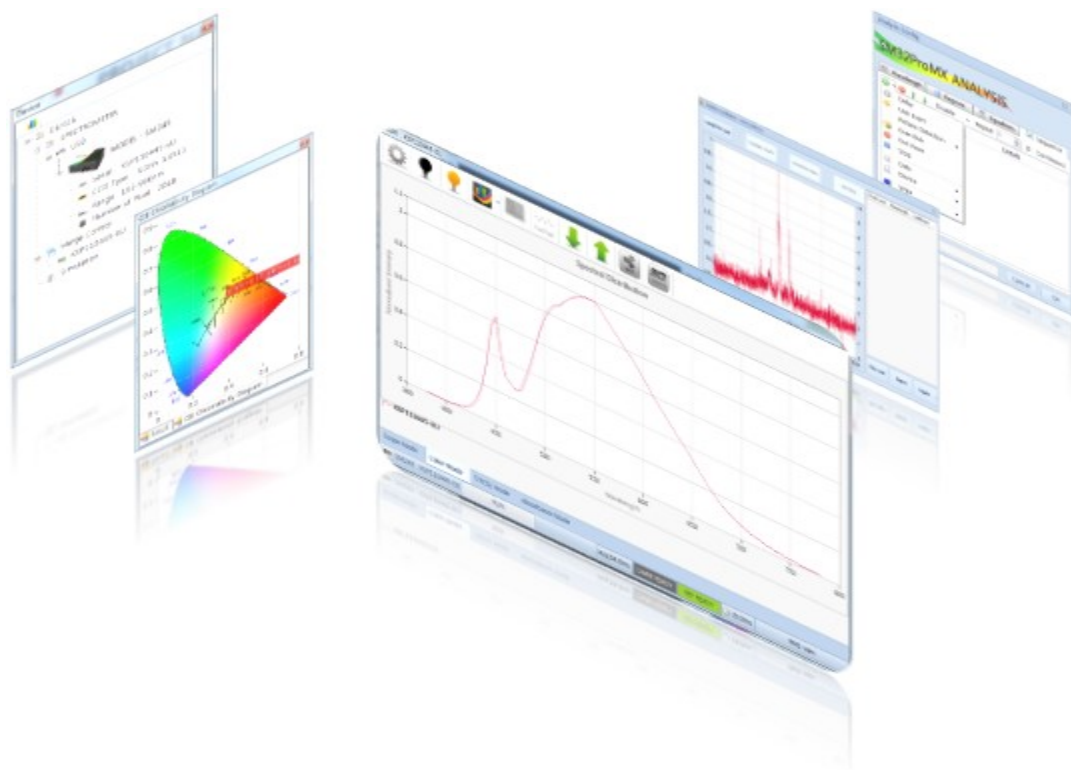


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SMPProMX SOFTWARE MANUAL v5.7.xx



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What is SMPro MX?

SMProMX spectroscopy Analysis Software is designed for the SM series spectrometer. This program can be used for various analyses in fields such as end point detection, colorization and metering analysis, and sample analysis in semiconductor processes.

The program outputs a time trend graph that shows the transmission graph, absorption graph, 3D graph, and wavelength band over time of the light source, and provides more accurate and reliable analysis. This including calibration functions that interpolates the “Wavelength by Pixel” using reference data to calibrate graphs and calibrates to compensate for radiation illuminance. SMPro MX’s manual stipulates how the machine works, how to measure, calibrate the data , and how to interpret each graph. The copyright of this program is located in Spectral Products, which developed the program, and can be updated from the official website:

www.spectralproducts.com.

SMPro MX Specifications

- Product Name: Spectroscopy Analysis Software
- Model Name: SMProMX
- Minimum system specification:
 - o CPU: Pentium Level 4 or higher (Recommended: Dual Core 2 or higher)
 - o RAM: 512MB or more (2GB or more recommended)
 - o USB: 2.0 Supported Ports

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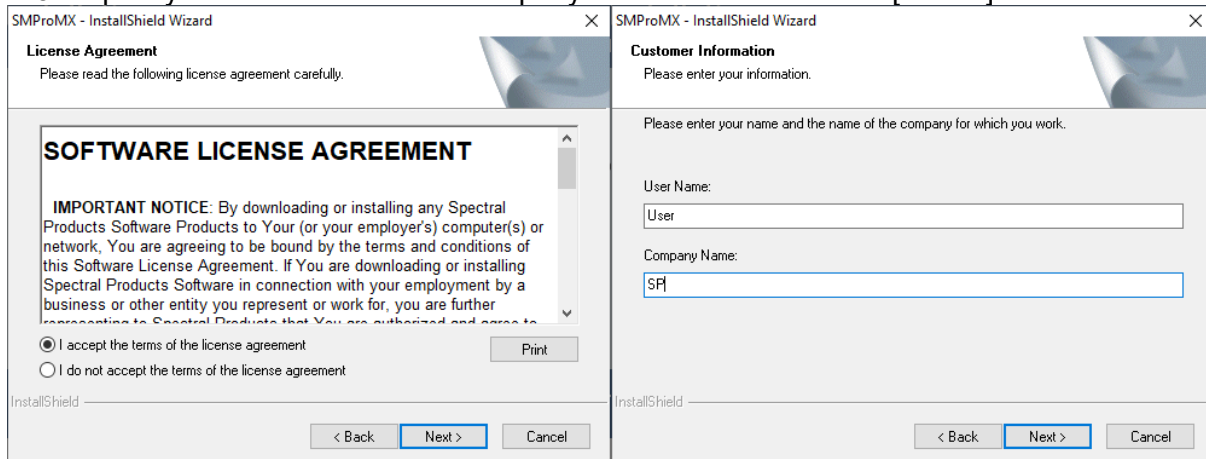
Introduction

Installation Process

1. Insert the SMProMX USB flash drive into a USB port and the installer will run automatically. If it does not run automatically, run Setup.exe from the USB flash drive.

※ Do not connect the USB spectrometer to the computer until SMProMX is installed.

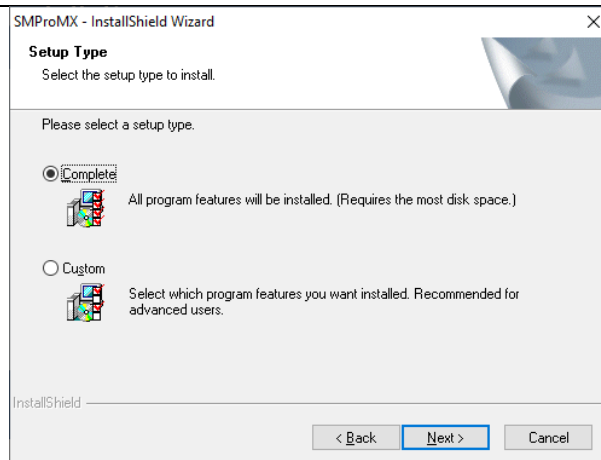
※ Depending on the computer OS, necessary programs will be installed before the installation process.
2. After reviewing the software license, please check [I accept...] and proceed with the installation.
3. Specify user information and company information. Then click [Next >]



4. Select Setup Type
 - a. Complete: Installs all the programs. (recommended)
 - b. Custom: Gives the user a choice on what programs to install.

※ SMProMX is a required installation item in the program.

※ SDK_EXAMPLE is an example program source code created with Visual C ++, Visual Basic and LabVIEW.

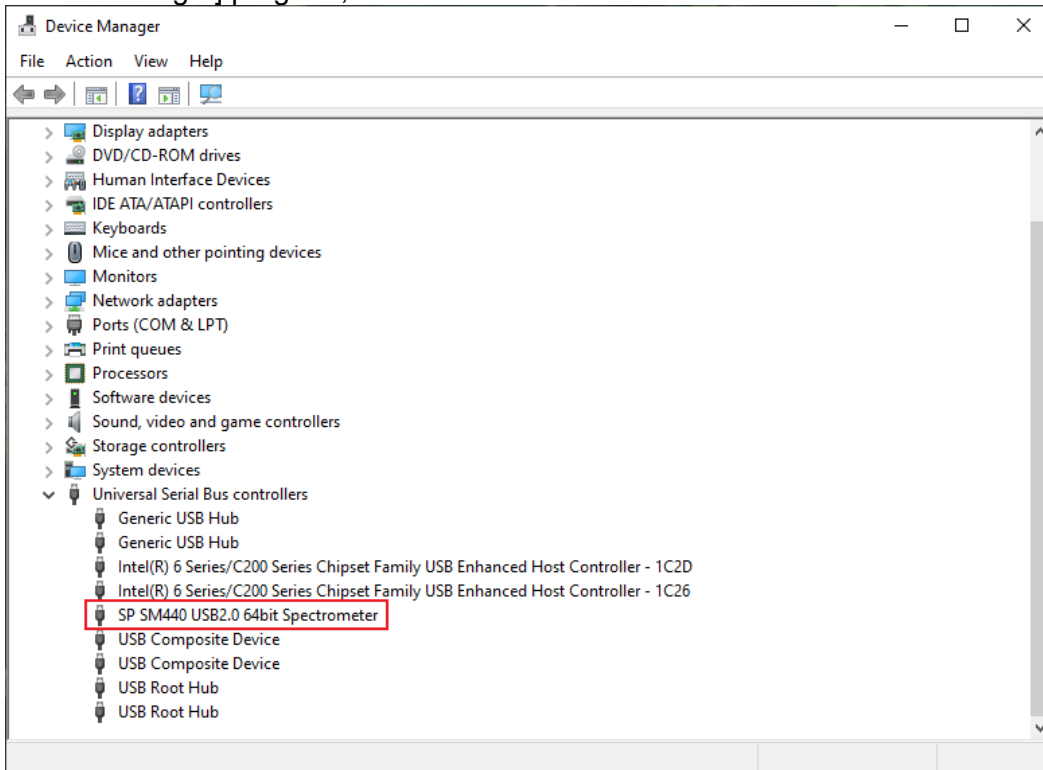


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5. Press the [Install] button to begin installation.
- Press [Back] to go back or [Cancel] button to cancel the installation.
6. When the installation is finished, click the Finish button to complete the installation.
7. After installing the software, connect the USB and the computer will automatically connect and install the new hardware.
 - a. You can check if the hardware installed correctly by checking the [Device Manager] program, under Universal Serial Bus Controllers



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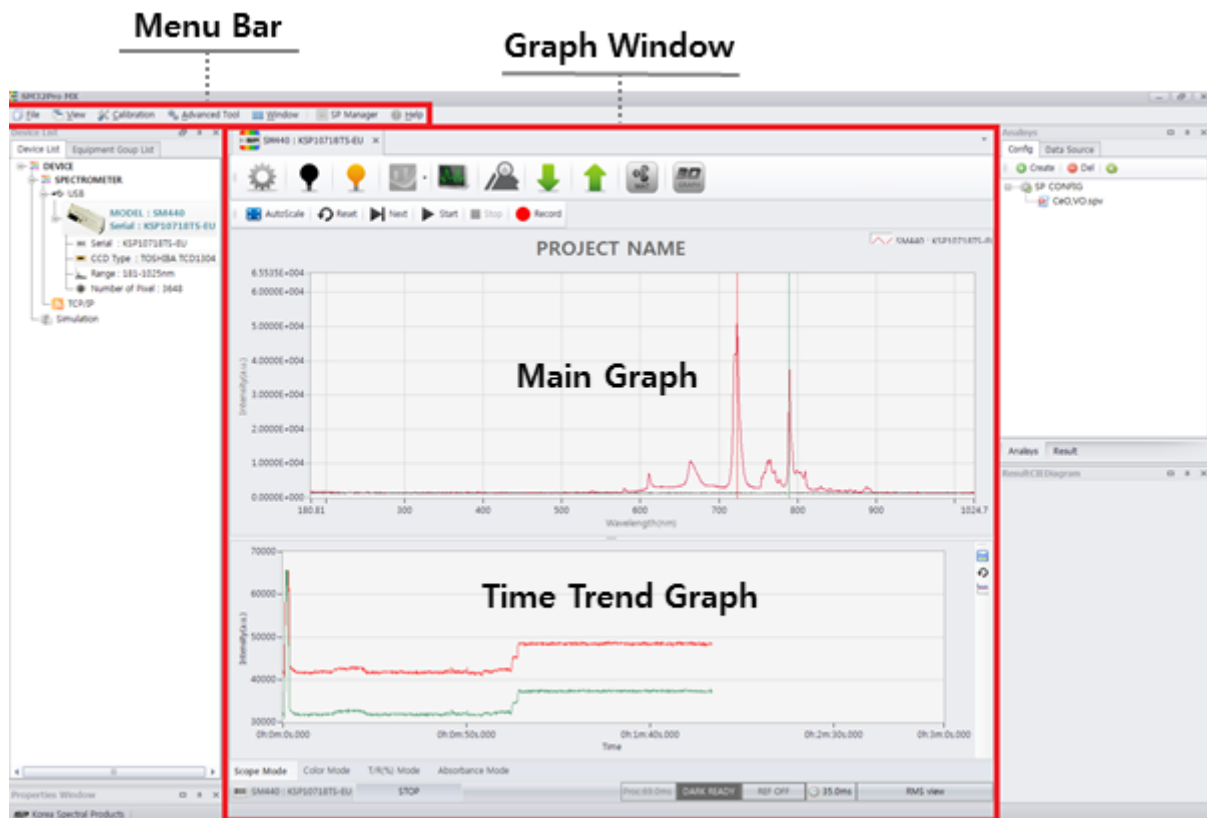
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Main Screen Layout Description

Menu Bar Layout

1. The Menu Bar consists of 6 tabs: [File], [View], [Calibration], [Advanced Tool], [Window], [SP Manager], and [Help].
2. The [View] menu can be controlled on the left and right windows of the Graph window. Calibration menu includes Wavelength for interpolation of Wavelength per pixel and Irradiance for irradiance correction.



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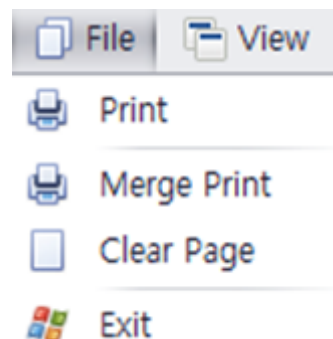
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File

In the File menu, you can use functions such as Print, Clear page, and Exit.

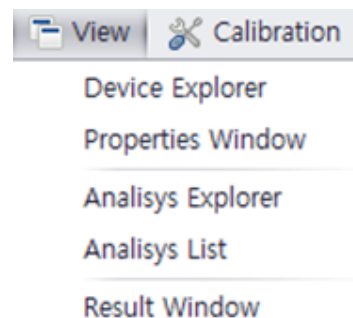
- **Print:** Displays the Project Name, Sample Name, Date, Graph, Unit Information, Wavelength value, Peak data, etc.
- **Merge Print:** Print the result continuously. When the Merge print item is selected, data is accumulated, and the accumulated data can be printed.
- **Clear Page:** Initializes accumulated data by using Merge print.
- **Exit:** Exits the program



View

The View menu brings up the windows related to the graph settings and measured data in the windows on both sides of the Graph window and allows you to control the analysis process through the Window.

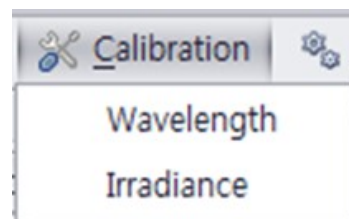
Please refer to [page 10](#) for detailed explanation of each window.



Calibration

The calibration function compares the data measured by the instrument with the previously measured standard data and makes more accurate measurements through calibration.

The menu is divided into Wavelength and Irradiance.



- **Wavelength:** Used to calibrate Pixel to wavelength. Wavelength calibration data provided by default is applied, and the user can set the desired calibration data.
- **Irradiance:** This function is to calibrate the reference light source with the data measured by the reference device.

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- **LampFile Load:** This function is to load the reference light source data. The file extension is "*.txp".

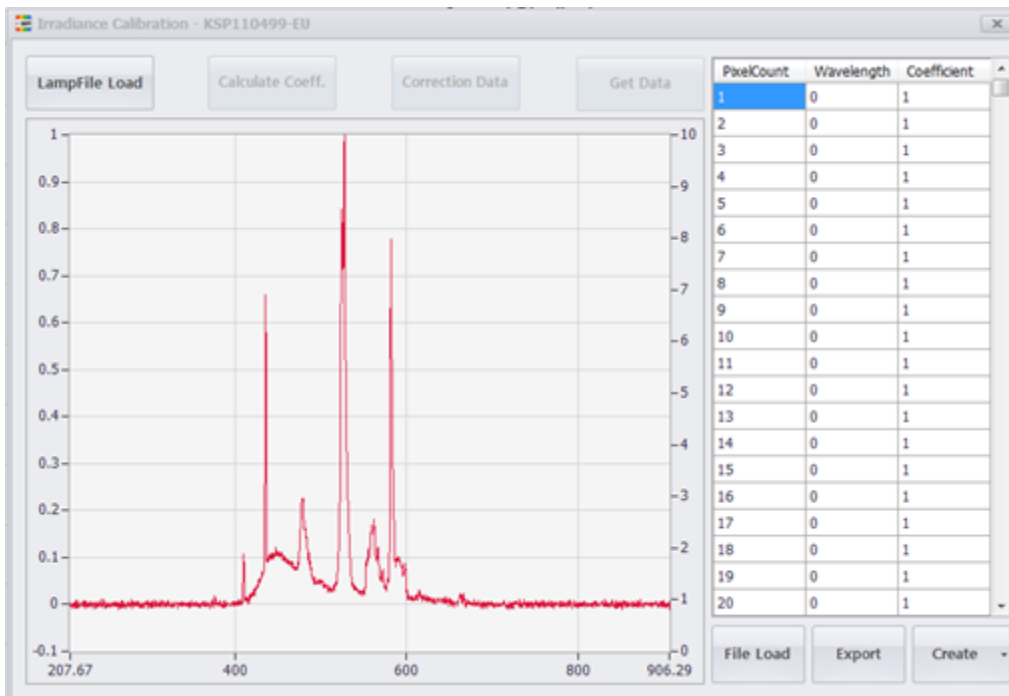
If a reference light source data file doesn't exist, it can be made with a text editor as the file format below.

*.txp file format

```
1000W-FEL Lamp
380      14.7816
390      17.7896
```

← Reference light source file name

← WL Intensity



[How to apply]

1. Measure the data of the reference light source with the connected equipment.
2. Press the Lamp File Load button to load the reference data.
3. Press the Calculate Coefficient button to get the calibration factor.
4. Press the Correction Data button to correct the data using the coefficients obtained. .
5. Press Get Data button to apply the calibrated data by pressing the spectrometer button and measure the light source to confirm calibration.
6. Press the Create button to create a file with the corrected data information.

Advanced Tools

- SPEA Mode is not included in the manual.

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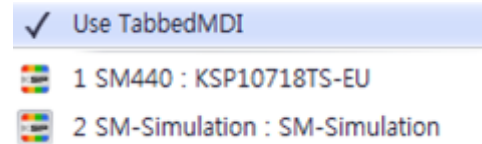
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Window

Set the sort order of the window being analyzed.

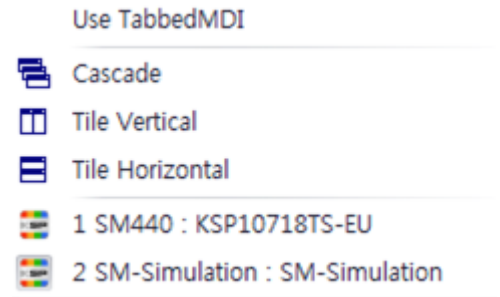
- When Use TabbedMDI is enabled

Displays the activated Main Window on the screen and can move to the window of another window by using the Tab button.



- When Use TabbedMDI is disabled

- **Cascade**: Shows window in multiple stages.
- **Tile Vertical**: Splits the Window left and right.
- **Tile Horizontal**: Splits the Window up and down.



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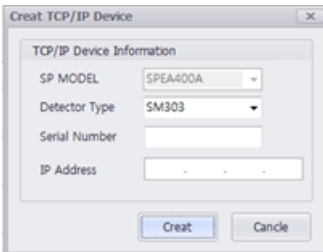
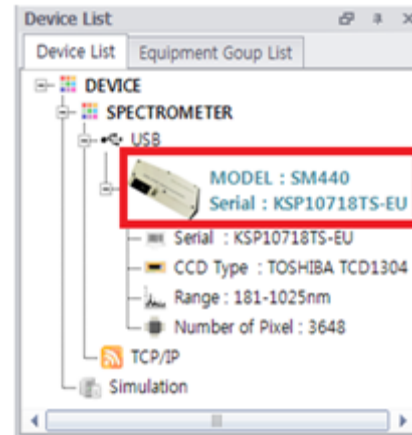
Device Explorer

If you select 'Device explorer' on the top menu bar, the device window will appear on the top left.

Device List

All currently connected equipment is added to the DEVICE list and shows the information of that equipment.

- **Model:** Displays images and model names of connected devices.
 - **Serial:** Displays the serial number of the connected equipment.
 - **CCD Type:** Displays the CCD Type used in the Device.
 - **Range:** Displays the wavelength band that the equipment can measure.
 - **Number of Pixels:** Displays the number of pixels the device can activate.
 - **TCP/IP:** With the SPEA400A, you can add one or more devices currently connected to the same operation with the communication method required to drive spectrometer.
- Right-click to load the next window.



- **SP MODEL:** Model Name of SROES
- **Detector Type:** Spectrometer Type
- **Serial Number:** Spectrometer's Serial Number
- **IP Address:** IP Address to connect

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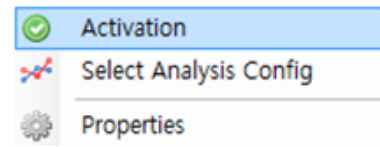
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Simulation

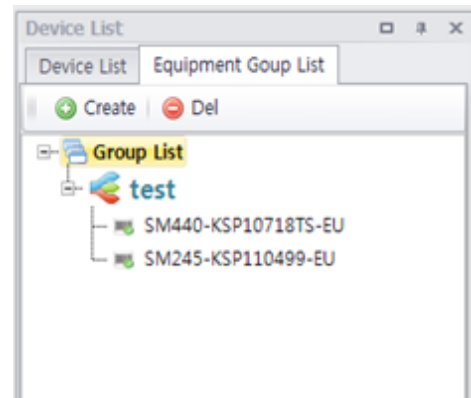
The ability to reload data that was previously measured. The measured data can be stored in excel format and Data base format. Only files stored in the Data Base format can be imported using Simulation. Please refer to [page 55](#) for a description of the simulation.
If you right-click above the items in the linked model, you will see a menu of details.

- **Activation:** Select and activate the equipment. Graph window is enabled to perform operations.
- **Select Analysis Config:** Select the Analysis config file to use when measuring Data. For a description of Analysis Config, please refer to [page 47](#).
- **Properties:** Characterizes or sets the instruments and analytical methods used for measurement.



Equipment Group List

- Data can be collected by connecting multiple device data at the same time.
- You can collect data by dividing the data from each device into the desired wavelength area.
- For more information, please refer to Group Function on [page 42](#).

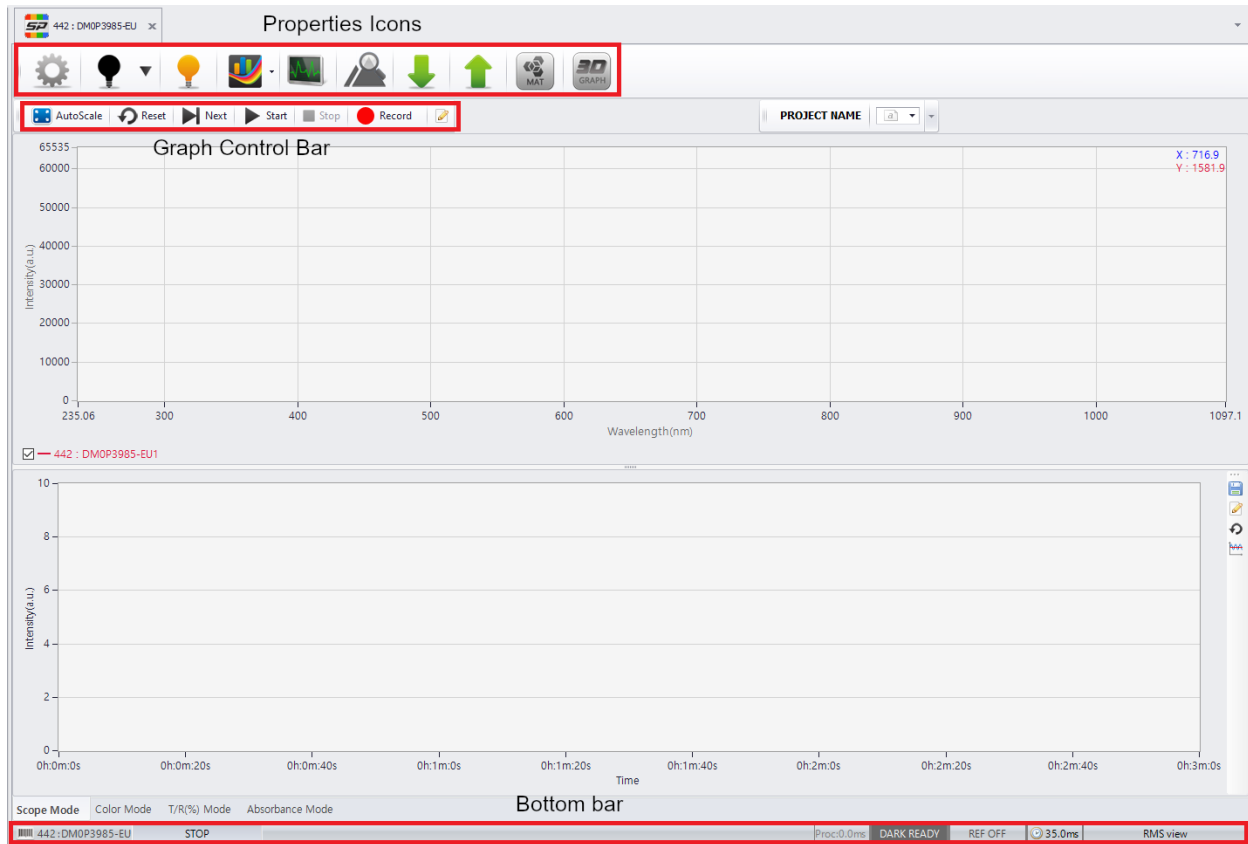


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Graph Window



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Properties Icon



Located at the top of the Graph window, the properties icon consists of:



Set up

Properties window activation,
You can change the overall
settings of your equipment.



Dark scan

Measure the data value of the
spectrometer without light
exposure.



Reference scan

Store Spectrum Data from
the source meter in the
absence of a sample.



View mode

You can change the graph mode.
(Scope mode, Color mode,
T/R mode, Absorbance mode)



Timeline

Displays time trend graph.



Find peak

Displays the peak value of Data
based on the properties setting
value.



Tec

Set whether TEC cooling fan
is enabled or not.
* Tec-enabled Device only



Import

It loads spectral data in the form of
stored Excel files.



Export

Save spectrum data.
It can be stored in the CSV
or Data base format.



Material Lib

You can find information about the
elements that are detected by the
wavelength band.



[3D Graph]

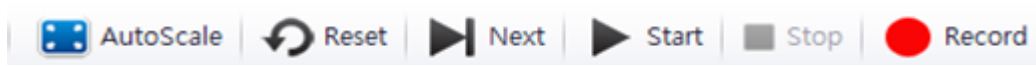
Show real-time spectrum
data in 3D.

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Graph Control Bar

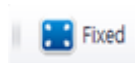


Located under Properties Icon at the top of the Main Graph, it consists of simple controls related to graph measurement and measurement.



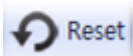
Auto scale

Based on spectrometer data values, the graph automatically sets the scale of the x and y axes.



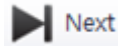
Fixed scale

Users can scale the graph and zoom in by dragging the area they want to measure.



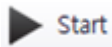
Reset

Reset the scale to the Default scale value of the graph.



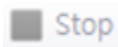
Single read

Measure Spectrometer Data once.



Continues read

Spectrometer Data is continuously measured in real time.



Stop

Stop spectrometer data measurements.



Record

Continuous storage of Spectrometer Data in real time.

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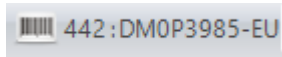
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Bottom Bar

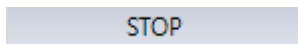


The bottom bar includes a simple operation with respect to the Graph Window graph.



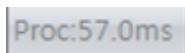
Serial number

Displays the name of the machine and the Serial number.



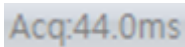
Progress bar (%)

Tells you the progress percentage of the work that is currently underway.



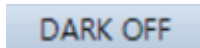
Displays progressing time/acquisition time

- You can switch (change) by pressing the left button of the mouse.



Processing time: How long it takes to collect and process data

Acquisition time: How long it takes to collect data



Dark Off/ Dark Ready

When Dark Data is measured, the Dark Off button changes to the Dark ready button.

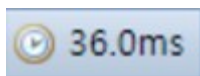


When you click the button with the left mouse button, Dark Data appears in the graph along with the measurement graph data. If you right-click, the graph displays values other than Dark Data.



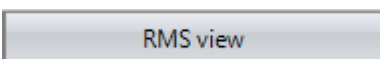
Ref Off /Ref Ready

When Ref Data is measured, the Ref Off button changes to the Ref Ready button, and when you click the button with the left mouse, Ref Data is displayed in the graph with the measurement graph data.



Integration time

You can show integration time and change settings. Right-clicking -1ms left button will change to +1ms



RMS view

Right-clicking shows the RMS value that calculates the mean of the data, Mean, and the standard deviation. The standard deviation is the amount of distribution of data.



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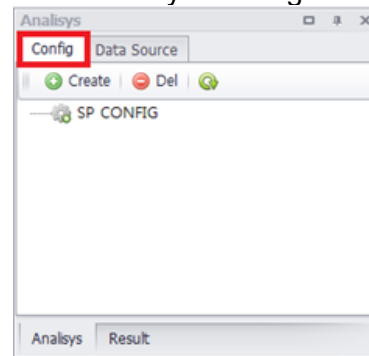
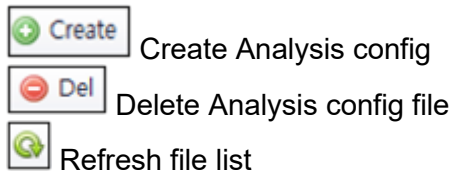
Analysis Explorer

Set Spectrometer Data to a variety of analytical methods. The settings are saved as files and can be managed. Saving analysis config as a file eliminates the need for a reset when you want to use the same method of analysis. For examples related to Analysis config, please refer to [Page 47](#).

Config Tab

Analysis Config file.

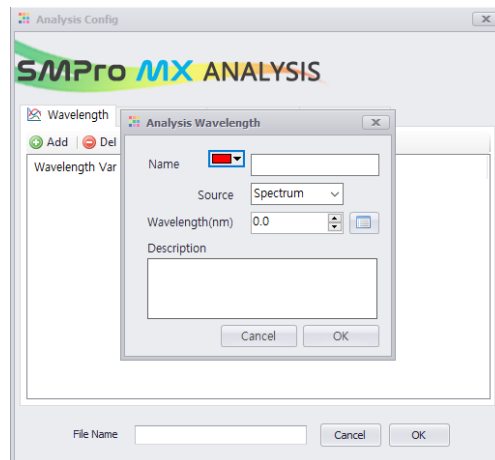
The files you create can be selected on a device-by-Device basis in select analysis config.



Wavelength Tab

Enter the wavelength you want to set (✓). Select the Add button at the top of the Wavelength tab to enter the color of the graph, the name of the graph, the wavelength (nm), and the Description, and then click the OK button to complete the settings.

※ The Data set by this tab is printed as a graph in the Time Trend Graph window in the Graph window and is used as a Parameter in equations tab - General equation.



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Regions Tab

Set the range of wavelengths you want to set (ok).

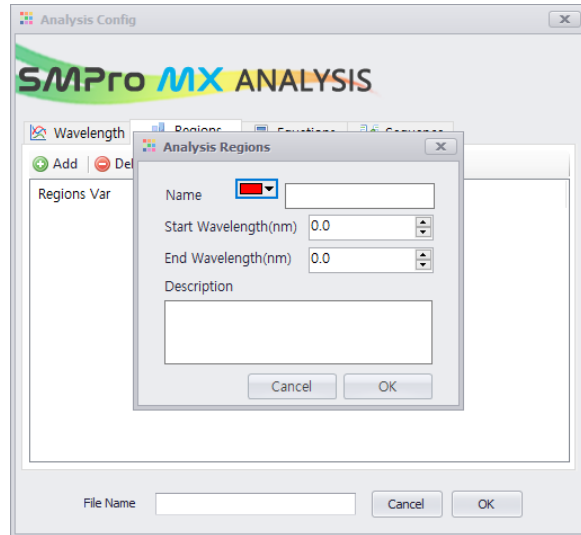
Press the Add button to color the graph and the name of the graph,

After setting the start and end points of the wavelength range (nm),

After entering the description, press OK

Complete the settings.

※ In this tab, you can set only the range of wavelengths to analyze the Data, and the analysis settings of that range can be set in equations tab - Region equation

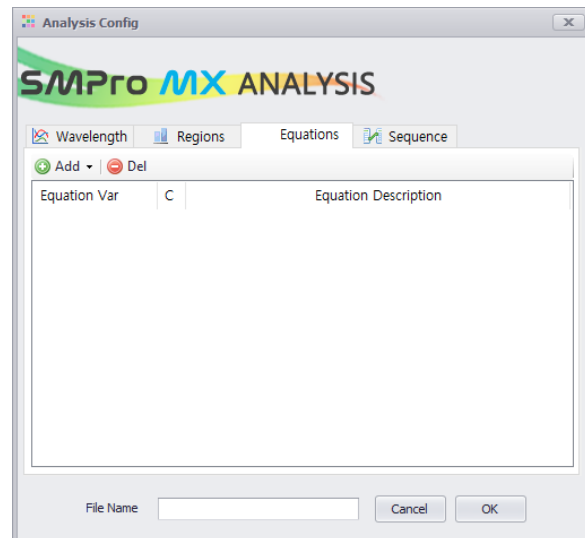


Equations Tab

The data you set will be printed as a graph in the Time Trend window of the Graph window.

Outputs data values from a specific wavelength according to the formula that you set.

- Consists of region equation and general equation.



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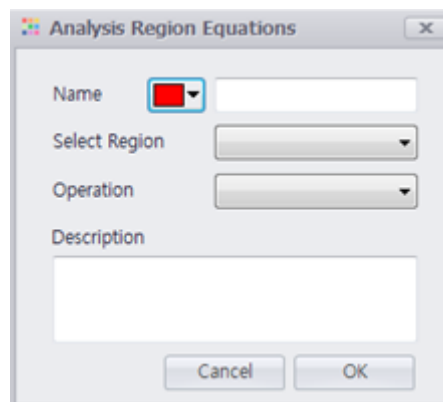
<http://www.spectralproducts.com>

Region Equation

Create parameters by applying data of wavelengths set by Region tab to a simple Operation.

- **Name:** Set the color and name of the graph.
- **Select region:** Operation selects the wavelength to apply.
- **Operation:** Select the operation to run.
- **Description:** You can enter a description of the formula.

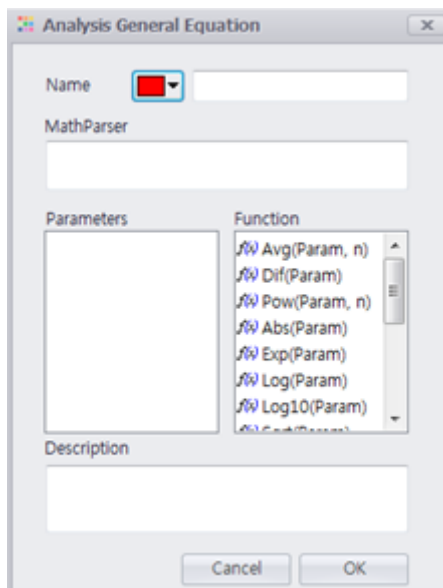
※ In this tab, you can set only the range of wavelengths to analyze the Data, and the analysis settings of that range can be set in equations tab - Region equation



General Equation

Set the equation you want to set at wavelength tab and regions tab. In addition to simple operations, you can enter formulas yourself.

- **Name:** Give the color and name of the graph
- **MathParser:** Enter a formula to calculate parameters. (Inlavs and Function functions)
- **Parameters:** The value corresponding to the wavelength set by the Wavelength tab and the equation region.
- **Function:** A list of equation functions provided appears. Use it by typing a function in the Math Parser window. [Yes: AVG (a,5): Averages after collecting data in a Parameter 5 times.]
- **Description:** You can enter a description of the formula



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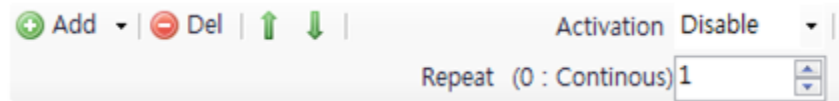
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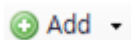
Function


Avg (Parameter, n) - get data n times to get the value average of the parameter
Dif (Parameter) - Value differential value of Parameter
Pow (") - Value square value of Parameter
Exp (") - Parameter for exponential value
Log (") - Value log in Parameter
Log₁₀ (") - Value Log₁₀ in Parameter
Sqrt (") - Intensity square root of Parameter
Floor (") - A function used to discard a decimal point in parameter intensity or less
Round (") - Rounding of parameter value values
Sin (") - Parameter Value for Sin
Cos (") - Parameter Value for Cos
Tan (") - Parameter Value for Tan
Asin (") - Parameter Value for Asin
Acos (") - Parameter Value for Acos
Atan (") - Parameter Value for Atan

Sequence Tab

The ability to configure the behavior you want to perform during data measurements.



 Press the button to add the action you want to run.

 Press the button to remove the registered actions.

 Press the button to determine the order of the actions.

- **Activation:** Whether the Sequence is activated or not.

Disable: sequence inactive

Enable: sequence enabled

- **Repeat:** Repeat the entire sequence the number of times you set it up. 0 means infinite repetition.

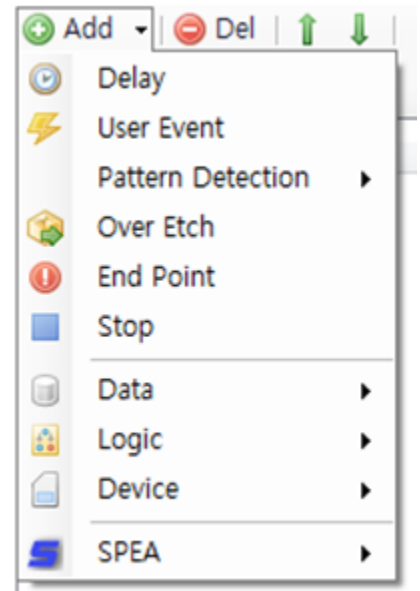
Here's what you can add:

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- **Delay:** Delay the time. It is divided into Time and nSample.
Time (ms) - Millie units, depending on the value you set
Time delay nSample - Sample count unit time delay based on the value you set
- **User event:** will be implemented
- **Over Etch:** will be implemented (not yet activated)
- **End Point:** will be implemented (not yet activated)
- **Stop:** Stop spectrometer data measurement.

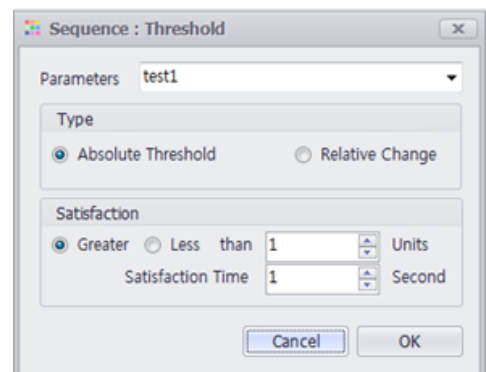


- Pattern Detection

Threshold: Sets the condition to move on to the next Sequence action. Set intensity's Satisfaction of the wavelength set by Parameter. For relevant examples, please refer to page 51.

Absolute Threshold - When the intensity of the wavelength set by parameter meets the criteria for Satisfaction, it moves to the next action.

Relative Change - Intensity at the time of The Threshold in Sequence becomes the base value, and when you meet the conditions of Satisfaction compared to the intensity of the wavelength set by the parameter and the reference value, move on to the next action

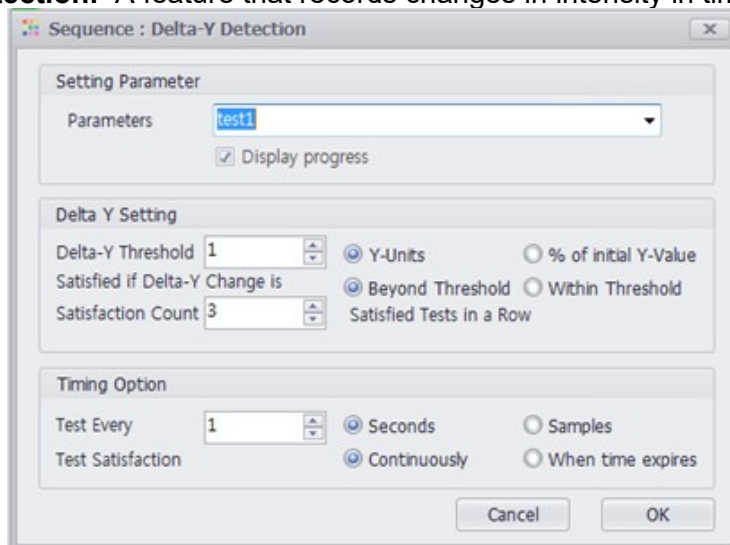


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Delta-Y Detection: A feature that records changes in intensity in time trend graph.



Y-Units - Set the amount of intensity to change.

% of initial Y-Value - When delta-Y Detection turns on in sequence, you get the intensity of the parameter you set and set the % of this value to the change amount.

Beyond Threshold - If the amount of change you set exceeds the Threshold, write to graph.

Within Threshold - If the amount of change you set does not exceed the Threshold, write to graph.

Continuously - If you are satisfied with the conditions in real time, record them in graph.

When time expires - Read the value only for timing set to Test Every and write to Graph if you are satisfied with the Setting conditions.

- **Data:** Save or record data

Save: Save the spectral data of 1 count currently drawn on main graph.

Record: Save data in real time.

- **Device**

Integration Time: Changes Spectrometer's Integration Time

Dark scan+ correction: Apply scan data after dark scan.

- **Balance (only for SM301/SM301-EX)**

Stabilization is underway for the optical detector. This process must be performed before the measurement is taken. Balance measurements should be carried out in a dark state that is not exposed to the light source.

- **Shutter**

Shutter open: Expose the light source to open the shutter to proceed with the measurement.

Shutter close: Close the shutter for stabilization of the light source and balance measurements.

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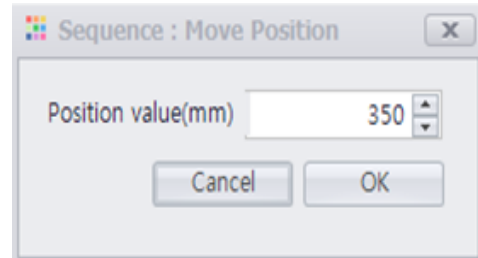
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- SPEA (only for SPEA users)

SPEA Sequence measures spectrum data along the Scan map that SPEA400A measures or sets spectrum data at a specific point on the board.

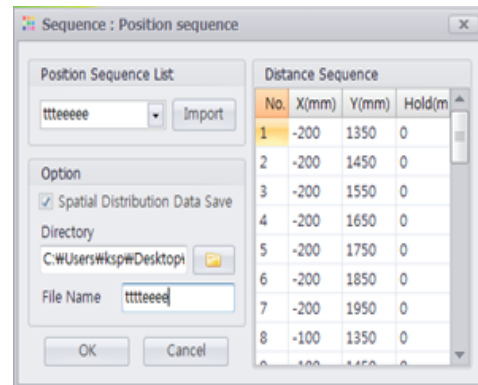
Move Position - Enter the Y position to move to Position value (mm) and then click the OK button to complete the registration in the sequence.



Position Sequence List: Select the registered Scan Map.

Distance Sequence - When you press the Import button, you can see the point information that the Scan Map you selected in the Position Sequence List.

Option - The ability to store spectrum data from each point in the Sequence. When you check Spatial Distribution Data Save, the feature is activated, you can specify the directory to store Data, and set the File name to save Data.



For examples of Analysis config, see Page 47.

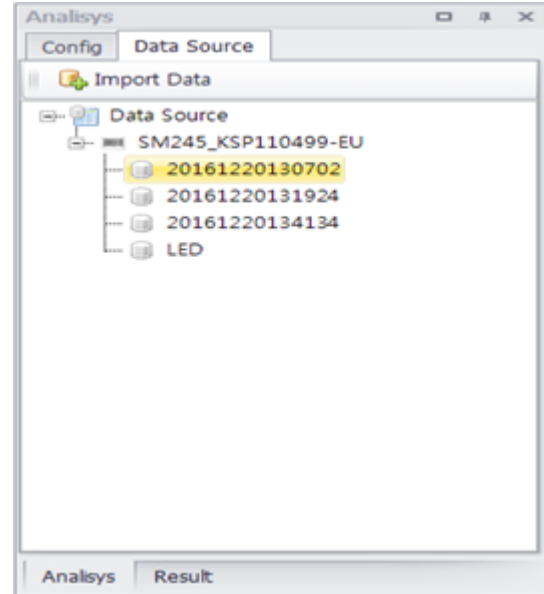
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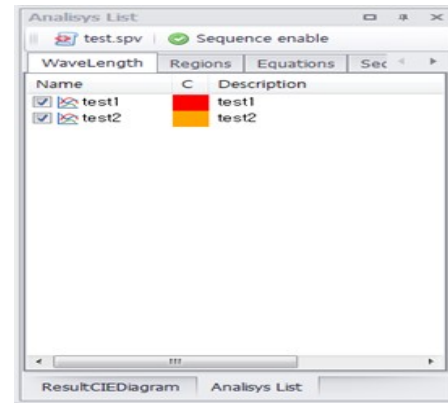
Data Source Tab

Files stored in the Data base type are displayed. Stored Database files can be exported to excel files or graphs can be viewed and analyzed in the device window simulation window. For more information, please refer to Simulation on [page 55](#).



Analysis List

It displays the parameter of the Analysis config file that Device is using and determines whether the Time trend window is printed as a graph. If you turn off the checkmark, the specified Analysis config will not be output from Graph.



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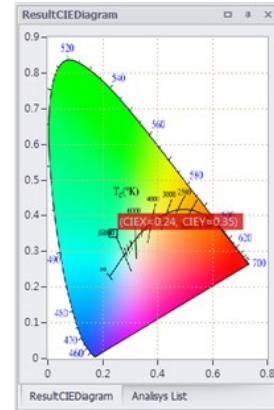
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Result CIE Diagram Window

ResultCIEDiagram

Displays the color of the data measured on the color coordinate system set by Properties.



Result Window

Result

Shows the information on the Device you set up.

Integration Time: Displays the light exposure values set for properties.

Signal level: Displays the maximum value of the measured Y-axis Intensity signal.

Signal sensitivity: Dynamic range 16bit (65535counts) shows the percentage of intensity maximum scans.

Time average: Displays the value set for properties.

The Result window displays measurement parameters and results. It includes a Quick Search bar and a list of parameters. The parameters are organized into two sections: 1. Measurement Parameter and 2. Measurement Result. The results section shows various color and intensity measurements, including CIE coordinates and a color bar.

1. Measurement Parameter	
Integration Time	35.0
Time Averages	1
Signal Level	15610 Counts
Signal sensitivity	23.8 %
2. Measurement Result	
Peak WL	525.1 nm
SubPeak WL	524.4 nm
Center WL	525.9 nm
Centroid WL	380.9 nm
FWHM	6.5 nm
Dominant WL	493.8 nm
Display Color	103, 254, 255
Purity	0.304
CIE x	0.2405
CIE y	0.3487
CIE u	0.1435
CIE v	0.3121
CIE u'	0.1435
CIE v'	0.4682

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Properties Window

Represent or set the characteristics of the instruments and analytical methods used for the measurement.

Device

Device Type: Displays the type of connected equipment.

Model Name: Displays the name of the connected equipment.

Serial Name: Displays the serial number of the connected equipment.

1. Device	
Device Type	Simulation
Model Name	SM-Simulation
Serial Name	SM-Simulation

Project Name

Project Name: Set the name of Project

Sample Name: Set the name of Sample.

2. Project Name	
Project Name	PROJECT NAME
Sample Name	Sample

Device Settings

Set the behavior of spectrometer.

Integration time (ms): You can set the spectrometer's light exposure time to microsecond.

Time average: Represents the average value measured and measured repeatedly as much as the value set when collecting data.

Acquisition interval (ms): Set the time interval for collecting data.

Trigger mode: Set spectrometer's operating mode.

Internal: Internal signal mode

External: External signal mode

Timing: Set timing in Trigger mode.

When Trigger mode is internal

Software trigger: Start collecting data when you call the Read Data function.

Free run: Continuously collects data as the program operates.

When Trigger mode is external

Rising mode: Works when the external signal is at the rising edge.

3. Device Setting	
Integration time(ms)	100
Time Average	1
Acquisition Interval(0
Trigger Mode	Internal
Timing	S/W Trigger
Analysis Config	test.spv
Auto Dark	<input checked="" type="checkbox"/> True
Offset value	0
Dark Correction	<input type="checkbox"/> False
Bad Pixel	
Nonlinearity Cal. Use	<input type="checkbox"/> False
Irradiance Cal. Use	<input type="checkbox"/> False

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Falling mode: It works when the external signal is at the descent edge.

- Output Trigger (only SM245N series)

This function is activated only when the SW/HW trigger mode is on when using the SM245N model.

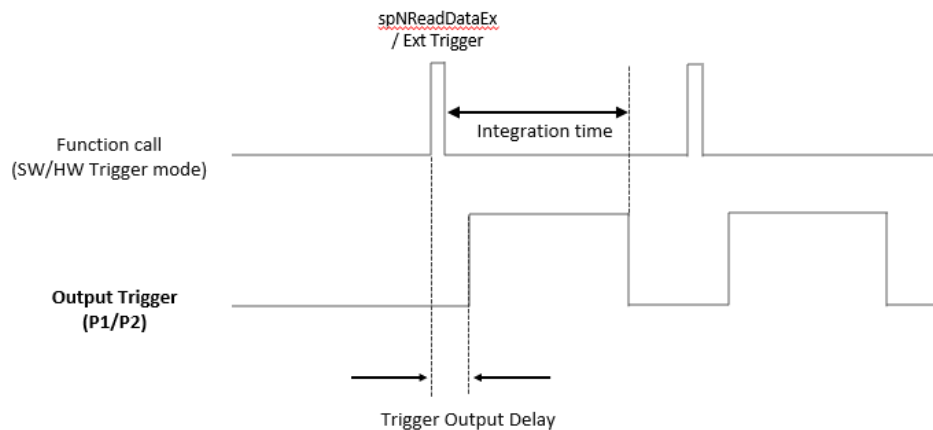
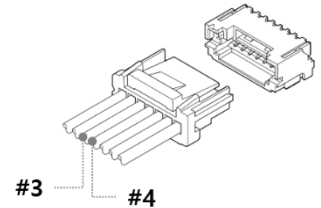
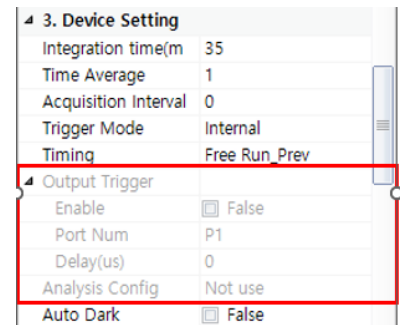
Once this function is activated, after a given delay (usec) from the start of the integration time, the HIGH (1) signal will be generated and sent to the external output pin assigned. When the integration time is over, it will change to LOW(0) signal status.

Enable: Enable the Output Trigger Mode.

Port Num: Setting the EXT output Pin

- P1: #3 Pin
- P2: #4 Pin

Delay(us): Setting the delay time in usec. The EXT Output signal will be generated and sent after this delay from the start of the integration time.



[Output Trigger Timing]

- **Analysis Config:** Shows the analysis config selected by Device Window.

- **Auto Dark:** Excludes optical black values set in Device.

- **Offset value:** You can set the value of the base line at the output of the graph. It can only be executed when Auto dark is running.

- **Bad Pixel:** If you enter the pixel where Bad Pixel occurred, you can remove bad pixel software.

- Nonlinearity Cal. Use

Determines whether nonlinear calibration data stored in the EEPROM is applied.

Nonlinearity Calibration - Linearly calibrate the nonlinearity properties of CCDs

- **Irradiance Cal. Use:** Option to use this data when there is irradiance correction data

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Graph

Change the settings in Main graph.

- **View** mode: You can set the x axis of the graph to Wavelength or Pixel.
- **Y-Axis** Max: Set the maximum value of the Y-axis graph.
- **View time** trend: Choose whether to view the time trend graph of the Graph window. Hide singing when selected as False and shows the graph when selected as true.

4. Graph	
View Mode	Wavelength
Y-Axis Format	Numeric
Y-Axis Max	65535
View time trend	<input checked="" type="checkbox"/> True
Time trend Mode	Fixed
Line Color	 220, 20, 60
View raw data plot	<input type="checkbox"/> False
Plot history capacity	10000

Time trend mode: Set the view mode of Time trend graph.

Fixed: Collect data up to the time interval of the most recently analyzed graph and then stop.

Auto scale Loose: Collect data up to the time interval of the most recently analyzed graph and accumulate new data every one second. (The time interval is adjusted every 10 seconds after 30 seconds.)

Auto scale Exact: Collects data up to the time interval of the most recently analyzed graph and accumulates new data in real time.

Scope Chart: Collect data from the most recently analyzed graph and reset the graph.

Strip Chart: After collecting data from the most recently analyzed graph, the graph moves to the left and collects new data.

Auto scale Visible Loose: Shows a graph of the Auto scale loose state.

Auto scale Visible Exact: Shows a graph of the auto scale exact state.

4. Graph	
View Mode	Wavelength
Y-Axis Format	Numeric
Y-Axis Max	65535
View time trend	<input checked="" type="checkbox"/> True
Time trend Mode	Fixed
Line Color	Fixed
View raw data plot	AutoScaleLoose
Plot history capacity	AutoScaleExact
	ScopeChart
	StripChart
	AutoScaleVisibleLoose
	AutoScaleVisibleExact

- **Line color:** Set the color of the graph to be drawn.
- **View raw data plot**
Draw Raw Data together in Main graph.
Raw Data - Spectrometer Data that does filter and harmonic removal.
- **Plot history capacity:** represents the amount of storage.

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Signal Process

Filter: Smoothing the data measured by spectrometer using Savitzky Golay filter.

Use: Choose whether to apply the filter

Order: Determines the order of the entire equation to be applied.

Side point: Determines the number of points to use during the entire data.

5. Signal Processing

Filter	SavitzkyGolay
Use	<input type="checkbox"/> False
Order	3
Side point	4
FFT Use	<input type="checkbox"/> False
Frequency Cut-Off	50

FFT use: Convert spectrometer data components into frequency components using Fourier conversions.

Frequency Cut-off: Enter the settings to cut-off.

Find Peak

Method: Press Find peak to see the window displaying the information.

Maximum: Displays the peak value of Data

Centroid: Displays the center of gravity of Data.

6. Find Peak

Method	Maximum
Noise Multiplier	5
Threshold(%)	10
WD Width	3

Noise Multiplier: You can set noise filtering.

Threshold: Use to find peaks in data values above constant sensitivity.

WD Width: Set the minimum size of the peak width in the Color calculation.

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Color Measurement

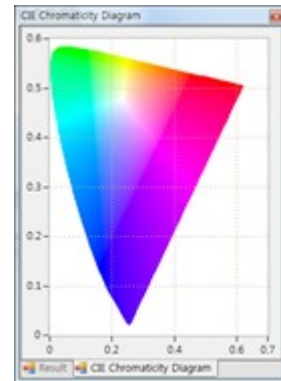
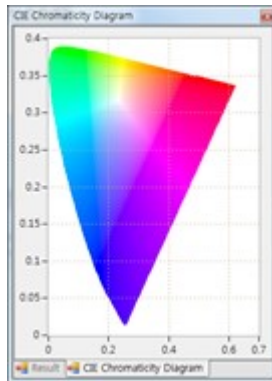
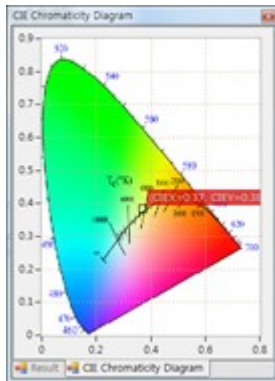
Sampling Type: You can adjust the data collection interval. (5nm, 1nm)

Save Color: When you save Data, you also store color information as well. Available only in Color mode, and when stored via the save button on the properties icon, color information is stored together

Chromaticity Diagram: Select the color coordinate system to use in the Result window.

7. Color Measurement

Measurement Target	Reflectance
ILLUMINANT	D65
Observer	CIE1964
Reference Lab	PreviousValue
Reference Lab Value	0.00, 0.00, 0.00
White Reflectance	98.5
Sampling Type	Sampling_5nm
Save Color Data	<input checked="" type="checkbox"/> True
Chromaticity Daigra	CIE1931
Sensitivity Threshold(10
Measurement Distan	1
Radius of Integrating	1



CIE1931

Coordinate system that represents color from a human perspective

CIE1960

Coordinate system that complements the time-sensitive color difference and numerical color difference of CIE1931.

CIE1976

The color coordinate system that is currently the most representative of the cie1960 modified.

Sensitivity Threshold (%) : Executes the operation of the color only above the set value.

Measurement Distance: Enter the measurement distance of Data.

Radius of Integrating Sphere: Enter the radius of the used integrator.

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Record

Record format: Set the file format of the Data to be stored.

Excel: Save in CSV format.

Database: Save in SPD format.

Save parameter Data: When you save, the parameters set by Analysis Config are stored together.

8. Record	
Record format	Database
Save Parameter Data	<input type="checkbox"/> False
Save Raw Data	<input type="checkbox"/> False
Record Mode	DataSet
Value	2
Sampling interval(ms)	1000

Save raw Data: Save unfiltered data together.

Record Mode: When the Data size becomes constant Data, save it back to the next file. The Data value setting can be set in Value. (Unit Mb)

Value: You can set the Data value or cycle of the selected mode in Record Mode.

Sampling Interval (ms): Set the storage interval for Data.

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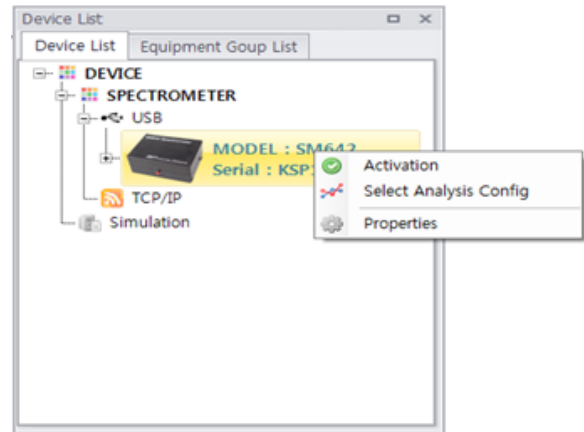
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Running the Equipment

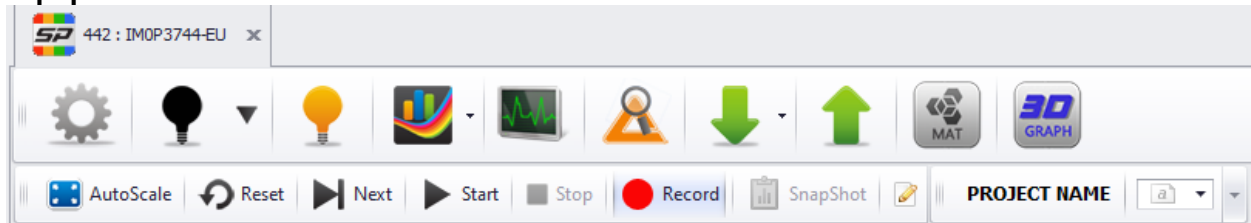
Equipment Activation / inactivity

Equipment activation

Right-click on the connected device to select Activation. Clicking the button activates the device and creates a Graph window.



Equipment Inactive



If you click the X button on the right side of the model name at the top of the Graph window, the device will be disabled.

Changing the Layout

For your convenience, you can use the floating panel option or manually arrange the windows. You can also hide, resize, and freeze windows.

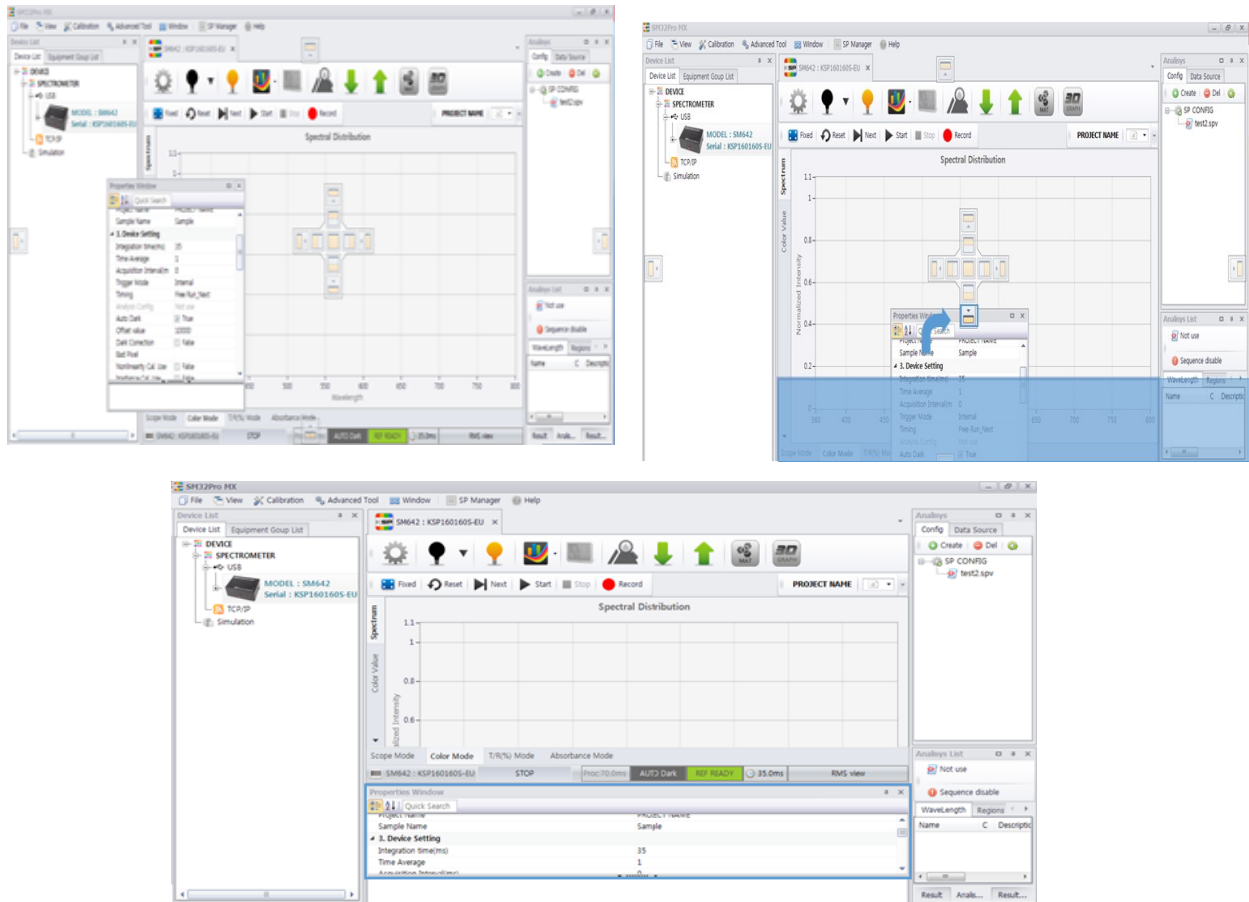
1. Position the window you want to move with your mouse.
2. Move the Window over to the location where you want to move over the floating panel that is created when you select the Window with the mouse.
3. The window is fixed where you want it.



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The Properties window is fixed at the bottom. Conversely, you can drag the frozen window to move it where you want it.

Graph Analysis

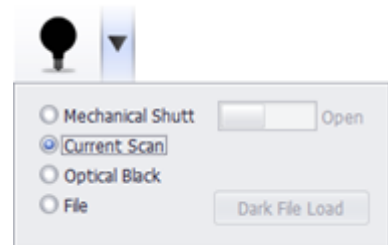
Measure the data value without optical exposure to Spectrometer. Dark scan must be measured first in order to measure Transmittance mode and Absorbance mode. This Data is used to calibrate Noise when measuring Transmittance mode and Absorbance mode.

Mechanical Shutter: Determines whether to use Mechanical Shutter.

Current Scan: scan the dark state with spectrometer.

Optical Black: Set the reading value in the Optical black area of CCD to dark.

File: Read a specific dark value from The File and set it to dark.

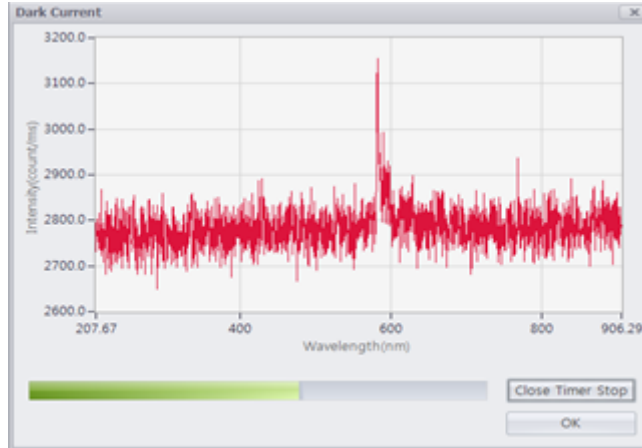


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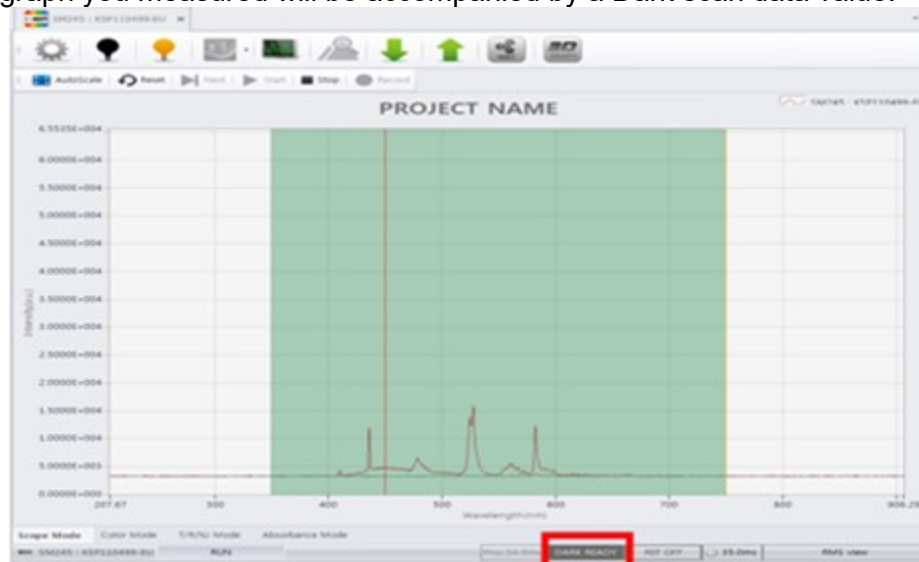
Pressing the Dark Scan button activates the Dark current window as shown below.



After measuring the Dark scan data in the Dark current window, press the OK button to generate data.

When Data is created, the Dark off button at the bottom of the Graph window is activated with the Dark ready button.

When you press the Dark ready button at the bottom of the Graph window with the left mouse button, the first graph you measured will be accompanied by a Dark scan data value.

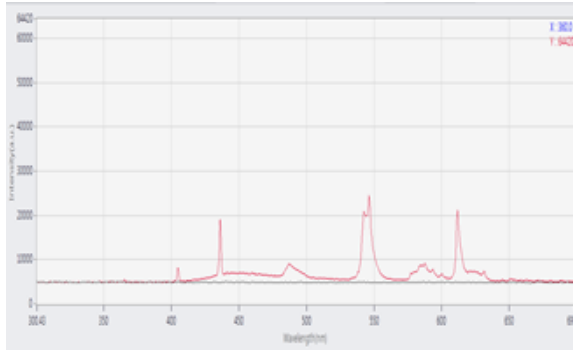


Right-click the Dark ready button at the bottom of the Graph window to show the compensated value by subtracting dark scan data from the first measured graph value.

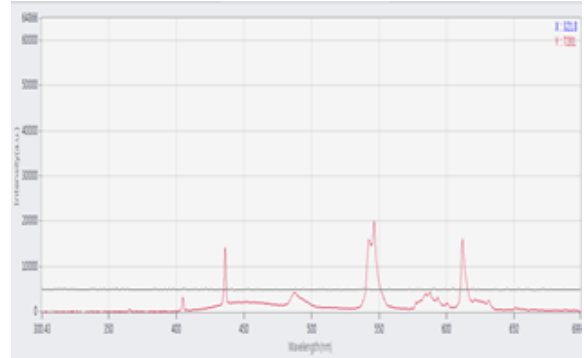
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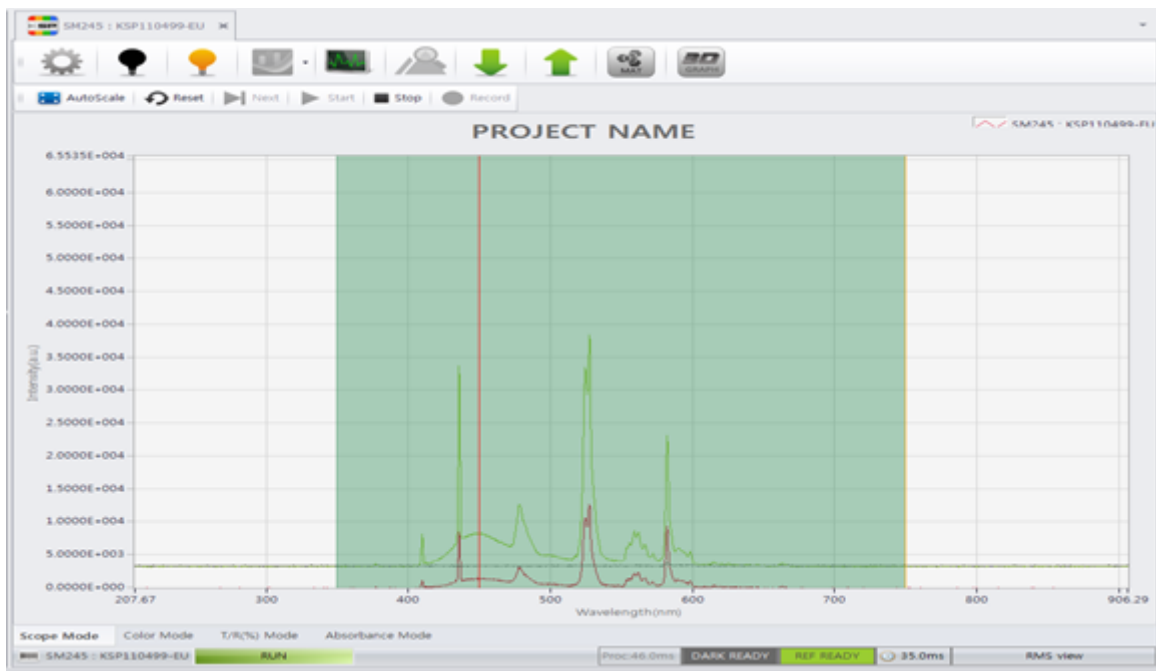


=



Reference Scan

Without a sample, save spectrometer data from the light source that occurs in the Source Meter. When measuring Transmittance mode and absorbance mode, reference data and Dark Scan Data are required. This data is used to output transmittance and absorbance graphs compared to light source data after passing through the sample. When Reference scan Data is created, when the Ref off button at the bottom of the Graph window is activated with the Ref ready button, you can press the left mouse button to display it together in the Main graph.



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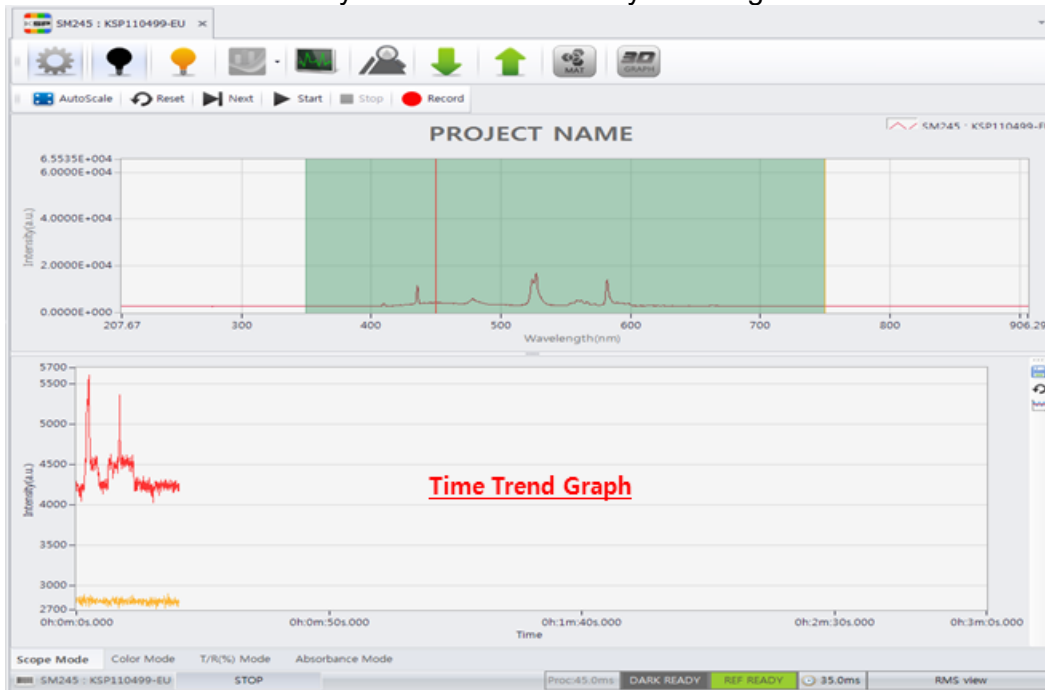
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View Mode

Scope mode:

The light source that passes through the measurement sample is measured within the set range and printed as a graph.

When you press the Timeline button in Scope mode, you can see the time trend graph together at the bottom of the Main graph. Time trend graph shows data over time. You can see the parameter and numerical analysis values set in Analysis config here.



*** Dark Scan and Ref Scan must be performed to activate scope mode.**

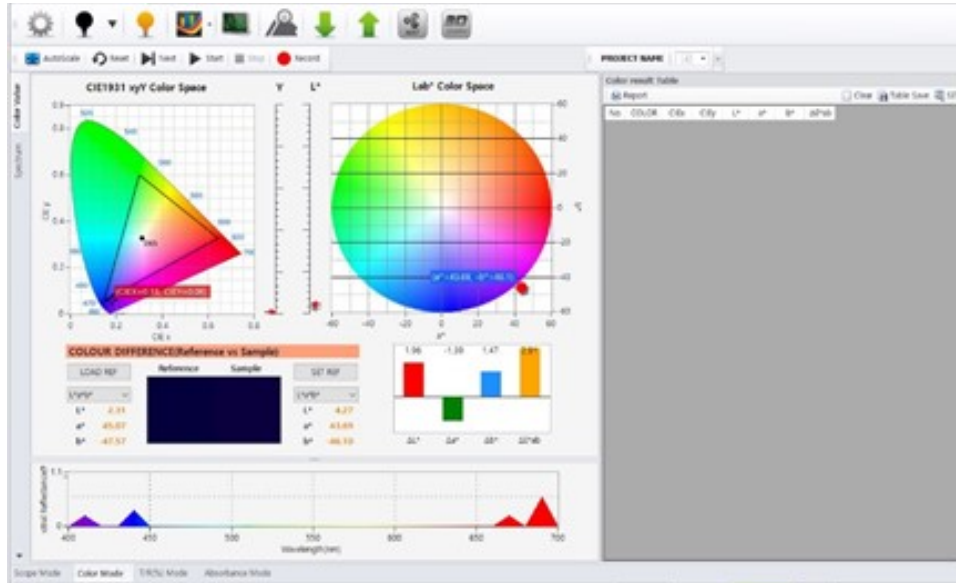
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Color Mode

Color Data, which corresponds to the wavelength absorbed by the material you want to measure, is displayed in graphs and color coordinate systems. The color coordinate system is displayed in the Result window.



T/R (%) mode

Reference scan data and dark scan data can be measured when transmitted or reflected.

✂ When the light source is illuminated in the sample to be measured, the sample absorbs the light source by the corresponding wavelength depending on the nature of the material, and the graph that measures how much the light source is transmitted or reflected is a T/R (%) graph.

(T= Transmittance (or reflectance) light (y), R= reference light (y), D= dark Data (y)))

$T/R (\%) \text{ Data} = (T-D)/(R-D) \times 100$

Absorbance mode

You can measure absorption graphs when reference scan and dark scan data are generated.

✂ A graph measured in the same way as transmittance graph, which shows how much the light source has been lost is absorbance graph. It can be qualitatively analyzed by where the light source has been absorbed. It is also possible to analyze the type of material according to the peak form of the graph.


Spectral Products

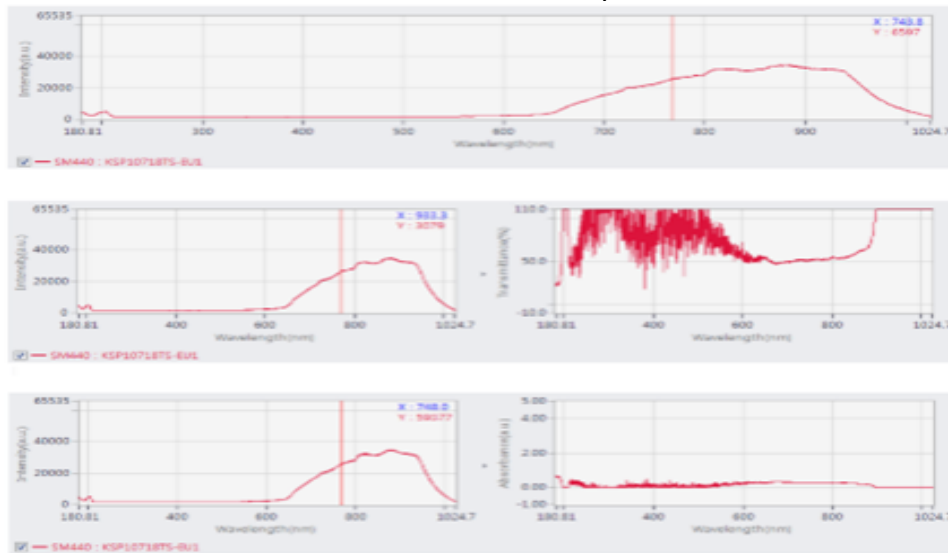
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Split view mode

There are two modes: Scope + T/R and Scope + Absorbance, which show two graphs at the same time when used.

Press the  button to cancel Split view mode.



Analysis example

- Properties Window Setting Value
- Integration Time = 35
- Filter order = 3
- Measuring light source: white LED
- Time Average = 1
- Side point = 10

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Data Measurement



This graph is obtained by setting properties values, performing Ref scan and Dark scan, and then measuring samples. The wavelength area of the light source appears at 380 nm to 800 nm.

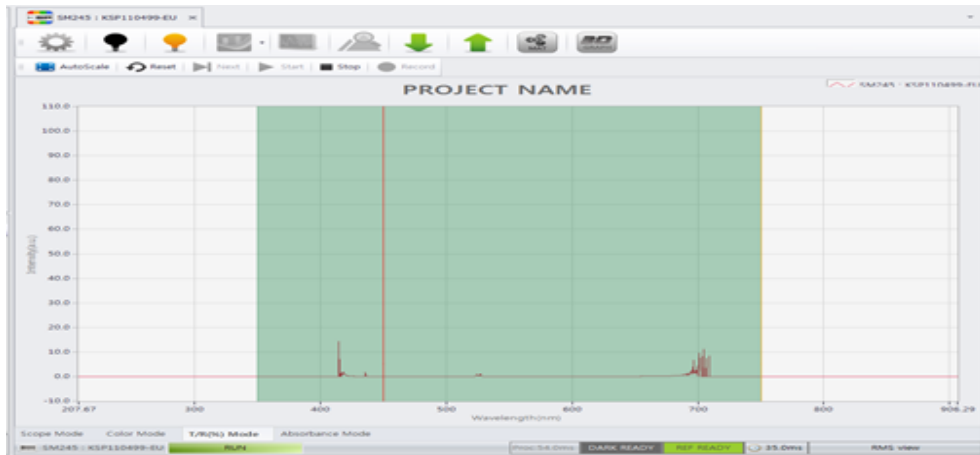
1. **Setting:** Set the value of Device Setting in the Properties window to Integration Time=35, Time Average=1 Signal Processing's Order=3, side point=10. (See Properties Window on [page 25](#))
2. **Dark scan:** Press the **Dark scan** button without both the light source and the sample to create the Data, then press the Dark Ready button to display the graph. (See [page 32](#) for Dark scan)
3. **Ref scan:** Press the Ref scan button to create data for the light source without putting a sample, and then press the Ref Ready button to display the graph. (See [page 33](#) for Ref Scan)
4. **Measurement:** Press the **play** button on the Graph control bar to start the measurement while putting the sample in and illuminating the light source. (See graph control bar on [page 14](#))

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T/R (%) Mode measurement




T/R (%) dark state without exposing light source. This is a picture measured by Mode. If you look at the graph of the 380nm to 800nm area, you can see that the light source is not detected, and the transmission rate is 0%. The horizontal axis represents Wavelength, and the vertical axis represents Intensity (%)

1. Activate View Mode by performing Reference scan, Dark Scan without turning on the light source
2. Press the  button in Scope mode to start the measurement.
3. View Mode T/R (%) Switch to Mode.



The data of the light source that passed sample. You can see a graph of the light source that passed the sample in an area of 380 to 800 nm.

1. Insert the sample and perform reference scan, Dark Scan to activate View mode.
2. Place View mode as Scope mode and press the  button to start the measurement.
3. View Mode T/R (%) Select Mode.

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Absorbance measurement




The above picture shows of a light source that did not pass sample in Absorbance Mode. In the graph of the 380nm to 800nm area, you can see that all the light sources are transmitted, and the absorbance is measured at 0%. The horizontal axis represents Wavelength, and the vertical axis represents Intensity (%).

1. Do reference, Dark Scan without including sample, expose the light source, and activate View Mode.
2. Place View Mode  as Scope mode and press the button to start the measurement.
3. Switch View Mode to Absorbance mode.



This is a measure of the light source that passed through the sample in Absorbance Mode. You can see it in the graph of the 380nm to 800nm area.

1. Insert the sample and perform reference scan, Dark Scan to activate View Mode.
2. Place View Mode as Scope mode and press the  button to start the measurement.
3. View Mode t/R (%) Switch to Mode.

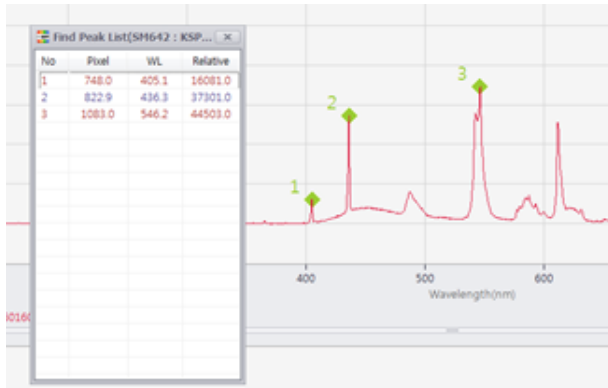
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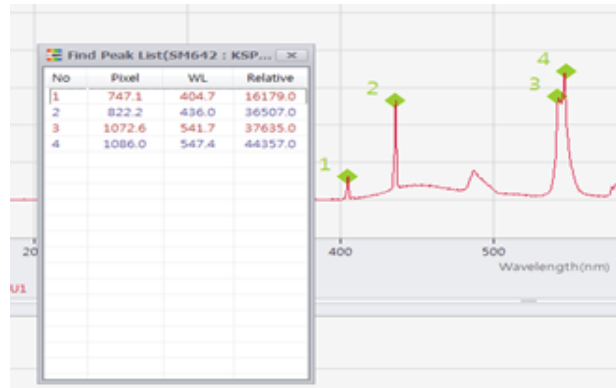
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Find Peak

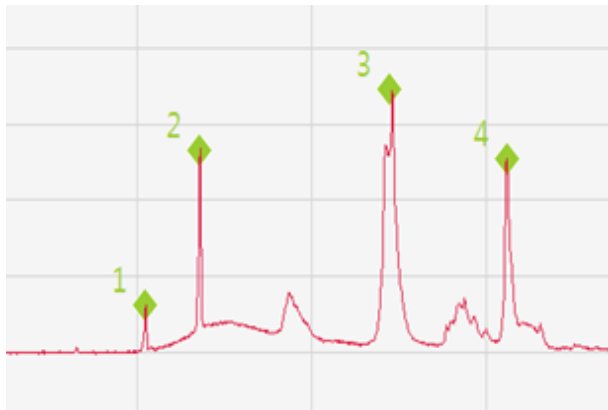
Find the peak value of Data based on the Properties setting value. You can change the Find peak setting value in Properties Window to find the peak value of the graph. The Find peak window shows Pixel, Wavelength, and Intensity. You can adjust the Noise Multi and Threshold values to adjust the sensitivity of Find Peak.



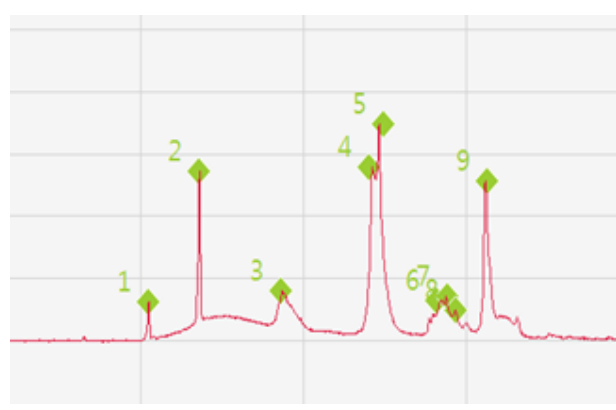
[If you set it to Maximum]



[If you set it to Centroid]



[If the Noise multiplier is large]



[If the Noise multiplier is small]

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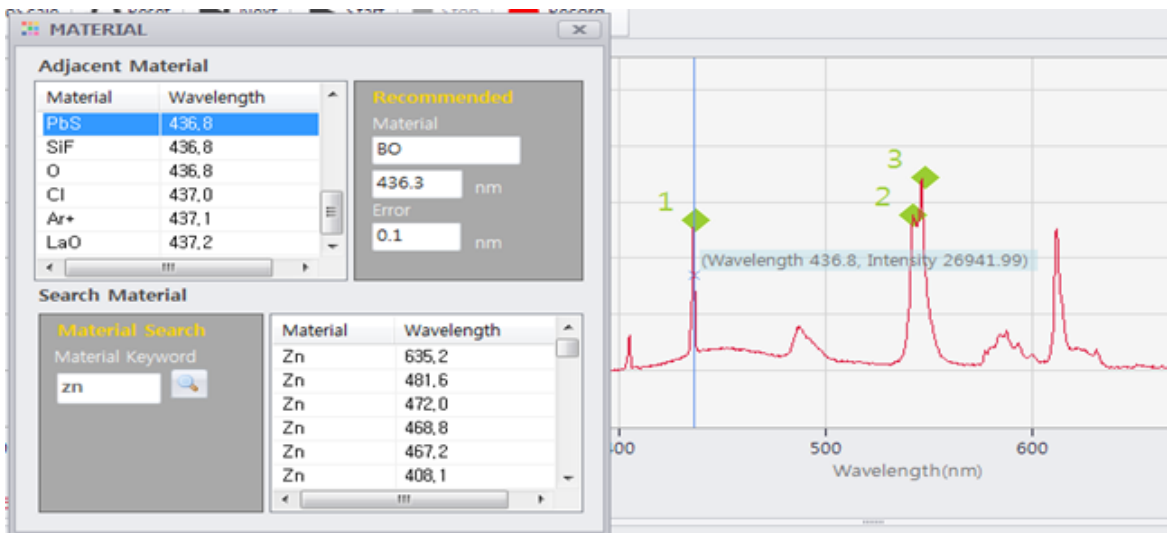
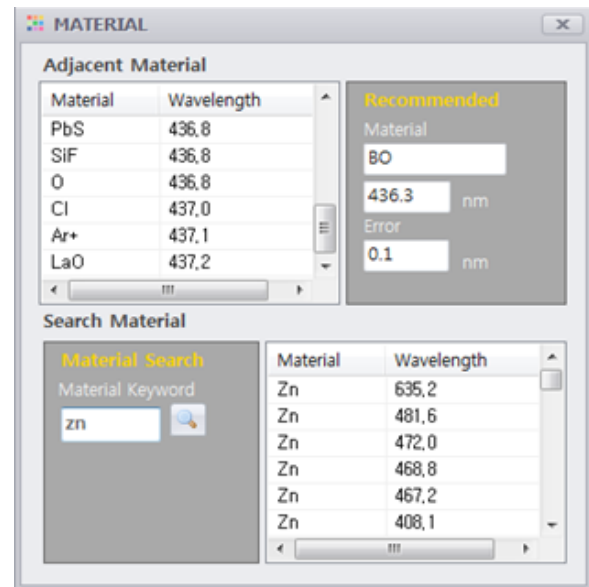
Sample Analysis

Material Lab

Material Lab makes it easy to compare the reference values of each element provided by the program with the graphs obtained from the sample, making it easy to see what sample you want to analyze.

Adjacent Material: When you activate the peak position with Find peak, it shows the reference value of the element presents in the surrounding Wavelength.

Material Search: If you enter the keyword of the element you want to know in the search box, the reference value of that element will appear. Double-clicking Material shows a blue line on the graph, as shown below, for elemental analysis.



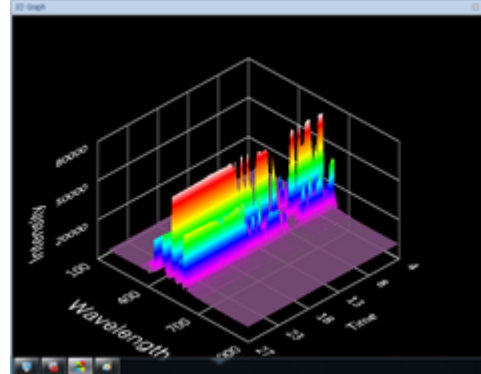
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3D Graph

Real-time spectral data is stacked over time to show a 3D graph with time, wavelength, intensity, x, y, and z axes. You can drag it with your mouse to orient the 3D graph, and you can also adjust the size of the graph with a mouse scroll.



Cooling

Tec Cooling Fan can be operated.

* Models that do not support TEC will not be activated or show this icon.



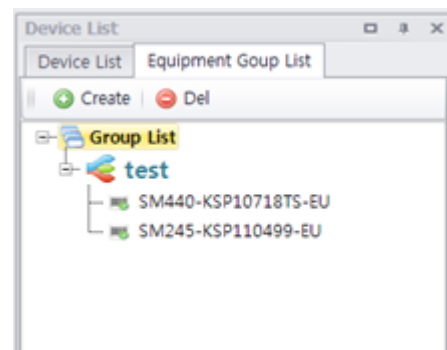
Group Function

The ability to connect multiple instruments at the same time and integrate each data to analyze, synchronously and asynchronously.

Device Group creation

It is created by group to easily compare and analyze the data of the different devices that you want to measure.

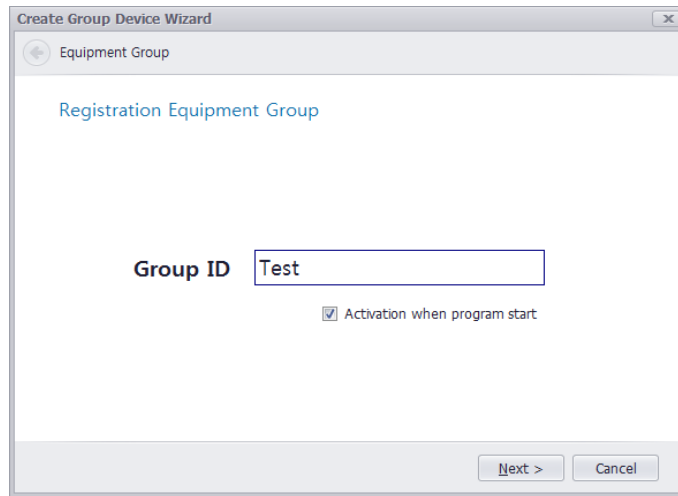
Device List - You can create a Group by tapping Create in the Equipment Group List Tab.



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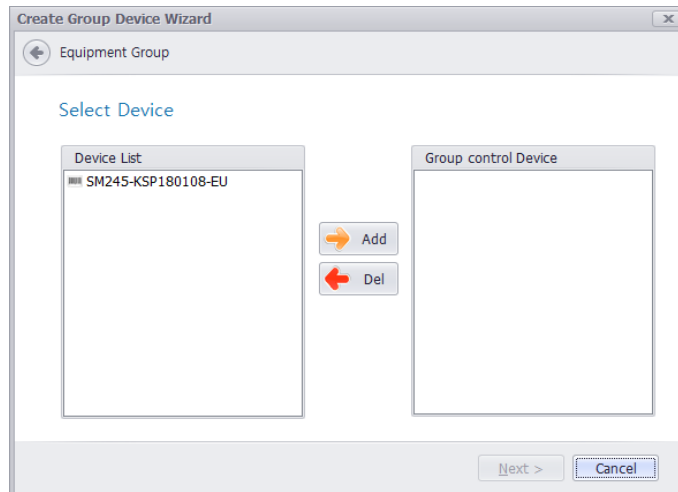
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Registration Equipment Group: Name the Group to set in the Group ID. After setting the Group name, press the Next button to proceed to the next process.

※ Activation when program start SMPProMX to determine whether the group that was created immediately after the software is run.



Select Device: You can add the device to be included in the Group via the Add button. If you incorrectly add the Device, you can remove it from the Group via the Del button.

- ※ When selecting a continuous Device, shift+ mouse left-click, discrete device selection, Ctrl+ mouse left-click, you can select multiple devices.
- ※ You can go back to the previous step by pressing the upper left arrow button in the Wizard window.

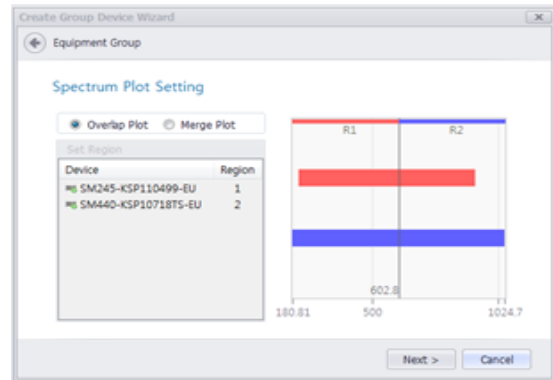
Spectrum plot setting: Determines how the data in the Device group is printed.

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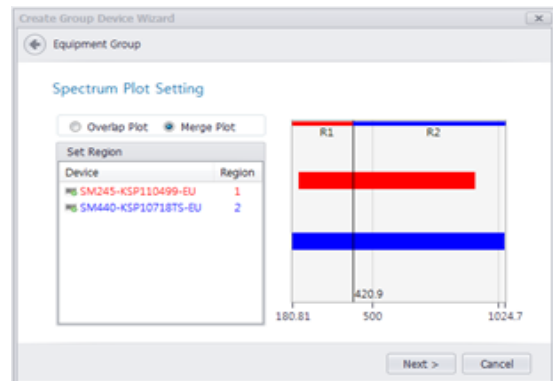
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Overlap Plot: Superimposes data from multiple devices on one graph and outputs them all.



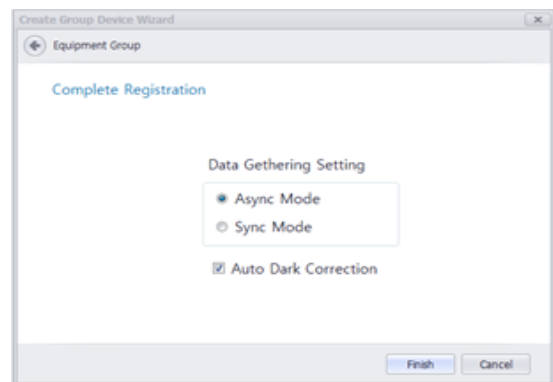
Merge Plot: The device belonging to the Group divides the total wavelength area of the graph for each device, and the device prints the data to the graph only for the corresponding wavelength region.



Complete Registration: Determines how each device collects data.

- Async Mode: The data of the devices belonging to the Group is not collected at the same time, but each data is collected in an asynchronous manner.

- Sync Mode: The data of the Devices belonging to the Group is collected at the same time and each data is collected synchronously.



* The Dark of devices belonging to Auto Dark Correction Group is automatically set and applied.

※ If the Group you created is gray-disabled, please make sure that you are using the device included in the Group in another project.

※※ **During Merge Plot mode:** If you would like to use the “Find Peak” function, check **Sync Mode** and don’t choose **Auto Dark Correction** option (**Find Peak** function will not work properly in **Async Mode** and/or with **Auto Dark Correction**).

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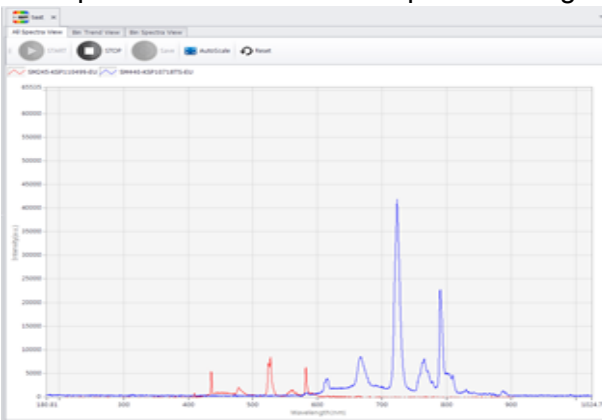
Group View Tab

A tab that graphs data measured by devices tied to a group. It consists of All spectra view, Bin Trend View, and Bin spectra view.

All Spectra view

If you choose Overlap Plot in Spectrum Plot Setting, all the data from the Device included in the group will be printed on one screen.

If you select Merge Plot in Spectrum Plot Setting, the data in the device included in the group will output like one data for the split wavelength region.



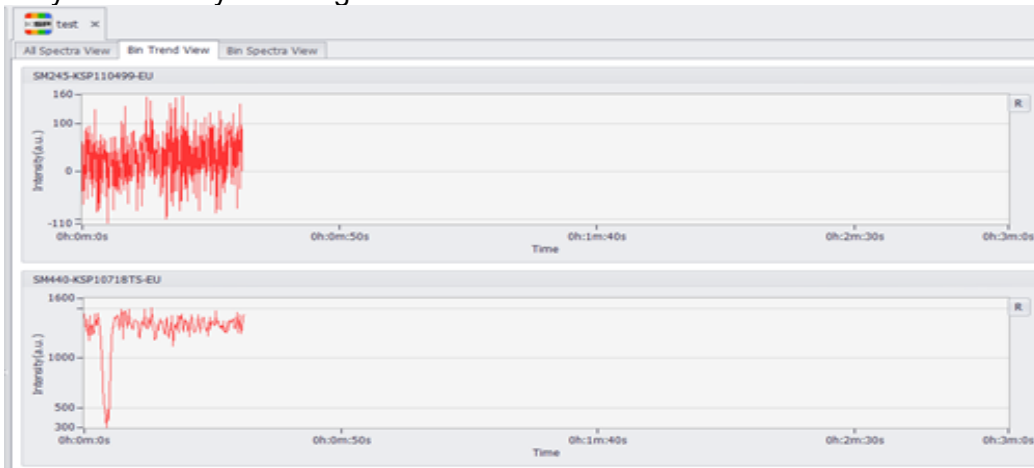
▲ Overlap plot



▲ Merge plot

Bin Trend View

You can collect time trends of the data that each Device has selected. To view Time Trend, you must specify select analysis config for each individual device in the Device list.



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Bin Spectra View

You can analyze the devices belonging to the Group individually, and device conversion can be done using the left tab located in the blue box of the picture.



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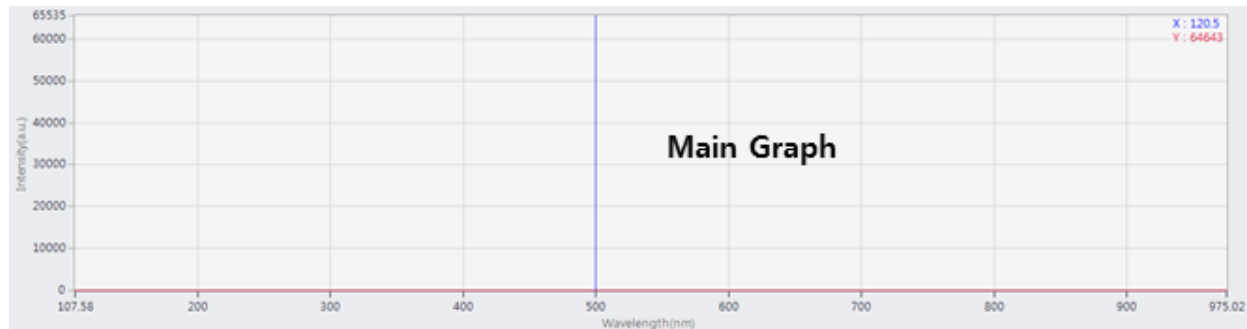
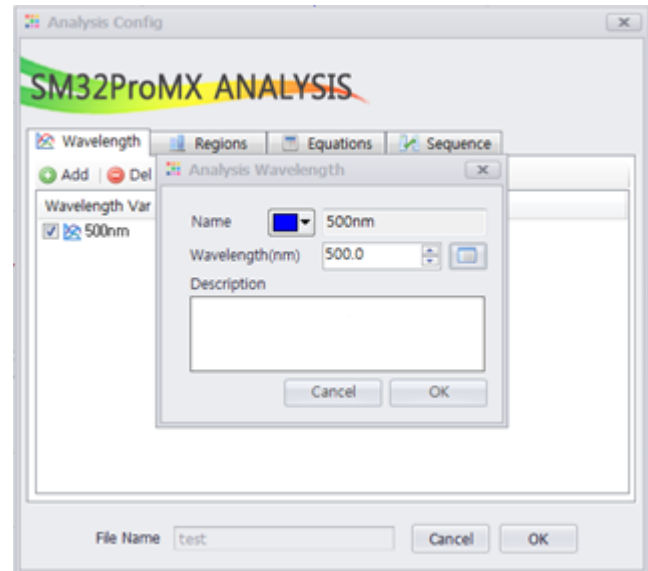
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Taking Advantage of Analysis Config

- Wavelength Registration

1. Press the config tap Create button in Analysis Window.
2. Press add on wavelength tap.
3. Enter the name of Analysis Wavelength, the color on the screen, and the wavelength of the data you want to get, and then press OK.
4. If you set up File name and press OK, you'll see the line of color you set above wavelength above the Main graph.



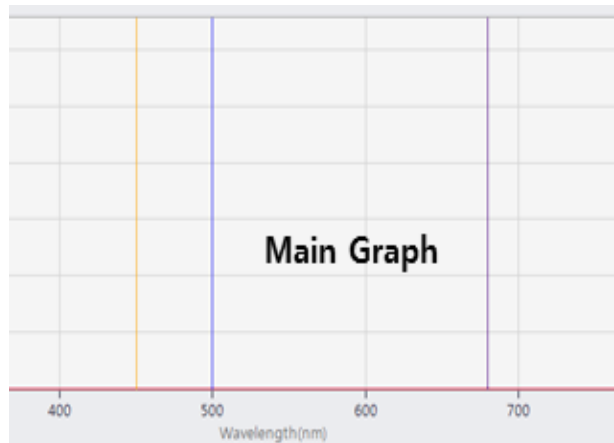
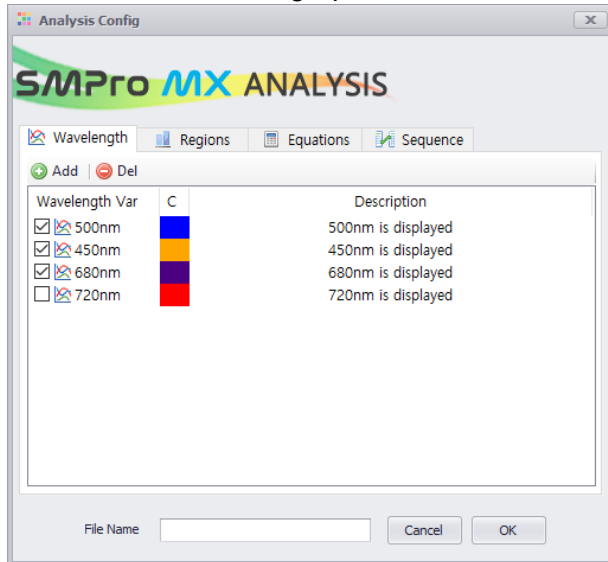
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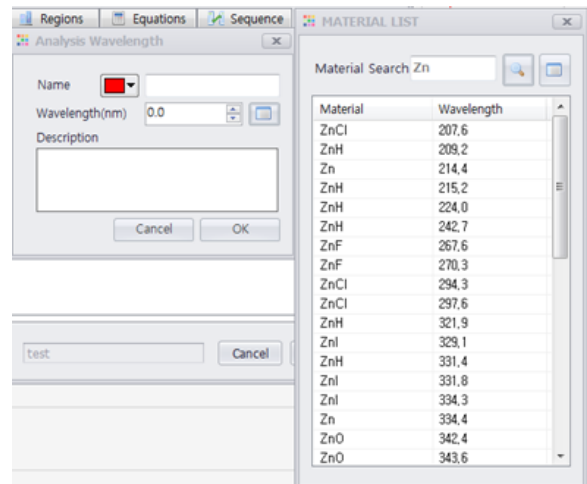
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How to create a Parameter

If you have multiple Wavelengths that you want to register, you can also create multiple Parameters as shown in the following figure. If you turn off the checkmark, the Wavelength bar is removed from the Main graph.



When you press the  button on the right side of The Wavelength, you will see the Material List.

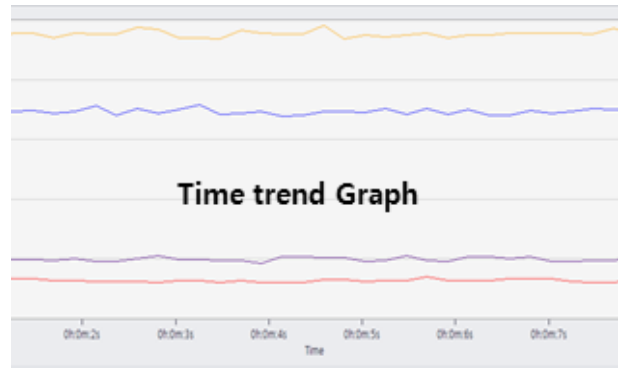
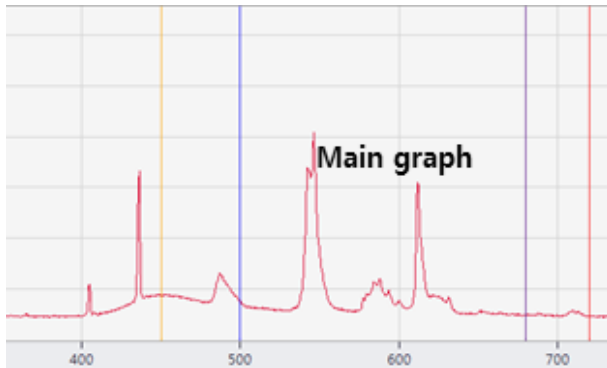


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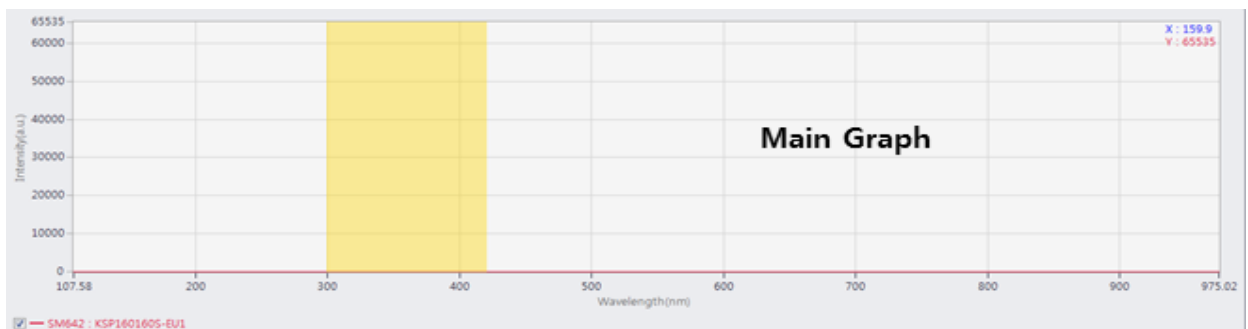
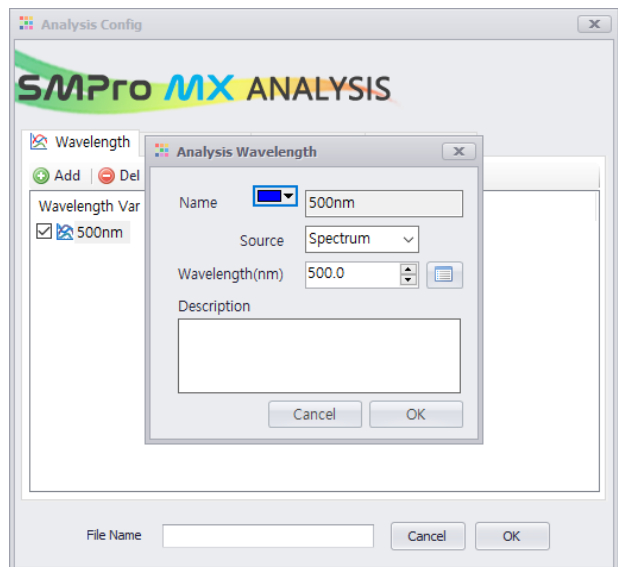
When measuring in real time, the Parameter in Analysis Config is displayed in time trend graph in the color set.



- Region Settings

The process of setting the scope when you want to do different analyses in a specific Wavelength range.

1. Click on the Region tab of Analysis config.
2. Press Add, enter the name of the Analysis Region, the color that will be displayed in the range, the starting point and end of the wavelength range you want to check, and then press OK.
3. When you press OK, you'll see the colors you've set in the Wavelength range you want to know above the Main graph.



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How to create equations

- Region equation

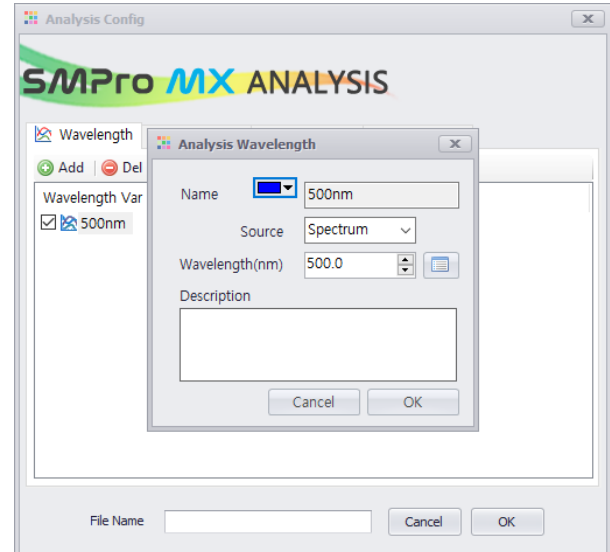
1. Click equation tap of Analysis config.
2. Select add-region equation and set the name and graph color of the equation, the wavelength region (which can be created in region tap) and operation to apply equation.
3. When you press OK, The Operation you set to Time trend graph will appear in the color you set.

Sum : Sum of Intensity values in region

Average : Average intensity value in region

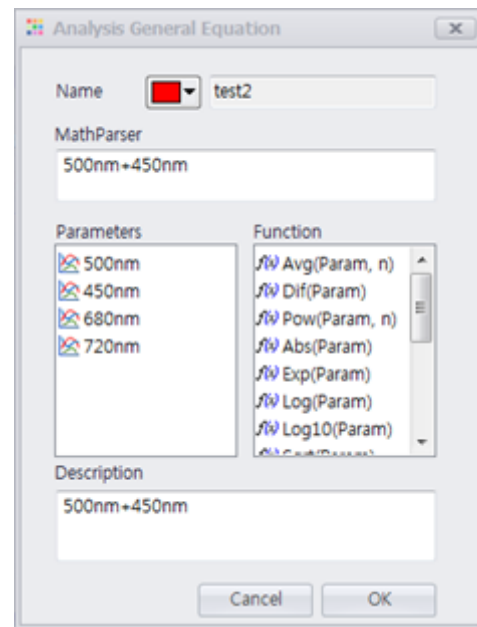
Minimum : The minimum value of intensity in the Region

Maximum : Maximum of Intensity values in region



- General equation

1. Click equation tap of Analysis config.
2. Select Add ≤ General Equation and put the equation to the name and graph color of the equation, and the parameter to be applied to Math Parser as a variable. (It is possible to function the arithmetic and the operation.)
3. When you click the OK button, The Operation you set for Time trend graph will appear in the color you set.



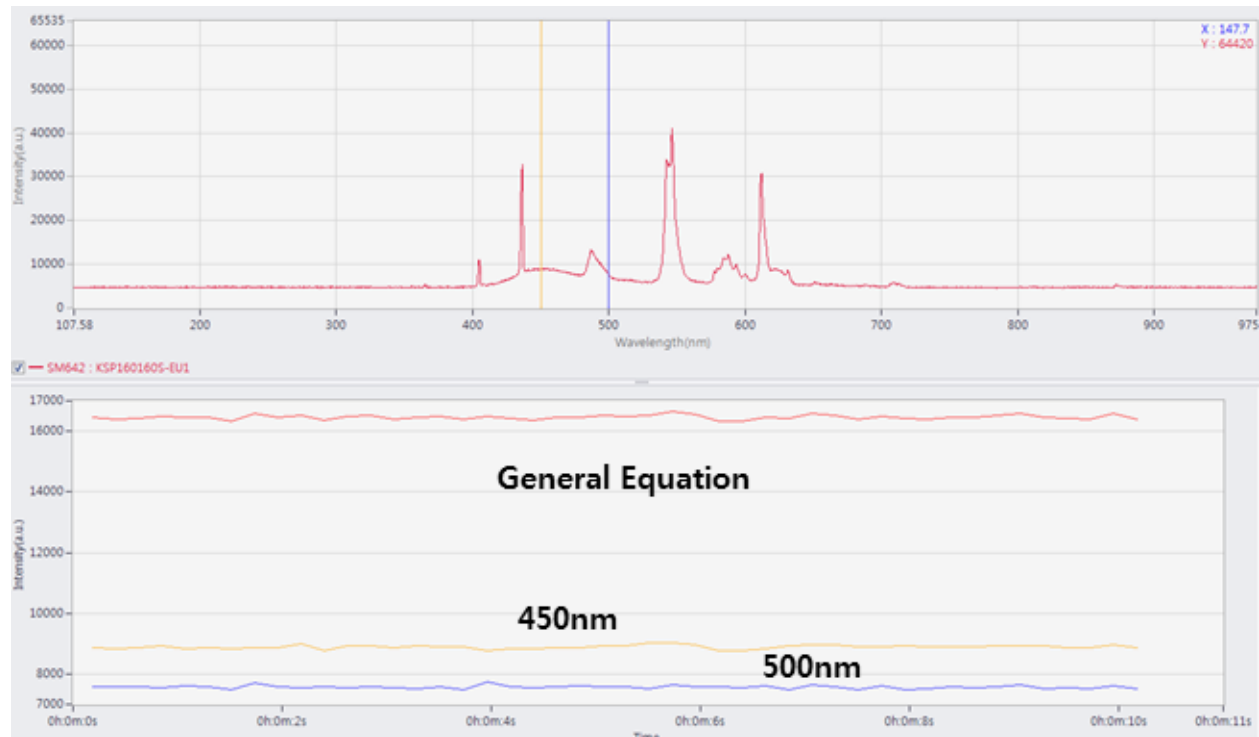
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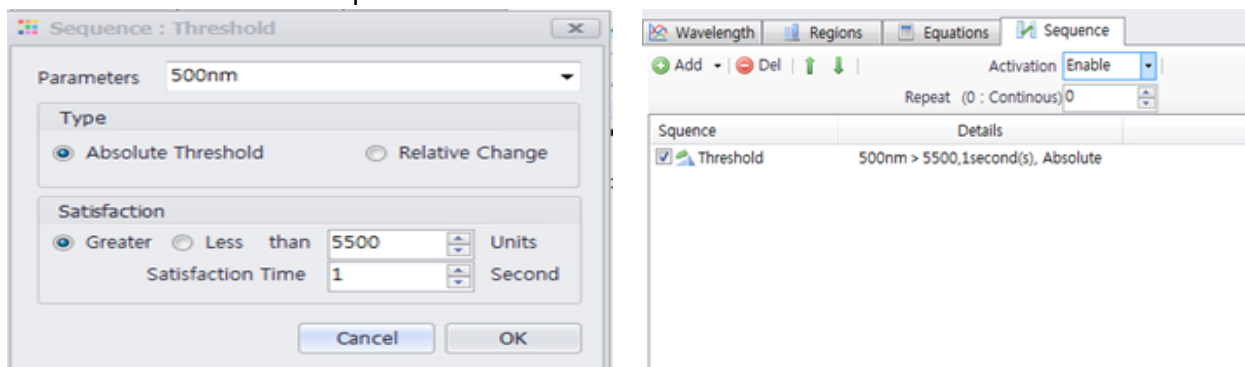
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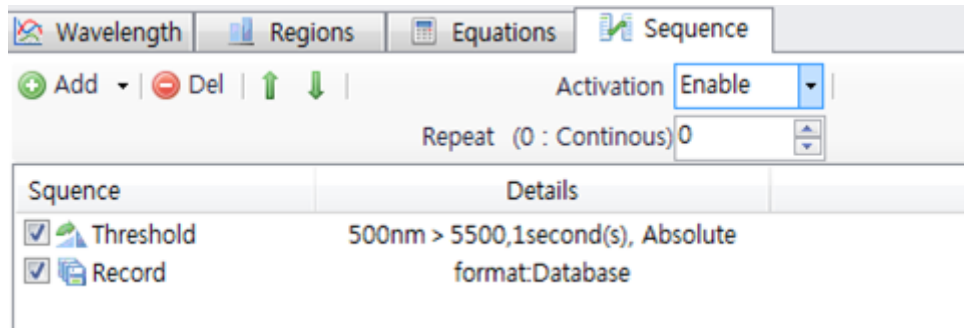
Sequence example

Sequence does not require cumbersome manipulation if you need to set up an algorithm for analysis to perform the same analysis. You can also create a sequence that sets and then moves to action when you have set and set certain conditions.

1. Set the Parameter to set the condition in the Add-Pattern detection threshold.
2. Select Absolute Threshold and enter Satisfaction. It gives you the Threshold condition: 'When the Intensity of Parameter satisfies more than 5500 for more than one second.'
3. Press OK to create a Sequence.



4. Tap Add+Data Record, select the Data Base format, and press OK to add the action.
5. If intensity does not exceed 5500 for more than one second at 500nm for real-time measurement, it will not move to the next record.
6. If intensity lasts 5500 at 500nm and meets the condition, it will be changed to the next set action and record will start.

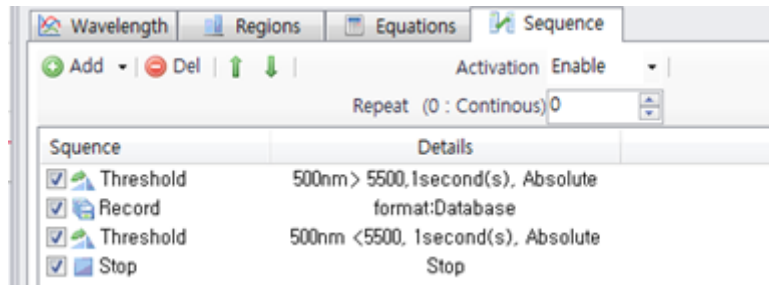


7. Add the Threshold as the Add-Pattern detection threshold.
8. Select Absolute Threshold and enter Satisfaction. Set the condition that 'Intensity of Parameter meets 5500 or less than one second'.
9. Press AddThresholdStop to add an action.
10. If you meet the threshold condition "Intensity is less than 5500 seconds at 500nm" while continuing the Record state, the record will be changed to the next set action and the Record will end.

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11. If you set Repeat to 0, repeat the set sequence infinitely.
12. If intensity exceeds 5500 at 500nm with Record stopped, the Record starts again.



The blue graph refers to intensity of 500nm, which measures real-time. Intensity satisfies the 5500 when exposed to light exposure, so the threshold and time are displayed with a red line. You'll start record shortly thereafter, and the graph will show record and time in a green line. When the light disappears, intensity is lower than 5500, so the Threshold is satisfied, and the record action is stop. Stop is displayed as a violet line. It can be automatically measured with sequence sit-in and when light is blocked, each meeting the Threshold and setting record and stop without any interaction

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Data Processing

You can save files that you've measured with SMPProMX so far. There are two formats: Excel in .csv and Data base. The file format can be set in Properties Window-record-record for.

Storing/Loading Data

CSV file

Save to CSV files

1. In 8.Record in Properties Window, specify Record for-excel.
2. After measuring the sample you want to analyze; press stop on the graph window.
3. Press the export button on Properties icon and enter the file name to save it.

Save shots in a row

1. Adjust to Record for-excel in 8.Record in Properties Window and set the storage interval you want to get from the Sampling interval.
2. Press the record button on the graph control bar to name the file.
3. Press Stop on graph control bar to end continuous shooting.

Importing CSV files

1. Click the import icon of the properties icon to load the file where the extension is csv.
2. Some csv files cannot be loaded. (Ex. files taken in succession)

Data base file

A Data base file is an independent file format that allows you to save files from SMPProMX and recall and reanalyze data that you have already analyzed.

Save files to Data base

1. Adjust to Record for-data base in 8.Record of Properties Window.
2. Press the Record button on the graph control bar.
3. The Data base file is stored in the Data Source tab of the Analysis window. (default data name-record date time)

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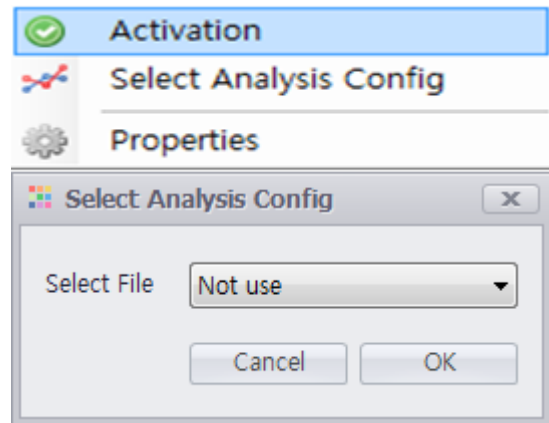
Simulation

If you click the right mouse button above the Simulation item in the Device List window, you'll see the Settings menu.

Simulation is the ability to import and reanalyze data stored in the data base format you've previously measured.

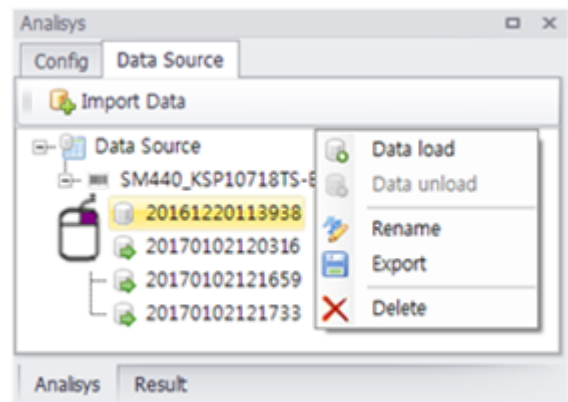
Press the right mouse button above the Simulation item in the Device List window and you will see the Settings menu.

- **Activation:** Run Simulation to load the Graph window.
- **Select analysis config:** Select the Analysis config file to apply to the Data to be simulation.



Menu Bar - View - Analysis Explorer - Data source tab : Right-click on the file person to select and you will see the following menu:

- **Data load:** Select the data to be simulation. You can select multiple data using shift and Ctrl keys.
- **Data unload:** You can unload the imported data.
- **Rename:** Change the file name.
- **Export:** Save the files saved by Data source as excel files.
- **Delete:** Delete files.



You can press the button in the upper left corner of the Graph window to see the graph measured in Scope mode again. You can reproduce the graph by pressing the Measure mode button to press Scope mode, Transmittance mode, Color mode, and Absorbance mode.

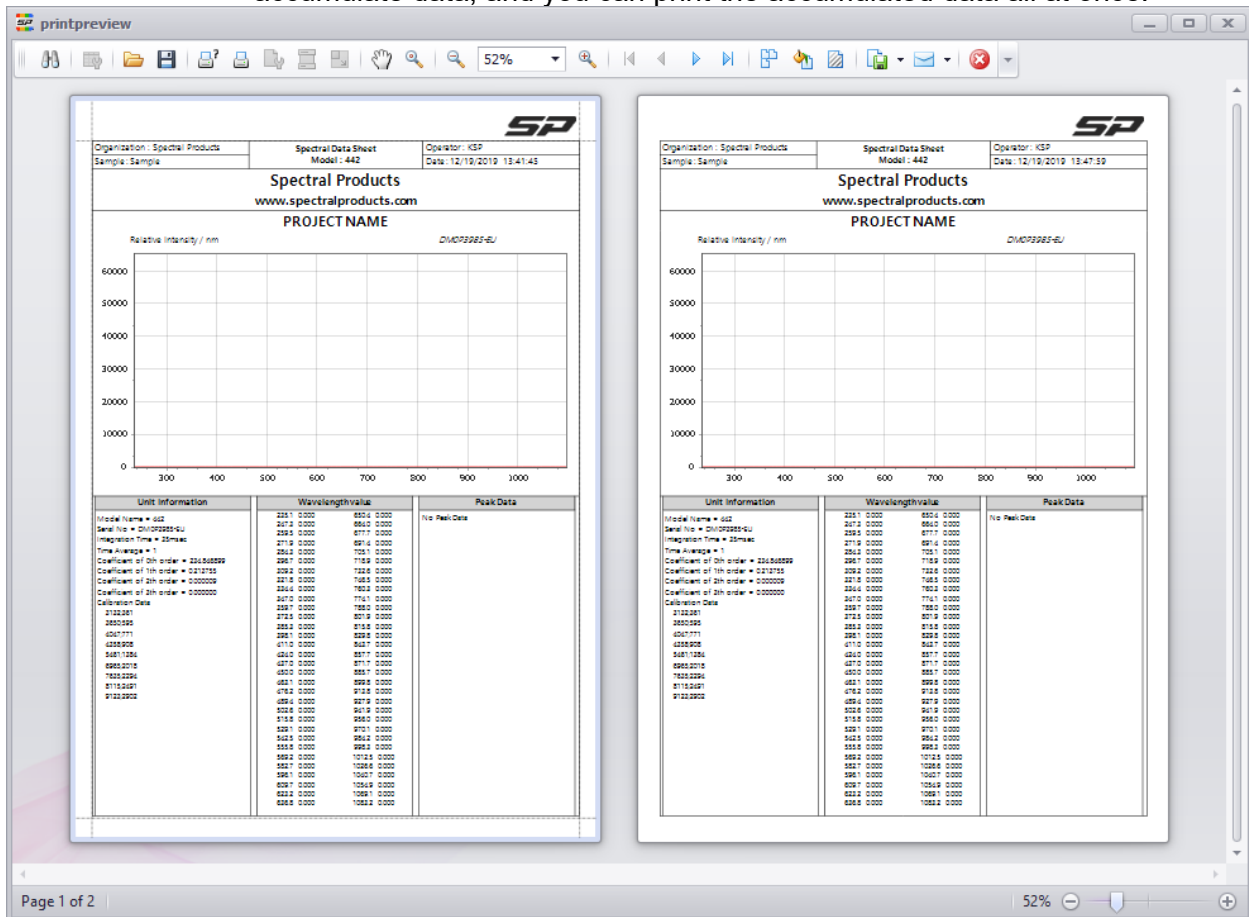
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Data Printing

Print the results of Main graph. You can print by pressing the Print, Merge and Merge buttons in the File tab.

- **Print:** Print the measurement results. Project Name, Sample Name, Date, Graph, Unit Information, Wavelength value, Peak data, and more.
- **Merge Print:** Print the measurements in succession. When you click Merge print, you accumulate data, and you can print the accumulated data all at once.



▲ Merge Print

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Warranty and Liability

This product has a one-year warranty from the date of shipment for the heat of manufacturing technology. Defective products or components can be repaired or replaced free of charge within the warranty period. For warranty service or repair, the product must be returned to the service center, and the price of transportation, duties, taxes, etc. must be paid upfront by the buyer, and the company will refund the shipping charges upon return of the product.

This warranty does not apply to the results of unauthorized repairs, modifications or improper maintenance by buyers. We are not responsible for any resulting damage and user damage.

Spectral Products

Spectrometers · Spectrophotometers · Color Instruments · Spectrographs · Monochromators

111 Highland Drive · Putnam, CT · 06260 · USA
PHONE (860) 928-5834 · FAX (860) 928-2676
<http://www.spectralproducts.com>

Technical Support

In order to provide an efficient answer, we ask that you check the following questions prior to the consultation.

1. Detailed cleanup of the issues that have occurred
2. Specific cleanup of errors or error messages that occurred
3. Your system information
 - (1) Computer specifications
 - (2) Windows version
 - (3) Serial number of spectrometer (S/N: Serial Number)
 - (4) Specific information about the entire experimental system and interlocking facilities in which spectrometers are being used