INSTRUCTION MANUAL

FL970	Fluorescence Spectrometer

Techcomp

FL970——Fluorescence Spectrometer

Edition：01

Contents

PREFACE

Thank you very much for your purchase of FL970 fluorescence spectrometer.

Please read carefully the instruction manual and comprehend sufficiently the safety cautions before operating FL970.

Keep this instruction manual in a handy place for reference when necessary.

Information contained in this instruction manual is subject to change without notice for product improvement.

ABOUT THIS MANUAL

This instruction manual is used to guide the user's operation of FL970 fluorescence spectrometer, the operation methods and safety cautions when operating the instrument are introduced, be sure to read through this manual before using the instrument. Especially for the cautions, which is related to the safety and protection of human body and instrument itself, it is necessary to read them carefully for correct operation instrument.

Precautions on Electromagnetic Wave Interference

(1) Possible Electromagnetic Wave Interference Caused by this Instrument

When this instrument is in use, it may cause electromagnetic wave interference to the other equipment, such as television and radio.

The electromagnetic wave interference can be minimized by choosing the specific circuit connection cables.

However, there is no guarantee that electromagnetic wave interference will not be caused by this instrument.

If it is suspected that this instrument causes electromagnetic wave interference, the power switch of this instrument can be closed, and observe the signal reception status of television and radio to confirm.

If this instrument does cause electromagnetic wave interference to television and radio, the following improvements can be attempted.

・Increase separation distance between this instrument and television/radio.

Connect this instrument to an outlet on a circuit different from that to which the television/radio are connected.

(2) Possible Electromagnetic Wave Interference Affecting This Instrument

During the operation of this instrument, if there are other large equipment nearby, the electromagnetic wave interference, noise and vibration by such equipment will affect its performance or functionality.

To prevent this, use the specified system connection cables in strict accordance with the instruction manual. The instrument is designed to minimize possible electromagnetic wave interference affecting it if the specified cables are connected properly.

However, there is no guarantee that electromagnetic wave interference will not occur in this instrument. If the instrument does incur electromagnetic wave interference, which can be determined by turning on and off possible sources of electromagnetic wave interference nearby, the user is encouraged to try to correct the interference by one or more of the following measures.

・Reorient the instrument.
・Increase separation between the instrument and possible sources of electromagnetic wave interference.
・Connect the instrument to an outlet on a circuit different from that to which possible sources of electromagnetic wave interference are connected.
・Confirm that any other device connected with the instrument is not affected by electromagnetic wave interference.

Warranty on Product

The FL970 fluorescence spectrometer is warranted to operate according to the specifications given in the instruction manual, provided it is used in accordance with the instructions described in the manual.

(1) Scope of Warranty

 (a) Main unit of the instrument which prove to be defective in design or workmanship during the warranty period will be repaired without charge.

 (b) A substitute part may be used for repair, or replacement with an equivalent product may be made instead of repair.

 (c) Such system components as a personal computer and printer to be updated frequently for improvement may not be available in original versions at the time of replacement.

 (d) The instruments can't be provided repair for free in warranty period if they were sold to other users or they have been abandoned.

(2) Warranty period

One year from the date of initial installation or not more than eighteen months from the date of delivery (whichever comes first).

(3) Limitations and Exclusions on Warranty

Note that this warranty is void in the following cases, even if they occur within the warranty period.

 (a) Failure due to operation at a place not meeting the installation requirements specified by us.

 (b) Failure due to power supply voltage/frequency other than specified by us or due to abnormality in power supply.

 (c) Corrosion or deterioration of the tubing due to impurities contained in reagent, gas, air or cooling water supplied by the user.

 (d) Corrosion of the machine elements and circuit elements or deterioration of the optical elements due to highly corrosive atmospheric gas.

 (e) Failure due to use of hardware, software or spare parts other than supplied by us.

 (f) Failure due to improper handling or maintenance by the user.

 (g) Failure due to maintenance or repair by a service agent not approved or authorized by us.

 (h) After disposal of this instrument, or after its resale without our approval.

 (i) Failure due to relocation or transport after initial installation.

 (j) Failure due to disassembly, modification or relocation not approved by us.

 (k) Consumables of deuterium lamp, tungsten lamp, cuvette, etc. And failure of parts that have reached the end of specified useful life.

 (l) Failure of parts excluded from the warranty in the instruction manual or other documents.

(m) Failure due to acts of God, including fire, earthquake, storm, flood, lightning, social disturbance, riot, crime, terrorist activities, war (declared or undeclared), radioactive pollution, contamination with harmful substances and other force majeure causes.

(n) Failure of the hardware, or damage to the system software, application software, data or hard disk due to computer virus infection.

(o) Failure of the personal computer connected with the instrument, or damage to the system software, application software, data or hard disk due to power interruption or momentary power voltage drop caused by lightning or the like.

(p) Failure of the personal computer connected with the instrument, or damage to the system software, application software, data or hard disk due to disconnection of main power to the personal computer without taking the specified normal shutdown procedure.

(4) Disclaimer of Warranty

(a) Any express warranties other than the explicit conditions indicated in (1) are excluded from this warranty.

(b) Any other implied warranties of merchantability and fitness for a particular purpose are not included in this warranty. No liability is assumed for direct or indirect damages arising out of explicit or implied warranties.

(c) Oral or written information or advice given by our dealers, distributors, agents or employees without our express permission shall not create a warranty or in any way increase the scope of this warranty.

Technical Service on Installation、 Relocation and After Sale

Installation of this instrument shall be carried out by or under supervision of qualified service personnel of Techcomp Corporation or its authorized service agent.

Before installation of the instrument, the user shall make preparations for satisfying the installation requirements in accordance with the instruction manual.

If relocation of the instrument becomes necessary after initial installation (delivery), please notify your local sales representative or nearest service office of Techcomp.

Technical Training

For using the instrument safely and correctly, technical training speeches are held at Techcomp's or user's site. Contact Techcomp or distributor for attending procedures. Technical training speeches are payable, it will charge fee

About Discard

Due to the use of lithium battery in the instrument, please distinguish it from common waste and avoid causing environmental pollution. Meanwhile, the relevant laws and regulations may be changed in future, or new laws and regulations may be issued. Therefore, at the time of discarding the instrument, please be sure to confirm it in accordance with relevant laws and regulations, or consult our relevant departments.

Other Precautions

(1) Use and Storage of Samples and Reagents

      (a) The user is responsible for proper use, maintenance and treatment when using the instrument for daily analysis. Moreover, all the samples and reagents used shall be in accordance with the prescribed operation procedures.

      (b) Reagents, standard solutions and accuracy-control samples shall be used, stored and discarded as instructed by the respective suppliers.

(2) About this Instruction Manual

      (a) Information contained in this instruction manual furnished with the instrument is subjected to change without notice for product improvement.

      (b) The copyright of this manual belongs to the technical department of Techcomp.

      (c) No part of this manual may be reproduced or transmitted in any form or by any means without our express written permission.

⚠ In Order To Operate Safely

Safety Precautions

Before using FL970 fluorescence spectrometer, please read the following safety instructions carefully and understand them fully.

⚠ **General Precautions on Safety**

■ Following all the operation procedures provided in this instruction manual.
■ Installation and maintenance activities of this instrument are limited to the service personnel trained and qualified by Techcomp.
■ Be sure to observe the warnings indicated on the product and in the instruction manual. Failure to do so could result in personal injury or damage to the instrument.
■ Among safety precautions, there will be (Danger), (Warning), (Attention), and other prominent prompt words, attention signs and phrases as the followings.

⚠ **Dangger**: Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
(There is no such sign in this instrument.)

⚠ **Warning**: Indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

⚠ **Attention**: This sign reminds users the potential danger causing slight injuries or major damages of the instrument.

⚠ : This attention sign usually comes with phrases; it often records the notices of operating the instrument safely and accurately; it has fairly clear purposes.

In addition, there are also "Notices" warning words shown as followings that are indirectly related to human safety.

△ Notice: It refers to those signs that are indirectly related to human safety, and only used to prevent and avoid instrument from damages.
◇ Note: It is a supplementary sign with the purpose of accurately operating the instrument and testing samples.

⚠ In Order To Operate Safely

■ Please do not operate and use the instrument other than all contents recorded in the instruction manual.

■ If there are any problems of the instrument, please contact related distributors or our company's technical service department.

■ When customers need to use the samples and reagents that are impossible to be hazardous to human and environment, please be liable for enough air exchange in the room.

■ Please do not decompose, rebuild, replace the parts and use undesignated parts or use with the security protection equipment taken off by yourself, because it's dangerous from a security standpoint.

■ When delivery, please let our company's acceptable technical service people install, maintain and move the installation location, etc.

■ Although all listed notices from the instrument or the instruction manual are researched fully, it is not impossible that some unexpected situations happen. Hence, operators not only shall operate the instrument according to the instruction manual, but also need to be careful and pay attention to avoid unexpected accidents happening at any time.

⚠ In Order To Operate Safely

This instruction manual contains the following important safety notices:

⚠ Danger

No such signs in this instrument.

⚠ Warning

Electric shock accident caused by power supply voltage (100V, 200V)

■ Power supply voltage of 198V～242V is supplied to this instrument, which may cause electric shock and death accident. Before connecting the power cord of the instrument, make sure the power switch of the instrument is off.

⚠ Attention

Fatigue due to prolonged work

■ Viewing the display screen and operating the instrument or dealing with data at the meantime can cause eye and physical fatigue if you continue to work in the same posture for extended periods. When operating or dealing with data for a prolonged period, for your health, make sure to take a break for 10 to 15 minutes every hour in order to rest your eyes and body.

Indoor ventilation

■ If using UV detection system in a small room for a long time, it may cause the concentration of indoor nitrogen to increase and the concentration of indoor oxygen to decrease, or produce a small amount of ozone, which will affect human health. In this case, please install exhaust fans or open the windows frequently to keep the room well ventilated.

⚠ In Order To Operate Safely

Safety Precautions On FL970 Fluorescence Spectrometer

About working power

    (a) The voltage for FL970 fluorescence spectrometer must be AC100V or AC220V (50Hz or 60Hz), and the power is over 1KVA. If the power supply is fluctuated or there is interference on the power supply line, which will not only affect the normal operation of the instrument, but also may cause accidents.

    (b) When connecting and installing the power cord, it is necessary to install the ground wire at the same time and confirm that the ground resistance of the ground wire is below 100Ω. Defective grounding not only reduce the ability of the instrument to resist external interference, but also generate the floating voltage of the instrument host, which may cause the danger of electrical shock.

    (c) High-voltage circuits are applied inside the instrument. Do not open any other covers than necessary for operation.

    (d) In case of sudden cold power failure, the power switch of the instrument should be turned off. When the power supply is restored normally, the instrument can be restarted.

About fire

    Avoid smoking and using a fire in the vicinity of the instrument.

About warning signs on the instrument

    There are warning signs related to high voltage and high temperature attached on the FL970 fluorescence spectrometer host. Pay more attention to them during operating the instrument to avoid causing safety accidents.

About backing up computer data

    If the computer is disturbed or the misoperation occurs, the data may be lost. It is recommended to save the data from the computer hard disk to a CD or floppy disk every once in a while.

    To avoid the misoperation, be sure to set space of more than 100MB in computer hard disk as work area for the related application software.

About computer viruses

    If programs or data has suddenly been destroyed, if an unexpected operation takes place or if an abnormal display appears on the screen, your computer may have been infiltrated by a computer virus. The computer viruses are rogue programs and software that secretly invade a computer and operate it willfully while destroying memorized data. Computer viruses can be infected by using programs and software

containing viruses, as well as programs, software and electronic documents containing viruses when surfing the internet or communicating with others. Therefore, please be sure to confirm the programs, software and electronic documents that need to be used. Do not use the programs and software from unknown sources to avoid computer virus infection. In some cases, antivirus software can be used to remove the virus, but some viruses may not be eliminated by antivirus software. In this case, it may be necessary to reinstall the operation system or repair the computer hardware. Please prepare the antivirus software and deal with the computer virus by yourself.

⚠ In Order To Operate Safely

About turning off computer power

  If turning off the computer together with the instrument which is still running, it may do a damage to the computer, or operation system, application software and data may be destroyed, or the data can't be saved. Before turning off the computer, please exit the application software of the instrument, and then shut down the computer according to the correct steps in the operation system.

About sudden power failure of computer

  Sudden power failure or momentary voltage drop due to the power grid voltage fault, power outages and lightning, which may do a damage to the computer or operation system, application software and data. To avoid such problems, it is recommended to use a device to prevent sudden power failure of AC power source.

⚠ In Order To Operate Safely

Warning Labels

The warning labels shown below are attached to FL970 fluorescence spectrometer.

(1) Dangerous voltage (500V、220V)

The warning label above is attached to the cover of the lamp source compartment and power supply socket

(2) Attention to high temperature
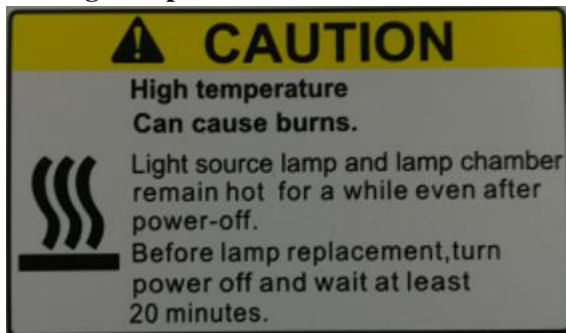
The warning label above is attached to the cover of the lamp source compartment.

Social Responsibility of Enterprise

Shanghai Techcomp Instrument Limited, adhering to the mission of "assisting scientific research; serving industry innovation; caring for human health; creating a better life", strive to fulfill the social responsibility of enterprise. We are care for our employees, making progress actively, contributing to society and protecting environment based on scientific innovation, standardized production, strict management and teamwork.

Shanghai Techcomp Instrument Limited is well aware of the importance of social responsibility to enterprise and it is the pillar for the sustainable development of the enterprise. In the daily production process, Shanghai Techcomp Instrument Limited deepens continuously the understanding of the corporate responsibility, adheres to the road of the sustainable development of human society, learns actively and abides by the relevant laws and regulations, strengthens the environment protection, participates in the charity and integrates the social responsibility into the company's strategy, plan and culture.

Shanghai Techcomp Instrument Limited not only provides the customers products and makes technical exchange, but also actively communicates with the customers, uses and processes rationally the consumable materials and waste from the instrument experiment, cooperates with the customers to promote the progress of science and technology and maintain the harmonious society, realize the social responsibility of the enterprise together and jointly create a social atmosphere of the environment protection, civilization and harmony.

Chapter 1   Installation

1.1   User Cautions

Installation and commissioning of this instrument is offered by Techcomp and its representative. If you need this service, please fill in the user contact card and the warranty card, and then send them back to Techcomp, so that we can arrange on-site service. Meanwhile, keep the instrument and accessories intact without power on or operate is. Please prepare the installation site and power supply for this instrument.

1.2   Unpacking Check

After opening the packing, please check the standard items against Table 1.1.

Table 1.1 List of the host, spare parts and accessories

No.	Description	Qty
1	Main unit	1
2	Manufacturer's Certificate	1
3	Power Cord	1
4	Dust Cover	1
5	Fuse	2
6	Communication Cables	1
7	Xenon Lamp (Short-arc)	1
8	Quartz Fluorescence cuvette	1
9	Cross screwdriver	1
10	Small Box	1
11	External Memory containing the PC Software and Instruction Manual	1
12	T-Type Hex Wrench	1

Remark: The standard items, spare parts and accessories may change without prior notice. Please refer to the packing list attached the instrument.

1.3 Instrument Connection
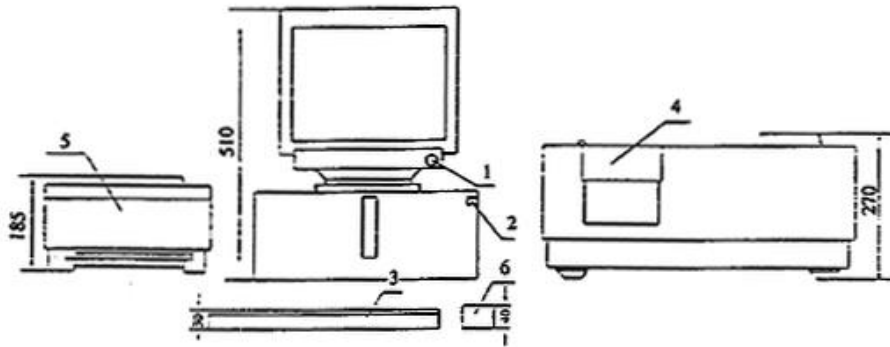
Figure 1-1 Instrument constitution

1. Display   2. Computer   3. Keyboard   4. Host   5. Printer   6. Mouse

1.4 Installation Site: Installation and Adjustment

1.4.1 Installation Site

In order to full utilize the instrument and to keep performance for long term usage, please install the instrument in the sites that meet the following requirements. Techcomp and its representative will not be responsible for the performance deterioration and damage of the instrument due to operate the instrument in the sites that do not meet the specified requirements, even within the warranty period. Please pay attention to it.

1) The room temperature should be between 10 °C and 30 °C when we measuring the samples;
2) Avoid direct sunlight;
3) Strong vibration or continuous weak vibration enough to be felt by the human body must not be transmitted to the instrument;
4) Avoid strong magnetic field or strong electric field. There should be no equipment that can generate high frequency wave nearby;
5) The humidity should not exceed 85%;
6) There should be no corrosive gas, organic and inorganic gases that there is no absorption in the region of UV
7) Room should be with less dust;
8) The stability of the power supply should meet the requirements of the instrument.

1.4.2 Power

1) The power supply voltage of FL970 should be 220V/50Hz, fluctuation within ±10% is allowed, the fuse is 3A. It is recommended to configure the on-line stabilized voltage power supply or UPS to keep the instrument work normally all the time.
2) The instrument is controlled and the data is processed by the computer. Please do not share the same power supply with the other equipment that can generate strong pulse signal.

1.4.3 Precautions on Using Workstation

This workstation is an extension from the computer and apply advanced software to manage the whole system. The work status of the instrument is complex and the data volume is large, which result in heavy loading on the computer. Thus, the computer with the workstation should never be used as a general computer. Games playing on this computer is not allowed. Otherwise, if the workstation is infected by computer viruses, the consequences will be unimaginable, and Techcomp and its representative is not responsible for the damage done by this cause, even within the warranty period.

1.5 Xenon Lamp Installation and Adjustment

During the installation of xenon lamp, in order to prevent electric shock, make sure the AC power cord is not connected to the power supply.

Please follow below procedure for installation:

1） Remove 2 screws a on the outer cover of the lamp compartment ① and detach the outer cover from the instrument (Figure 1-2). Then disconnect the socket to the fan ② (Figure 1-3);

2） Remove 3 screws ④ on the inner cover of the lamp compartment and detach the inner cover ③ from the lamp compartment (Figure 1-4);

3） Profile of xenon lamp for reference (Figure 1-5);

4） The light source safety switch on the inner cover of the light source is shown in Figure 1-6. It can be changed to Figure 1-7 by unscrewing 2 screws;

5） Install the inner cover of the lamp compartment. Be careful to press the light source safety Switch (Figure 1-8);

6） Tighten 3 screws on the inner cover and return them to the status shown in Figure 1-4. At this stage, turn on the power supply and check and optimize the energy of the lamp according to Chapter 1.6. After optimizing the lamp energy, connect the power cord of the fan ② on the outer cover of the lamp compartment (Figure 1-3). Install the outer cover of the lamp compartment with 2 screws to the status shown in Figure 1-2. Turn on the instrument and start using it.
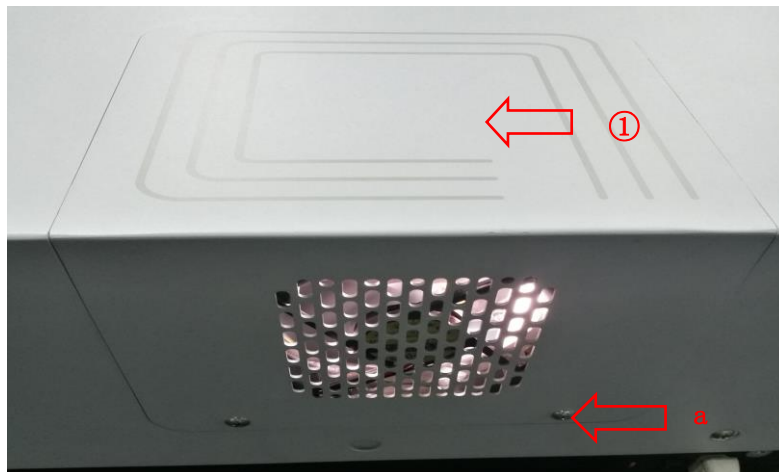
Figure 1-2 Remove the outer cover of the lamp compartment
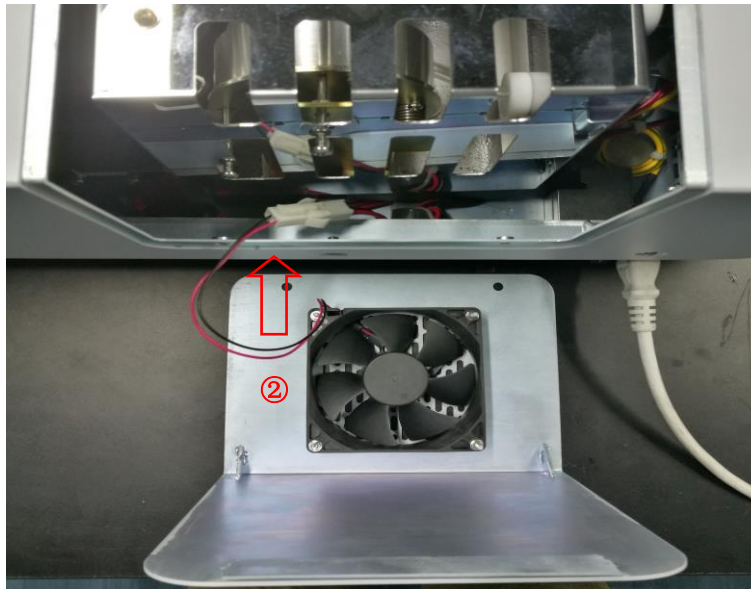
Figure 1-3 Pull out the connection line from the fan wire interface
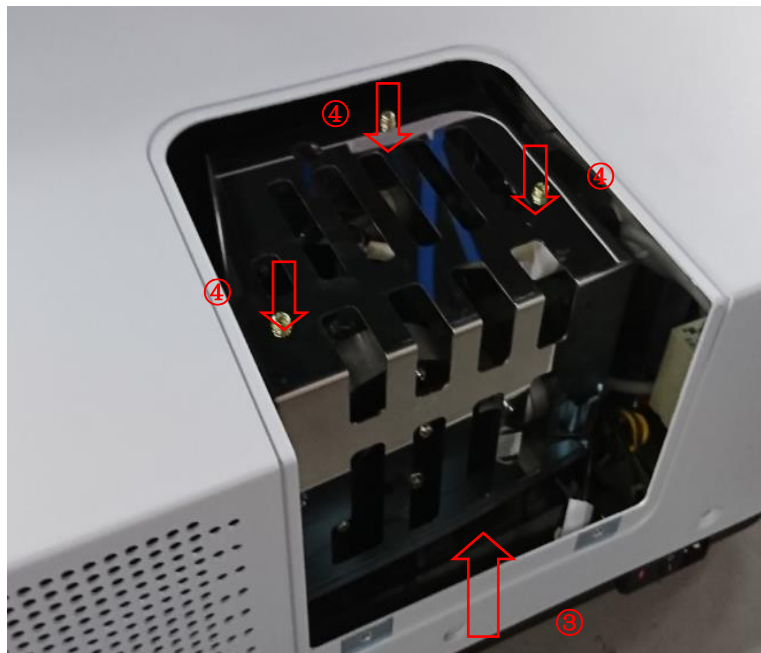
Figure 1-4 Remove the outer cover of the lamp compartment
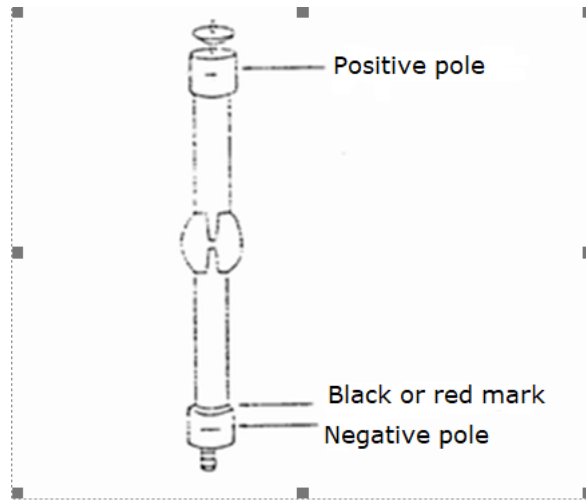
Figure 1-5 Schematic diagram of xenon lamp profile
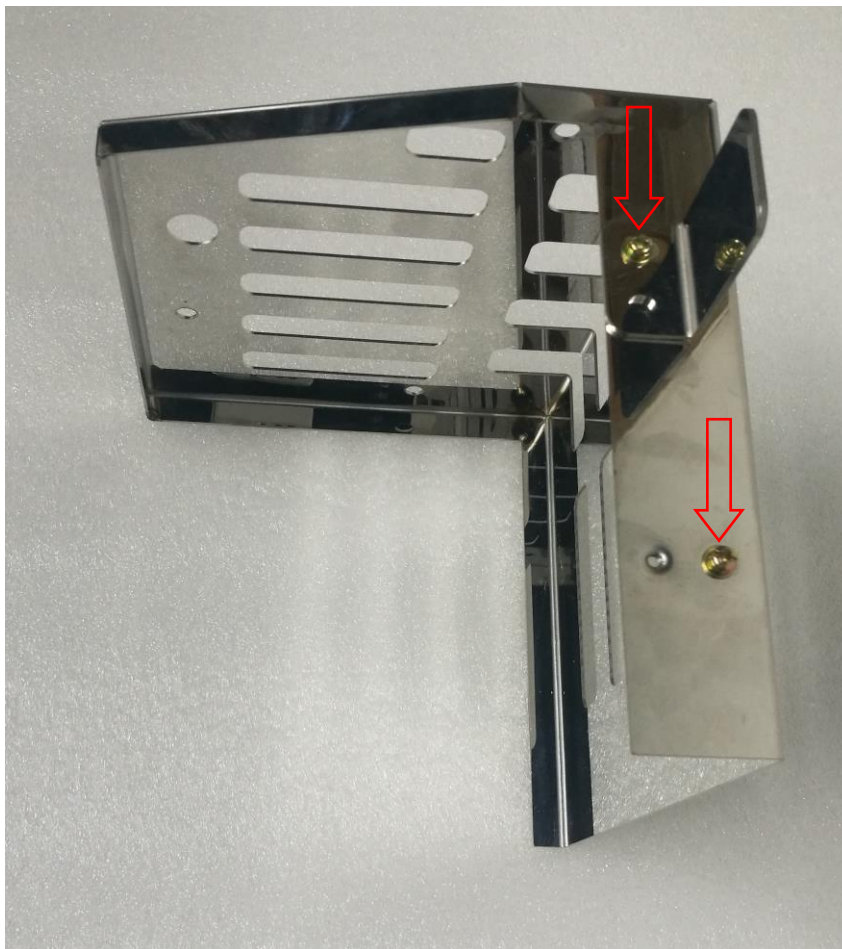
Figure 1-6 Light source safety switch bar on the inner cover of the light source
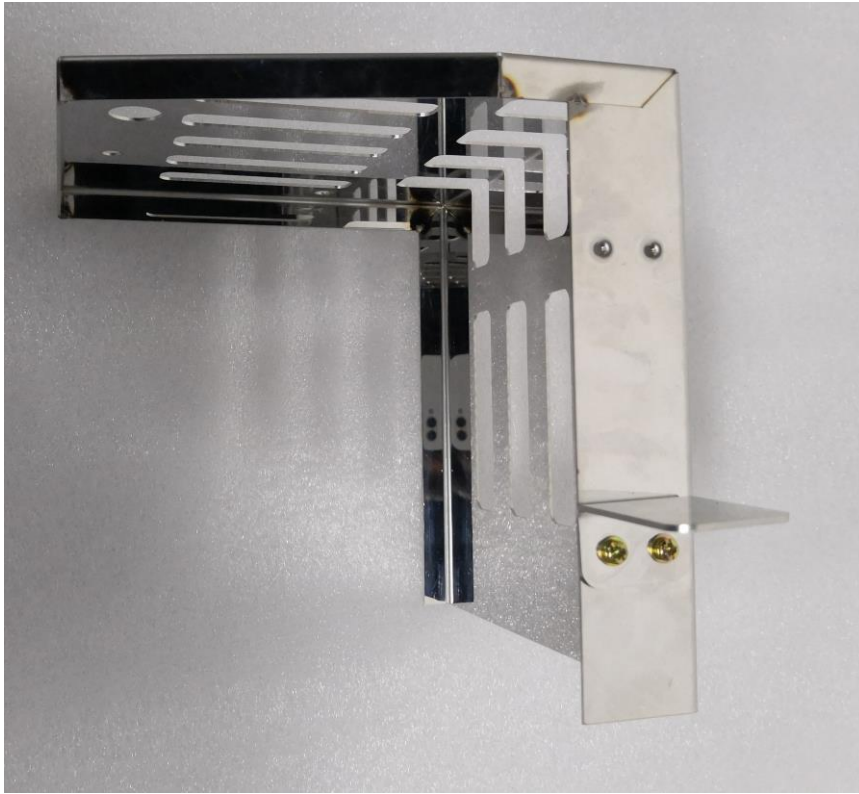
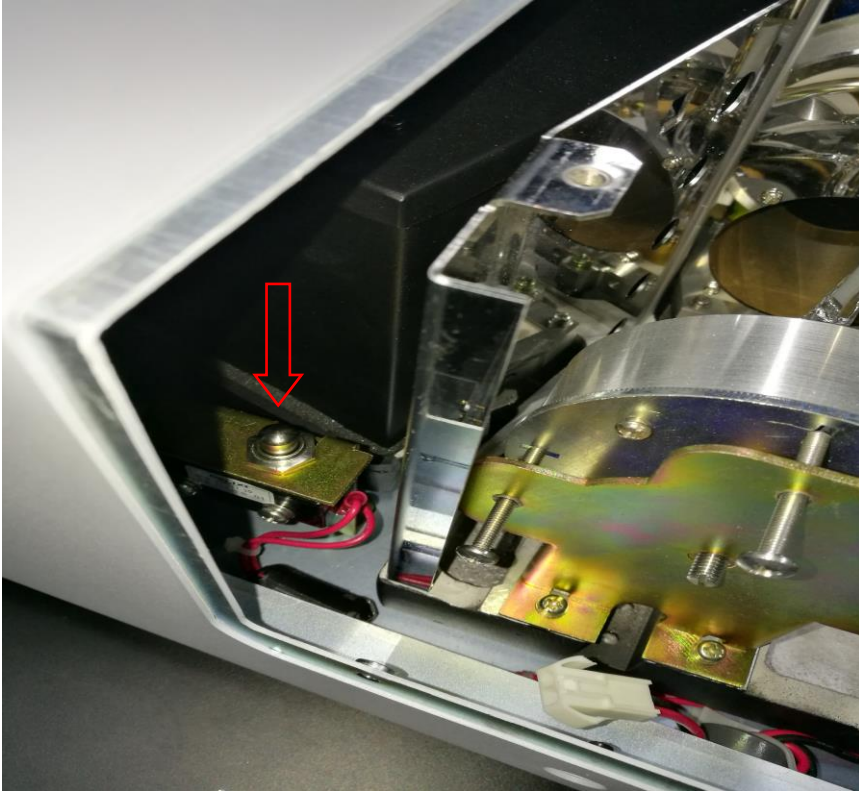Figure 1-7 Change the location of the light source safety switch

Figure 1-8 Install the inner cover of the lamp compartment

⚠ **Attention**
Don't pull the lamp by the positive wire when fixing the positive end with a nut. Be sure to reserve a natural bending section of the positive wire, if the positive wire is pulled too tightly, the xenon lamp will be at the risk of being damaged when lighting it.

1.6 Lamp Position Adjustment

In order to optimize the performance of the instrument, please adjust the position of the lamp after the initial installation or replacement the lamp. The adjustment method is as follows (Raman spectrum of distilled water is used for adjustment):

1) Turn on the instrument and the xenon lamp;
2) After five minutes, turn on the computer and start the system initialization;
3) Fill distilled water to a clean cuvette and then put it in the sample holder;
4) Close the cover of the sample chamber
5) Choose "Wavelength Scan" and set the following parameters: EM Slit and EX Slit are 10.0nm; Range of PMT value is 600～700V; Scan mode: EM scan; EM Start WL is 350nm, EM End WL is 450nm; EX Fixed WL is 350nm; Speed is 240nm/min; Interval is 1.0nm; Click "OK".

   Click "Start", the instrument will start the wavelength scan.

   Select the maximum absorption wavelength of Raman peak of distilled water after the scan. Record the wavelength (it's usually around 400nm).

   Click "Time Scan" and set the parameters of time scan. The parameters are set as below: EM WL is a, EX WL is 350nm, Resp. Time is 0.5S, Scan Time is 600S, click "OK".

   Click "Start", and the instrument start the time scan.

   Use a Phillips type screw driver to adjust the screw (Figure 1-9) on the focusing mirror during the run process of "Time Scan". Ensure the energy value of Raman peak to be maximum (Figure 1-10).
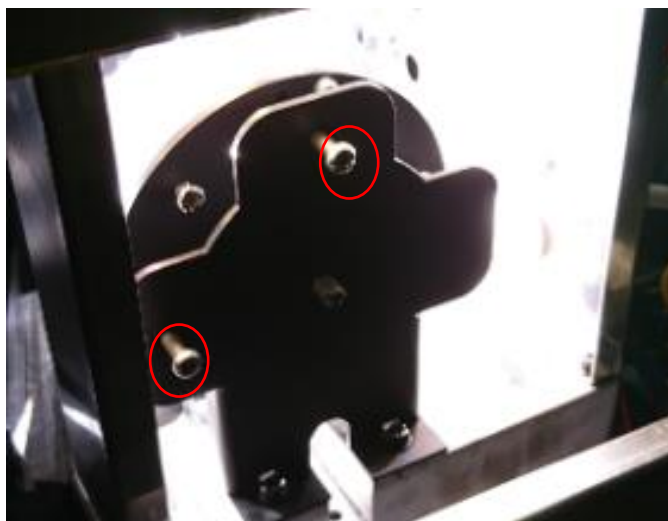
Figure 1-9 Adjust the Phillips screws (Philips) of the focusing mirror
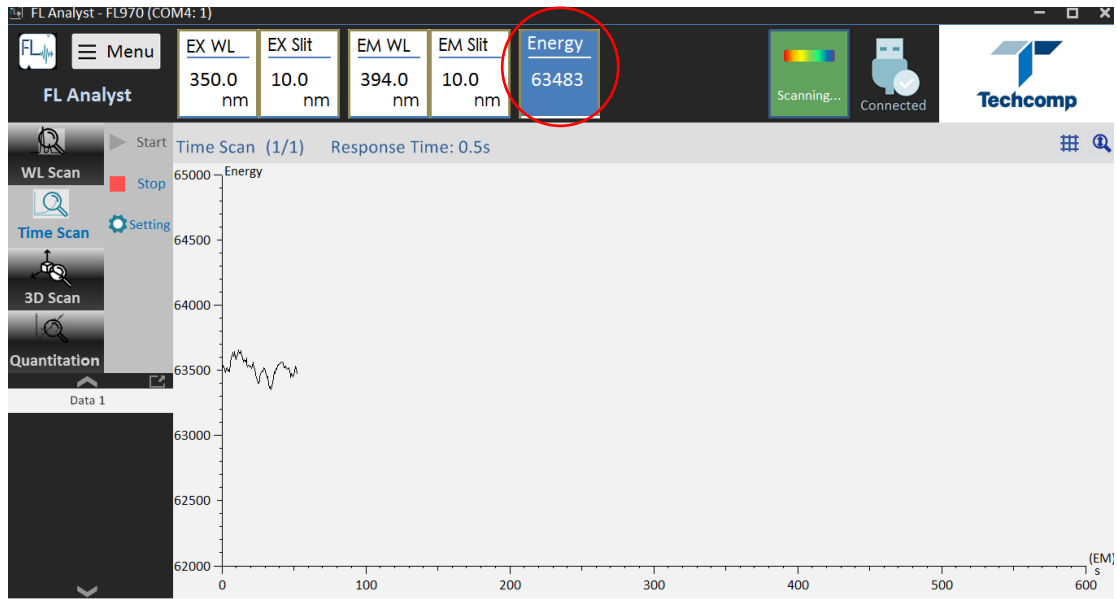
Figure 1-10 Adjust the energy value of Raman peak to be maximum

Techcomp and its representative is responsible for the installing and commissioning of FL970 fluorescence spectrometer. Techcomp and its representative is to open the cover of FL970 fluorescence spectrometer and adjust it accordingly before the instrument is handed over to the user.

Chapter 2　Function

2.1　Optical System

Figure 2-1 is the schematic diagram of FL970 optical system. The light source is 150W xenon lamp.　Ozone generated is sealed by the structure of the light source chamber and can be decomposed by the heat generated. The bright spot of the xenon lamp is magnified by the ellipsoidal lens, focused and directed to the entrance slit on the excitation side by the dichroic. The light beam is diffracted and focused by the grating and a narrow band of the spectrum will pass through the exit slit and then reaches the sample cell.

The monochromator is holographic type that consist of a concave diffraction grating and a slit components.　Part of the excitation light beam is split by a beam splitter is reflected by a quartz plate and enter the photomultiper for monitoring.　Light emitted from sample cell will be focused by a focusing mirror and then enter the monochromator, which is consist of a slit and a concave diffraction grating.　The fluorescence light will enter the photomultipler for detection of signal intensity via a reflector

1) Ellipsoidal mirror
2) Xenon lamp
3) Quartz plate
4) Reflector
5) Excitation incident slit
6) Excitation concave diffraction grating
7) Excitation exit slit
8) Silicon photocell
9) Lens component
10) Sample cell
11) Emission incident slit
12) Emission concave diffraction grating
13) Emission exit slit
14) Reflector
15) PMT
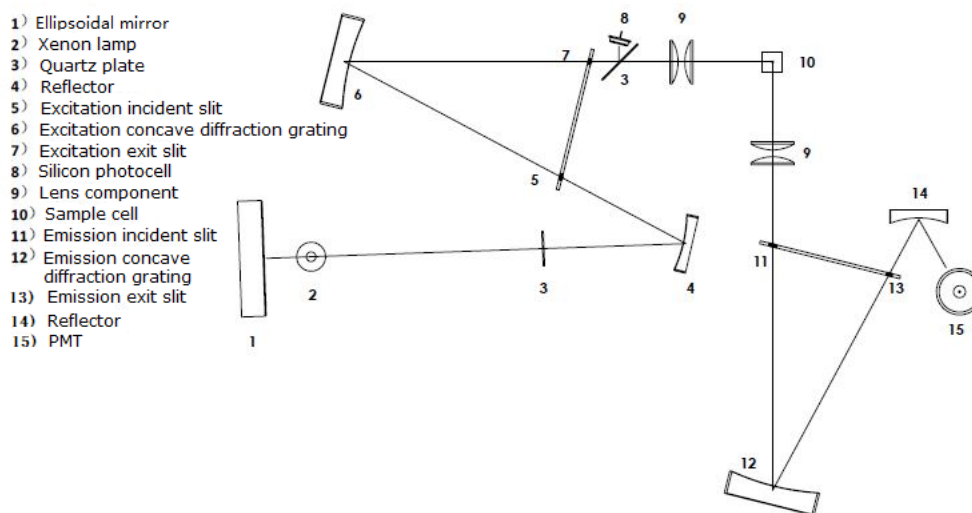
Figure 2-1 Schematic diagram of FL970 optical system

2.2 Theory

FL970 consists of lamp, EX monochromator, sample chamber, two photoelectric conversion components, control circuit, data circuit and independent PC system (Figure 2-2).
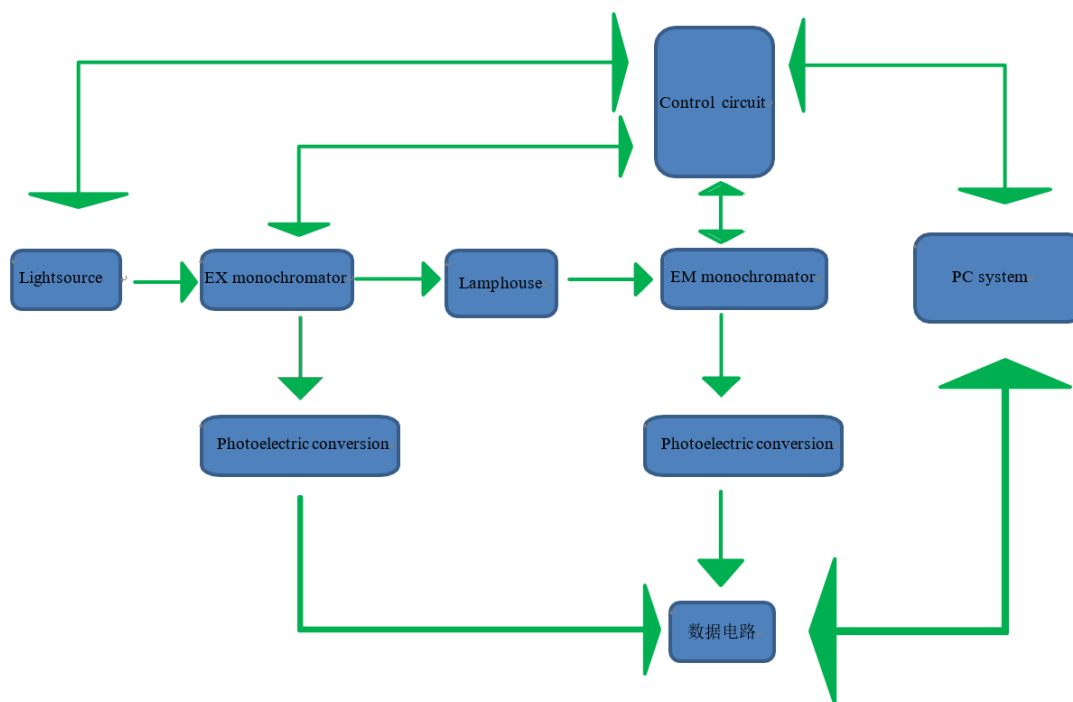
Figure 2-2 Schematic of FL970

2.3 Specifications

1) Light source: 150W xenon lamp

2) Wavelength range: Excitation (EX) 200nm~900nm;

Emission (EM) 200nm~900nm.

3) Spectral bandwidth: Excitation 1nm, 2.5nm, 5nm, 10nm, 20nm;

Emission 1nm, 2.5nm, 5nm, 10nm, 20nm.

4) Wavelength accuracy: Excitation wavelength ±2nm, Emission wavelength ±2nm.

5) Wavelength repeatability: Excitation wavelength ≤1nm, Emission wavelength ≤1nm.

6) Response time : Raman peak of distilled water 0~98%，about 2s

7) Signal-to-noise ratio (S/N ratio): When the excitation and fluorescence frequency bandwidth is 10nm, Raman peak of distilled water (S/N ratio) ≥200

8) LOD: 5×10^{-11}g/ml

9) Linearity of the instrument measurement results: Y≥0.995

10) Repeatability of the peak values of the fluorescence spectra: ≤1.5%

11) Zero line drift within 10 minutes: ≤0.3%

12) Variety of fluorescence intensity value within 10 minutes: ≤±1.5%

2.4 Software

Smoothing; 1-4 Derivative; Retrieve peaks; Calculate spectrum peak area; Continuous scanning measurement; Synchronous scanning measurement; Sample Quantitation analysis; Draw the standard curve (1-3 order); Sample concentration; Spectra arithmetic; Save and open the spectra; Spectra window processing; Measure S/N ratio automatically; Measure D/S ratio automatically; 3D Scan; Quantitation measurement.

2.5 Printout: Print of photometry and Quantitation analysis, and spectrum

2.6 Power: 220V±22V, 50Hz±1Hz; Rated power 300W

2.7 Dimension: Length 667mm; Width 601mm; height 258 mm

2.8 Weight: 47kg

Chapter 3 Operation

3.1 Software Installation

Computer hardware and software configuration:

Hardware: standard personal computer (PC), has a main unit, monitor, keyboard, mouse and at least one USB port for connecting to FL970.

Software: Microsoft Windows7 (32-bit) or Windows10 (64-bit) operating system. Microsoft Office software must also be installed if the user needs to export the data.

Choose the correct version of the FLA software from the USB flash disk, according to the configuration of the PC, then make the setup clicking.

3.2   Communication Port Installation

Connect the instrument to the computer with a USB communication cable and turn on the power switch. The computer will recognize a new hardware serial port. If not, it is necessary to install the driver.(the driver is available in the USB flash disk)

3.3   Uninstall FL Analyst

Remove the FL970 Analyst software in the control panel of the PC.

3.4   Software Initialization and Exit

1)   Connect the instrument to the computer with a USB communication cable and turn on the power switch. The instrument will initialize itself and this will take about 5 minutes.

2)   Double Click the shortcut of "FL Analyst" on the desktop to enter the software initialization interface.

3)   As shown in Figure 3-1, the software will automatically identify the instruments connected to COM1 to COM8 and display information such as instrument model, serial number, software version number and connection of optional accessories.
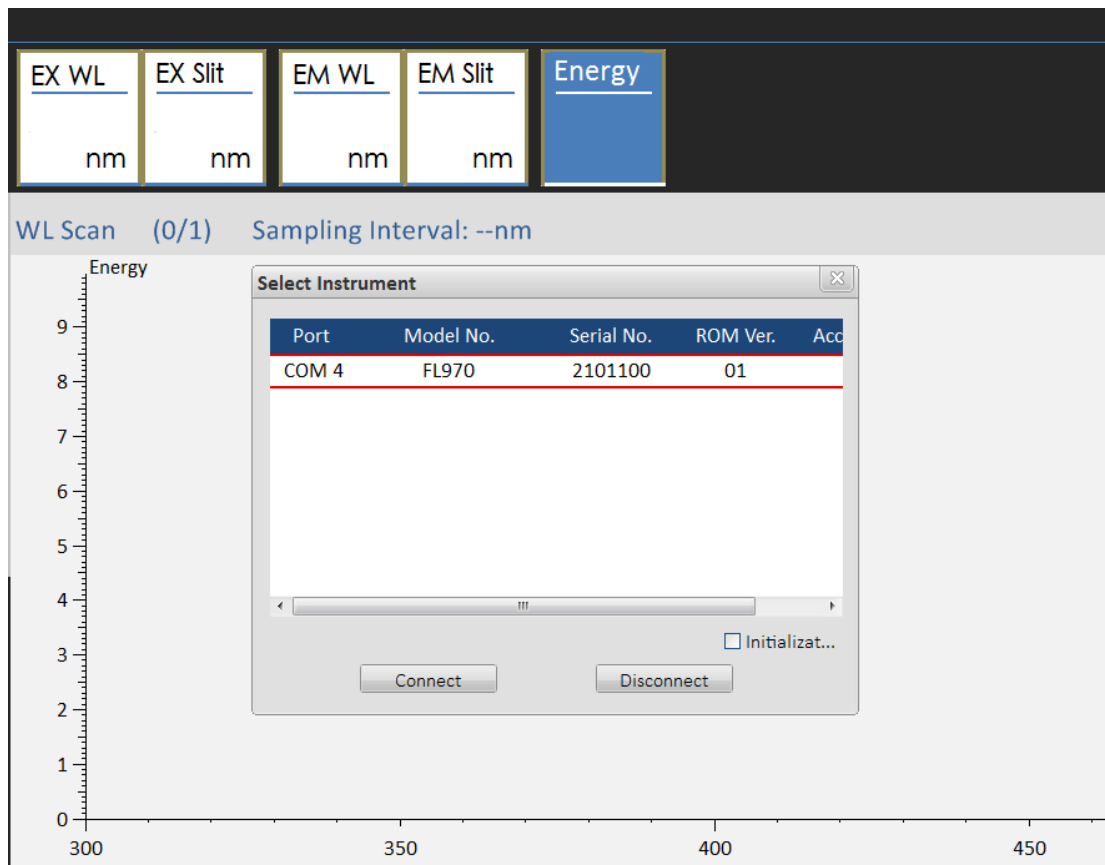
Figure 3-1 Connection window of FL970 and the software

After use, please exit the software and turn off the instrument according to the following steps:

1) Click the "×" in the upper right corner of the software interface, and the dialog box as shown in Figure 3-2 will appear;
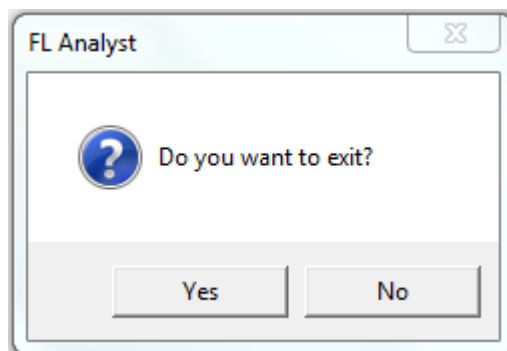
Figure 3-2 Dialog box of the exit of the software

2) Click the "Yes" button to exit the software;
3) Turn off the power switch of the instrument.

3.5 Software Main Menu

Click the "Connect" button and enter the main interface of FL analyst, as shown in Figure 3-3:
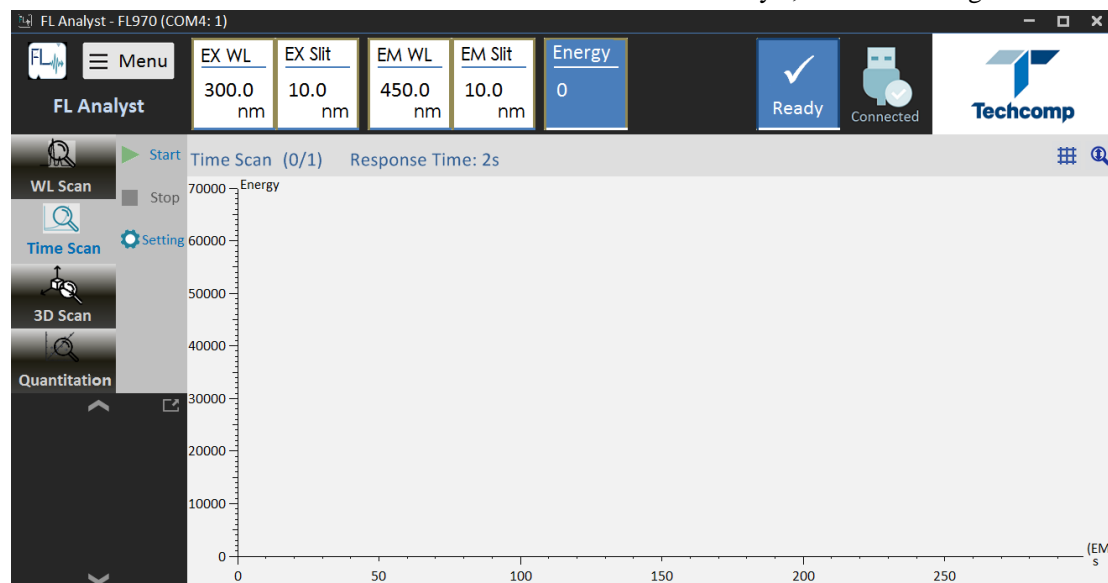
Figure 3-3 Main menu of FL970 software

Click the menu button of "Function" in the upper left corner, and there are 4 drop-down menus, which are respectively:

- File
- Instrument
- Self-Diagnostics
- Settings

File:

In the menu of "File", there are 4 submenus: "Open", "Overlay from a File", "Overlay" and "Save As".

1） Open

Click "Open", as shown in Figure 3-4, select the file you want to open and click "Open".
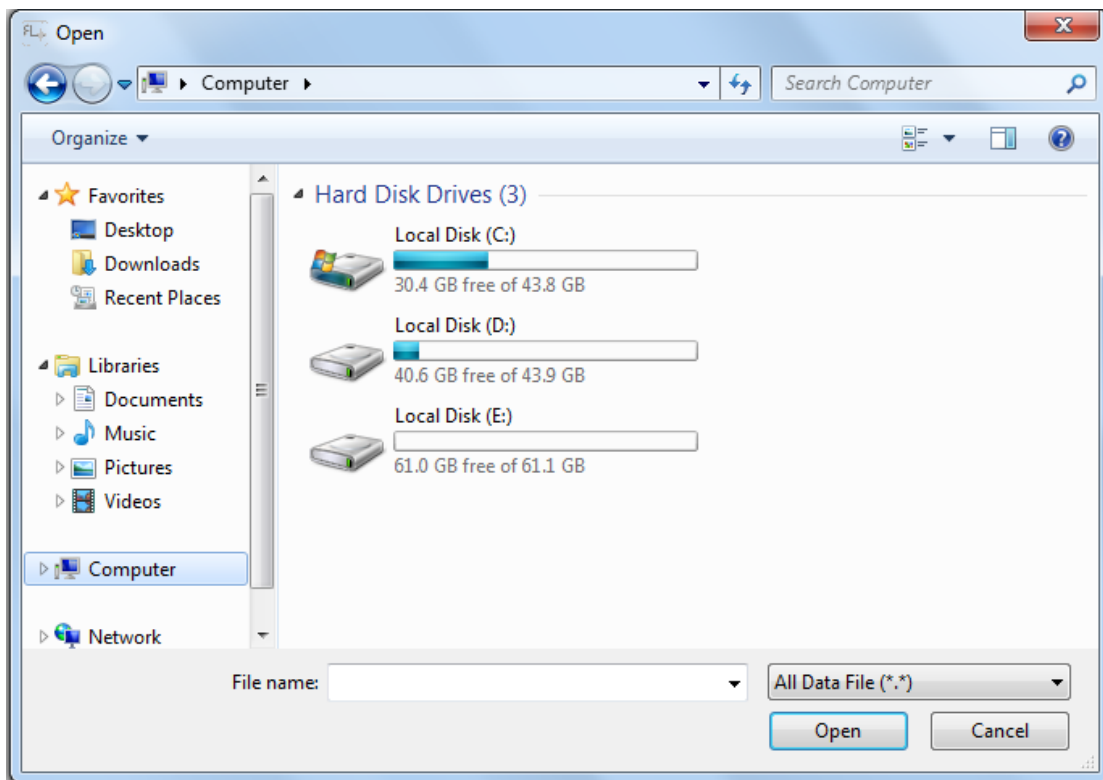
Figure 3-4 Dialog box of openning the file

2）Overlay from a File

Select the spectra you want to overlay. When selecting the spectra, note that we can only select the spectra that scan mode and data mode are the same.

After overlaying the spectra, the interface is shown in Figure 3-5. Different spectra are displayed in different colors on the interface. Select the data to display from the right side of the interface as needed (Data 1-1 or Data 1-2).

Using the mouse or the keyboard to move the red cursor in the spectra, the corresponding data will be marked in the data table on the right side, and the color mark belts on the top of the spectra will show the fluorescence intensity values of the two spectra. As shown in Figure 3-6.
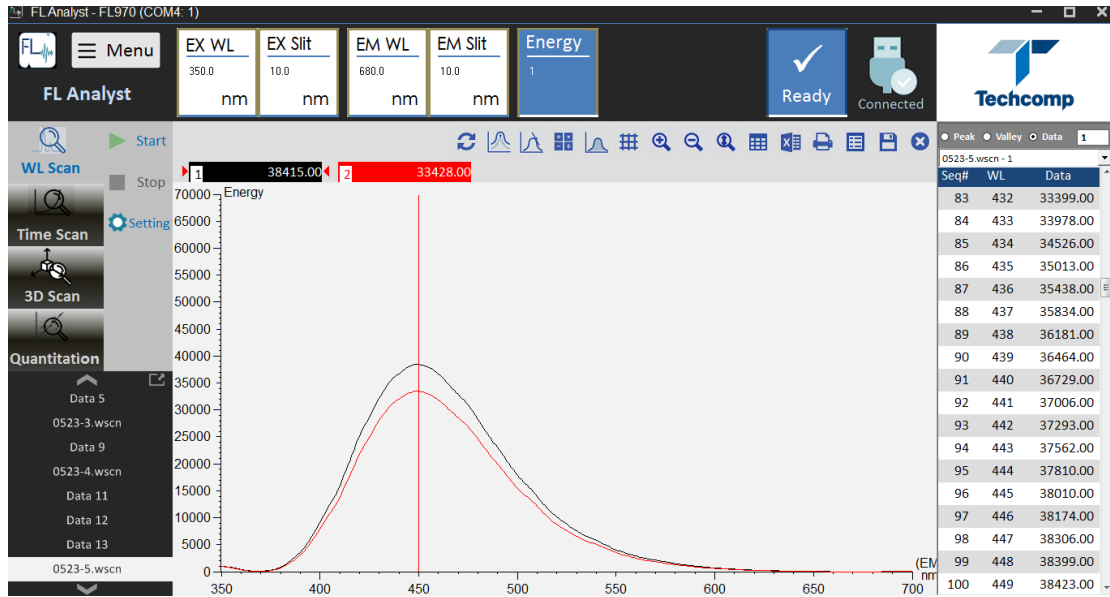
Figure 3-5 Window of overlaying the spectra
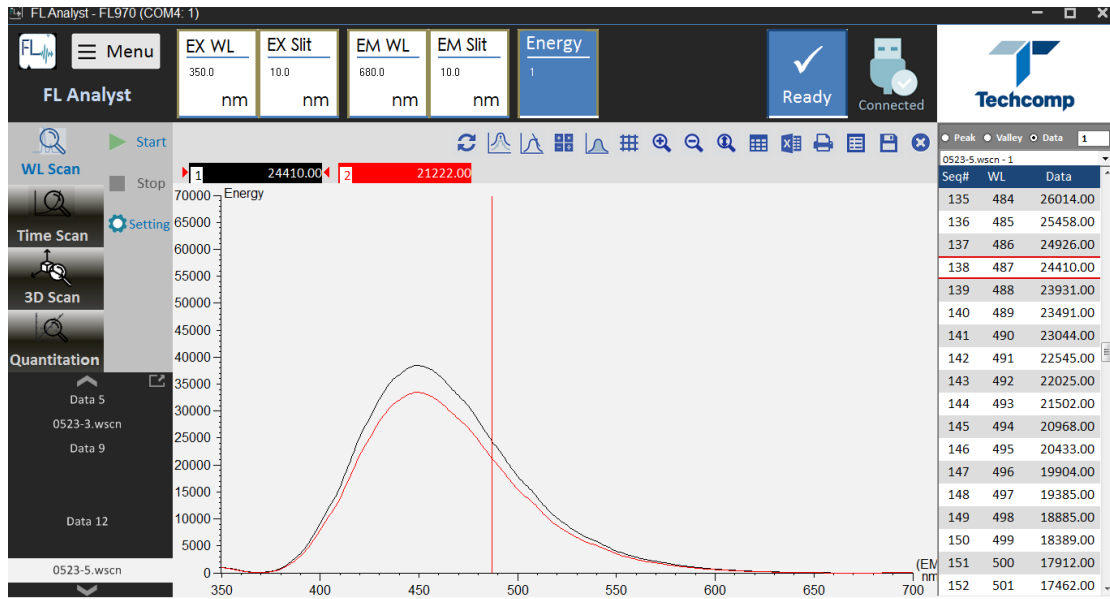
Figure 3-6 Color mark belts of the fluorescence intensity values of the two spectra

When overlaying several spectra, we can select some of the spectra to be hidden or seen as needed, as shown in Figure 3-7. The data can be hidden by double-clicking the color mark belts above the spectra with the mouse. The color mark belt becomes gray, and the related spectra is hidden. Meanwhile, the selected data from the right drop-down box becomes gray

If you want this data to be visible, double-click the gray mark belt above the spectra.
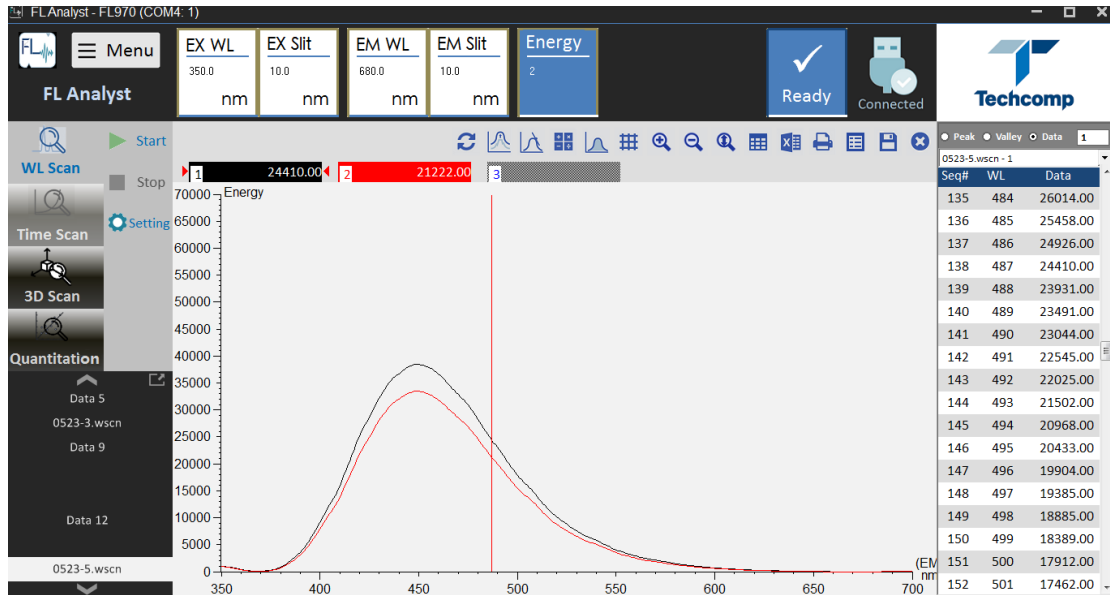
Figure 3-7 Window of displaying or hiding the spectra

3） Overlay

Click "Overlay", as shown in Figure 3-8. The overlay dialog box appears, as shown in Figure 3-9.
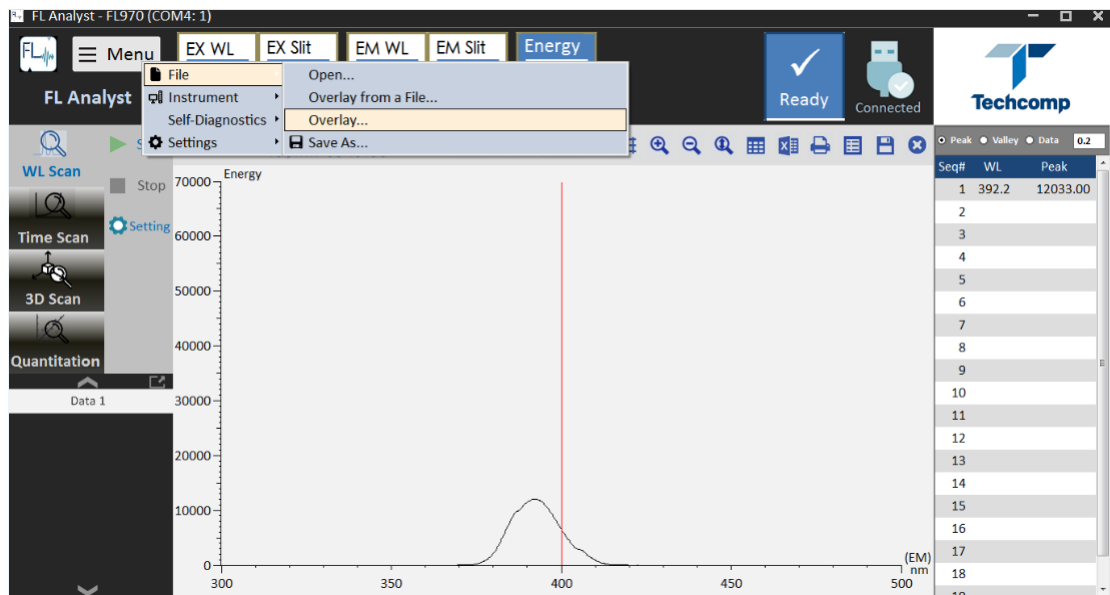
Figure 3-8 Demo window of overlaying the spectra

"Overlaid spectrum" is in the left of the dialog box, "Existing" is in the right of the dialog box. Move the left spectrum to the right as needed and click "OK", the spectra will be displayed on the main interface. Data marked with an asterisk in the "Existing" dialog box, which can't be moved to the "Overlaid Spectrum" by "«" or "Remove All".
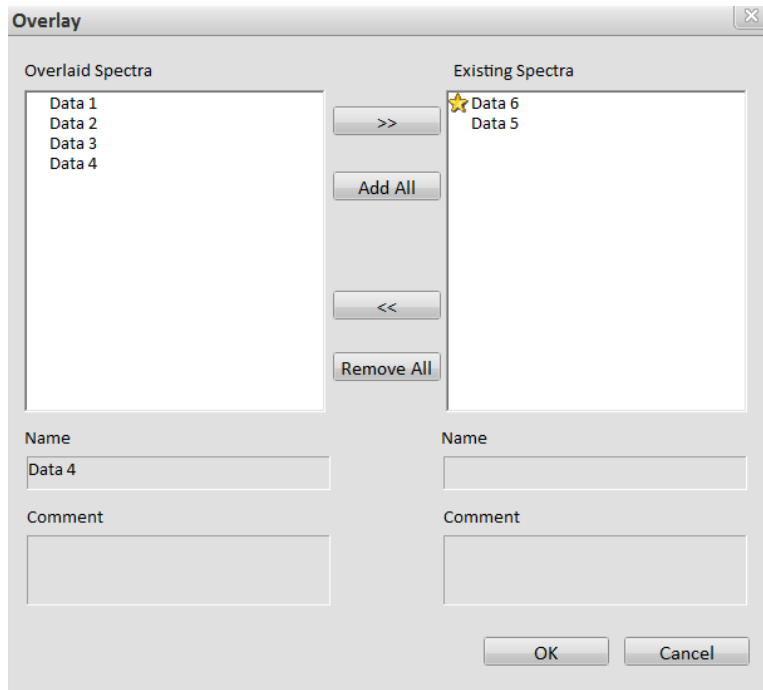
Figure 3-9 Dialog box of overlaying the spectra

Data without an asterisk marker can be removed from "Existing" to "Overlaid Spectrum". As shown in Figure 3-10 and Figure 3-11.
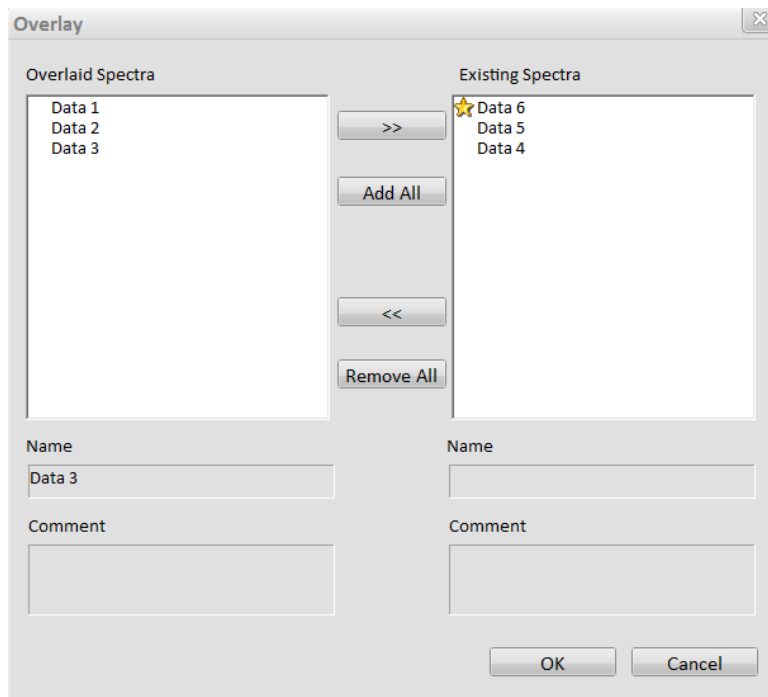
Figure 3-10 Dialog box of removing spectra from "Existing" to "Overlaid Spectrum"
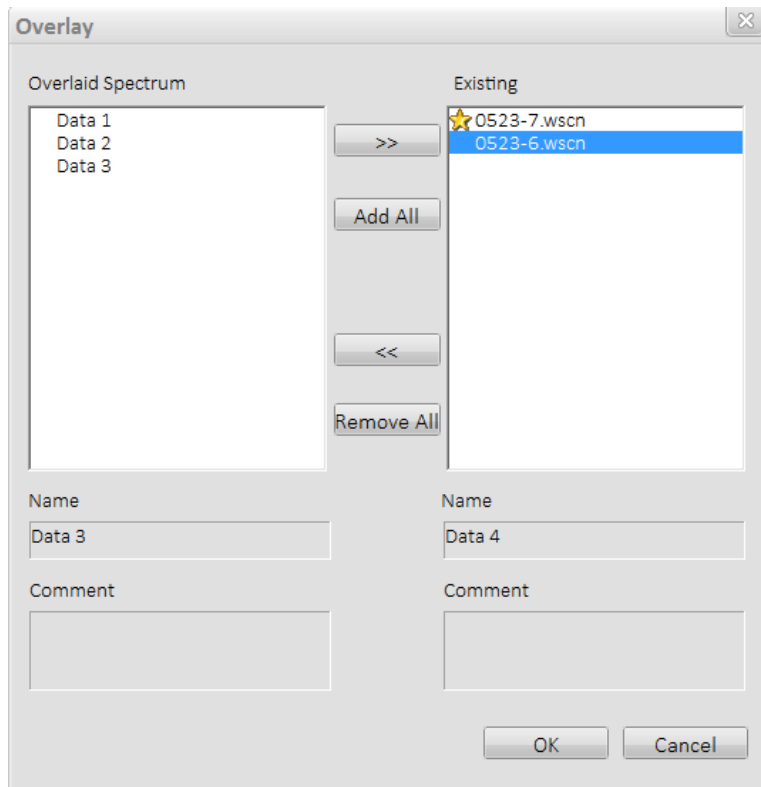
Figure 3-11 Demo dialog box of removing spectra from "Existing" to "Overlaid Spectrum"

4）Save As

Save the spectrum as the corresponding type as needed.

Instrument:

Click "Instrument", there are 5 submebus: "EM Wavelength Shift", "EX Wavelength Shift", "Concentration Measurement", "Search Instrument" and "Initialize".

1) EM Wavelength Shift, EX Wavelength Shift

EM, EX wavelength shortcut setting options. Click them and set the correspongding wavelength as needed. As shown in Figure 3-12.
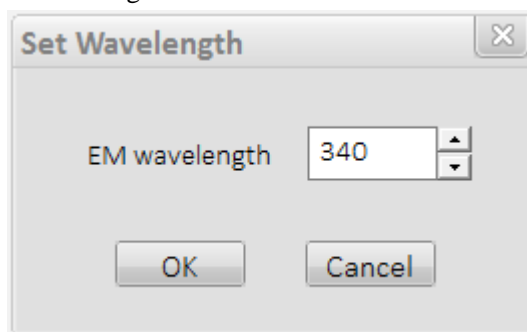
Figure 3-12 Dialog box of setting wavelength

2) Concentration Measurement

Click "Concentration Measurement", the below dialog box appears. As shown in Figure 3-13. The displayed results of concentration measurement is fluorescence energy value. Select whether to measure or deduct the background (or blank) as required.

If it is necessary to deduct the background (or blank) for measurement, put the background (or blank) solution in the sample room, and click "Background Measurement" to

measure the background. Click "Measurement INT" to measure the samples one by one and the results are displayed sequentially in the left dialog box. The result is the value that the background (or blank) have been deducted.

If it is unnecessary to deduct the background (or blank), click directly "Measurement INT" and the value will be displayed in the left dialog box.

Click "Clear Data" as needed to clear the data.
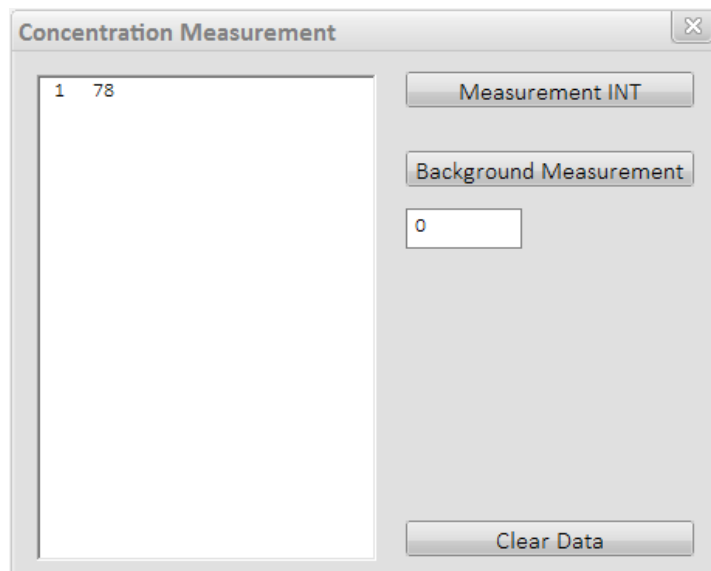
Figure 3-13 Dialog box of the concentration measurement

Self-Diagnostics:

Click "Self-Diagnostics", there are 4 submenus: "Drift" (Debug internal control indicators), "Change of Fluorescence Value" (Debug internal control indicators), "S/N (RMS)" and "S/N (RMS-BG)".

The PMT value can be set in the "setting" of "Wavelength Scan" or "Time Scan" as needed, click the options that need to be executed, and the instrument will automatically perform the operation.

The PMT value of RMS and RMS (BG) is set as 700V. Distilled water that is distilled three times is put into the cuvette, and other parameters are set automatically.

Settings:

"Set <WL Scan> Parameters", "Export <WL Scan> Parameters", "Import Parameters", "Import Standard Curve" (Effective when "Quantitation") and "About FL Analyst" (FL970 software information, such as the version number) can be set in the submenu. As shown in Figure 3-14.
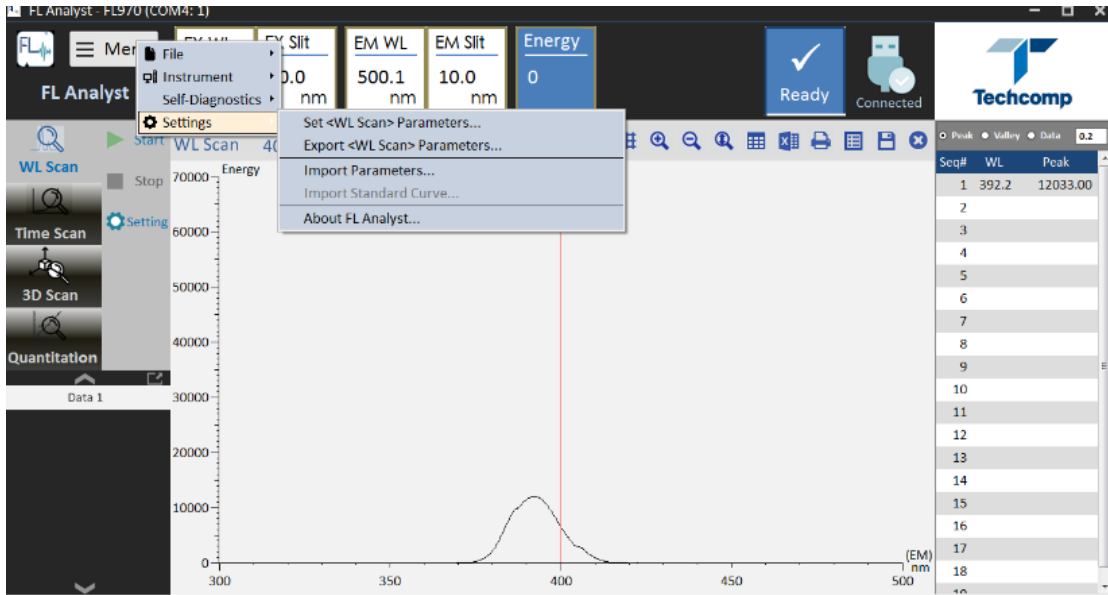
Figure3-14 Demo window of Settings

Close all data views:

　　Click the icon as shown in Fig 3-15, all displayed spectra and data can be deleted.
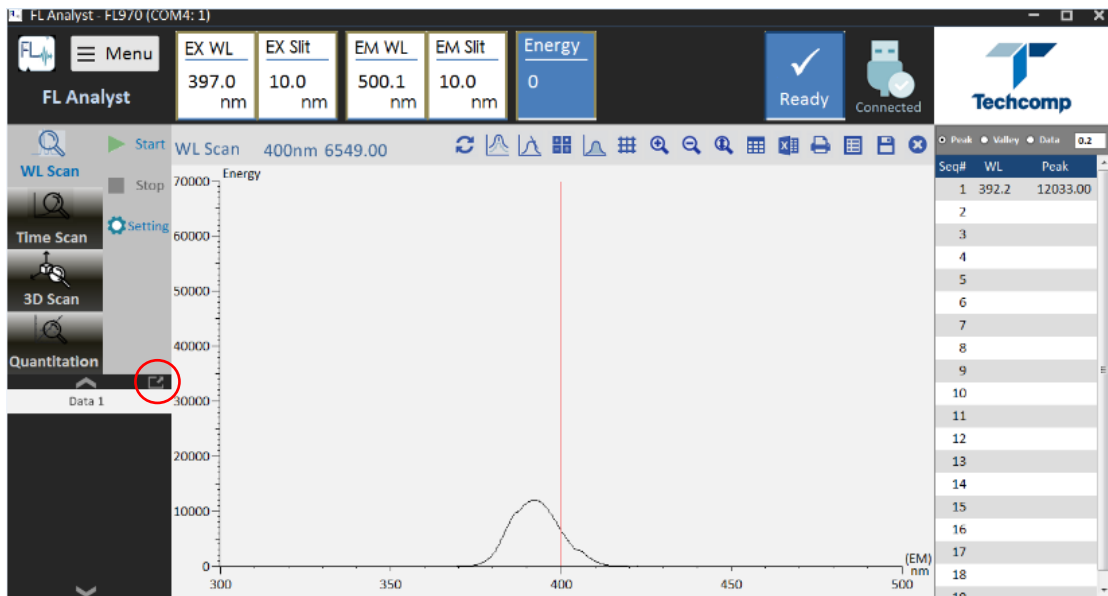
Figure3-15 Icon of closing all the data

3.6 Wavelength Scan

At the end of initialization and the state of the instrument is "Ready", click "WL Scan" in the left main function bar and enter the function interface of wavelength scan, as shown in Figure 3-16.
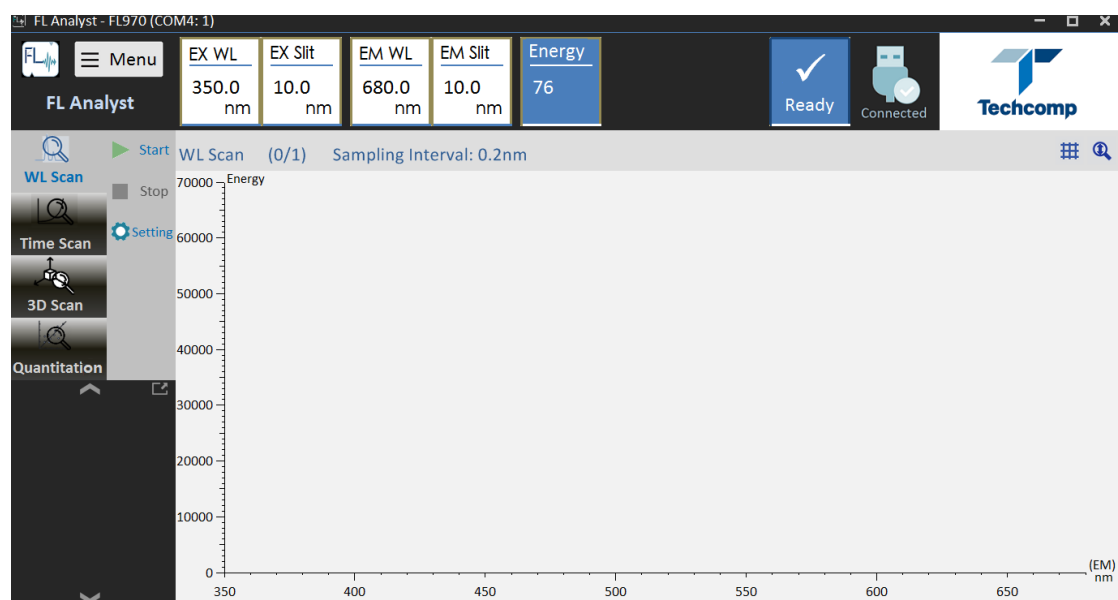
Figure 3-16 Function interface of wavelength scan

3.6.1 Parameters Setting

Click the "Setting" button in the right toolbar of "WL Scan" for parameter input; the parameter setting window consists of 5 tabs, which are respectively:

- General
- Instrument
- Wavelength Scan
- Data Processing
- Plot

1）General

As shown in Figure 3-17, the company name and operator can be input, and instrument information can be displayed.
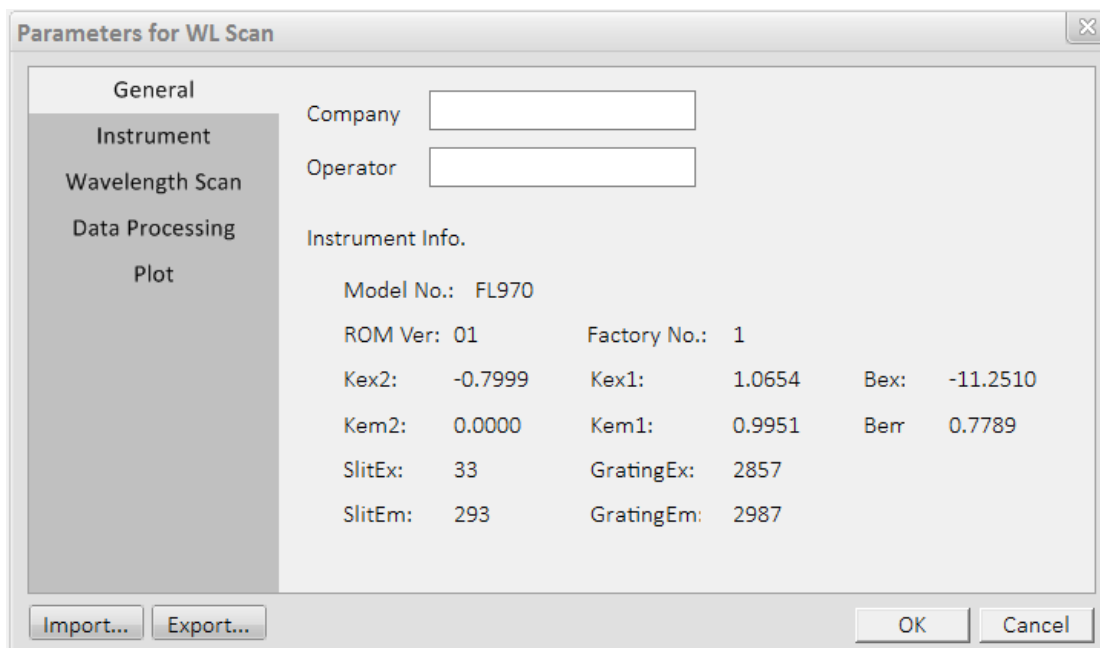
Figure 3-17 Dialog box of General parameters for WL Scan

2）Instrument

As shown in Figure 3-18, the introduction of various system parameters of the instrument is as follows:
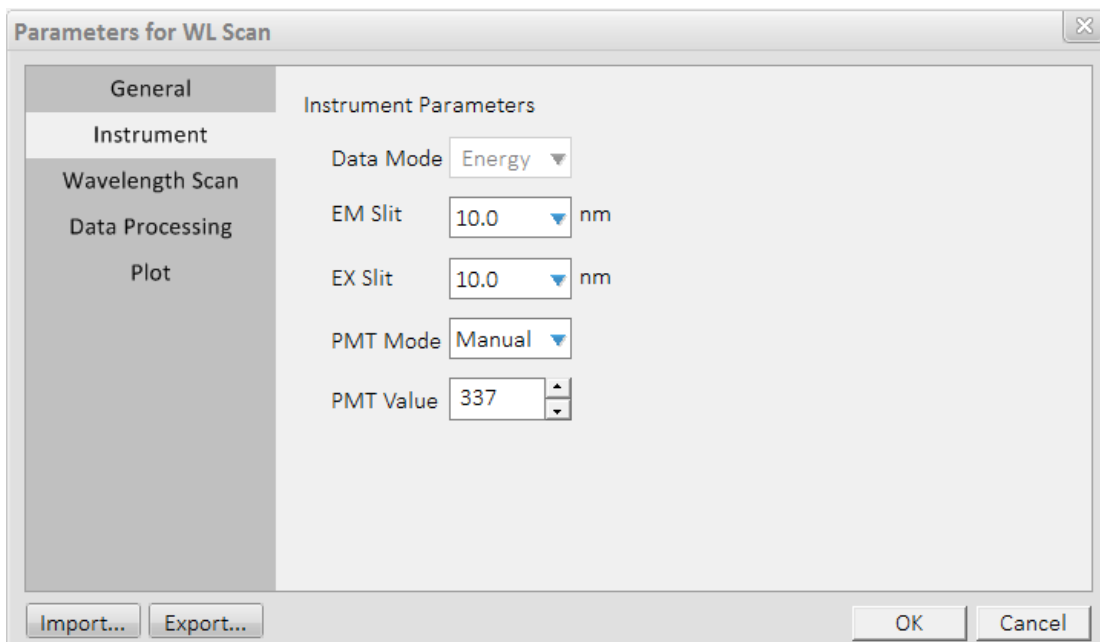
Figure 3-18 Dialog box of Instrument parameters for WL Scan

- Slit

  EX Slit and EM Slit of FL970 can be adjusted, which are respectively: 20nm, 10nm, 5nm,

2.5nm, 1nm and closed.

- PMT Mode and PMT Value

PMT Mode refers to the boosting mode of the photomultiplier. PMT Value can be entered in manual mode, the range is 0～900V.

Open the cover plate of the sample compartment lid, the high voltage will automatically switch off. Close the cover plate, it is necessary to reset in the interface of "Setting".

3) Wavelength Scan

As shown in Figure 3-19, the parameters required for wavelength scan are described as follows:
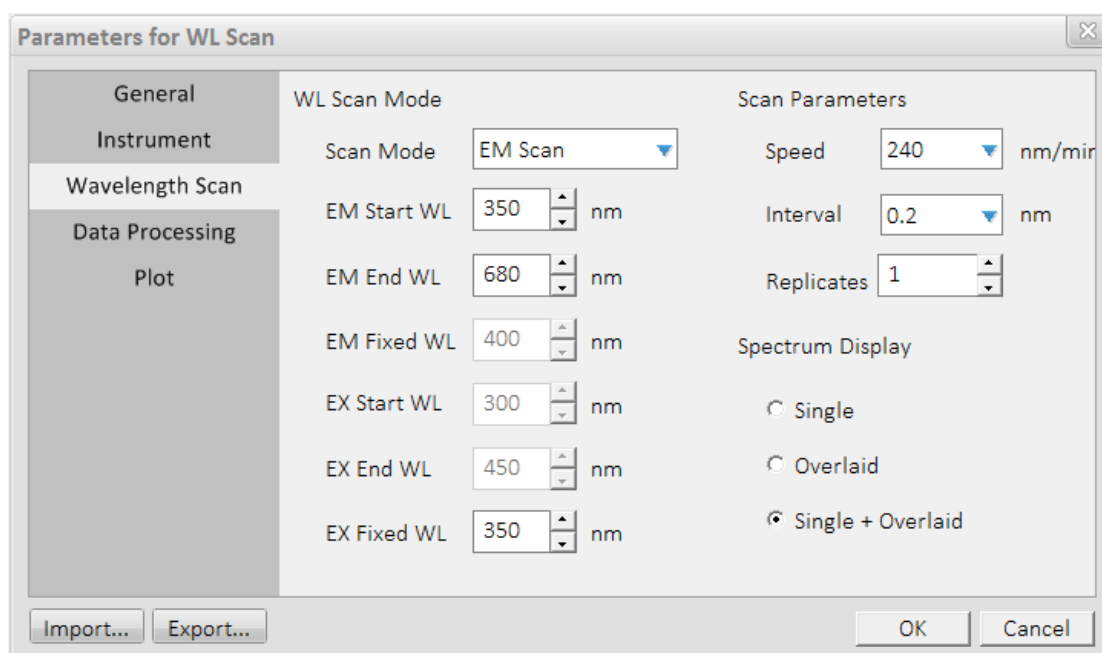
Figure 3-19 Dialog box of wavelength scan parameters for WL Scan

- Scan Mode

There are three Scan Modes: EM Scan, EX Scan and Synchronized Scan from top to bottom.

- Start WL

Start value of wavelength scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the start wavelength must be less than the end wavelength at least 1nm.

- End WL

End value of wavelength scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the end wavelength must be more than the start wavelength at least 1nm.

- Fixed WL

Fixed value of wavelength scan can be input from 200nm to 900nm with a minimum step size of 0.2nm.

- Scan Speed

Speed of wavelength scan: 30, 60, 240, 1200, 2400 and 30000nm/min.

- Data Interval

  Data interval of wavelength scan: 0.2, 1.0, 2.0, 3.0, 5.0, 10.0nm

- Replicates

  Continuous scan of the times one through ten can be selected.

  4) Data Processing

  As shown in Figure 3-20, the parameters that are necessary for judging peak and valley are described as follows:

- Threshold

  When the difference value between peak and valley is more than this value which the peak valley can be judged. Recommend value is 5.

- Sensitivity

  The number required of the data points between peak and valley which the peak valley can be judged. Recommend value is 2.
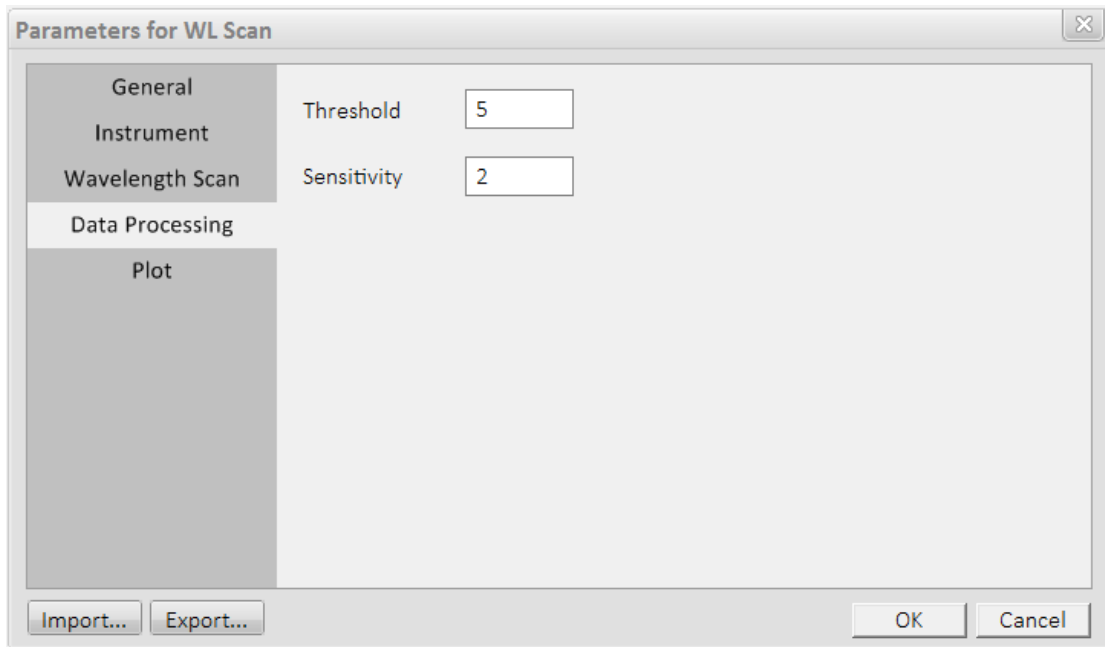
Figure 3-20 Dialog box of Data Processing parameters for WL Scan

  5) Plot

  As shown in Figure 3-21, the parameters that are necessary for plotting are described as follows:

- Max and Min of X Axis

  Max and Min of X Axis can be determined according to the values of start wavelength and end wavelength.   These value cannot be changed.

- Max and Min of Y Axis

  The range is -70000~70000. Recommended range is 0~70000.
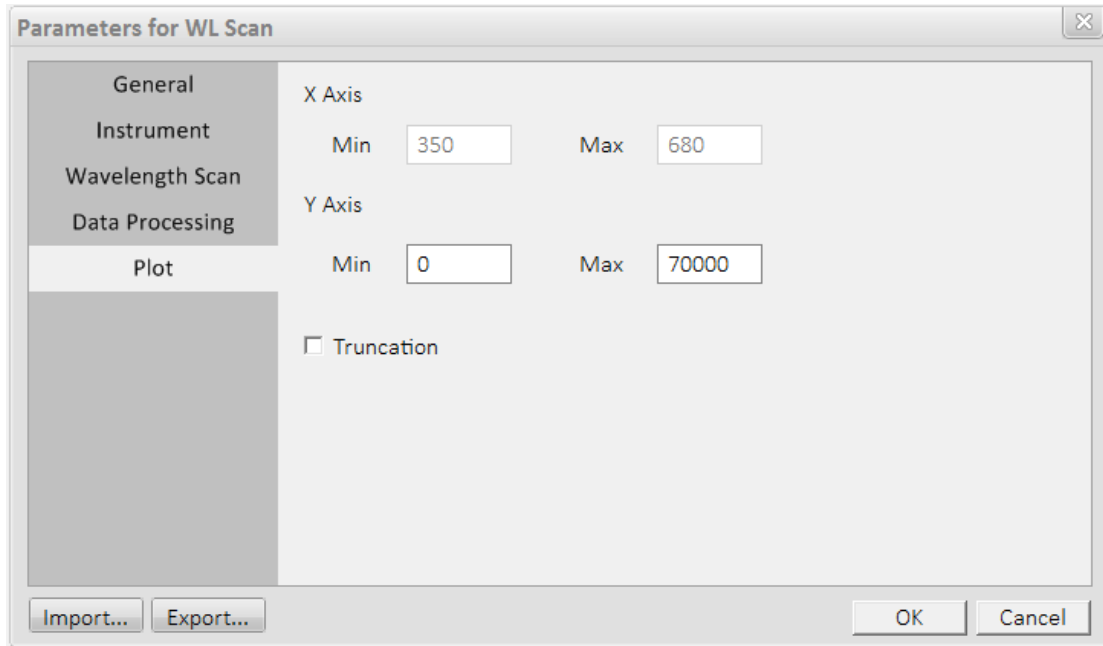
Figure 3-21 Dialog box of Plot parameters for WL Scan

3.6.2 Sample Measurement

1) Click "Start" button in the right toolbar of "WL Scan", and the status bar of the instrument prompts the conversion from "Ready" to "Scanning", as shown in Figure 3-22.

Note: the "Start", "Stop" and "Setting" buttons in the toolbar are valid, the rest are invalid. The interface of "Time Scan" is the same.
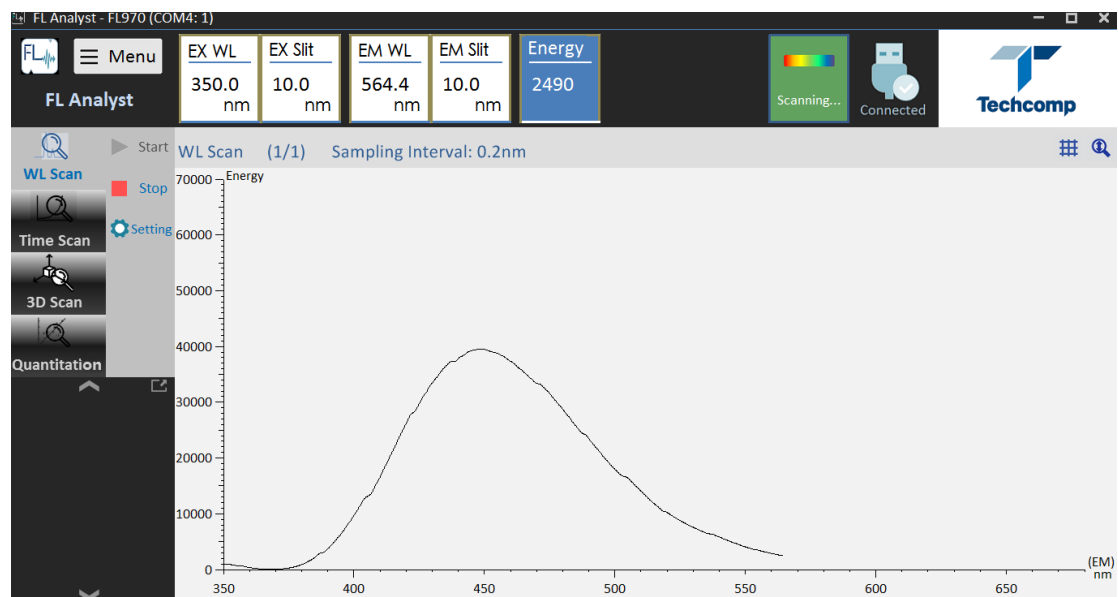
Figure 3-22 Display window of the status of clicking the "Start" button of WL Scan

The data window appears after the scan, as shown in Figure 3-23. There are several tool buttons in the toolbar above the window. The scan data area is on the right of the window, which can display three data types, such as Data list, values of Peak and Valley. The interval of the data list can be entered (in the right box of "Data", and press "Enter" to confirm). The default value is the same as the scan interval.
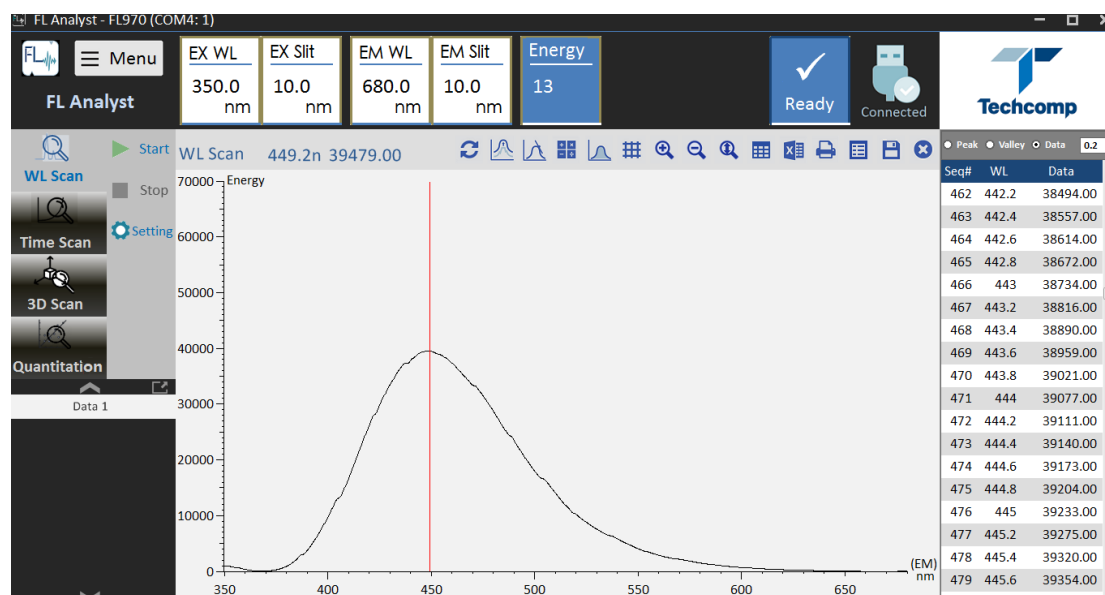
Figure 3-23 Display window of the end of wavelength scan

3.6.3 Data Processing and Print

1) Reset

After clicking "Reset" button, the spectrum and data are automatically restored to the original state. The X axis and Y axis coordinate data of the spectrum should be subject to the coordinates of the data file at the end of the measurement.

2) Smooth and Derivative

Click the corresponding buttons (as shown in Figure 3-23), the spectrum and data will become the spectrum and data that have been smoothed and derivated, which can be performed continuously. The number of smooth and derivation will be displayed in the upper right of the spectrum. If you save the file at this moment, the data is still as raw data.

3) Spectra arithmetic

This function is used for four arithmetic operation. Click "Spectra arithmetic" button, the window as shown in Figure 3-24 appears. Select the two spectra and algorithms that need to be calculated, and the processed spectrum is displayed in the right of the window. Each spectrum can first perform the four arithmetic operation that between the spectrum and a constant, the spectra that have been opened can be selected. The calculation results can be saved and printed.
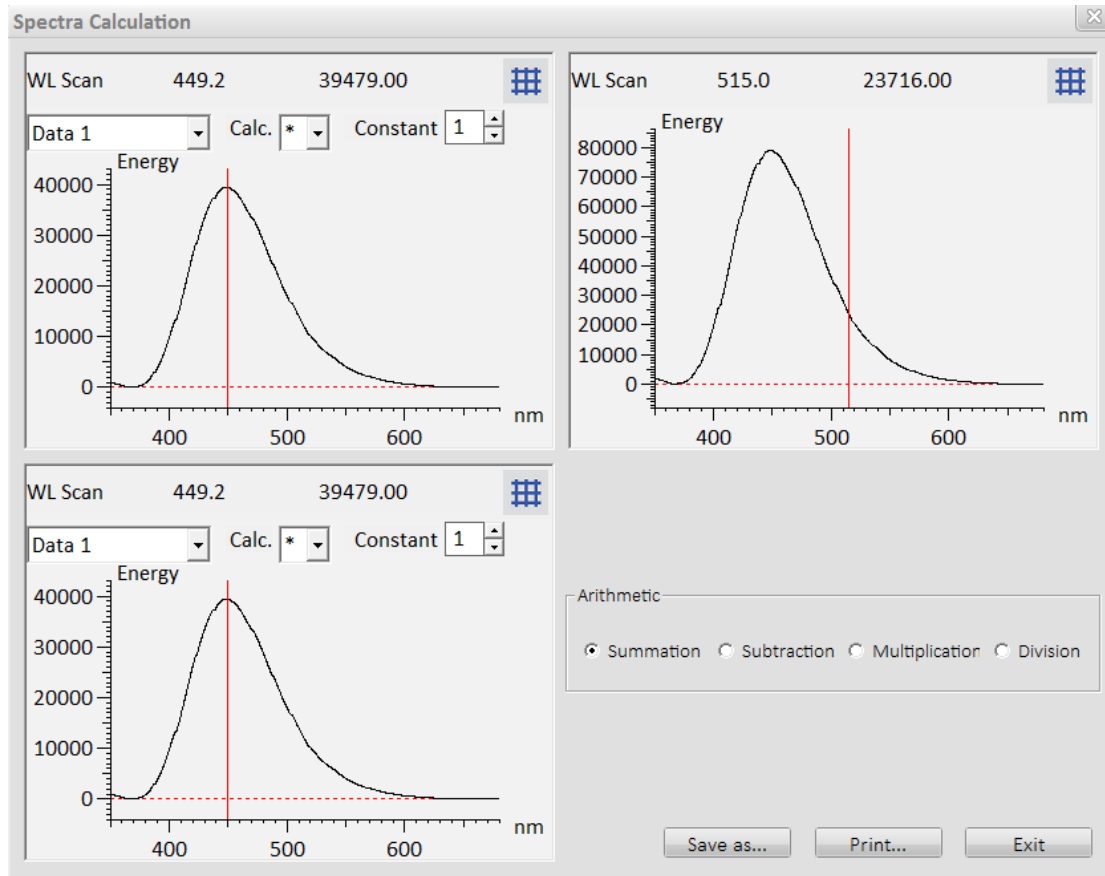
Figure 3-24 Dialog box of spectra arithmetic for WL Scan

△Note
Arithmetic can only be performed between the two spectra with the same data pattern

4) Calculate spectrum area

Click "Calculate spectrum area" button, the window as shown in Figure 3-25 appears. Enter start wavelength and end wavelength, and click "Calc. Area" to get the result. S1 represents the area of the spectrum below X axis. S2 represents the area of the spectrum above X axis. S3 equals one plus one. Average means that (positive area + negative area)/wavelength range or time scan range.
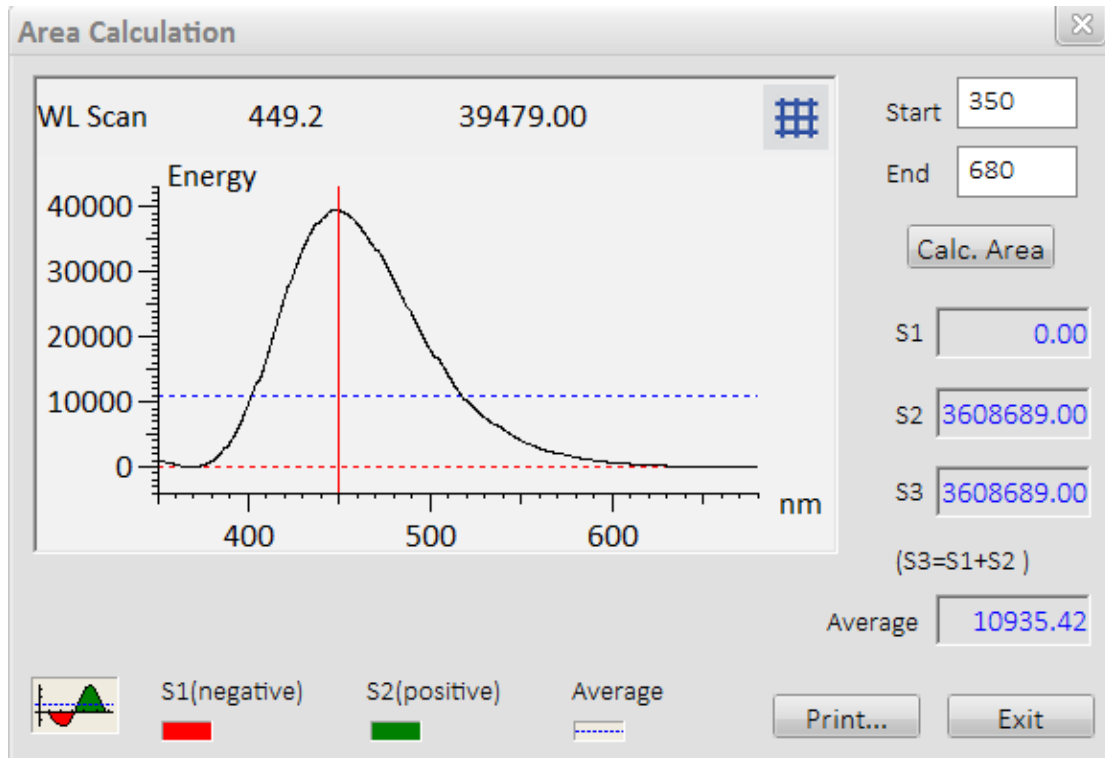
Figure 3-25 Dialog box of calculating spectrum area for WL Scan

5) View parameters

Click "View parameters" button, and the window as shown in Figure 3-26 appears.

There are four pages in the window of "Property of WL Scan". For the first three pages, leave them as the default.

● The general information is displayed in the first page.　The sample name and the comment can also be entered.　The length of the sample name is 24 characters.　The length of the comment bar is 200 characters.
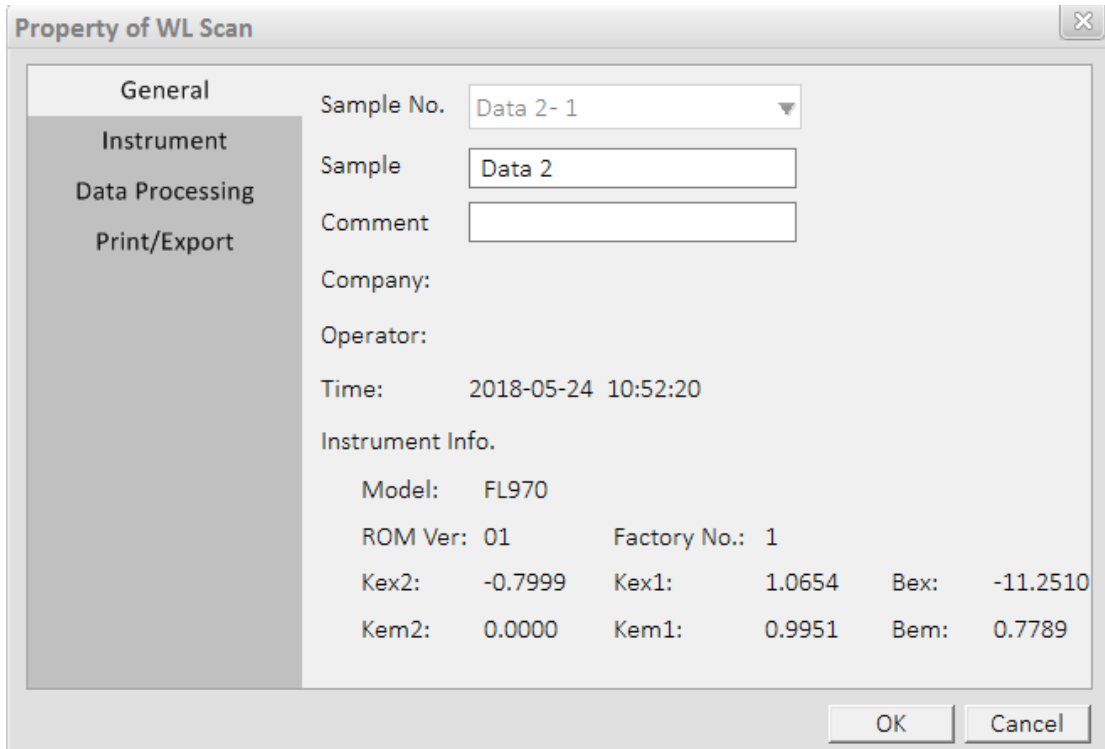
Figure 3-26 Dialog box of clicking the "View parameters" button for WL Scan

- The second page shows the system parameters of the instrument and the main parameters of wavelength scan, as shown in Figure 3-27.
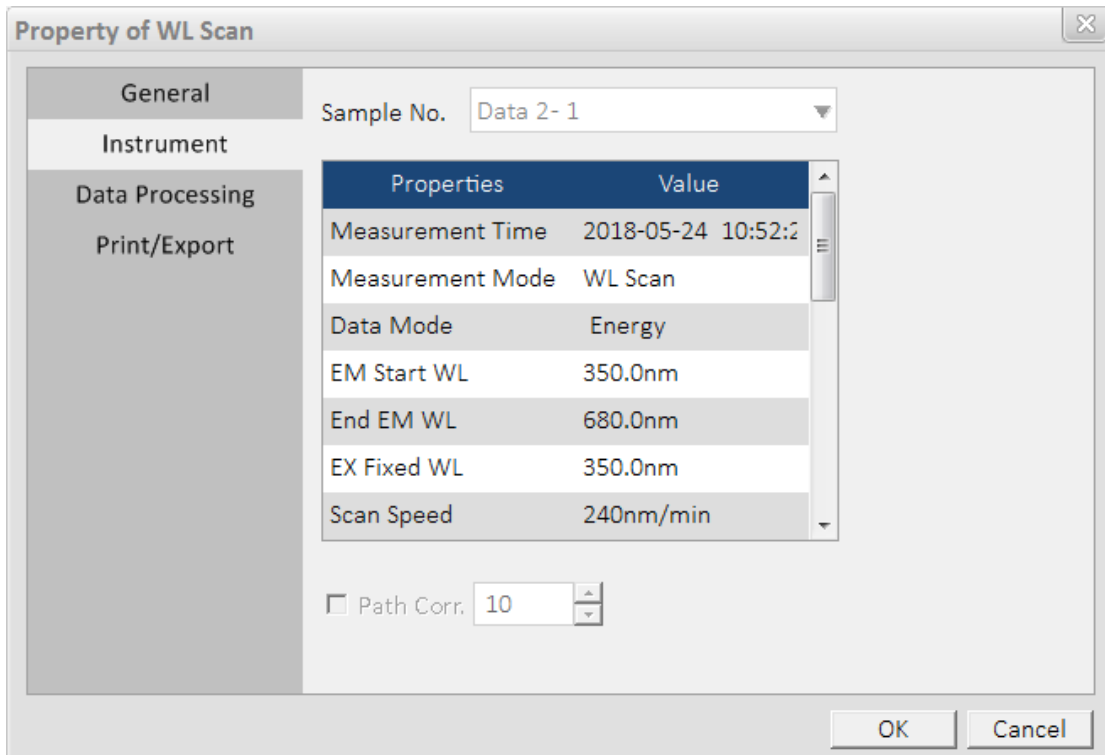
Figure 3-27 Dialog box of the system parameters of the instrument and the main parameters of WL Scan

- The third page is the parameters of "Data Processing", as shown in Figure 3-28. All parameters can be re-entered.
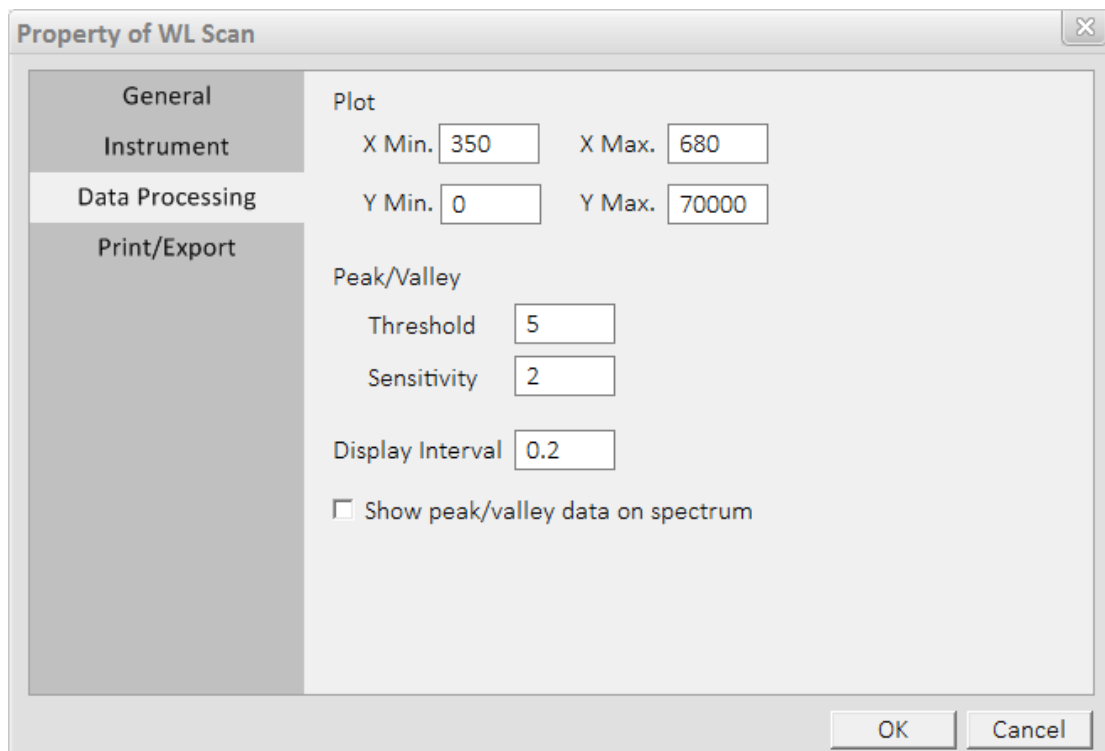
Figure 3-28 Dialog box of Data Processing after clicking the "View parameters" button for WL Scan

- The fourth page is "Print/Export", as shown in Figure 3-29. Print report/export file, the checked items are displayed and the font and size can also be selected. The default size of the font is 9.   It is better not to change it. If the font size is changed, it may lead to typesetting confusion.
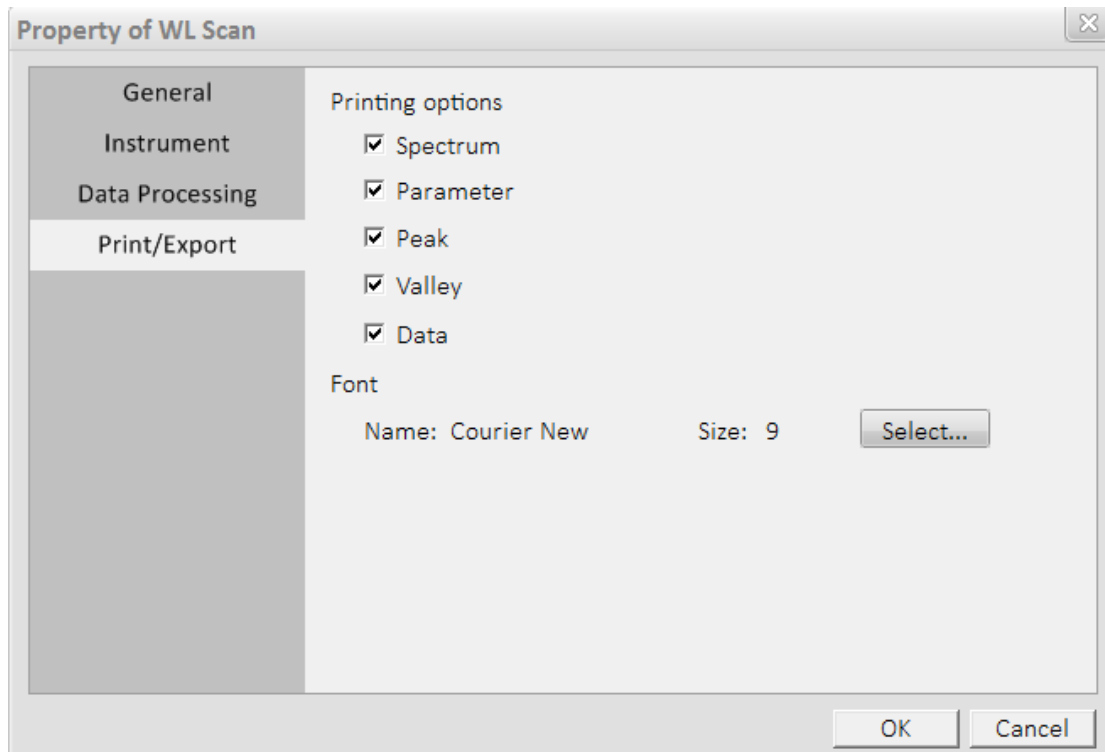
Figure 3-29 Dialog box of Print/Export after clicking the "View parameters" button for WL Scan

6) After setting the print options of scan property, click the print icon in the upper right of the spectrum window to print the related spectrum and data, etc.

7) Click the " 💾 " button in the main interface of the software to save the current spectrum and data; Click the " ✖ " button to exit the interface of wavelength scan.

8) Check in front of "Data" in Fig 3-29, and then click the "OK" button. Click " 📊 " Microsoft Excel icon in the upper right of the spectrum window, and save as dialog box appears as shown in Figure 3-30. Select the storage location, enter the file name, click "Save" button, the Figure 3-31 appears. Then the scanned spectrum can be processed in Microsoft Excel software.
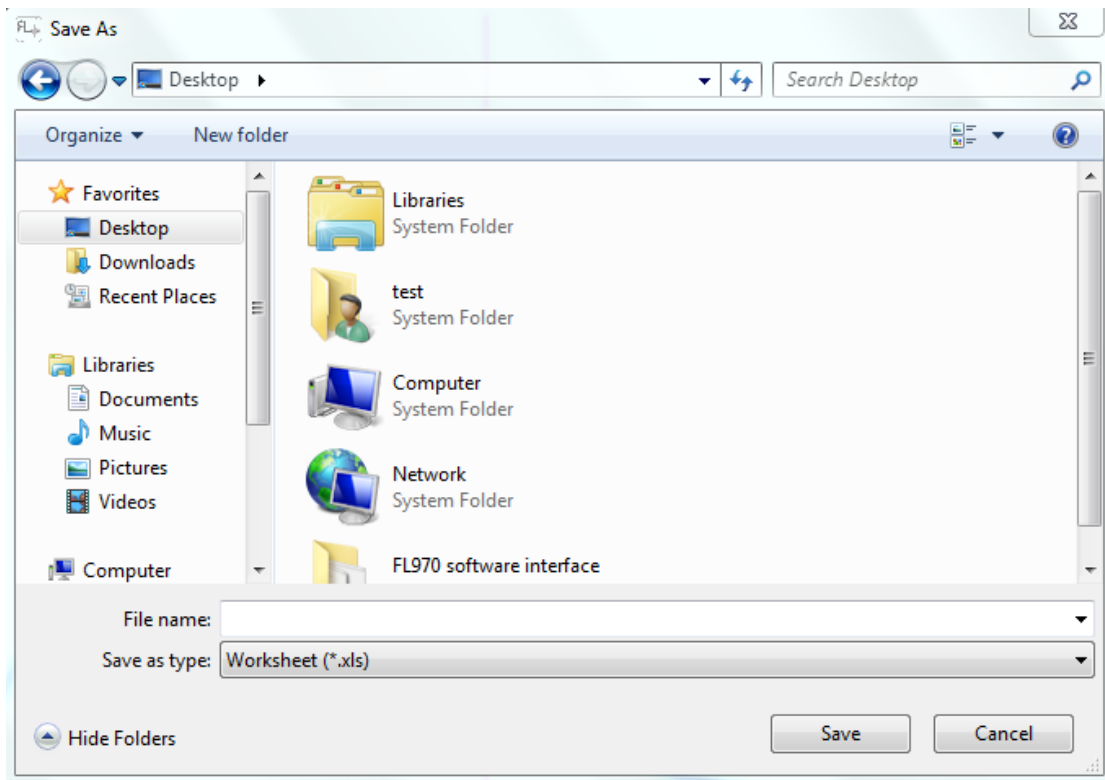
Figure 3-30 Dialog box of "Save As" after clicking the excel icon for WL Scan
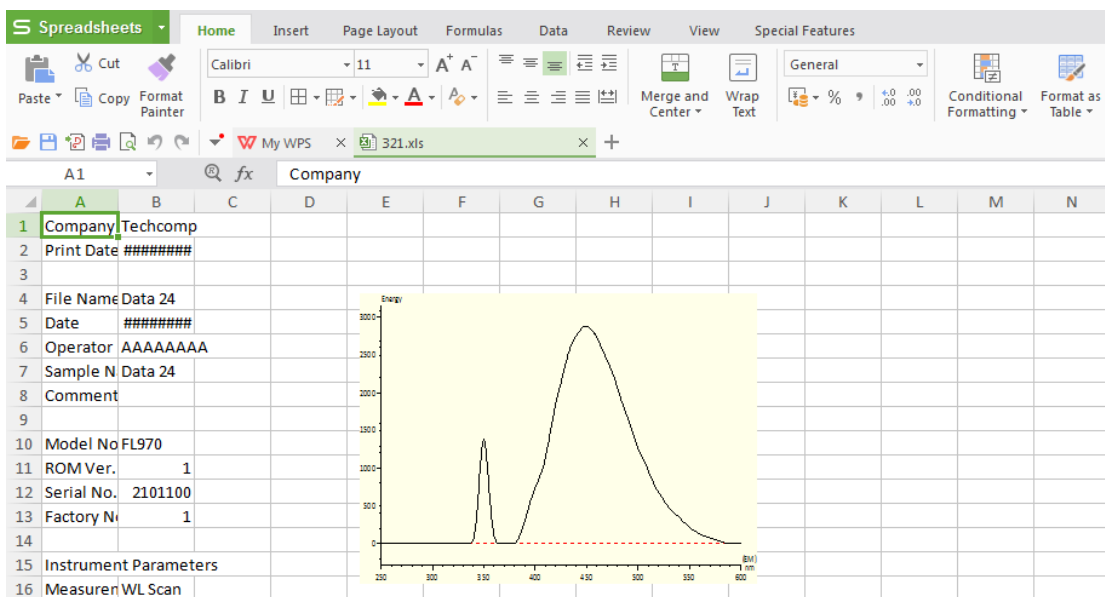
Figure 3-31 Excel display window after clicking the "Save" button

3.7 Time Scan

At the end of initialization and the status of the instrument is "Ready", click "Time Scan" in the left of the main function bar to enter the function interface of time scan, as shown in Figure 3-32.
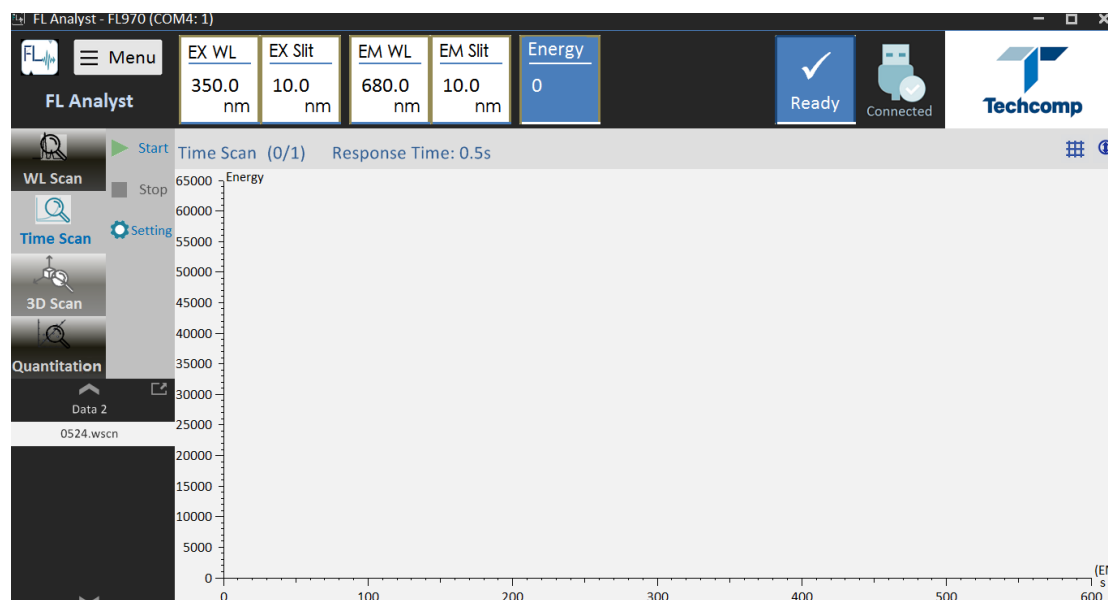

Figure 3-32 Function interface of Time Scan

3.7.1 Parameters Setting

Click "Setting" button in the toolbar on the right of time scan interface to input the parameters. The window of "Setting" consists of 5 pages, which are respectively:

- General
- Instrument
- Time Scan
- Data Processing
- Plot

1) General

As shown in Figure 3-33, the company name and the operator can be entered, and the instrument information can also be displayed.
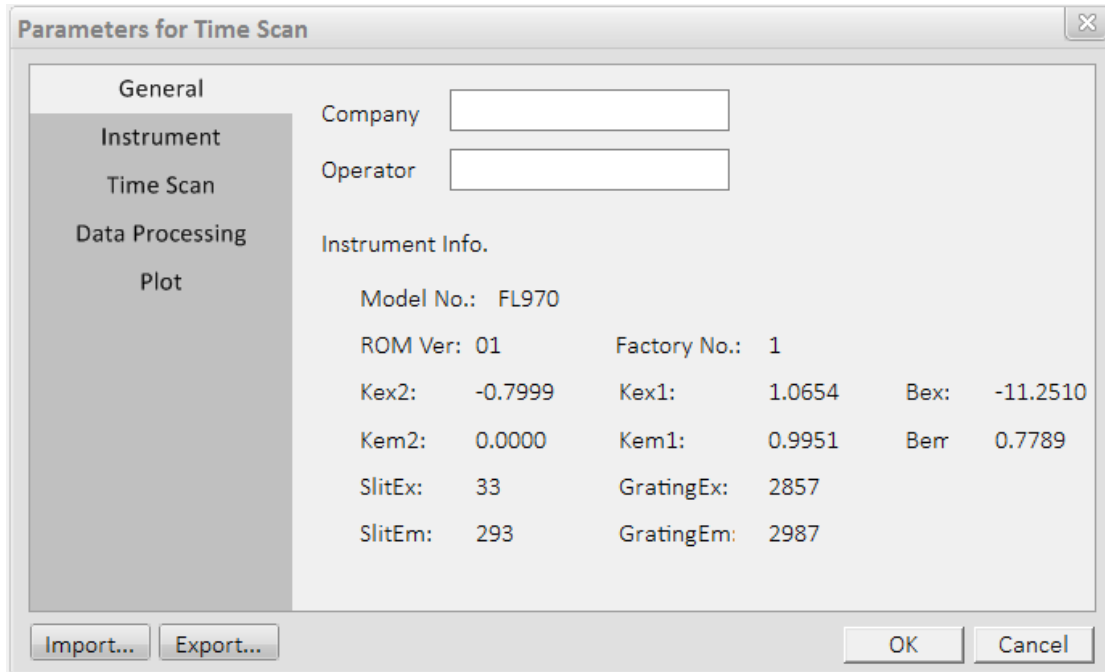
Figure 3-33 Dialog box of General parameters for Time Scan

2) Instrument

As shown in Figure 3-34, the introduction of various system parameters of the instrument is as follows:
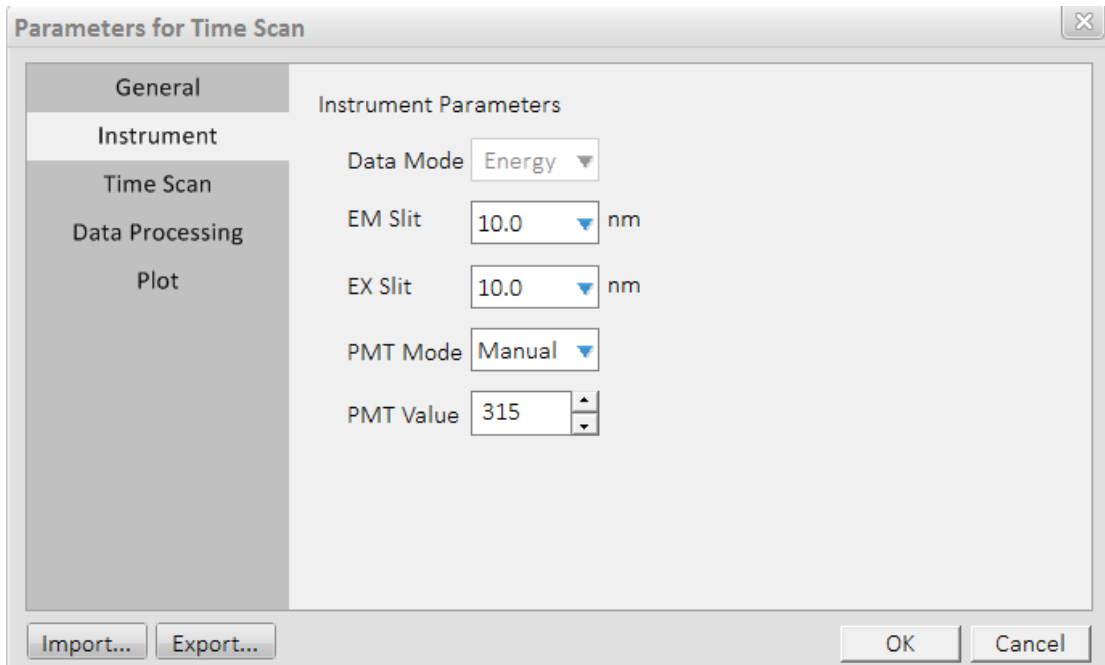
Figure 3-34 Dialog box of Instrument parameters for Time Scan

- Slit

EX Slit and EM Slit of FL970 can be adjusted, which are respectively: 20nm, 10nm, 5nm, 2.5nm, 1nm and closed.

- PMT Mode and PMT Value

PMT Mode refers to the boosting mode of the photomultiplier. PMT Value can be entered in manual mode, the range is 0～900V.

Open the cover plate of the sample room, the high pressure will automatically close. Close the cover plate, it is necessary to reset in the interface of "Setting".

3) Time Scan

As shown in Figure 3-35, the parameters required for wavelength scan are described as follows:
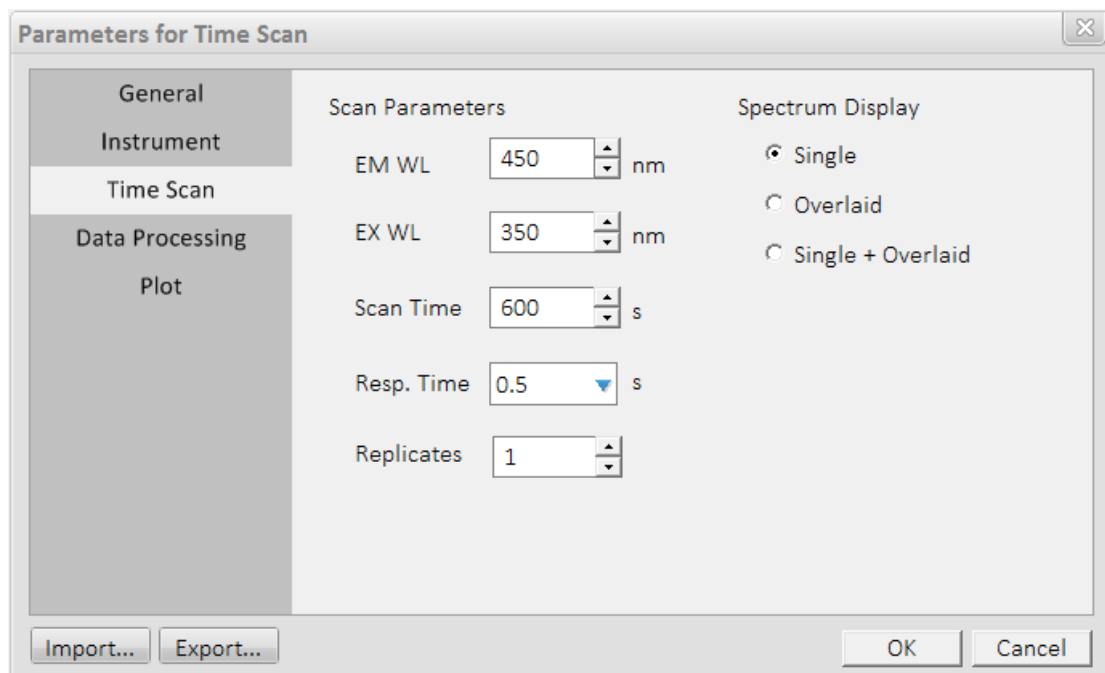
Figure 3-35 Dialog box of time scan parameters for Time Scan

- EM WL

The EM wavelength of time scan can be input from 190nm to 900nm with a minimum step size of 0.2nm.

- EX WL

The EX wavelength of time scan can be input from 190nm to 900nm with a minimum step size of 0.2nm.

- Scan Time

The input range is from 30 to 900 seconds.

- Resp. Time

The optional time for detector to collect signal points is 0.2s, 0.5s, 1s, 1.5s, 2s and 5s.

- Replicates

The selection range is from 0 to 10.

4) Data Processing：

As shown in Figure 3-36, the parameters that are necessary for judging peak and valley are described as follows:

- Threshold

When the difference value between peak and valley is more than this value which the peak valley can be judged. Recommend value is 2.

- Sensitivity

The number required of the data points between peak and valley which the peak valley can be judged. Recommend value is 5.
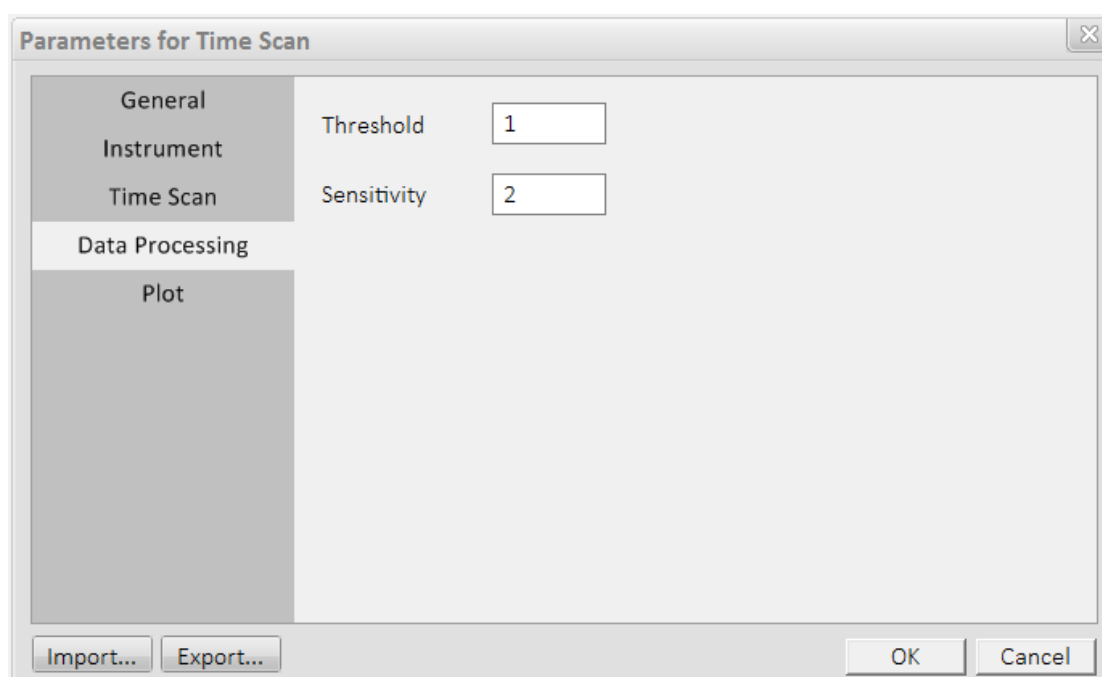

Figure 3-36 Dialog box of Data Processing parameters for Time Scan

5) Plot

As shown in Figure 3-37, the parameters that are necessary for plotting are described as follows:

- Max and Min of X Axis

Max and Min of X Axis can be determined according to the values of scan time, which can't be changed.

- Max and Min of Y Axis

The range is -70000～70000. Recommended range is 0～70000.
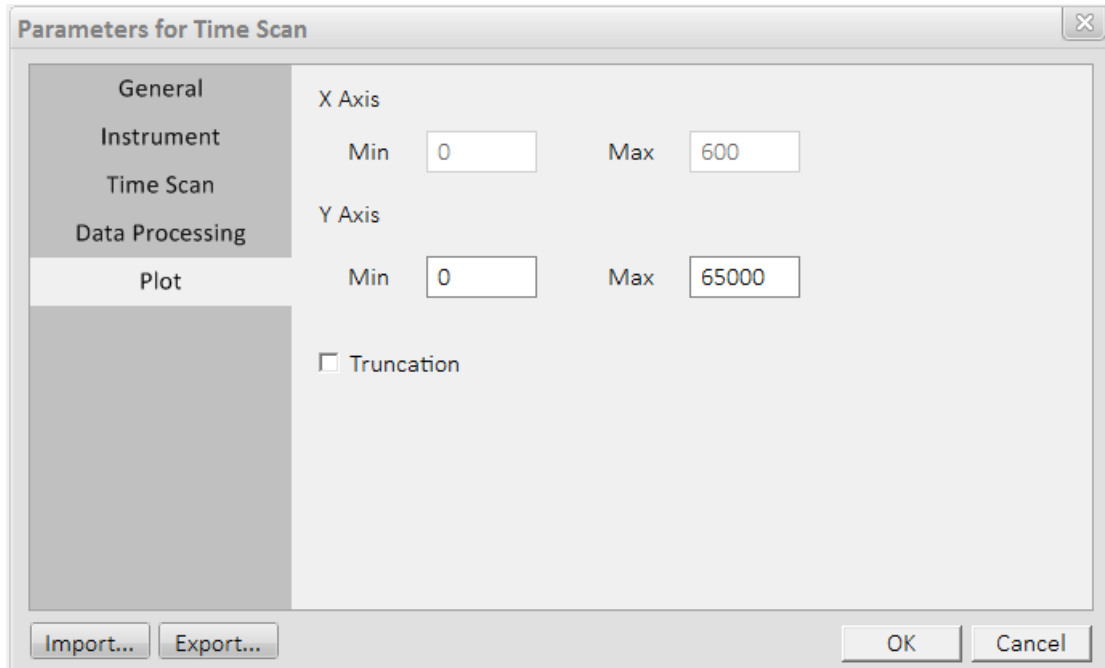
Figure 3-37 Dialog box of Plot parameters for Time Scan

3.7.2 Sample Measurement

1) Click "Start" button in the right toolbar of "Time Scan", and the status bar of the instrument prompts the conversion from "Ready" to "Scanning", as shown in Figure 3-48.

Note: the "Start", "Stop" and "Setting" buttons in the toolbar are valid, the rest are invalid.
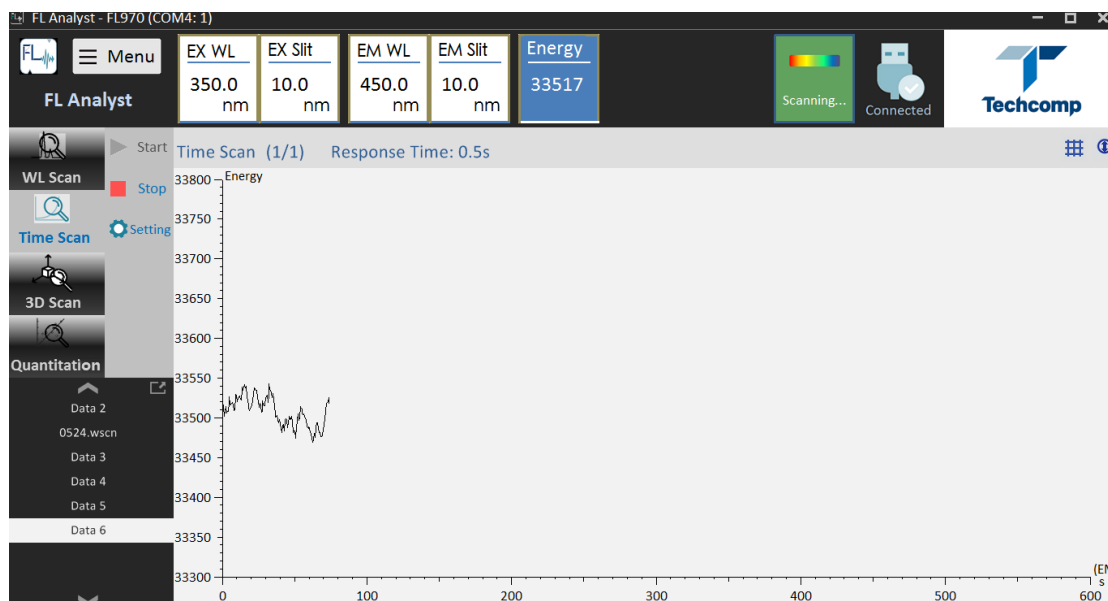

Figure 3-38 Display window of the status of clicking the "Start" button of Time Scan

1) The data window appears after the scan, as shown in Figure 3-39. There are several tool buttons in the toolbar above the window. The scan data area is on the right of the window which display three data types, Data list, values of Peak and Valley. The interval of the data list

can be entered (in the right box of "Data", and press "Enter" to confirm). The default value is the same as the scan interval.

Figure 3-39 Display window of the end of time scan

3.7.3 Data Processing and Print

As 3.6.3.

3.8 3D Scan

initialization completion and the status of the instrument will show as "Ready", click "3D Scan" in the left of the main function bar to enter the function interface of 3D scan, as shown in Figure 3-40.
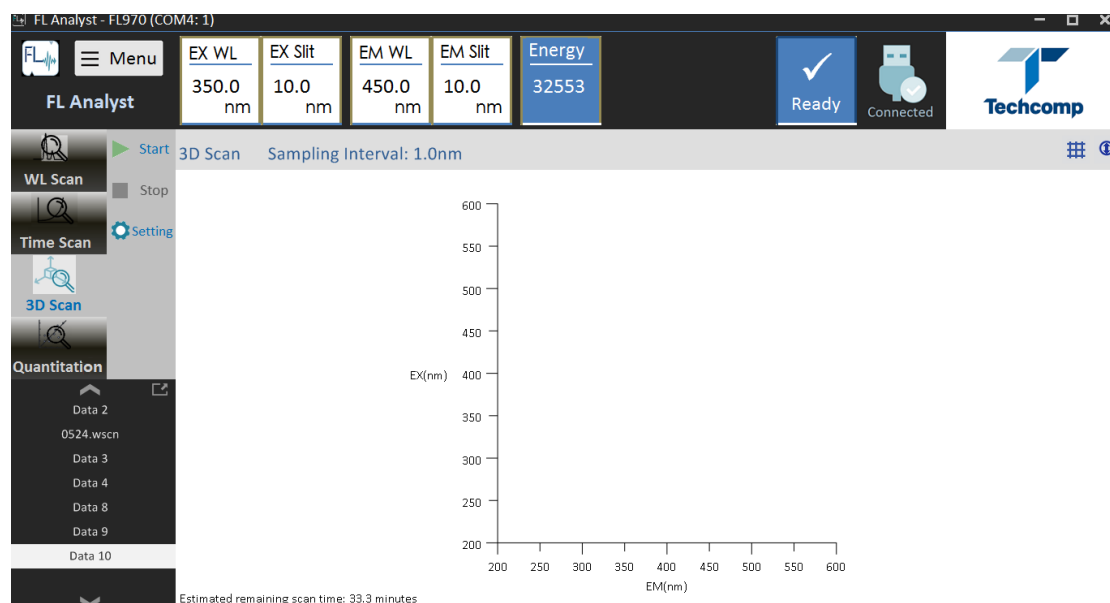

Figure 3-40 Function interface of 3D Scan

3.8.1 Parameters Setting

Click "Setting" button in the toolbar on the right of "3D Scan" to input the parameters. The window of "Setting" consists of 5 tabs.

- General
- Instrument
- 3D Scan
- Data Processing
- Plot 3D

1) General

As shown in Figure 3-41, the company name and the operator can be entered, and the instrument information can also be displayed.
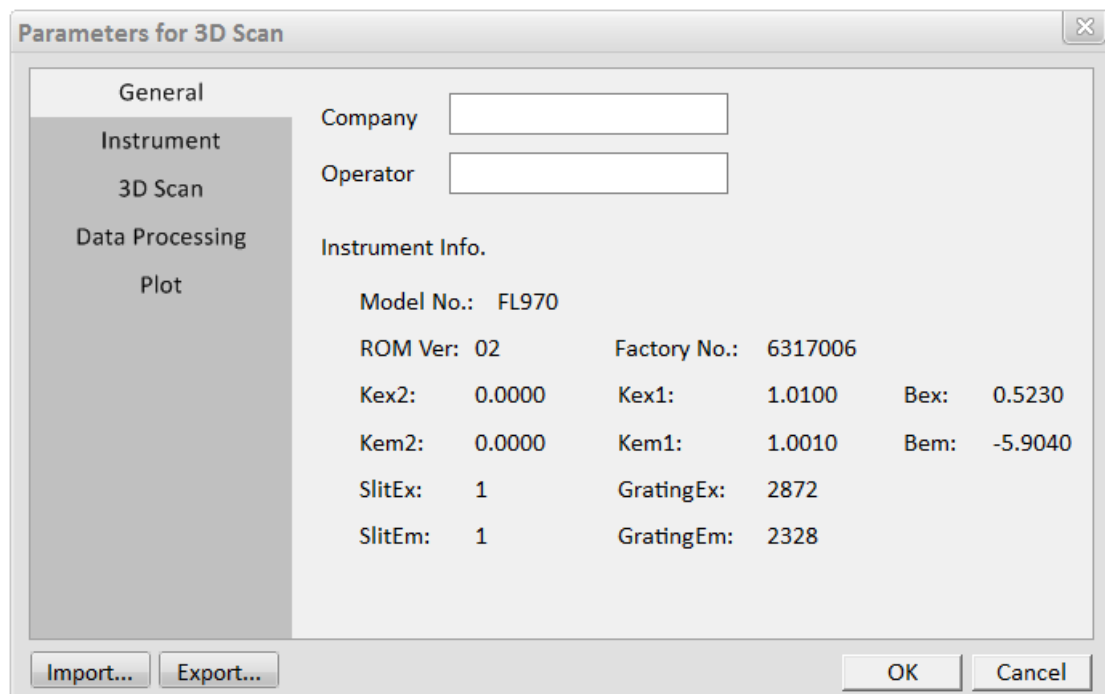

Figure 3-41 Dialog box of General parameters for 3D Scan

2) Instrument

As shown in Figure 3-42, the introduction of various system parameters of the instrument is as follows:
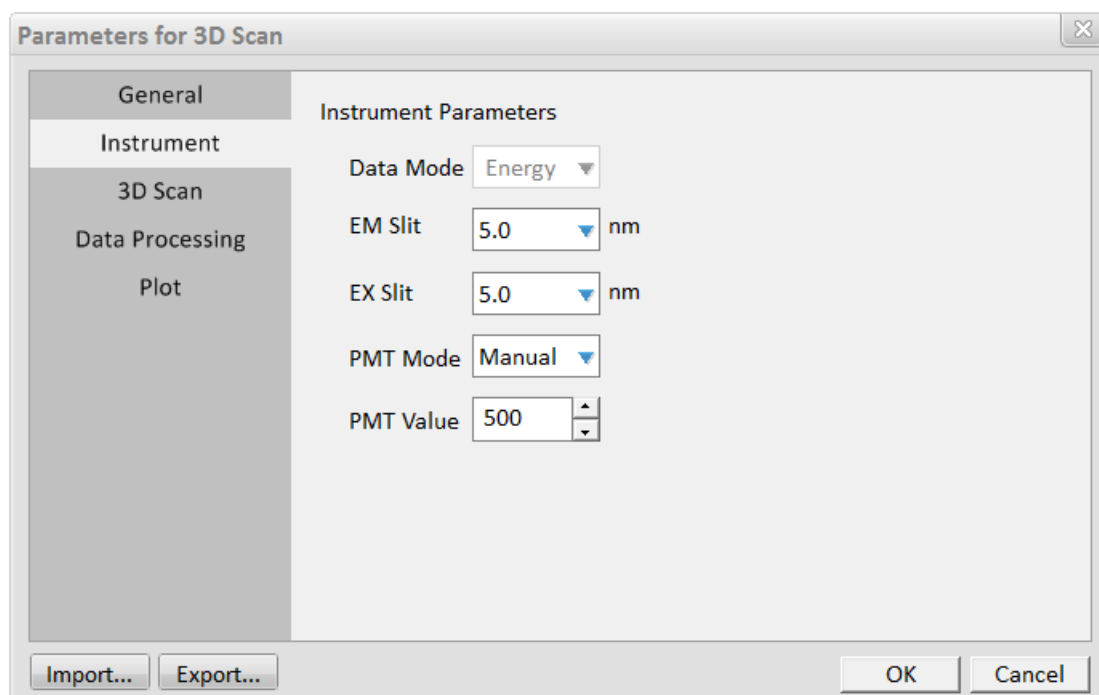
Figure 3-42 Dialog box of Instrument parameters for 3D Scan

- Slit

EX Slit and EM Slit of FL970 can be adjusted, which are respectively: 20nm, 10nm, 5nm, 2.5nm, 1nm and closed.

- PMT Mode and PMT Value

PMT Mode refers to the boosting mode of the photomultiplier. PMT Value can be entered in manual mode, the range is 0～900V.

Open the cover plate of the sample room, the high voltage will automatically switch off. Close the cover plate, it is necessary to reset in the interface of "Setting".

3) 3D Scan

As shown in Figure 3-43, the parameters required for 3D scan are described as follows:
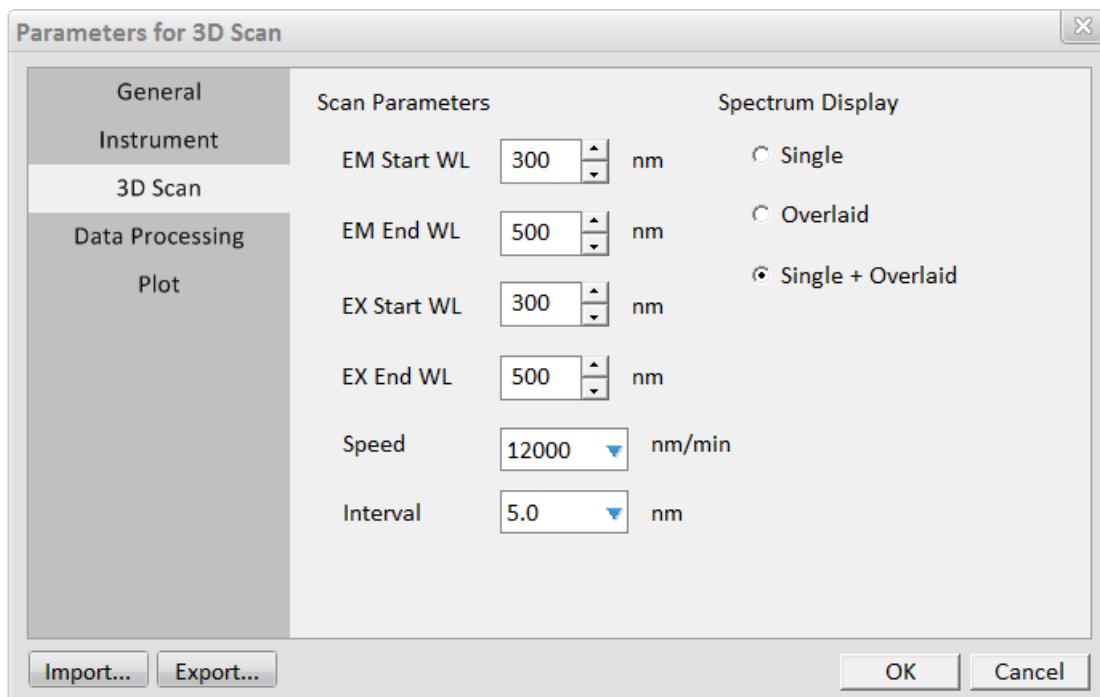
Figure 3-43 Dialog box of 3D scan parameters for 3D Scan

- EM Start WL

    Start EM wavelength of 3D scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the start wavelength must be less than the end wavelength at least 1nm.

- EM End WL

    End EM wavelength of 3D scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the end wavelength must be more than the start wavelength at least 1nm.

- EX Start WL

    Start EX wavelength of 3D scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the start wavelength must be less than the end wavelength at least 1nm.

- EX End WL

    End EX wavelength of 3D scan can be input from 200nm to 900nm with a minimum step size of 0.2nm, the end wavelength must be more than the start wavelength at least 1nm.

- Speed

    Speed of wavelength scan: 30, 60, 240, 1200, 2400 and 30000nm/min.

- Interval

    Data interval of 3D scan: 0.2, 1.0, 2.0, 3.0, 5.0, 10.0nm

    4) Data Processing

        As shown in Figure 3-44, the parameters that are necessary for judging peak and valley are described as follows:

- Threshold

    When the difference value between peak and valley is more than this value which the peak valley can be judged. Recommend value is 5.

- Sensitivity

    The number required of the data points between peak and valley which the peak valley can be judged. Recommend value is 6.
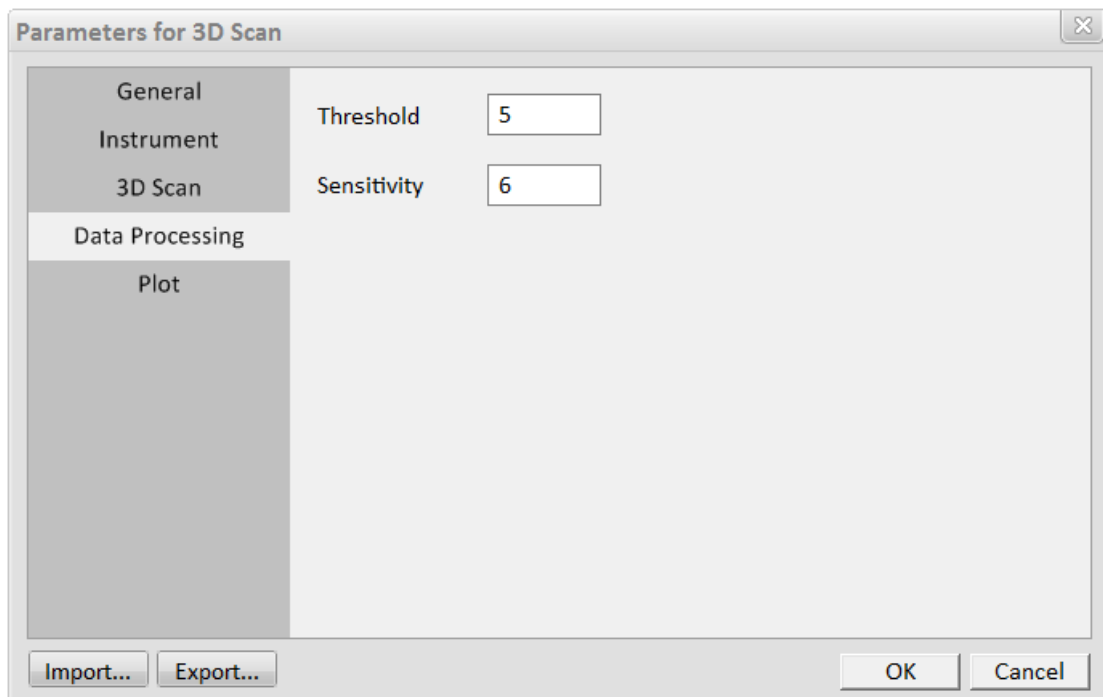
Figure 3-44 Dialog box of Data Processing parameters for 3D Scan

5) Plot 3D

As shown in Figure 3-45, the parameters that are necessary for plotting are described as follows:

Z Axis: The input range is -70000～70000. The recommended range is 0~70000.

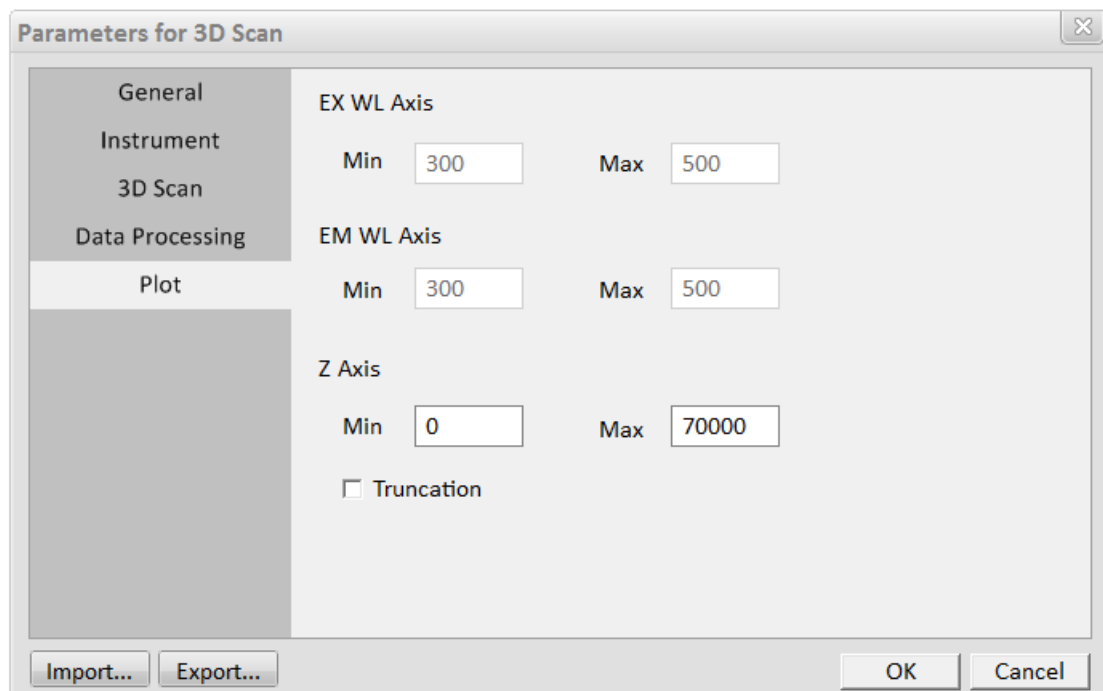EX wavelength and EM wavelength show the maximum and minimum values that have been set currently.

Figure 3-45 Dialog box of Plot 3D parameters for 3D Scan

3.8.2 Execute

1) Click "Start", at the end of the scan, the following 3D spectra appears (Figure 3-46):
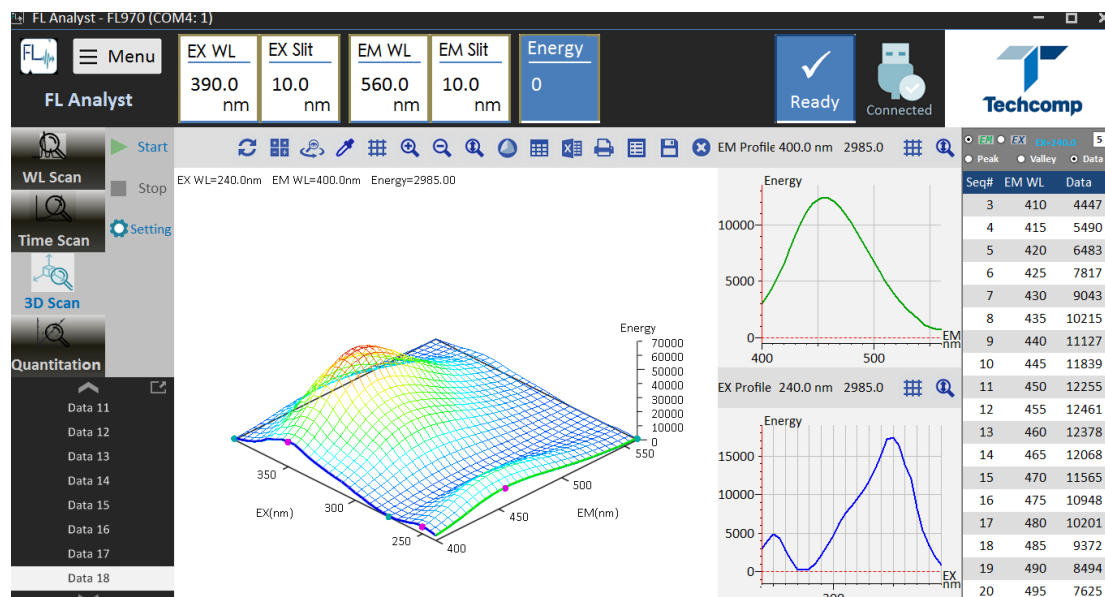
Figure 3-46 Display window of the end of 3D scan

2) Interface Description：

Figure 3-47 Icons of on the upper of the interface

A——Reset

B——Spectra arithmetic

C——Wireframe/Contour Plane/Contour line/Surface (change the display mode)

D——On/off color (display the color spectra or black-and-white specra)

E——On/off gridline

F——Scale up 3D spectra

G——Scale down 3D spectra

H——Scale automatically

I——On/off EM/EX profiles

J——On/off data table

K——Export to MS Excel

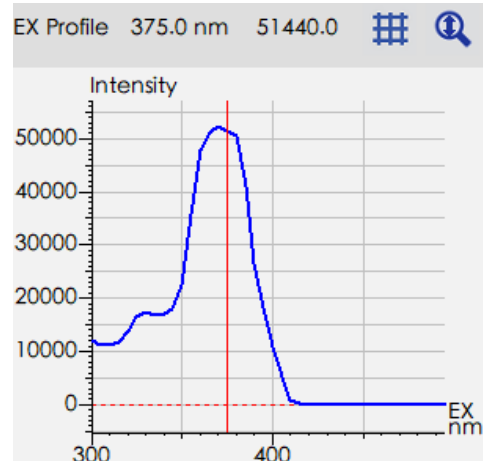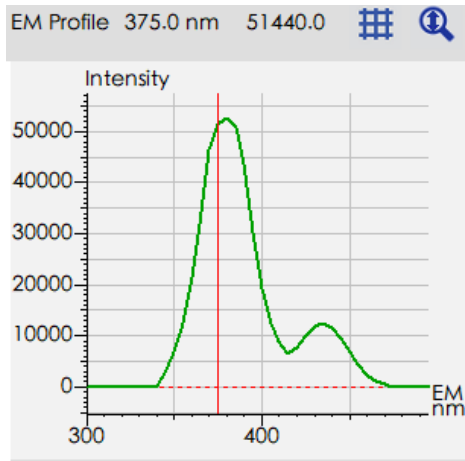L——Print

M——View parameters

N——Save

O——Close

Figure 3-48 Profiles of EM and EX of clicking any location of 3D spectra

Figure 3-48 are the cross section diagrams of EX and EM, the EX cross section and EM cross section of the current click location can be selected when clicking the 3D spectra.

3.8.3 Stop

Click "Stop" to end the 3D scan.

3.9 Quantitation Measurement

At the end of initialization and the status of the instrument is "Ready", click "Quantitation" in the left of the main function bar to enter the function interface of Quantitation measurement, as shown in Figure 3-49.
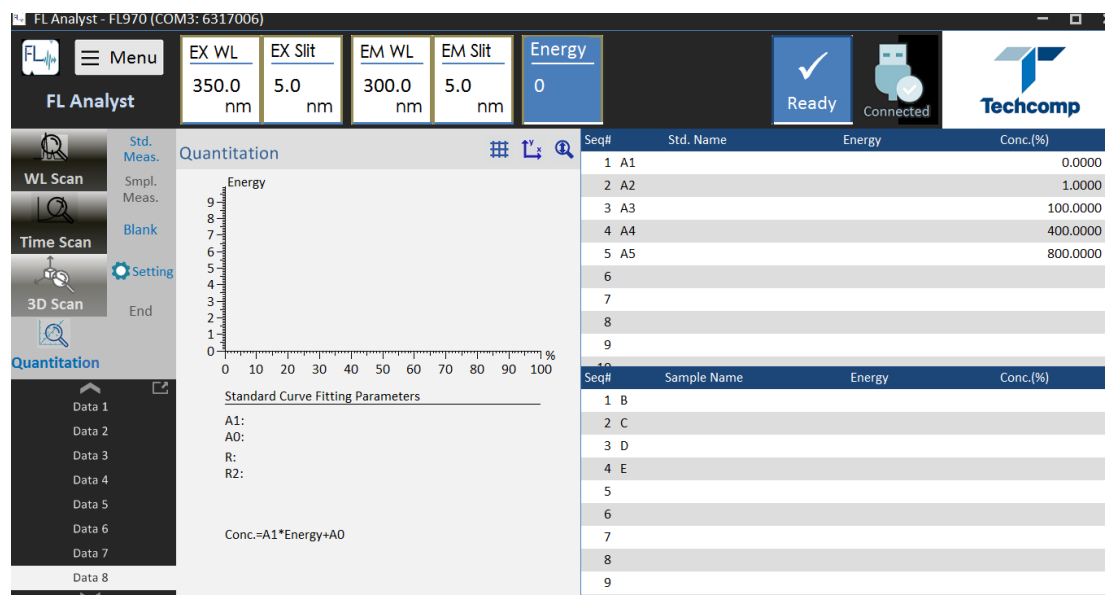

Figure 3-49 Function interface of Quantitation

3.9.1 Parameters Setting

Click "Setting" button in the toolbar on the right of "Quantitation" to input the parameters. The window of "Setting" consists of 6 tabs, which are respectively:

- General
- Instrument
- Quantitation
- Standard(S)
- Sample(S)
- Plot

1) General

As shown in Figure 3-50, the company name and the operator can be entered and the instrument information can also be displayed.
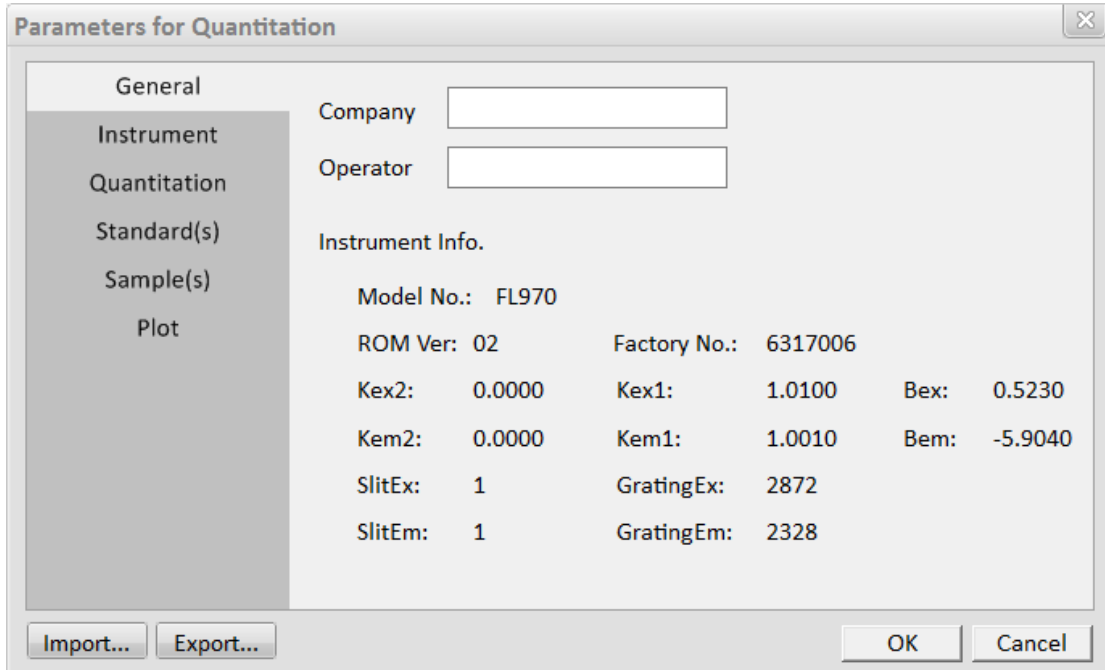
Figure 3-50 Dialog box of General parameters for Quantitation

2) Instrument

As shown in Figure 3-51, the introduction of various system parameters of the instrument is as follows:
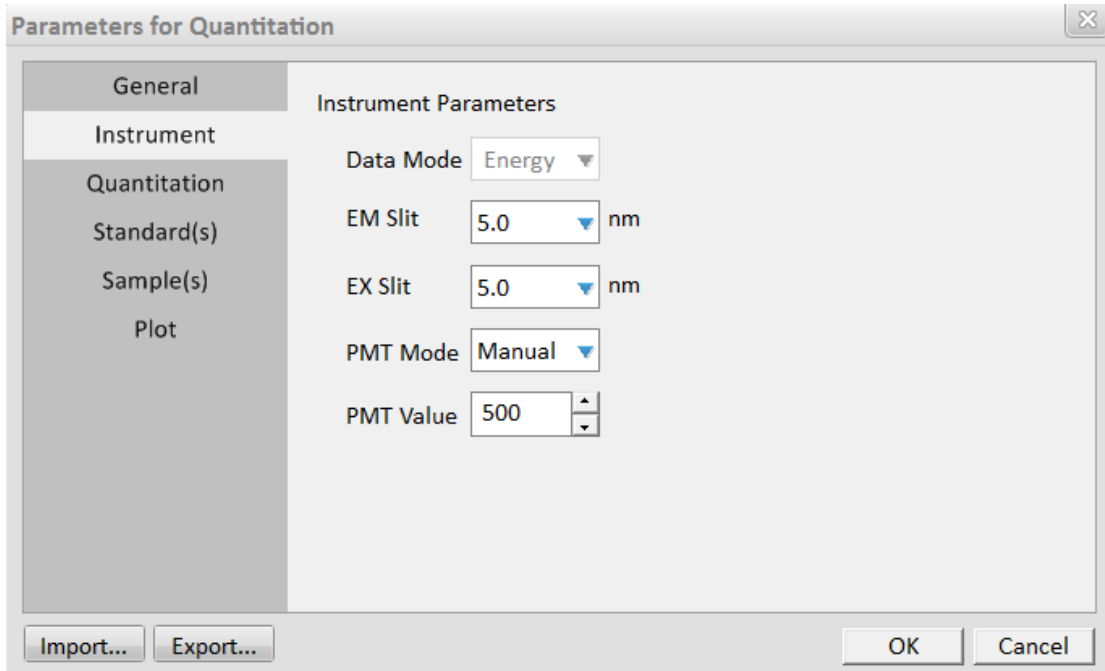

Figure 3-51 Dialog box of Instrument parameters for Quantitation

- Slit

EX Slit and EM Slit of FL970 can be adjusted which are respectively: 20nm, 10nm, 5nm,

2.5nm, 1nm and closed.

- PMT Mode and PMT Value

PMT Mode refers to the boosting mode of the photomultiplier. PMT Value can be entered in manual mode, the range is 0～900V.

Open the cover plate of the sample room, the high voltage will automatically switch off. Close the cover plate and it is necessary to reset in the interface of "Setting".
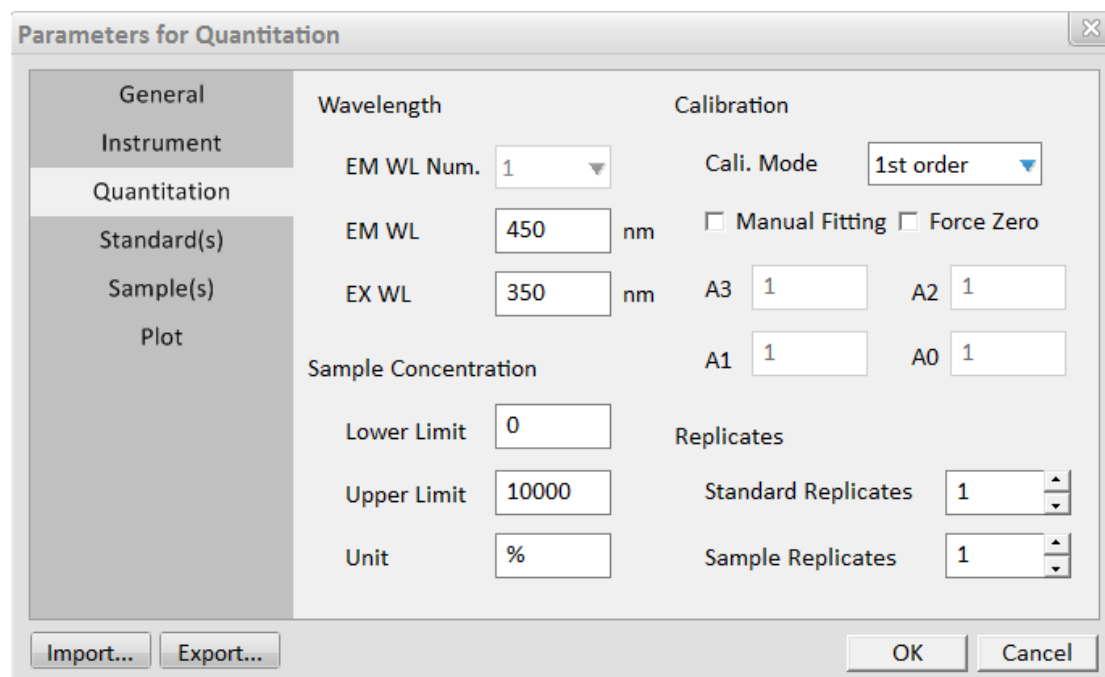
3) Quantitation

Figure 3-52 Dialog box of parameters for Quantitation

EX WL and EM WL can be selected from 200nm to 900nm;

Calibration: Standard sample fitting, "Manual Fitting" can be selected, fitting method:

1st order, 2nd order, 3rd order and Segmented.

Fitting Coefficient: A0, A1, A2 and A3;

"Force Zero" can be selected (machine fitting).

Replicates: Standard 1~100;

Sample 1~100.

Sample Concentration: Lower limit and upper limit can be set and concentration unit can also be entered manually.
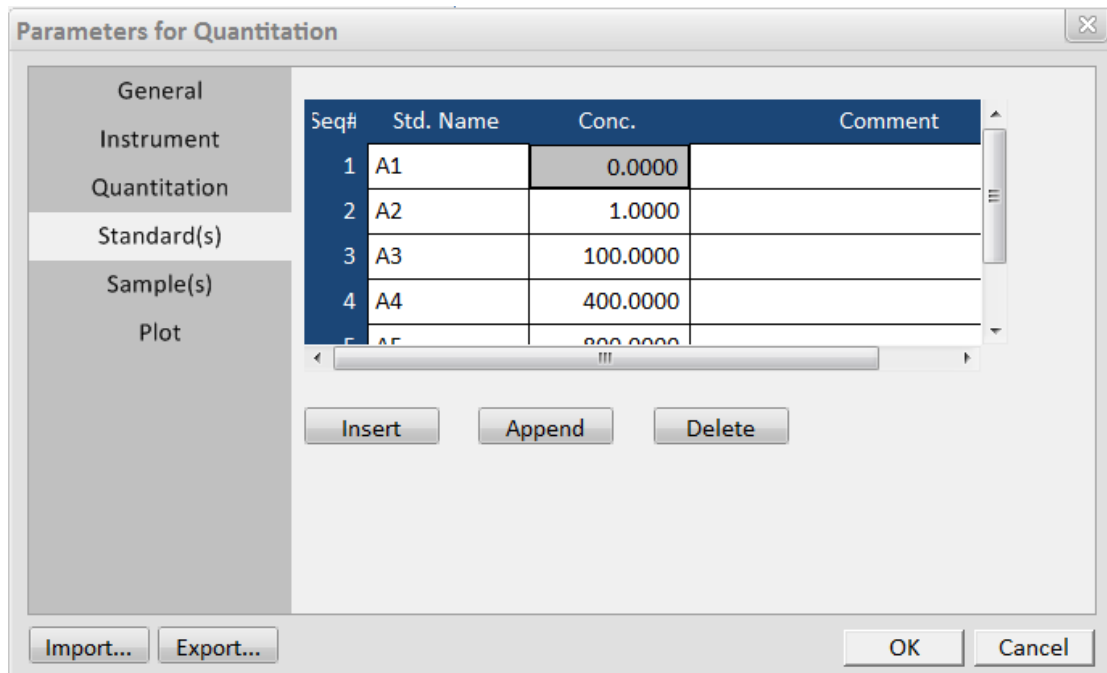
4)　Standard(S)

Figure 3-53 Dialog box of Standard(S) parameters for Quantitation

The standard sample name, concentration, comment can be entered and sequence number will be numbered automatically.

The information of the standard samples can be inserted, appended and deleted at the current location.
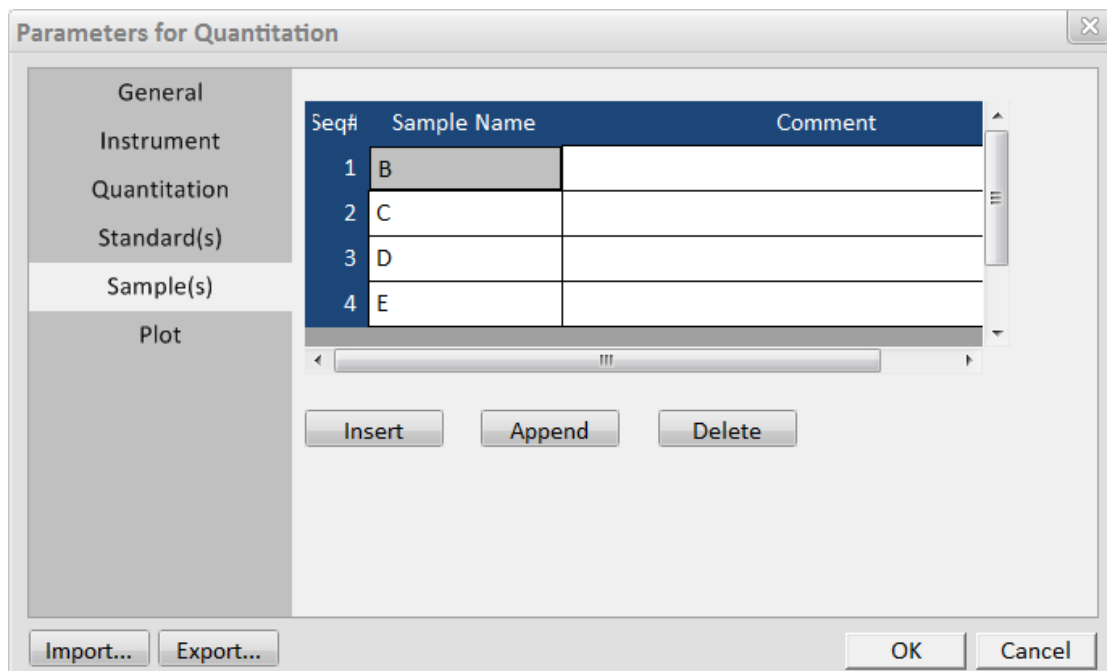
5)　Sample(S)

Figure 3-54 Dialog box of Sample(S) parameters for Quantitation

The standard sample name, concentration and comment can be entered.

The information of the samples can be inserted, appended and deleted at the current location.
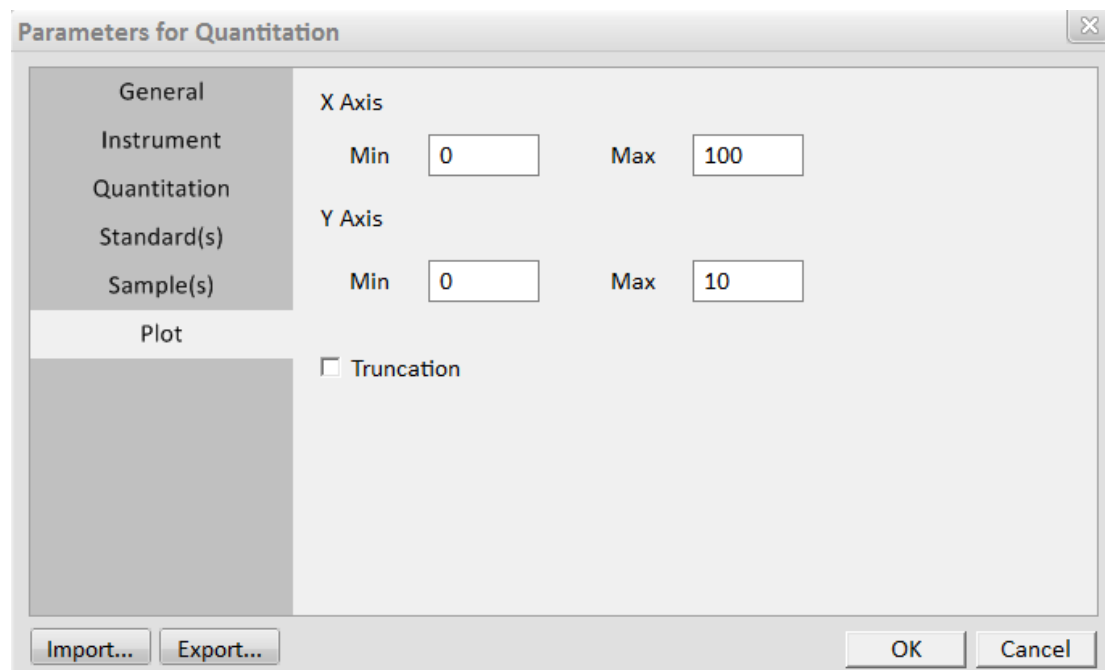
6) Plot

Figure 3-55 Dialog box of Plot parameters for Quantitation

As shown in Figure 3-55, the parameters that are necessary for plotting are described as follows:

- Max and Min of X Axis

Max and Min of X Axis can be determined according to the values of start wavelength and end wavelength, which can't be changed.

- Max and Min of Y Axis

The range is -70000～70000. The recommended range is 0～70000.

3.9.2 Blank Measurement

If blank needs to be deducted during the measurement, blank measurement should be performed first.

Click "Blank", and the prompt of "Please insert blank" appears, as shown in Figure 3-56. Put the blank sample into the sample room, click "OK" and measurement is performed automatically.
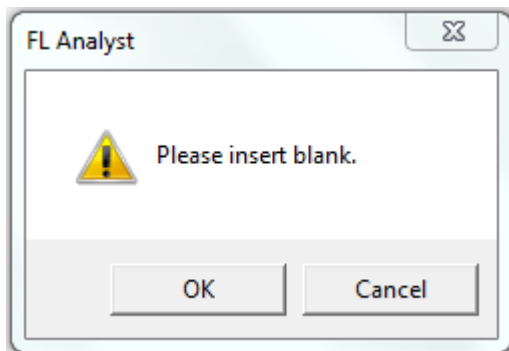
Figure 3-56 Dialog box after clicking the "Blank" button of Quantitation

3.9.2 Standard Sample and Sample Measurement

After blank measurement, the sample measurement will be performed automatically, the Quantitation measurement of "Blank" logo will be red, as shown in Figure 3-57, standard sample measurement and sample measurement will automatically deduct the blank data after being reminded.

If blank measurement is not performed, the red reminder will not appear, as shown in Figure 3-58.
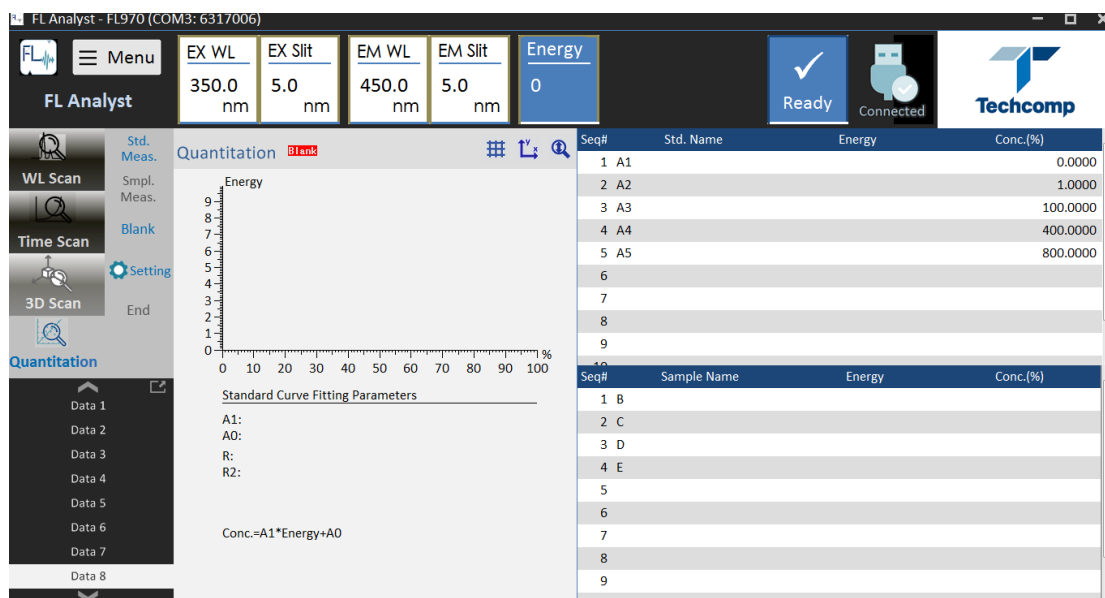

Figure 3-57 Display window of the end of blank measurement for Quantitation
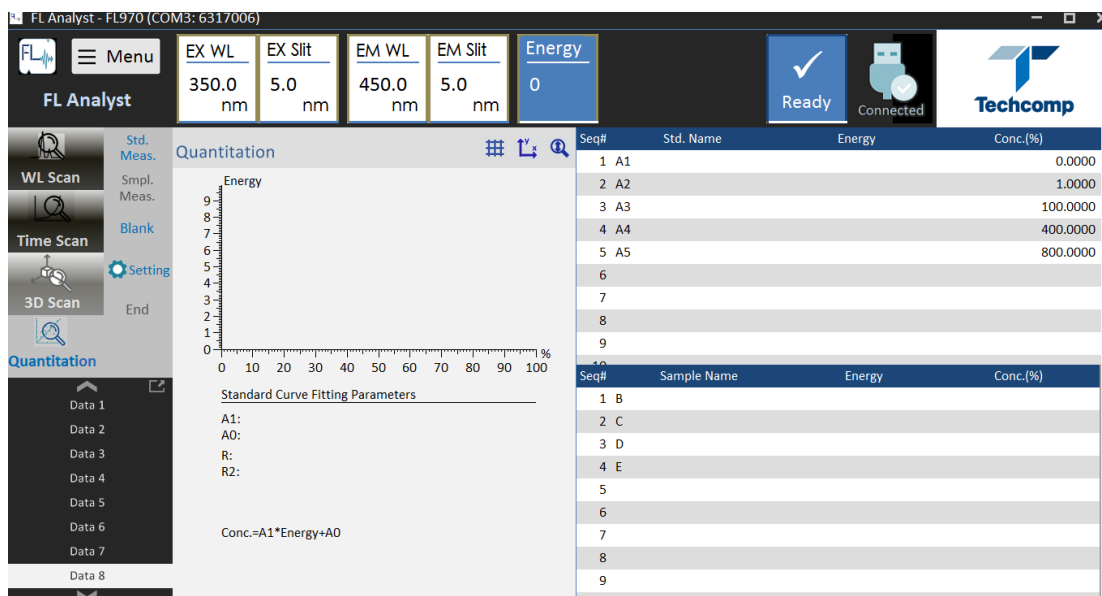
Figure 3-58 Display window before blank measurement for Quantitation

According to the parameters that have been set, click "Std. Meas." to measure the standard samples successively. At the end of standard sample measurement, the data, calibration curve and fitted formula can be displayed, as shown in Figure 3-59. (Figure 3-59 is only for understanding the operation, no specific data value.)
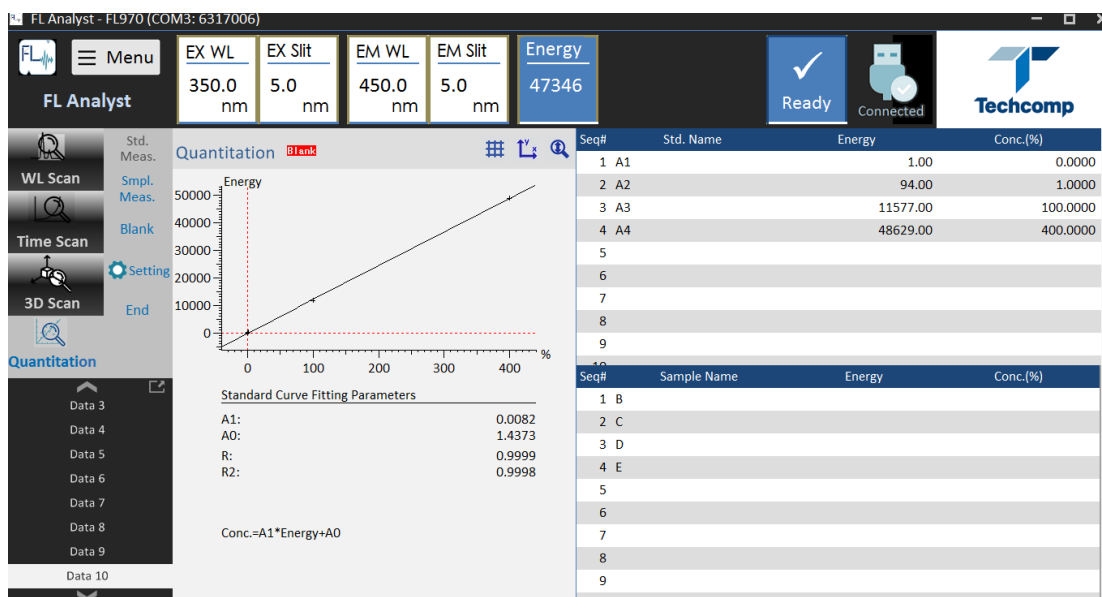

Figure 3-59 Display window of the end of "Std. Meas." for Quantitation

After the completion of "Std. Meas.", the measurement of unknown sample can be performed directly.

Click "Smpl Meas." after the unknown sample being put into the sample compartment. The fluorescence value and the concentration of the unknown sample can be displayed in the right list after the measurement, as shown in Figure 3-60. (Figure 3-60 is only for understanding the operation, no specific data value.)
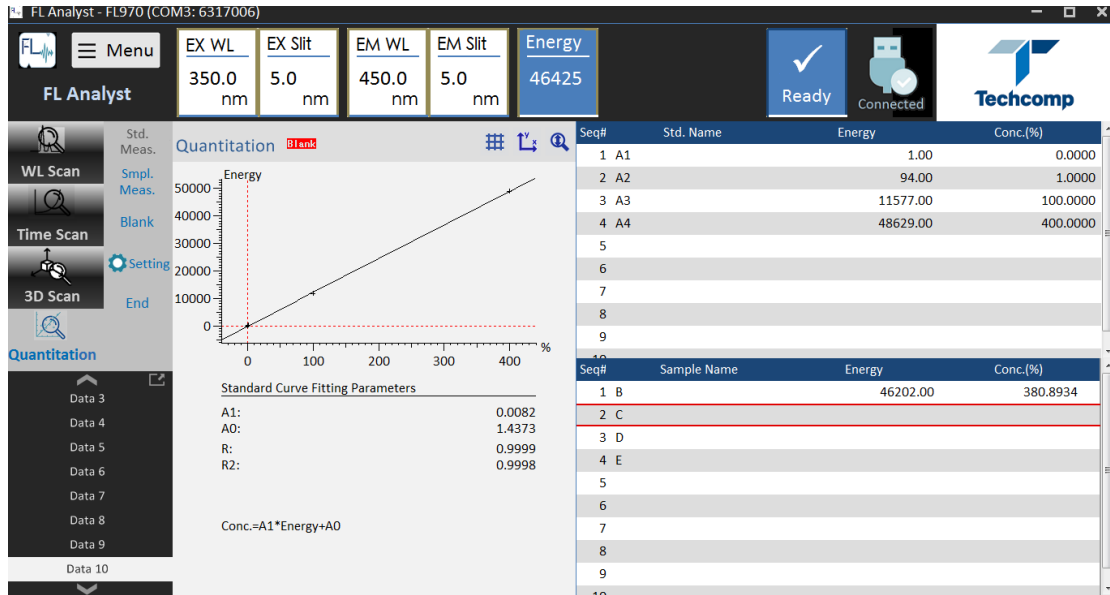
Figure 3-60 Display window of the end of "Smpl. Meas." for Quantitation

3.9.4 Measurement stop

Click "End" to end the measurement.

Chapter 4 Maintenance

- Xenon lamp is a consumable product with a certain service life. There will be a change of light point or a sudden change of strength or weakness after being used for a long time. Then the noise of the baseline will increase, which will result in incorrect measurement. The service time that light intensity begins to become unstable is the stable lifetime of the xenon lamp. The guarantee time of the stable lifetime of 150W xenon lamp is 1200h. When the xenon lamp is used for more than 1200h, it must be replaced. Otherwise, if it is used for too long, there will be a possibility of damage. It is necessary to keep a record for the service time of the xenon lamp in the process of using the instrument, which will be the basis for the replacement of the xenon lamp.

- Precautions for xenon lamp replacement
  1) Never touch the lamp tube with your hand when installing and disassembling xenon lamp, otherwise it must be cleaned with alcohol gauze.
  2) Remove the AC power cord from the power socket before replacing the xenon lamp.
  If the sample holder is contaminated with strong acid or alkali, which should be removed from the instrument by removing the fixed screws and washed with water and dried. At the end of the detection, the organic solution should be removed from the cuvette. Do not place the cuvette containing solution inside the sample compartment after use if the instrument is off.

- Precautions for use
  1) The instrument should be kept by a specially-assigned person and the instrument use profile should be built;
  2) Read the instruction manual carefully before use;
  3) The working environment of the instrument must comply with the instruction manual;
  4) The computer is a special part of the instrument, which is forbidden to be used for other purposes to prevent computer damage. Otherwise, the user must be responsible for all consequences;
  5) Unauthorized personnel is not allowed to open the instrument and workstation;
  6) If the instrument will not be used for a long time, please power it on regularly (generally once two weeks, power on for more than two hours).
  7）Please make sure that the sampler chamber cover closed, as testing.

- Fault handling
  In order to facilitate the maintenance, the user should explain the fault condition as accurately as possible when the maintenance personnel from Techcomp and its representative that will repair the instrument.

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