automatically run the control commands in the process for testing.

7 System Settings

7.1 Chapter Introduction

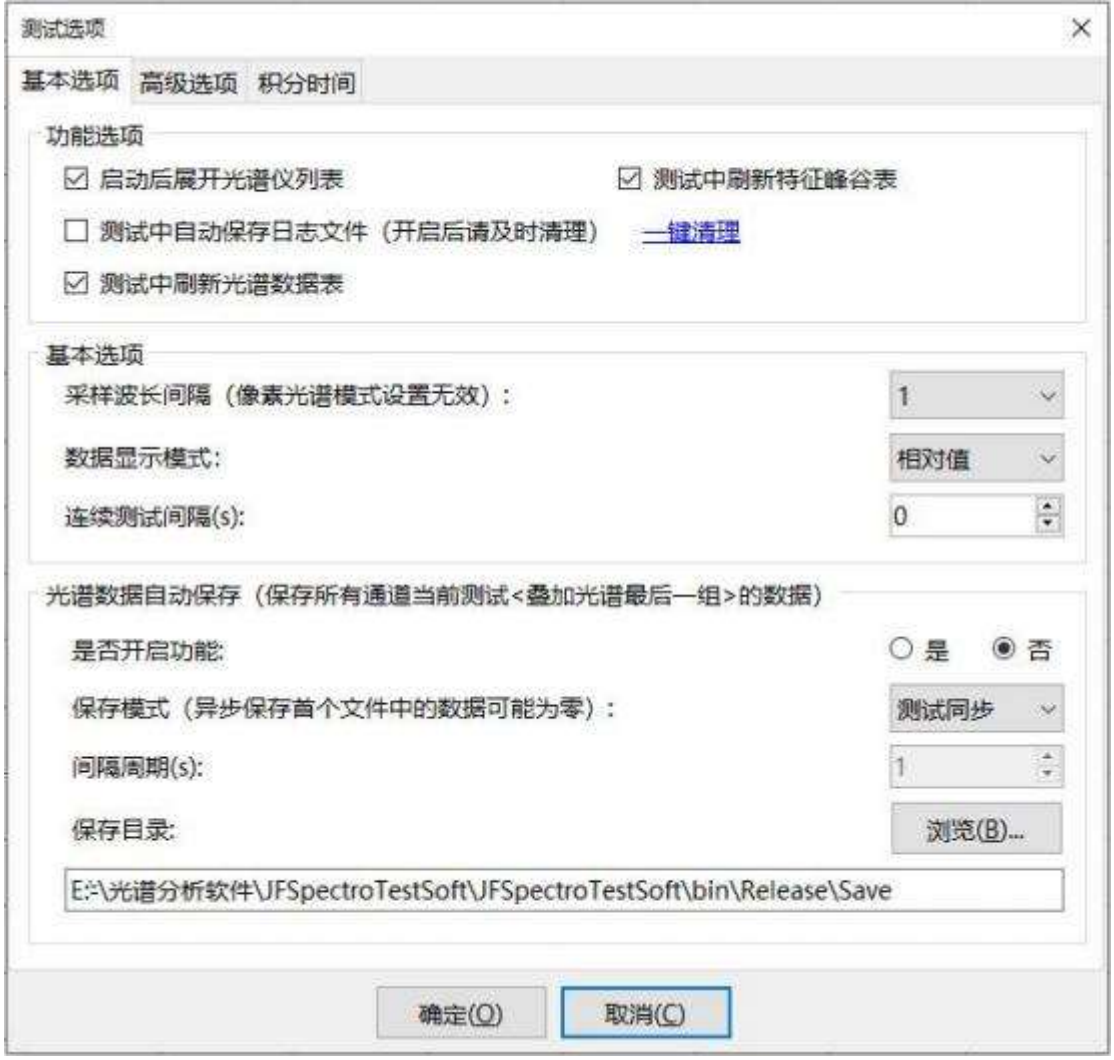
After installing the software, the first time you open the software, there is a set of default test options, and each connected device has independent instrument properties, which can be observed and edited during use.

Note: Instrument attributes depend on the connected device model, and the instrument attributes covered in this section may differ from the instrument attributes of the device you are using.

7.2 Test Options

This section introduces some test conditions and default function options in the spectral test process, in the menu bar: ***Test (T) - Test Option (O),*** after modification, it will be saved on the local computer, the last modified content will be displayed after restarting the software, and the default options will be restored after reinstalling the software.

7.2.1 Basic Options



Options	illustrate
Expand the list of spectrometers after starting	When the software is launched, the spectrometer list is expanded by default
Refresh the characteristic peak and valley table during the test	The test refreshes the feature table once at a time
Refresh the spectral data sheet during the test	The test refreshes the spectral table one at a time

Log files are automatically saved during testing	During the test, the log information is stored in the log file, the file name is named "LOG_ + year, month and day", and the log information of the day is stored in the same document, and the storage directory: \\LogFile. Note After turning on auto-save, you need to clean it up in time, or you can

	to do it by cleaning with a single click.
Sampling wavelength interval	The wavelength interval of the sampled data in the spectral test (except for the pixel test).
Data display mode	Normalized value: The value calculated by generalizing the maximum value in the whole spectrum; Relative value: When spectral test or light color test, the set energy saturation value is used as the percentage; When transmitting the test, the percentage calculated relative to the reference; When the absorption test is conducted, the absorbance is calculated relative to the reference; Absolute value: obtain the actual value of the full spectrum, which can be used to calculate the chromaticity parameters when the light color test;

Continuous test intervals	Interval time between continuous tests, unit: seconds/s
Spectral data is automatically saved	Whether to enable the function: If you select Yes, the function of automatically saving spectral data will be enabled. Save mode: asynchronous means that the test and save operations are independent of each other, and are stored regularly according to the set interval period; Synchronization means that the test and save operations are synchronized, and the test is saved once at a time. Interval period (s): how many seconds at intervals to save spectral data; Save Directory: Save the spectral data file in

	Specify the directory.

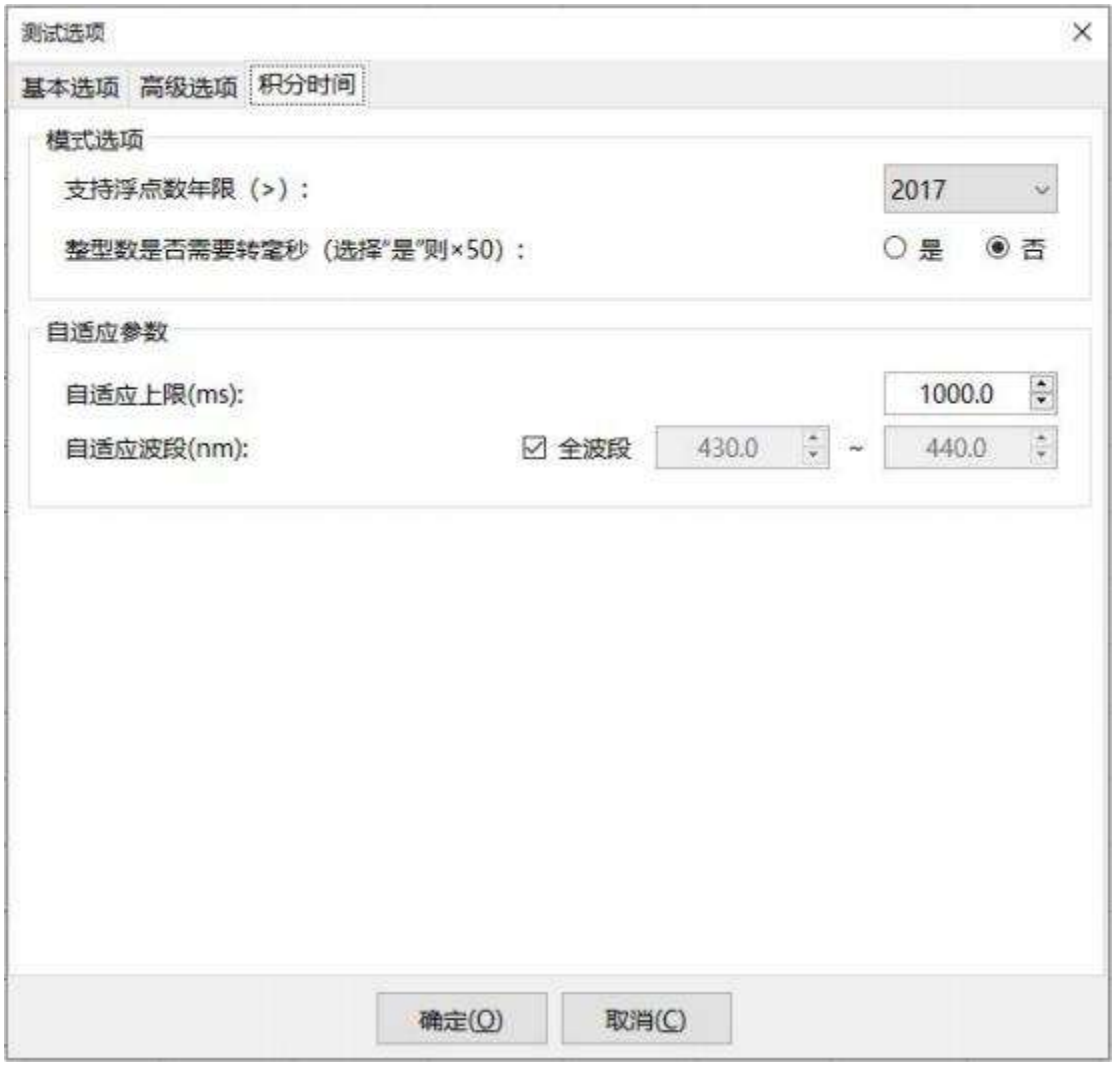
7.2.2 Advanced Options

Options	illustrate
Dark noise is automatically deducted during testing	Automatic deduction of dark noise during testing (dark background)
Always fill the landscape	The wavelengths of the horizontal axis are valid in the spectrogram
The list area supports scroll wheel setting parameters	The spectrometer list area setting parameters support keyboard-free settings

Shows how long it takes to run	The status bar shows how long the test process takes to execute
Disable external trigger mode switching	Trigger Control - Whether an external trigger is available

Turn on real-time device connection detection	Automatically refresh the list when the device connection status changes
Calculate the red specific wavelength range	Customize the wavelength range for calculating the red ratio
Calculate the green specific wavelength range	Customize the wavelength range for calculating the green ratio
Calculate the blue specific wavelength range	Customize the wavelength range for calculating the blue ratio
Calculate the wavelength range of ASD	Custom calculated ASD Aftamine range
Calculate the wavelength range > < radiated flux	Customize the calculation < radiated flux > ampere range, and you can also choose to calculate the radiant power, irradiance, and radiant brightness
Energy saturation value	The energy saturation limit of the spectrometer, beyond which it is regarded as spectral overflow, that is, the test is invalid. It can be used for relative value calculations during spectral testing.

7.2.3 Credit Time



Options	illustrate
Mode options	Support floating-point number period (>): Identify spectrometers that are larger than the set period as capable of supporting floating-point integration; Whether the integer number needs to be converted to milliseconds: Set whether to convert the integration

	time to milliseconds, and multiply by 50 if you select "Yes".
Adaptive parameters	Adaptive upper limit: When the integration time adaptation reaches this upper limit, the adaptation will be stopped. Adaptive band: Product within this band

	Time-based adaptation, default is full band;

7.3 Instrument Properties

This section introduces the device properties of the spectrometer, in the menu bar: ***System (S) - Instrument Properties (E),*** some of the attributes can be modified according to actual needs.

7.3.1 General Attributes

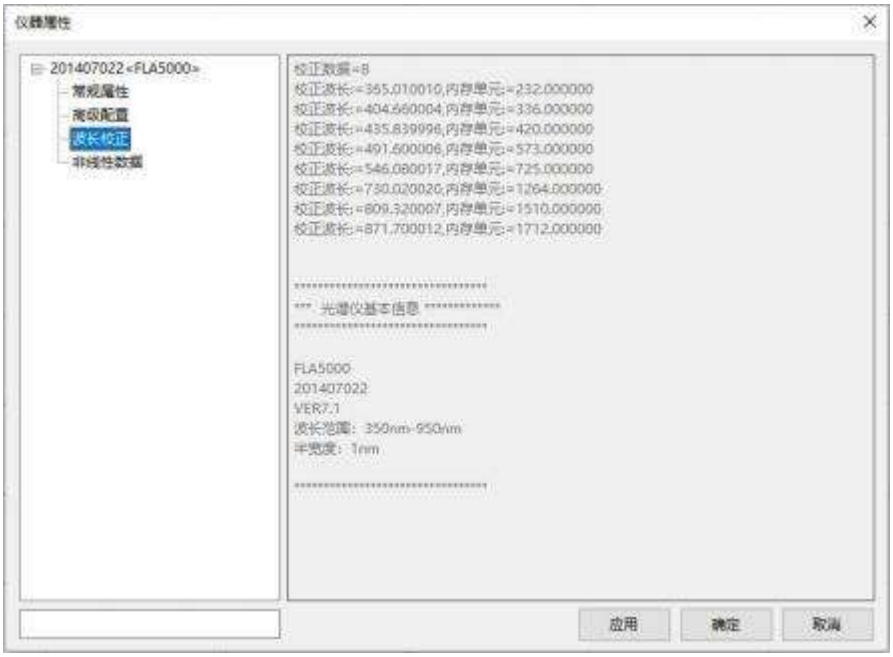
The basic attributes of the current channel instrument are displayed in the general properties, which cannot be modified after leaving the factory.

7.3.2 Advanced Configuration

All parameters in the advanced configuration can be modified, but operation permissions are required. The content of this page is not recommended for customers to modify by themselves, if you need to modify, please consult our after-sales personnel.

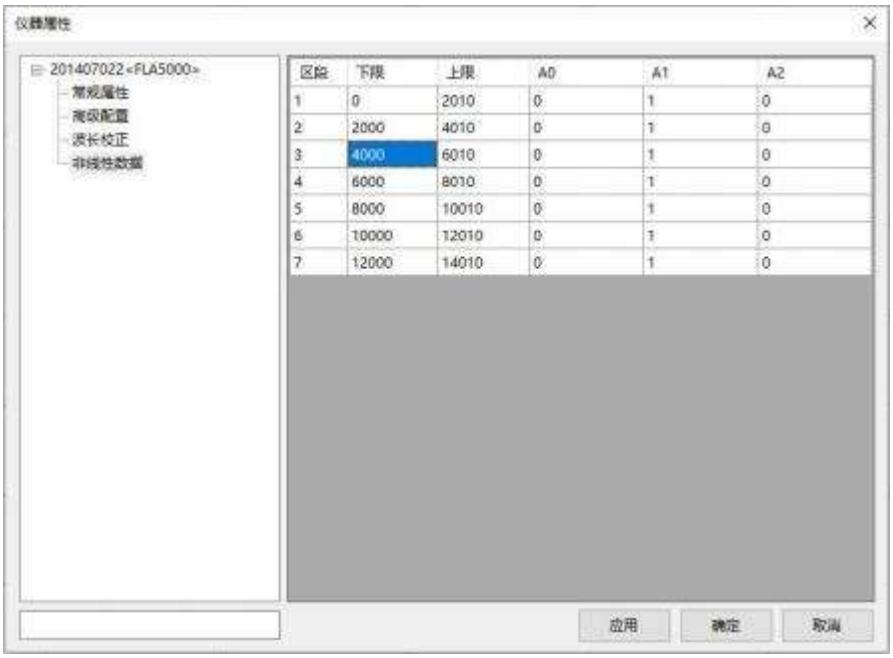
7.3.3 Wavelength correction

Wavelength correction is the wavelength file data corresponding to the current instrument, which can be modified but requires operation permission. The content of this page is not recommended for customers to modify by themselves, if you need to modify, please consult our after-sales personnel.



7.3.4 Nonlinear data

Nonlinear data is the nonlinear data corresponding to the current instrument, which can be modified but requires operation permission. The content of this page is not recommended for customers to modify by themselves, if you need to modify, please consult our after-sales personnel.


仪器属性
201407022<FLA5000>
常规属性
高级配置
波长校正
非线性数据
区段 下限 上限 A0 A1 A2
1 0 2010 0 1 0
2 2000 4010 0 1 0
3 4000 6010 0 1 0
4 6000 8010 0 1 0
5 8000 10010 0 1 0
6 10000 12010 0 1 0
7 12000 14010 0 1 0
应用
确定
取消