Spectrophotometer

Software Operating Manual
(UV Professional)

PEAK INSTRUMENTS INC.
Version 2301

CONTENTS

1. Introduction

The software has the main functions of Photometry, Quantitative analysis, Kinetics, Wavelength Scanning, Multi-wavelength analysis and DNA/Protein analysis, with several additional features such as spectrum calculating (spectrum add, spectrum subtraction, spectrum multiplication and spectrum division) and spectrum derivative and spectrum comparison.

1.1 Main Functions

Photometry

- Two Test Modes include Absorbency Data (Abs)/Transition Data (%T)/Energy and Reflectance(optional with integrating sphere).

Quantitative Analysis

- Create standard curve with calibration standard samples, or with user setup coefficient method.
- Up to 20 standard samples to the standard calibration curve or directly enter the standard curve coefficient.
- 3 methods to standard curve fitting, linearity, linearity with zero crossing, quadratic(second-order).

Time Scan

- Custom scan time interval:0.5 seconds, 1.0 seconds, 2.0 seconds, 5.0 seconds, 10.0 seconds, 30.0 seconds, and 1 Minute.
- 2 display mode: Absorbance (Abs), Transmittance (%T).

Wavelength Scanning

- Set wavelength interval:0.1nm, 0.2nm, 0.5nm, 1.0nm, 2.0nm and 5.0nm.
- 3 test mode: Absorbance (Abs), Transmittance (%T) and energy.
- 3 display mode: Absorbance (Abs), Transmittance (%T) and energy.
- System baseline can be stored.

Multi-wavelength Analysis

- Up to 15 wavelengths

DNA/Protein Analysis

- built-in 2 analytical methods
- Test coefficient can be customized

1.2 Spectra Treatment

Spectral data show

- Move the cursor to the spectrum position, the corresponding data will be displayed

Peak valley automatically search

- Automatically search the data peak and valley, and the data will be showed in the peak data list, the corresponding data remark shown in the picture.

Zoom in/out spectrum view

- Change the X Position/Y Position scale data to zoom in or zoom out the spectrum view.

Derivative spectra

- Calculate and display first-order to fourth-order derivative spectrum view. In the absorbance mode, the derivative spectrum view is an extremely effective method.

Spectrum calculation

- Spectrum addition, spectrum subtraction, spectrum multiplication, spectrum division and spectrum derivative.

Dark Current Detect

- Retest the dark current of instrument.

2. Installation

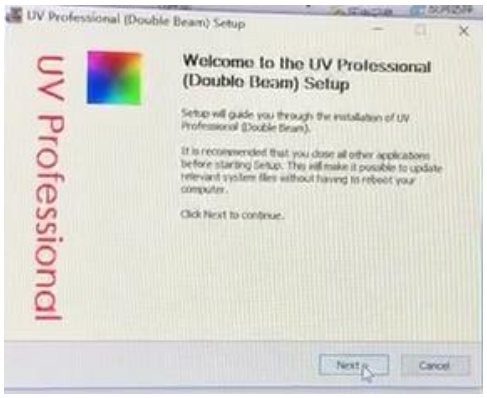
This chapter will show you how to install UV Professional on your personal computer.

2.1 System Configuration

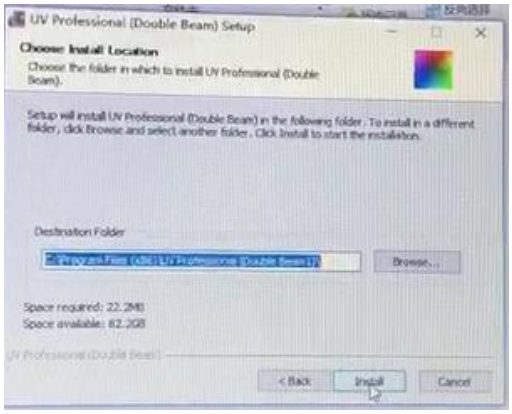
- Pentium or faster processor
- At least 2 USB interfaces
- 32MB RAM (recommend 256MB or more)
- 50MB or more hard disk space
- Microsoft Windows 2000, Win7, Win10.

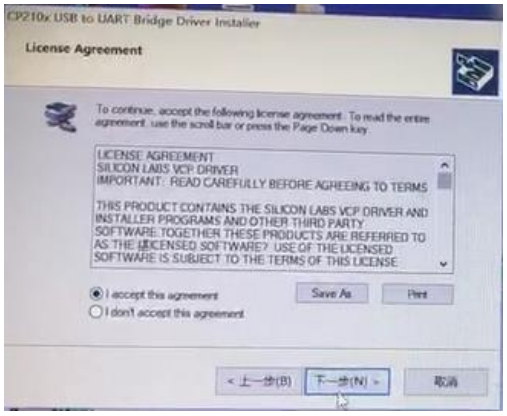
2.2 Installation UV Professional

1. Insert USB with UV professional software to the PC USB port.
2. In the USB, double-click **Professional.exe** to start the installation progress, click <Next> in the setup dialog, then select <accept this agreement…>, continue installation progress.

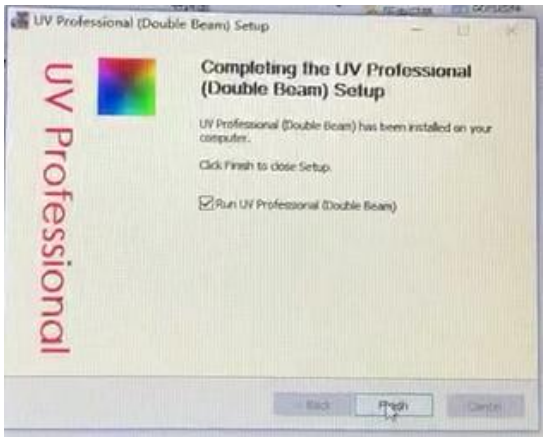


3. Click <Browse…> button to change the installation directory if you want, then click Next to continue the following steps until it is finished.





4. Click <Finished> to complete UV Professional installation process, setup program automatically install UV key driver and communications USB port driver.

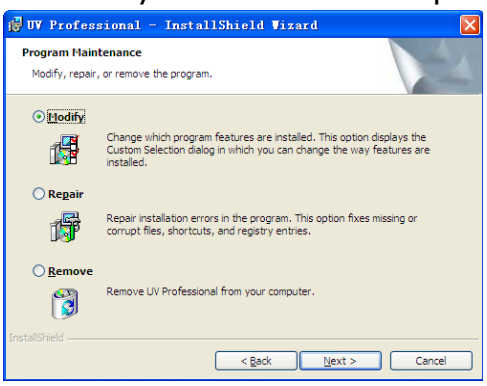


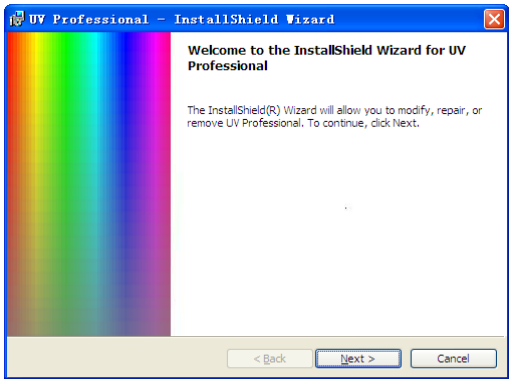
5. The installation process finished.

2.3 Uninstall UV Professional

There are 3 ways to safely uninstall UV Professional

1. In <Control Panel> and <Add or Remove Programs> dialog, select <UV Professional>, click the <uninstall> button.
2. In the start menu, <program> select <UV Professional> and <uninstall the UV professional>, the uninstall progress willl automatically uninstall the UV professional software.



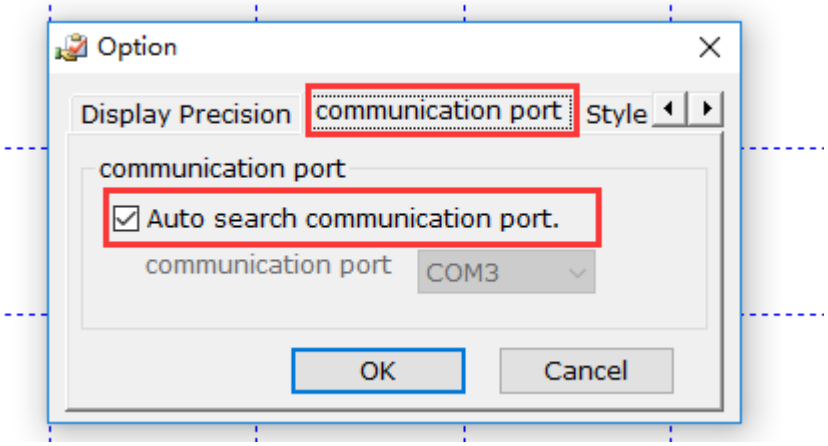


2.4 Run UV Professional

After UV Professional installation is finished, insert the dongle to your PC USB port and connect the instrument and PC with link cable.

There are two ways to run the UV Professional software

1. Double-click the icon  [UV Professional] on the desktop.
2. In the [Start] menu-> [All Programs] -> [UV Professional] -> [UV Professional], click [UV Professional] to start run UV Professional.
3. Go to View-option-communication port and make sure to select auto search communication port and the software will do it automatically.



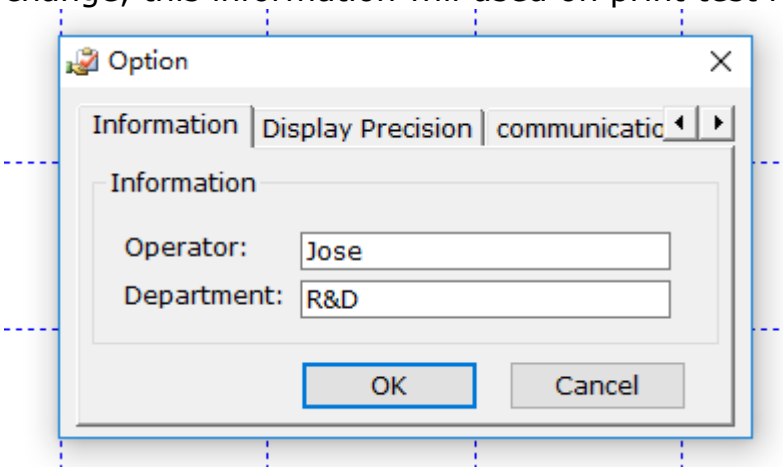
2.5 How To Connect The Instrument and PC.

1. Connect the instrument and PC with link cable. **Make sure the device is in the home page.**

2. Click connect button[] or choose Operate->Connect to connect it, software will automatically search the communication port to the instrument. The connection status will be shown in the left lower corner. Click release button [] to disconnect the software.

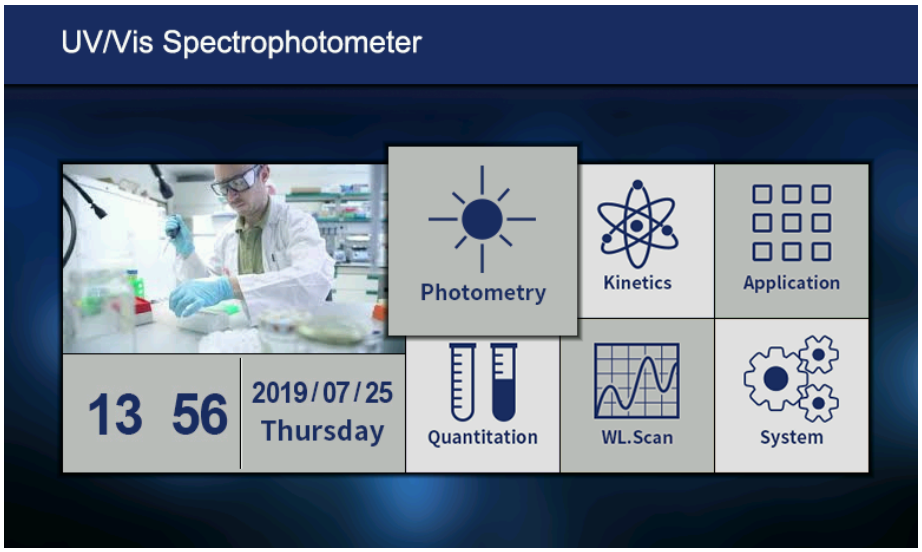
2.6 User Information

Select the main menu <View>-><Option>-><Information>, enter the operator and the department information, click OK to save the change, this information will used on print test reports.



2.7 Connect/Release host

1. Turn on the instrument, the instrument will run diagnostic program and warm up procedure. After this, the instrument will enter the following window.



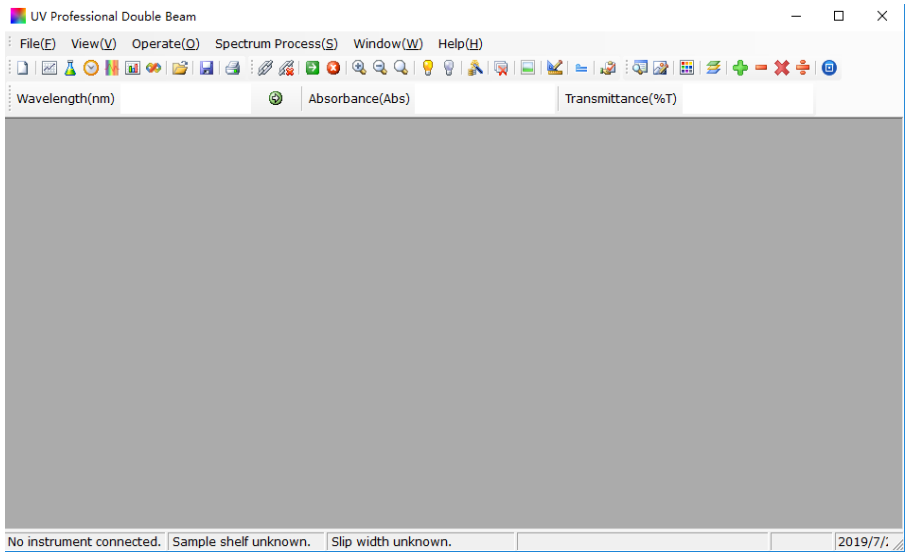
2. Click the shortcut on the toolbar button in the [Connect/Release] or select the main menu <operation>->[Connect/Release], software will automatically connect with the instrument, the toolbar button display the icon [Connect/Release] , click this button to release the instrument.

3. How to Use The Software

This chapter shows you how to use UV Professional

3.1 Main Interface

The main interface in the software startup:



3.2 Menu bar and toolbar

Software has the Menu bar and tools bar to provide user the easy ways use this software. At the same time, pop-up menu of right button include most commonly used functions to speed up user operation.

Toolbar button list:

Main	list			introduction
File(F)	New file		[new file]	selection the new file type list, user can choose to photometry, quantitative, time scan, wavelength scan, multi-wavelength, DNA / protein.
			[Photometry]	Create new photometry file.
			[Quantitative]	Create new quantitative file.

			[Time Scan]	Create new time scan file.
			[Wavelength scan]	Create new wavelength scan file.
			[Multi-wavelength]	Create new multi-wavelength file.
			[DNA/protein]	Create New DNA/Protein file.
	Open		[open...]	Open the test data files.
	Save		[Save...]	Save the test data files.
	Print		[Print...]	Print test report.
Operate	Connect/release		[Connect /release]	Connect or release the instrument.
	Test		[start test]	start test.
	Stop		[stop testing]	stop test.
	Tungsten lamp		[turn on/off tungsten lamp]	Turn on/off tungsten lamp.
	Deuterium lamps		[turn on/off deuterium lamp]	Turn on/off deuterium lamps.
	Lamp switch wavelength		[lamp switching wavelength]	Set lamp switch wavelength.
	Modify		[Modified]	Modify test record.
	Delete		[Remove]	Remove test record
	System baseline		[Create system baseline]	Create the system baseline
	Set blank		[Set blank]	Set blank(0.000Abs/100.0% T)
	Set wavelength		[set wavelength]	Set wavelength
	Option		[Option...]	setup the option

Spectrum Operation	peak search		[peak search]	Search the data peak and valley.
	Set Peak value		[set Peak value]	set peaks and valley value
	Computing spectrum		[spectrum smoothing]	spectrum smoothing
			[Spectrum add]	the two spectra of addition operations
			[Spectrum subtraction]	two spectral subtraction operation
			[Spectrum multiplied]	two spectral multiplication
			[Spectral division]	the two spectra computing division
			[Spectrum Derivative]	spectra derivative operator
Windows	cascading window		[Cascade]	Cascade window
			[Tile Horizontally]	Tile horizontally window
			[Tile Vertically]	Tile vertically window
Help	Help		[help...]	Help books
	About		[About...]	Software version information and product ID information.

4. Operation

This chapter show user the software main function: photometry, quantitative, time scan, the wavelength scan, multi-wavelength, DNA/protein.

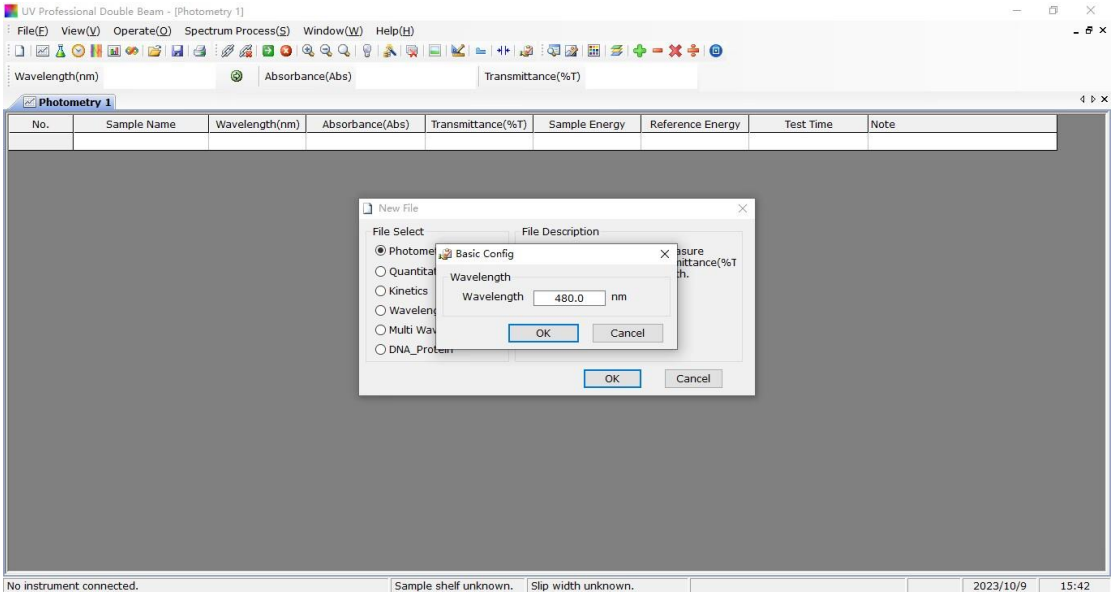
4.1 Photometry

Photometry have two Test Mode: Absorbency Data (Abs)/Transition Data (%T) in the custom wavelength.

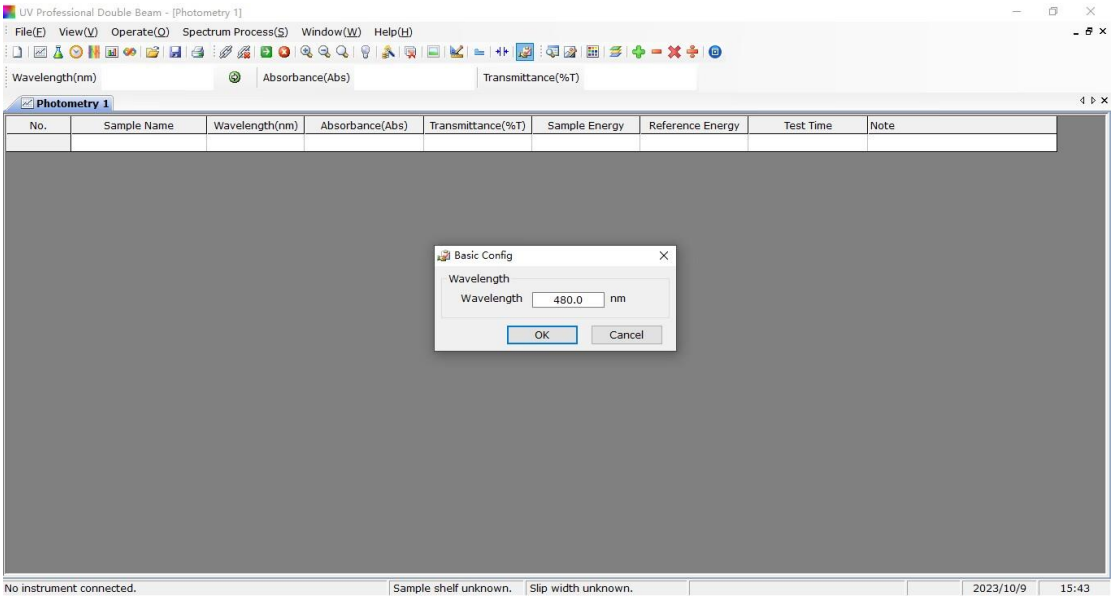
4.1.1 Measurement

1. Click the shortcut toolbar [ Photometry], or <New files> ->< Photometry > to create a new photometry file. You can input the test

wavelength directly.



2. If you want to change the wavelength, press (option) to enter the test wavelength, press OK. Then the device will set it at the wavelength when doing blanking with blank solution.



4.1.2 How to test

1. Put the sample into the light path, select the menu <operation> <Set Blank> or click the shortcut toolbar buttons [Set Blank], instrument will be set to the operating wavelength, and set blank 0.000 Abs/100.0 %T.
2. Put the samples into light path, select the main menu <operation> <start test> or click the shortcut toolbar buttons [start test] to

measurement the current Absorbency Data(Abs) and Transition Data(%T), then display the data in the data list.

4.1.3 Save data

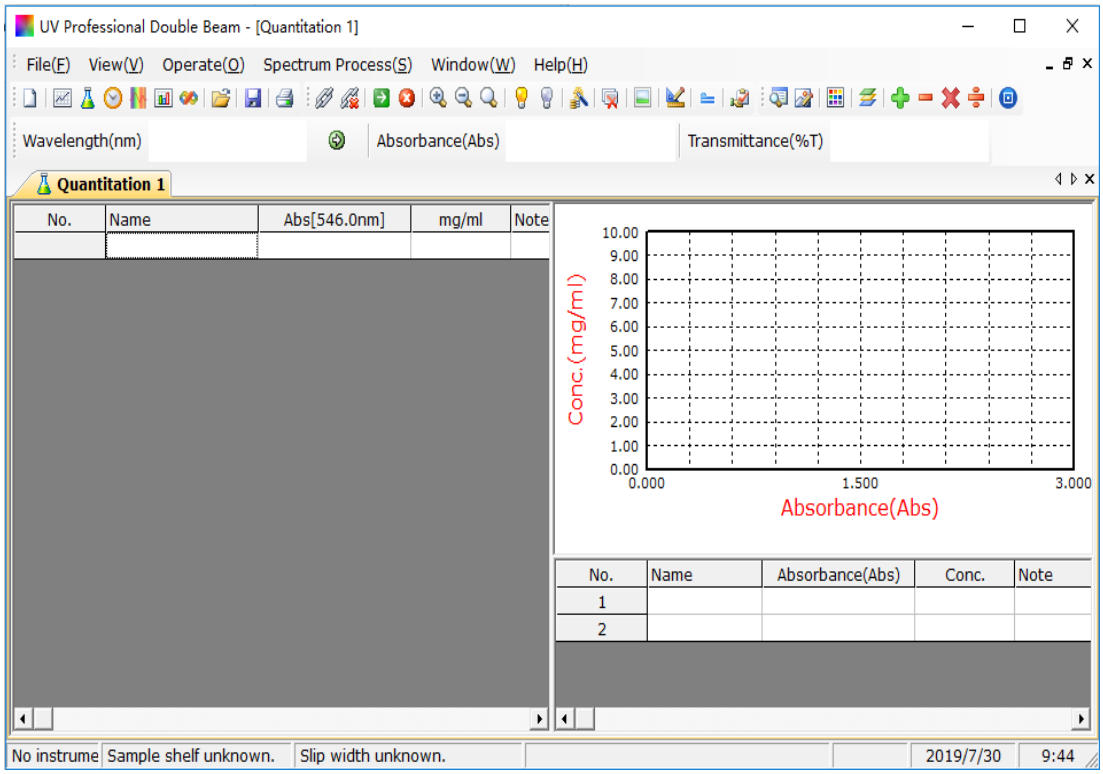
1. Go to File->Save or press  to save data.
2. Select the save path and enter the file name, then press OK
3. The data will be saved in name of *.bas.

4.2 Quantitative

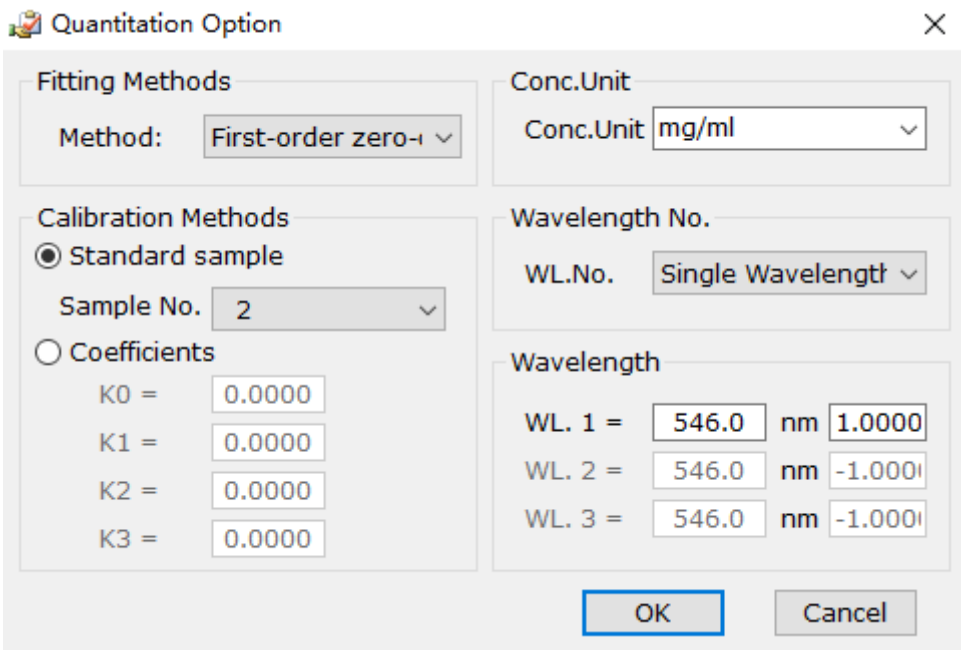
There are two methods: standard curve method and coefficient method to measure the concentration.

4.2.1 Measurement

1. Click the shortcut toolbar [ Quantitative], or <New files> -><Quantitative > to create a new quantitative file.

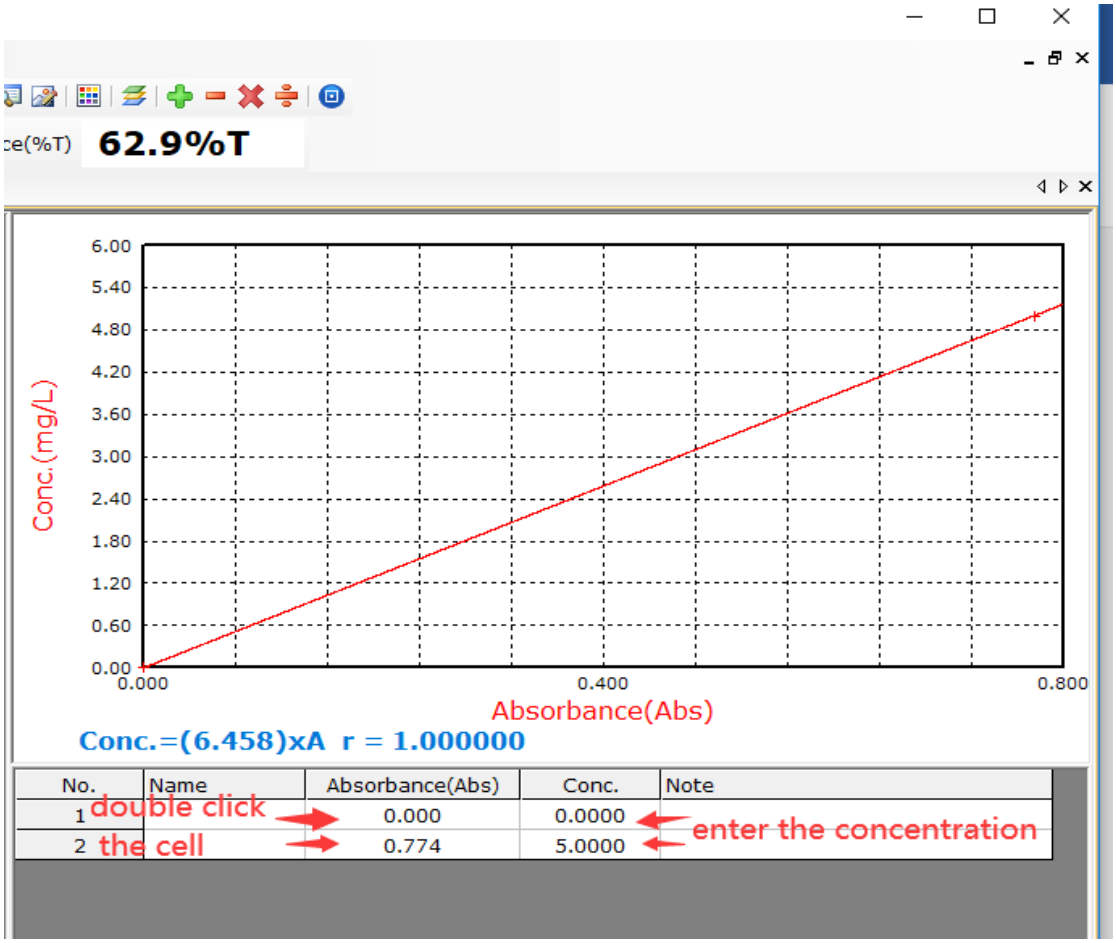


2. Shortcut toolbar [] to setup quantitative methods, concentration units, the number of wavelengths, coefficient. Click <OK> to save configuration.

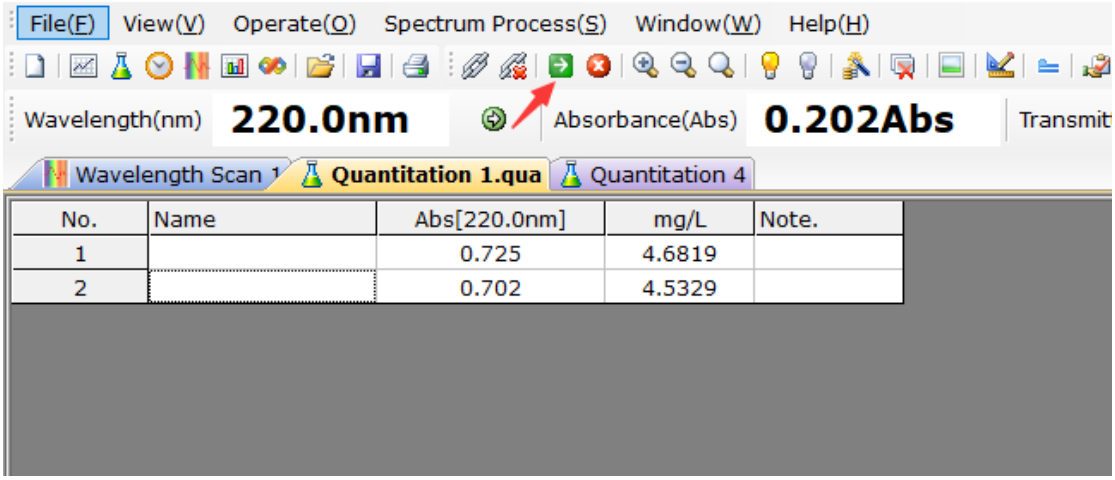


3. Put the reference solutions in both holders(double beam) or holder(single beam), then do the blanking.

4. After blanking, enter the concentration of the first sample and double click the cell of its corresponding concentration. And repeat the steps until the curve is created successfully.



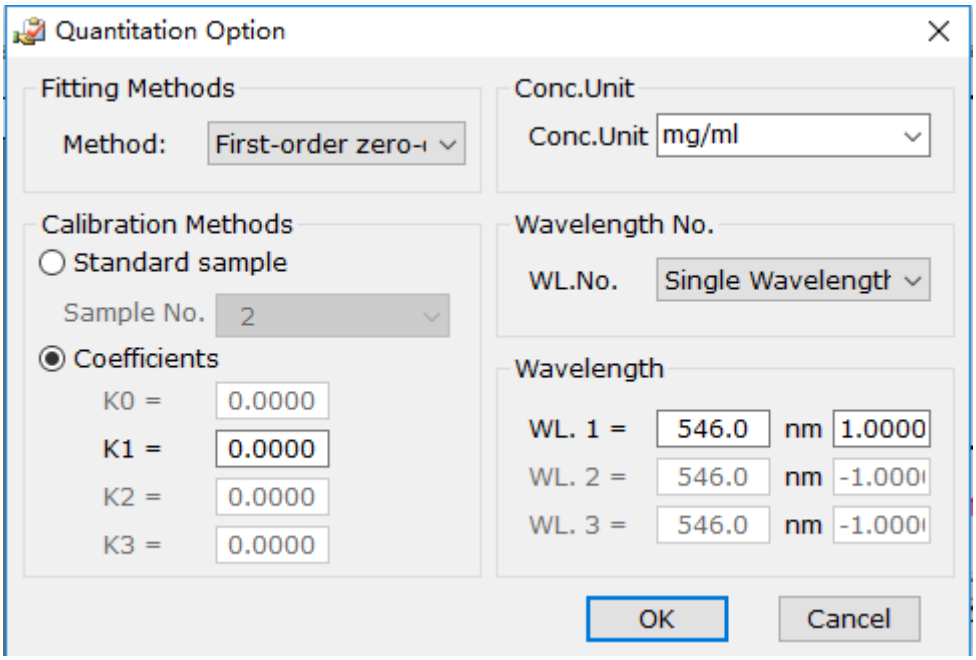
5. Put the sample into the light path, select the menu <operation> <Set Blank> or click the shortcut toolbar buttons [Set Blank], instrument will be set to the operating wavelength, and set blank 0.000 Abs/100.0 %T.



6. Put the samples into light path, select the main menu <operation> <start test> or click the shortcut toolbar buttons [start test] to measurement the current absorbance data, calculate the concentration within the above formula, then display the data in the data list.

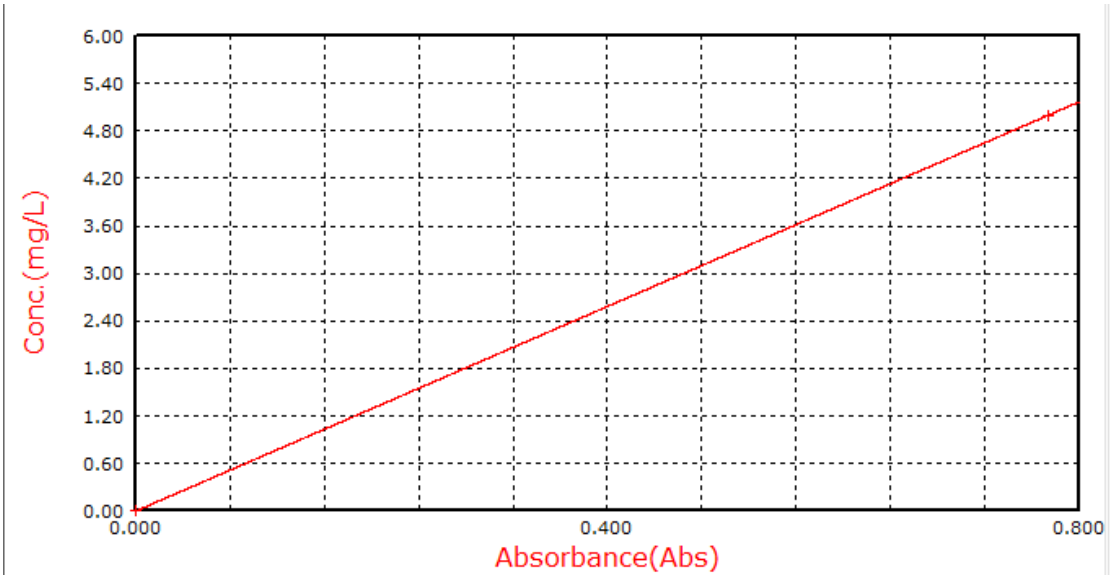
4.2.2 Coefficient

1. Select Coefficients methods, third-order fitting, single wavelength 500nm. The following diagram is configuration:



2. Put the sample into the light path, select the menu <operation>

<Set Blank> or click the shortcut toolbar buttons [Set Blank], instrument will be set to the operating wavelength, and set blank 0.000 Abs/100.0 %T. Coefficient formula is shown as follows.



3. Put the samples into light path, select the main menu <operation> <start test> or click the shortcut toolbar buttons [start test] to measurement the current absorbance data, calculate the concentration within the above formula, then display the data in the data list.

4.2.3 The calibration standard samples

1. Select standard samples calibration option, change the sample number (maximum number is 20), click <OK> button to complete the setup.
2. In the standard sample data list table, enter the concentration of each sample.
3. Put blank sample into light path, select the menu <operation>-> <Set Blank> or click the shortcut toolbar buttons [Set Blank(0.000 Abs/100.0%T)], Instrument will be set to the wavelength, the data will be set to 0.000 Abs/100.0%T.
4. Put the standard sample into light path, double-click the corresponding sample the absorbency data table in the standard sample data list. Software will read the absorbance values of standard sample and display them in the list table.
5. Just as the above way, measure all standard samples absorbency.
6. After all standard sample's absorbency is measured, the software will calculate the curve parameter and display the curve line and formula on the curve picture.

7. Put blank sample into light path, select the menu <operation>-> <Set Blank> or click the shortcut toolbar buttons [ Set Blank(0.000 Abs/100.0%T)], Instrument will be set to the wavelength, the data will be set to 0.000 Abs/100.0%T.
8. Put the samples into light path, select the menu <operation> <start testing> or click the shortcut toolbar buttons [ start test] to measure the sample's absorbency data and calculate the sample concentration, then display the data in the data list.

4.2.4 Rename sample

In the data list to select a sample named Double-click the name to enter the edit state of the sample, enter the name after the carriage return, and then click Save, the sample name on the sample data stored in the same data in a.

4.2.5 Save data

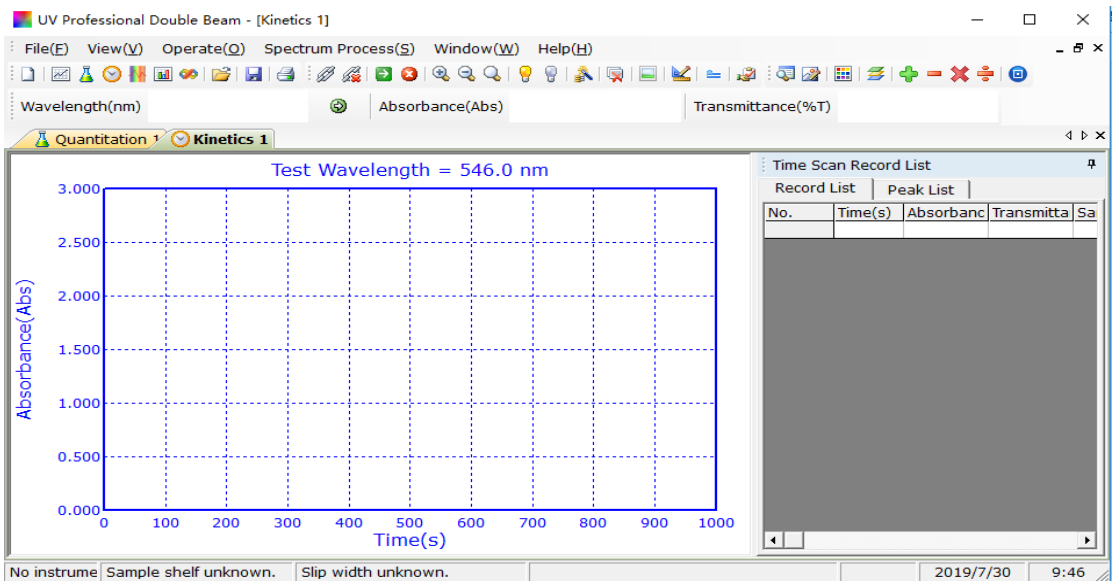
1. Select the menu <File> <Save...> or click shortcut toolbar [ Save...].
2. In the file save dialog, change the file directory and file name, click <OK> button.
3. The quantitative analysis data file is saved with *.qua file suffix.

4.3 Time Scan

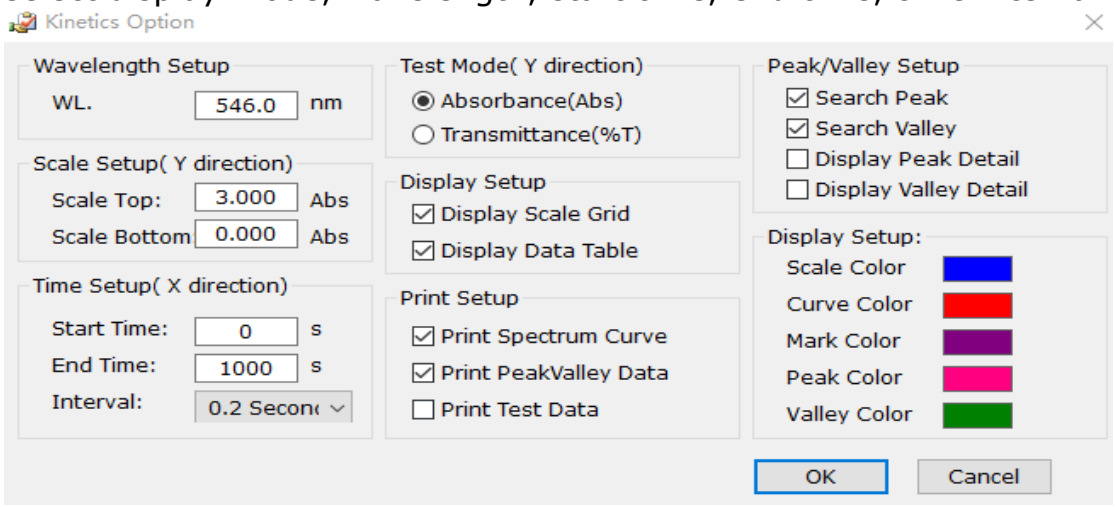
This chapter shows user how to do time scan measurement with the absorbance or transmittance mode.

4.3.1 Measurement

1. Click the shortcut toolbar [ scan time], or <File>-> <time scan> Create a new time scan file.



2. Click shortcut toolbar [option], setup time scan parameters, select display mode, wavelength, start time, end time, time interval.



3. Click <OK> button to save configuration.

4. Put blank sample into light path, select the menu <operation>-> <Set Blank> or click the shortcut toolbar buttons [Set Blank(0.000 Abs/100.0%T)], Instrument will be set to the wavelength, the data will be set to 0.000 Abs/100.0%T.

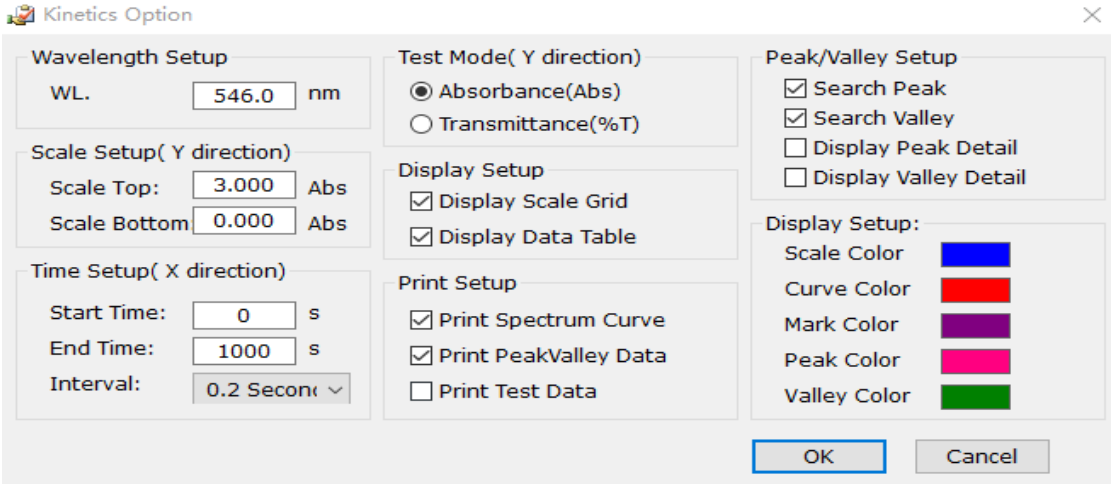
5. Put the sample into light path, select the menu <operation> <start test> or click the shortcut toolbar buttons [start test] to start the time scan measurement.

6. All data will be drawn in the picture and display in the data list.

4.3.2 Change display mode

Shortcut Toolbar [Option], in the option window, select the

absorbance mode or transmittance mode.



4.3.3 Save data

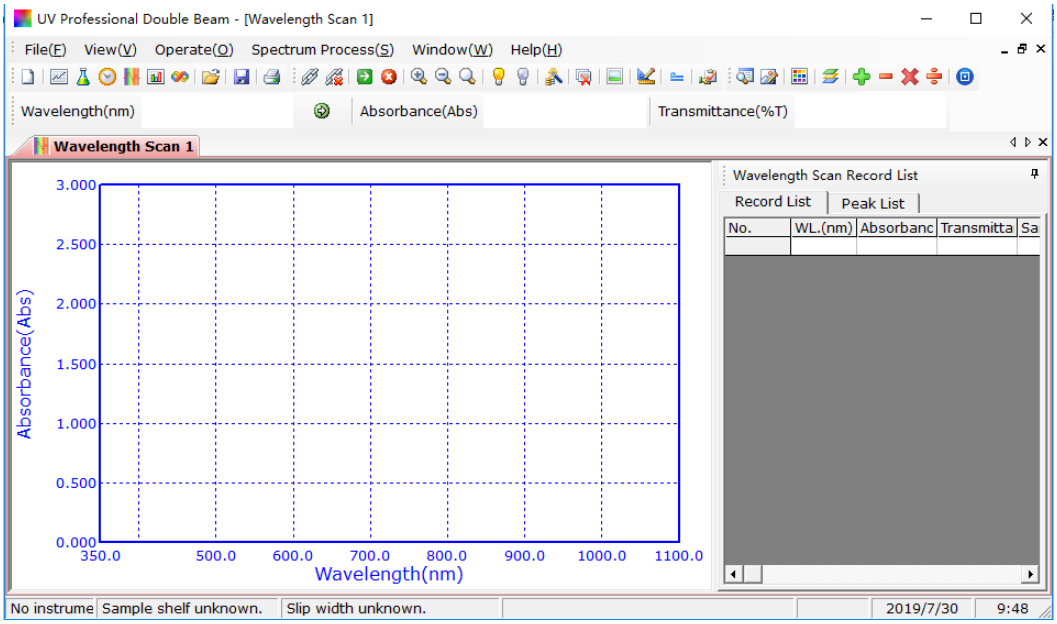
1. Select the menu <File> <Save...> or click shortcut toolbar [Save...].
2. In the save file dialog, change the file directory and file name, click <OK> button.
3. Time scan data file Data is saved with *.tis file suffix.

4.4 wavelength scan

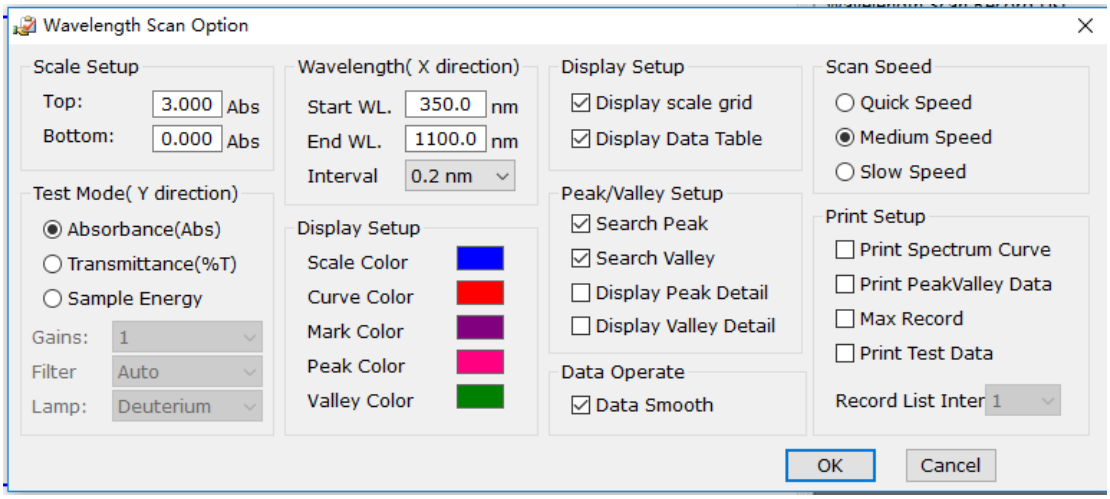
This chapter shows user how to do wavelength scan with absorbency, transmittance or energy mode.

4.4.1 Measurement

1. Click on the shortcut toolbar [wavelength scan] or [file] [wavelength scan] to create new wavelength file.

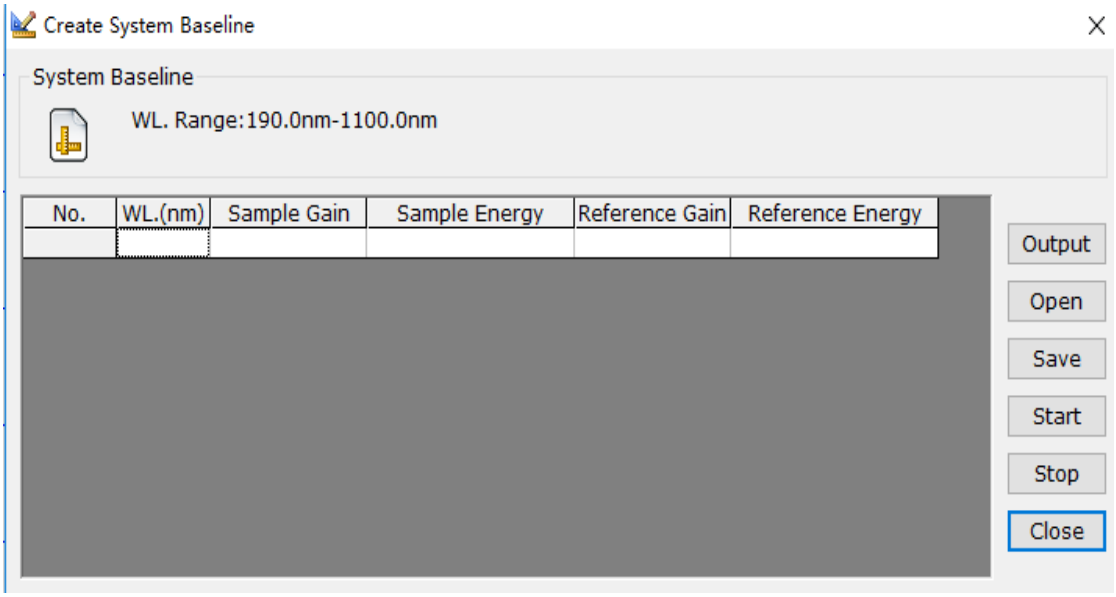


2. Select the main menu <operation> <set> or click the toolbar shortcut [Settings], open the Preferences window wavelength scanning.



3. Select display mode (elected to the energy scan mode, the proposal is set to a fixed gain), scanning the wavelength range, coordinates the upper limit, lower limit coordinates and scanning interval.
4. Click OK to complete and exit setup.
5. Will be placed in the reference light path.

6. Click on the shortcut toolbar [system set up baseline] or <operator> "Create system baseline> Open dialog system baseline to begin scanning system baseline or to open the system had previously stored baseline for testing. Click [Start] button to start the baseline correction system. Baseline correction system will take a few minutes, it is proposed that a longer time interval after baseline correction for a system to ensure testing accuracy. If you want to save the current system baseline, click [Save] button to save the current system baseline to a file. Click [Open] button to open the previously stored system baseline file.



7. Put reference sample into light path, select the main menu <operation>-><zero / full-scale> or click the shortcut toolbar buttons [zero/full-scale], software will set blank (0.000Abs/ 100.0%T) within measurement wavelength range.
8. Put test sample into light path, select the main menu <operation>-><start test> or click the shortcut toolbar buttons [test] to start the test.

4.4.2 Switch display mode

Click shortcut toolbar click [Settings], open the option dialog to choose display mode (transition or absorbance).

4.4.3 Display area to enlarge

In the wavelength scan option dialog, change the top limit and bottom limit, zoom in/out the display spectrum.

4.4.4 Peak search

Click the toolbar shortcut [search peak], after the search finished, the result will be in the list, peak value can be changed.

4.4.5 Save data

1. Select the main menu <File>-><Save> or click shortcut toolbar [Save].
2. In the file save window, select file directory and enter file name,

click <OK> button.
3. Data will be saved in the wavelength scan file with file postfix of wls wavelength scan data files.

4.4.6 Save data for the picture or text file

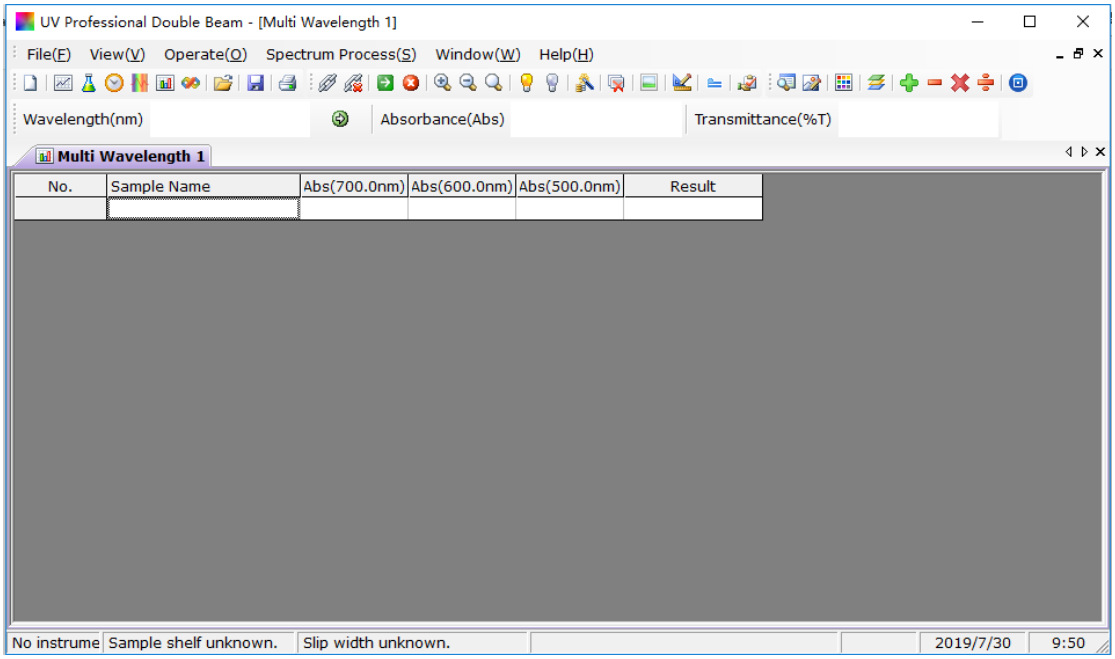
Select <File>-><output> to save data for BMP bitmap file or text file txt.

4.5 Multi-Wavelength

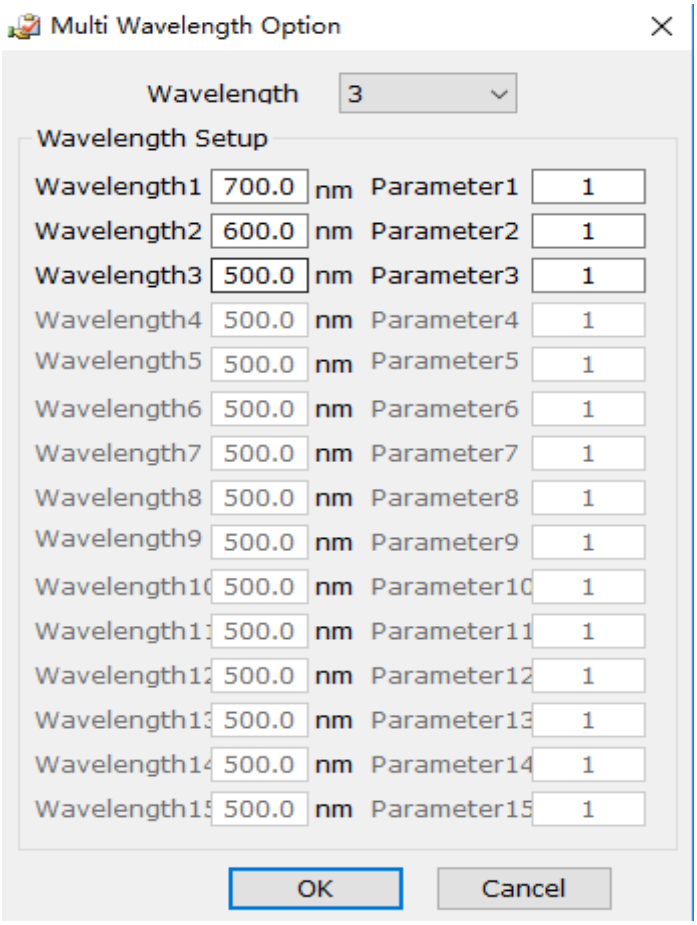
This chapter show user how to do multi-wavelengths (up to 15) measurement and to setup the multi-wavelength configuration.

4.5.1 Test

1. Select the main menu <File> <multi-wavelength> or click the toolbar shortcut [multi-wavelength], create a multi-wavelength measurement.



2. Select the main menu <operation> <option> or click the toolbar shortcut [Settings], open multi-wavelength analysis of parameter settings window.



3. Enter wavelengths number, and enter measurement wavelengths and coefficient:
Results = Abs(wavelength 1)×factor 1 + Abs(wavelength 2)×factor 2 + Abs(wavelength 3)×factor 3 +.....
4. Click <OK> button to complete configuration.
5. Put reference sample into light path, select the main menu <operation> <set zero / full-scale> or click the shortcut toolbar buttons [zero / full-scale], software will set 0.000Abs/100.0%T for each wavelength. This function will be need several seconds or a few minutes.
6. Put sample into light path, select the main menu <operation> <start test> or click the shortcut toolbar buttons [test] to start test.

4.5.2 Rename a sample

1. Select a named text box in the data list table.
2. Double-click, enter the sample name.

4.5.3 Save data

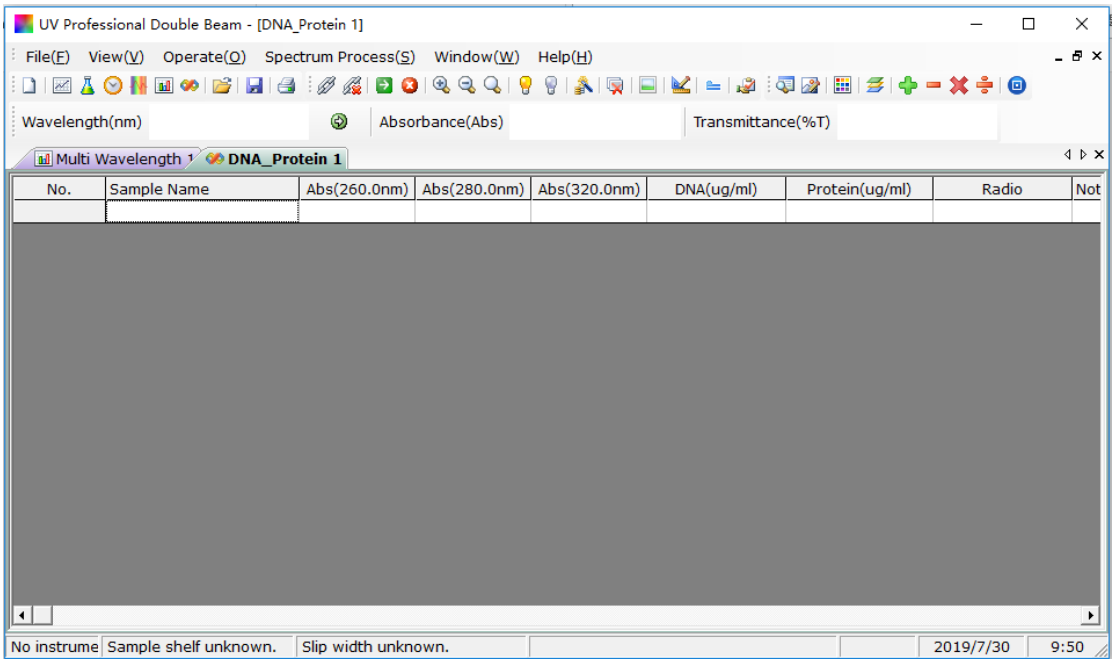
1. Select the main menu <File>-><Save> shortcut toolbar or click [Save…].
2. In the file save dialog, select file directory and enter file name, click <OK> button.
3. Test Data will be saved as the data file with suffix 'mul'.

4.6 DNA/Protein analysis

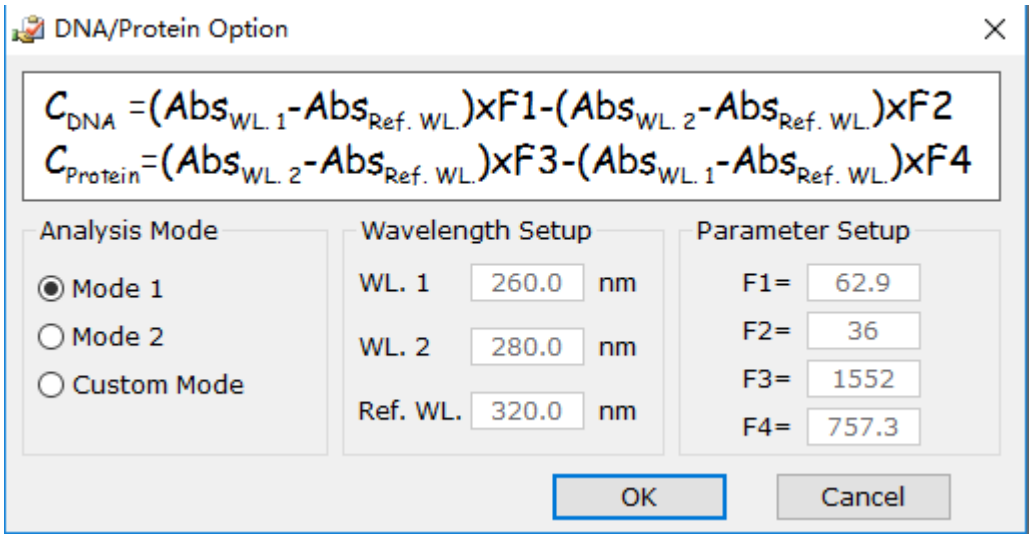
This chapter show user how to do DNA/protein measurement.

4.6.1 Test

1. Select the main menu <File>-><DNA/Protein> or click the toolbar shortcut [DNA / protein], create a DNA / protein measurement file.



2. Select the main menu <operation>-><Option> or click the toolbar shortcut [Settings], open the DNA/protein configuration dialog.
3. Select measurement method, the software have two kinds of built-in methods, you can also choose Custom method to enter the test wavelength and coefficient.



4. Click <OK> button to complete configuration.

6. Put reference sample into light path, select the main menu <operation>-><zero / full-scale> or click the shortcut toolbar button [zero / full-scale], software will set 0.000Abs/100.0%T for each wavelength.

8. Put sample into light path, select the main menu <operation> <start test> or click the shortcut toolbar button [test] to start test.

4.6.2 Rename sample

1. Select a named text box in the data list table.
2. Double-click, enter the sample name.

4.6.3 Save data

1. Select the main menu <File>-><Save> shortcut toolbar or click [Save…].

2. In the file save dialog, select file directory and enter file name, click <OK> button.

3. Test Data will be saved as the data file with <dna> suffix.

5. Other Features

This chapter shows the other features of UV Professional: set wavelength, set light switch wavelength, turn on/off tungsten lamp, turn on/off deuterium lamp, reset dark current.

5.1 Set wavelength

Select main menu <operation>-><set wavelength> or click the toolbar shortcut [ set wavelength], to set work wavelength, click <zero> button to set 0.000Abs/100.0%T for current wavelength.

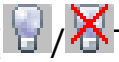
5.2 Set lamp switch wavelength

Select main menu <operation>-><set lamp switch wavelength> or click the toolbar shortcut [ set lamp switch wavelength] to set set lamp switch wavelength, the default value is between 300nm-400nm.

5.3 Turn on/off tungsten lamp

Select main menu <operation> <Turn on /off tungsten lamp> or click the toolbar shortcut / [ Turn on/off tungsten lamp] to turn on or turn off tungsten lamp

5.4 Turn on/off deuterium lamps

Select main menu <operation> <Turn on/off deuterium lamp> or click the toolbar shortcut / [ Turn on/off deuterium lamp] to turn on or turn off tungsten lamp

6 File Operations

Software file format description
Photometry: *.bas
Quantitative: *.Qua
Time Scan: *. Kin
Wavelength scanning: *.Wls
Multi-wavelength: *.Mul
DNA / protein: *.Dna
System baseline: *.Sbl

6.1 Save the test data

Select main menu <File>-><Save…> or click shortcut toolbar button [Save ...], to display open file save dialog, enter the file name, click

<OK> button to save the test data file.

6.2 Open Test

Select main menu <File>-><open> or click the toolbar shortcut button [open ...], to display open file dialog, select the file name, click <OK> button to open the file.

6.3 Print test reports

Select main menu <File> <print> or click the toolbar shortcut [Print ...] to print the test data and spectrum to current printer.

Appendix 1

DNA / Protein measurement methods:

$$C_{DNA} = (Abs_{WL.1} - Abs_{Ref.WL.}) \times F1 - (Abs_{WL.2} - Abs_{Ref.WL.}) \times F2$$
$$C_{Protein} = (Abs_{WL.2} - Abs_{Ref.WL.}) \times F3 - (Abs_{WL.1} - Abs_{Ref.WL.}) \times F4$$

Ratio= (Abs*[WL.1]* - Abs*[ref. WL.]*) / (Abs *[WL. 2]*-Abs*[ref. WL.]*)

Method 1:

WL. 1 = 260nm, WL. 2 = 280nm, ref. WL. = 320nm
F1=62.9 F2=36.0 F3=1552 F4=757.3
C_{DNA} = (Abs*[260nm]*-Abs*[320nm]*)×62.9—(Abs*[280nm]*-Abs*[320nm]*)×36.0
$C_{Protein}$=(Abs*[280nm]*-Abs*[320nm]*)×1552—(Abs*[260nm]*-Abs*[320nm]*)×757.3
Ratio= (Abs*[260nm]*-Abs*[320nm]*) / (Abs*[280nm]*-Abs*[320nm]*)

Method Two:
WL. 1 = 260nm, WL. 2 = 230nm, ref. WL. = 320nm
F1=49.1 F2=3.48 F3=183 F4=75.8

C_{DNA}=(Abs*[260nm]*-Abs*[320nm]*)×49.1—(Abs*[230nm]*-Abs*[320nm]*)×3.48
$C_{Protein}$=(Abs*[230nm]*-Abs*[320nm]*)×183—(Abs*[260nm]*-Abs*[320nm]*)×75.8
Ratio= (Abs*[260nm]*-Abs*[320nm]*) / (Abs*[230nm]*-Abs*[320nm]*)