



INSTRUCTION MANUAL

Colorimetric Image Software

CI-100

Introduction

Thank you for your purchasing Topcon Technohouse Corporation colorimetric image software CI-100.

The CI-100 is software for handling measurement data of 2D measuring instruments. By connecting and using an instrument with a PC with the CI-100, you can collect, store, calculate, and print measurement data.

This Manual describes the outline, basic operation, and the specifications of this device. Please keep this Manual near you for operating this device.

This manual assumes that you can know well the operation of Windows.

Disclaimer

- We are not responsible for the damages caused by various problems such as, fire, earthquake, behaviors by other persons, other accidents, intentional or negligent or wrong use of the device by the operator, and the use of the device under abnormal conditions.
- We are not responsible for incidental damages arising from the use or unavailability of the device (loss of business income, business interruption, etc.).
- We are not responsible for the damages caused by the uses other than specified in the Instruction Manual.
- We are not responsible for the damages caused by the installation or execution of the software and the malfunction of other software and PC.
- We are not responsible for the damages caused by the malfunction due to the combination with the connecting devices.

Precautions for Use

- Using this software together with other software may interrupt the communication with this device. Therefore, it is better for you to execute this software as independently as possible.
- Never install software other than commercially available software on the PC onto which this software is installed. Such behavior may cause the malfunction.

Contents

Introduction	i
Disclaimer	ii
Precautions for Use	ii
Contents	iii
Notation in This Manual.....	1
1. Before Using the System	2
1.1 Operating Conditions	2
1.2 Installation	3
1.2.1 Notice of Installation	3
1.2.2 Installation of Device Driver.....	4
1.2.3 Software (Application) Installation.....	7
1.3 Windows Setting	12
1.3.1 Jumbo Frame Setting	12
1.3.2 Power Saving Setting	12
1.4 Part Names and Functions in Window	13
1.4.1 Menu Bar	14
1.4.2 Tool bar	18
1.4.3 Shortcut Key	19
2. Measurement Operation	20
2.1 Measurement Operation Flowchart	20
2.2 Start and Exit the Software	21
2.2.1 Start the Software	21
2.2.2 Exit the Software	23
2.3 Installation.....	24
2.3.1 Live View	24
2.3.2 Collimation of Measurement Object.....	25
3. Recipe Setting	26
3.1 Open the Recipe Setting.....	26
3.2 Select Recipe	28
3.2.1 Select Recipe File.....	28
3.2.2 Save Recipe File	29
3.3 Change Standard White Point.....	30
3.4 Setting Parameters 1	31
3.4.1 Binning Type	31
3.4.2 Image Rotation	32
3.4.3 Measurement Range/Optimization Area	33
3.4.4 Image Processing ROI	35
3.5 Setting Parameters 2	37
3.5.1 Objective Lens.....	37
3.5.2 External ND filters.....	38
3.5.3 Measurement Distance.....	39

3.5.4	Layer Measurement.....	40
3.5.5	Saturation Detection.....	41
3.5.6	Continuous Measurement.....	42
3.5.7	Smoothing.....	44
3.6	Setting Parameters 3.....	45
3.6.1	Gain	45
3.6.2	Integral Time.....	46
3.6.3	Frequency Setting	47
3.6.4	ND Filter.....	48
3.6.5	Averaging Count.....	49
3.6.6	Scan Mode	50
3.6.7	Measurement Wavelength.....	51
3.6.8	Trigger Mode	52
3.6.9	Filters To Use.....	53
3.7	Luminosity Factor Correction.....	54
3.7.1	Outline	54
3.7.2	Setting of Luminosity Factor Correction.....	55
3.7.3	Setting of Luminous Coefficient.....	58
3.8	Diagonal Correction	59
3.8.1	Outline	59
3.8.2	Setting of Diagonal Correction	59
3.8.3	Input of Values for Diagonal Correction	63
3.9	Color Correction.....	65
3.9.1	Outline	65
3.9.2	Setting of Area Correction	65
3.10	Area Correction.....	67
3.10.1	Outline.....	67
3.10.2	Setting of Area Correction.....	67
3.11	White Plate Correction	70
3.11.1	Outline.....	70
3.11.2	Setting of White Plate Correction	70
3.11.3	Setting of White Plate Correction (White Point)	72
3.12	Microscope Correction	74
3.12.1	Outline.....	74
3.12.2	Setting of Microscope Correction	74
3.13	Ruler Correction	75
3.13.1	Outline.....	75
3.13.2	Setting of Ruler Correction	75
3.14	Spectrum Correction	79
3.14.1	Outline.....	79
3.14.2	Setting of Spectrum Correction	80
3.15	Application Common Setting.....	83
3.15.1	Outline.....	83
3.15.2	Set Display.....	84

3.15.3	Path Setting	88
3.15.4	Output Setting	89
3.15.5	Output Setting (Auto Saving).....	91
3.15.6	Output Setting (File Name Convention).....	92
3.15.7	Device List.....	94
3.16	Spectrum Management.....	95
4.	Measurement	97
4.1	Normal Measurement	97
4.2	Change of Measurement Parameters	101
4.3	Time-series Measurement	102
4.4	Calculate Optimal Values of Measurement Condition.....	104
4.5	Cancel Measurement.....	106
4.6	About Practical Measurements.....	107
4.6.1	Performing More Stable Measurement	107
4.6.2	Shorten Measurement Time	107
5.	Various Operations.....	108
5.1	Live View Operation.....	108
5.1.1	Open Live View.....	108
5.1.2	Setting of Live View	109
5.1.3	Gain	110
5.1.4	Integral Time	110
5.1.5	Trigger Mode	110
5.1.6	Focus Adjustment.....	110
5.1.7	Binning Type	113
5.1.8	Image Rotation	113
5.1.9	Objective Lens.....	113
5.1.10	Measurement Distance.....	113
5.1.11	Show Ruler.....	113
5.1.12	Enlargement/Movement.....	114
5.1.13	Show Marker.....	114
5.1.14	Snapshot.....	114
5.2	Measurement Image View Operation.....	115
5.2.1	Change Display Data.....	116
5.2.2	Change Display Color.....	119
5.2.3	Trimming of Measurement Image (Mouse Operation).....	121
5.2.4	Trimming of Measurement Image (Direct Input)	123
5.2.5	Cancel Trimming.....	124
5.2.6	Change Display Size	125
5.2.7	Show Ruler	126
5.2.8	Enlargement/Movement	127
5.2.9	Check Measurement Information	129
5.2.10	Edit Measurement Information.....	130
5.2.11	Update Data for Next Measurement.....	132
5.2.12	Save Measurement Data in CSV File Format	133

5.2.13	Set Output Items for CSV File Format.....	135
5.2.14	Save Snapshot.....	137
5.2.15	Open Property Window (Pseudo Color)	139
5.2.16	Set Upper Limit/Lower Limit Value of Pseudo Color Adjustment	140
5.2.17	Adjust Color Range in Pseudo Color View.....	141
5.2.18	Masking to the Outside of the Pseudo Color.....	142
5.2.19	Lock Pseudo Color Adjustment	143
5.2.20	Synchronize Color Adjustment	144
5.2.21	Change Number of Contour Lines.....	145
5.2.22	Change RGB Balance	146
5.3	Spot View Operation.....	147
5.4	Random Spot View Operation	150
5.4.1	Open Random Spot View.....	150
5.4.2	Set Measurement Spot (Circle/Square)	151
5.4.3	Set Measurement Spot (Polygon)	152
5.4.4	Set Measurement Spot (by Parameters).....	154
5.4.5	Set Measurement Spot (on Mesh)	156
5.4.6	Move or Copy Measurement Spot	159
5.4.7	Delete Measurement Spot.....	160
5.4.8	Delete All Measurement Spots.....	161
5.4.9	Select Measurement Spot.....	162
5.4.10	Showing/Hiding Spot Number	163
5.4.11	Display Random Spot List	164
5.4.12	Read/Write Spot Coordinate CSV	166
5.4.13	Set Threshold in Measurement Spot.....	169
5.4.14	Change the spot number of random spots.....	171
5.4.15	Display Random Spot Property	172
5.4.16	Set Initial Spot Pattern and Spot Size	173
5.4.17	Save/Read Random Spot File	174
5.5	Standard Spot View Operation	175
5.5.1	Open Standard Spot View.....	175
5.5.2	Showing/Hiding Spot Number	176
5.5.3	Display Standard Spot List.....	177
5.5.4	Display Standard Spot Property.....	178
5.5.5	Set Spot Pattern and Size	180
5.5.6	Change Formal Standard	181
5.5.7	Set Even Split Spot Basing Outer Frame.....	183
5.5.8	Set Center Standard Even Split	185
5.5.9	Save/Read Standard Spot File.....	186
5.6	Matrix Spot View Operation	187
5.6.1	Open Matrix Spot View.....	187
5.6.2	Display Split Spot List.....	188
5.6.3	Display Split Spot Property.....	189
5.6.4	Set Split Count.....	190

5.6.5	Save/Read Split Spot File	191
5.7	Data Sheet Operation	192
5.7.1	Save in CSV File Format.....	192
5.7.2	Set Output Items for CSV Format.....	194
5.7.3	Copy Items to Clipboard.....	196
5.7.4	Register Spectrum.....	197
5.7.5	Register As Comparison Spot	198
5.7.6	Display Data Sheet Property	199
5.8	Chromaticity Diagram View Operation	201
5.8.1	Open Chromaticity Diagram View	201
5.9	L*a*b* View	202
5.9.1	Open L*a*b* View	202
5.10	Hue-Chroma View	203
5.10.1	Open Hue-Chroma View.....	203
5.11	Spectrum View	204
5.11.1	Open Spectrum View	204
5.12	Thumbnail View Operation.....	205
5.13	Pixel Data View Operation	207
5.13.1	Open Pixel Data View.....	207
5.13.2	Display Spectrum.....	208
5.13.3	Display Peak of Spectrum	210
5.13.4	Display Measurement Data	212
5.14	Histogram Operation	214
5.14.1	Open Histogram View	214
5.15	Cross Section Operation	216
5.15.1	Open Cross Section View	216
5.15.2	Display in Cruciform Cross Section Form.....	217
5.15.3	Display in Shaded Cross Section Form.....	219
5.16	Measurement Image Comparison Operation	220
5.16.1	Compare Measurement Images	220
5.16.2	Define the comparison method by a formula.....	225
5.17	Spot Comparison Operation	228
5.17.1	Compare Spots	228
5.17.2	Change Comparison Setting.....	229
5.18	Spectrum Search Operation	231
5.18.1	Search for Spectrum	232
5.19	Object Color Simulation Operation	235
5.19.1	Perform Object Color Simulation	236
5.20	Color Rendering Operation	241
5.20.1	Calculate Color Rendering.....	241
5.21	Measurement Information List Operation	245
5.21.1	Display Measurement Information List	245
6.	Data Processing Operation	246
6.1	Time-series Analysis Operation	246

6.1.1	Perform Time-series Analysis.....	246
6.1.2	Time-series Analysis Result Operation	249
6.2	Batch CSV Output Operation	252
6.2.1	Perform Batch CSV Output.....	252
6.3	Back Light Simulation	255
6.3.1	Perform Back Light Simulation.....	255
7.	File Menu Operation	260
7.1	Open Measurement Image	260
7.1.1	Open from File Menu.....	260
7.1.2	Open File by Drag & Drop Operation.....	262
7.2	Close Measurement Image	263
7.3	Save Measurement Image	263
7.4	Export Measurement Image	264
7.4.1	HDF5 File Format.....	265
8.	Display Window Operation.....	266
8.1	Overlap and Display	266
8.2	Arrange Side by Side.....	267
9.	Help Operation	268
9.1	Display Manual	268
9.2	Check Version Information	268
10.	Error Message	269
10.1	Error Message List.....	269
11.	Appendix.....	272
	Unit of display	272

Notation in This Manual

Description in this Manual is in accordance with the following notation.

Notation	Description
[OK] [Correction Factor]	This represents the buttons, tab, and menus displayed on the screen, and the keys of a keyboard.
 []	This shows the reference section within the Manual.
 []	This shows the reference document.
 Note	This explains what you should know or consider before starting the operation.
 Memo	This explains the reference or convenient matters helpful for your operation.

All functions are listed in a displayed state in this document, but may be hidden or grayed out depending on the measuring instrument you are using.

1. Before Using the System

1.1 Operating Conditions

Operating conditions recommended for this software are as follows.

OS	Windows(R) 10 Pro (64bit)
CPU	Intel(R) Core(TM) i7-4770 or higher
Memory	16GB or higher
HDD	500GB or higher More than 3GB free space is necessary in the system drive (that is a drive where OS is installed).
Display	1920×1080 or higher, 16.77 million colors (32bit) or higher * Text and Application size can be set arbitrarily in the Windows display settings.
Drive	DVD-ROM drive

- * This specification is based on the test environment of Topcon Technohouse. Incompatibility problem with individual PC is out of warranty.

1.2 Installation

The CI-100 Installer enables you to install the following software.

(1) Driver

You can install the driver.

Select the suited driver for OS and model.

Installation of this driver is required when you use SDK.

(2) Measurement program (Application)

You can install the measurement program and the parameter files.

When the PC is connected to the measuring instrument, this program enables you to use all the functions. When the PC is not connected to the measuring instrument, the usable functions are limited.



Note

When you use SDK (Software Development Kit), copy the "SDK" folder included in the DVD-ROM into your PC manually. About usage of the SDK, refer to the [Instruction manual for SDK].

1.2.1 Notice of Installation

Please notice following points when installing the program into the PC.



Note

- Be sure to use the PC meeting the conditions specified in "Operating Conditions".
- To install the software, be sure to logon with the user name entered in one-byte character to proceed with the operation. Logging on with the user name entered in two-byte character may cause the error in the installation.
- Before installing, update driver software of controller to the latest one.
- Be sure to use the administrative right-given account to log on the computer for installation. You cannot install the software without using the administrative right-given account.
- To install this software, be sure to make the OS in the latest condition once using the Windows Update before installation even if the operating condition is met.



Memo

- For the connection for the PC, please refer to the instruction manual of your PC.

1.2.2 Installation of Device Driver

This chapter describes the procedure to install the device driver. This installer enables you to install the device driver for your measuring instrument. When the driver has already been installed, it is not necessary to install it.

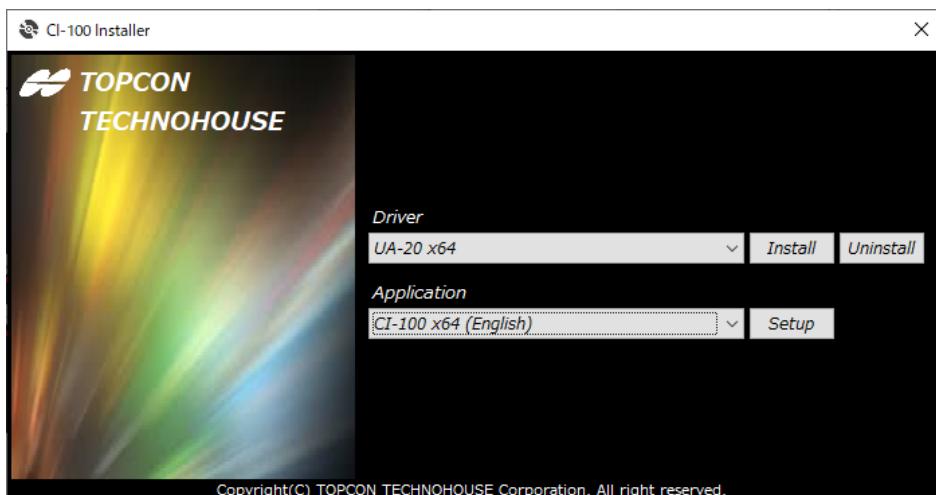
1.2.2.1 Installation

To install the driver, go through the following steps.

1. Insert the DVD-ROM into the DVD drive.

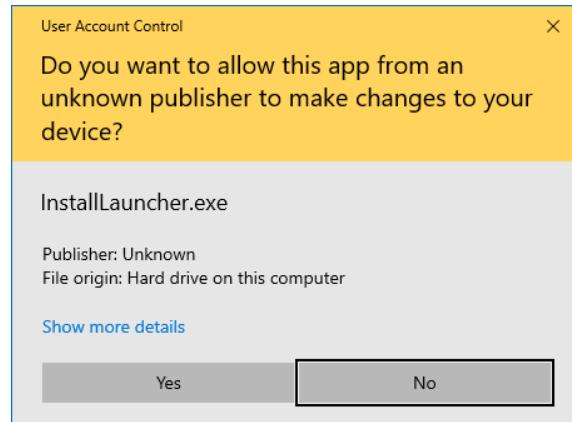
 Note	<ul style="list-style-type: none">• To uninstall the software, be sure to use the accessory DVD-ROM. Using the procedure of [Control Panel] - [Programs and Features] may not remove the software correctly.• After transferring the contents of the DVD-ROM to USB memory, never install the software. The software may not be installed correctly.• Please update your USB controller driver to the latest version.
--	---

2. Open the DVD-ROM drive from the Explorer and double-click the [InstallLauncher.exe]. The following window appears.

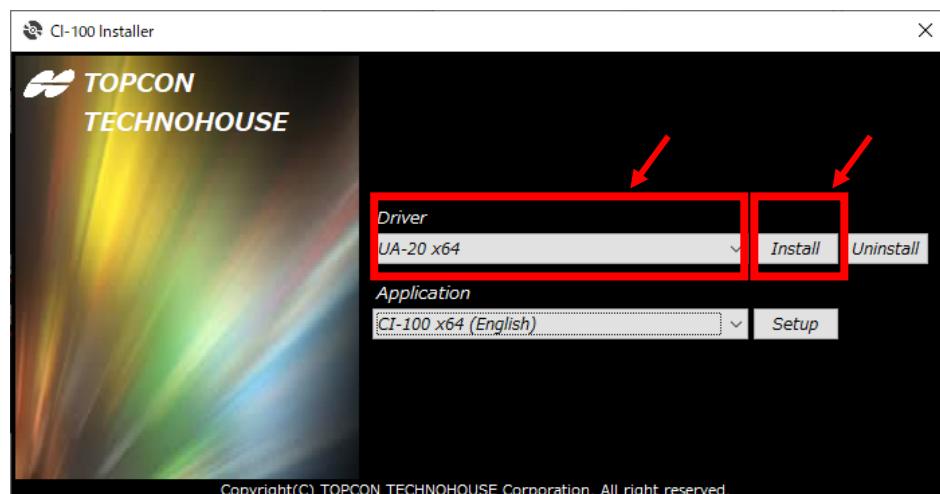


 Memo

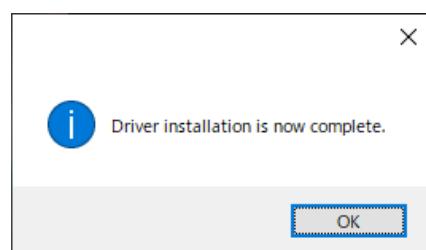
- When the [User Account Control] dialog appears, select [Allow] or [Yes].



3. Select the suited item from the [Driver] combo box and click the [Install] button.



4. After installing was completed, the following message box appears.



 Memo

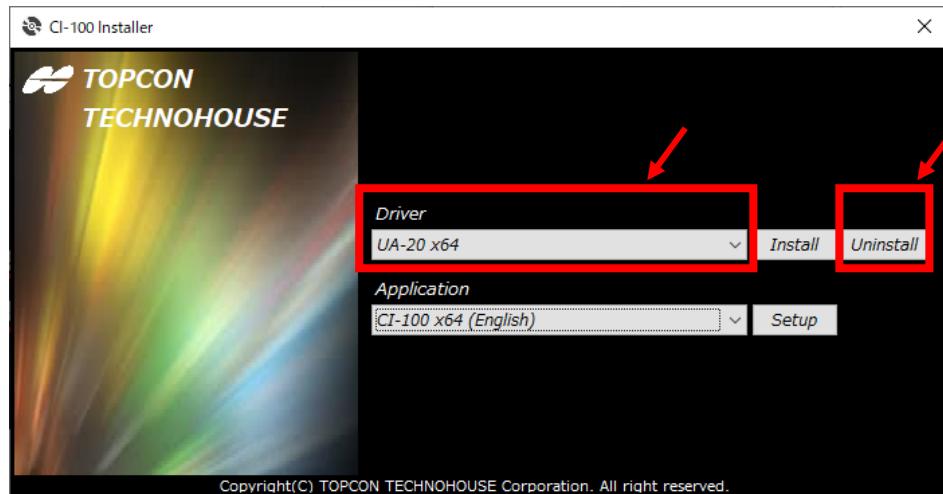
- Please reboot your PC after installing driver software.

1.2.2.2 Uninstallation

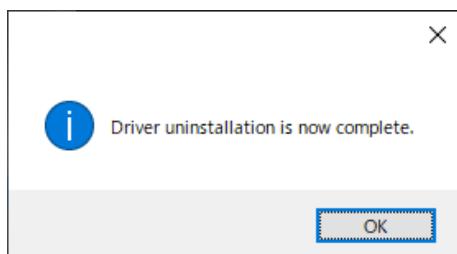
In the same way as the installation, start “InstallLauncher” and click the [Uninstall] button.

To uninstall the driver, go through the following steps.

1. Select the suited item from the [Driver] combo box and click the [Uninstall] button.



2. After uninstalling was completed, the following message box appears.



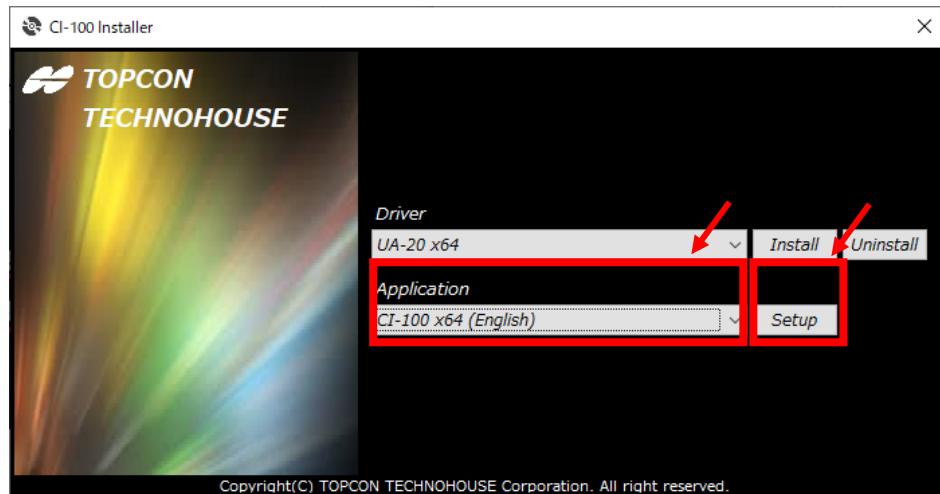
1.2.3 Software (Application) Installation

This chapter describes the procedure to install the application software.

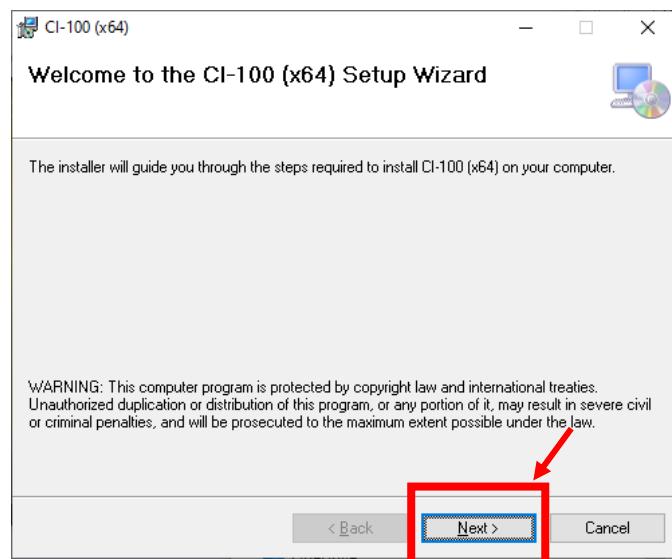
In the same way as the installation of the device driver, start “InstallLauncher”.

1.2.3.1 Installation

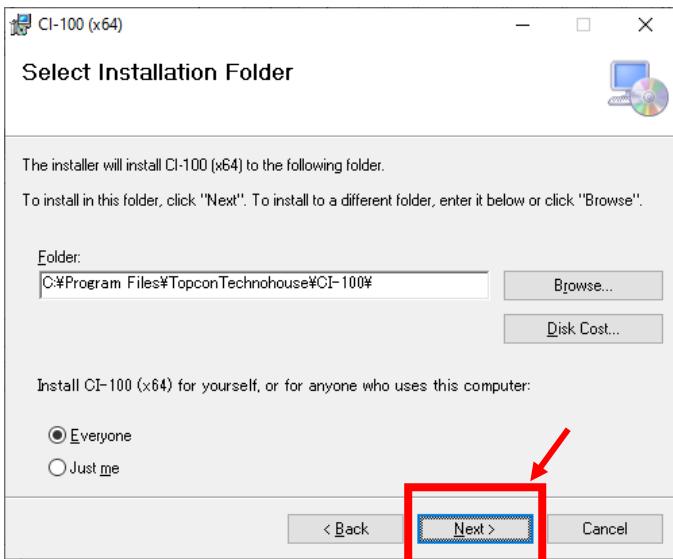
1. Select [CI-100 series x64(English)] from the combo box and click the [Setup] button.



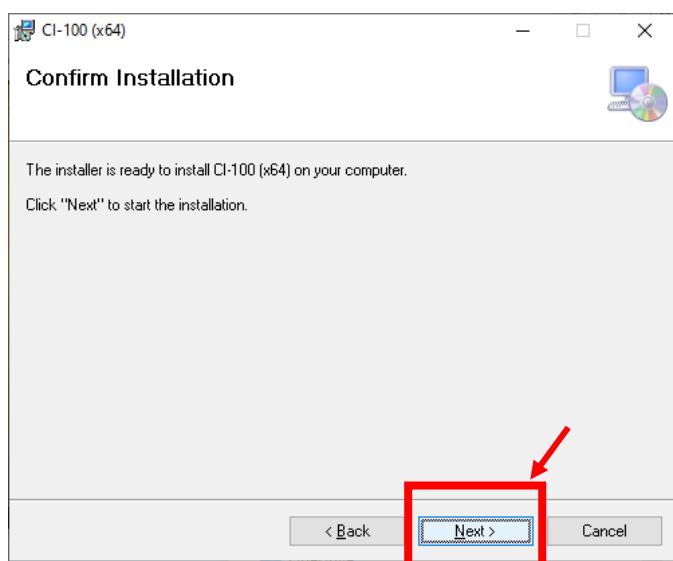
2. Select [Next] and proceed to the next step.



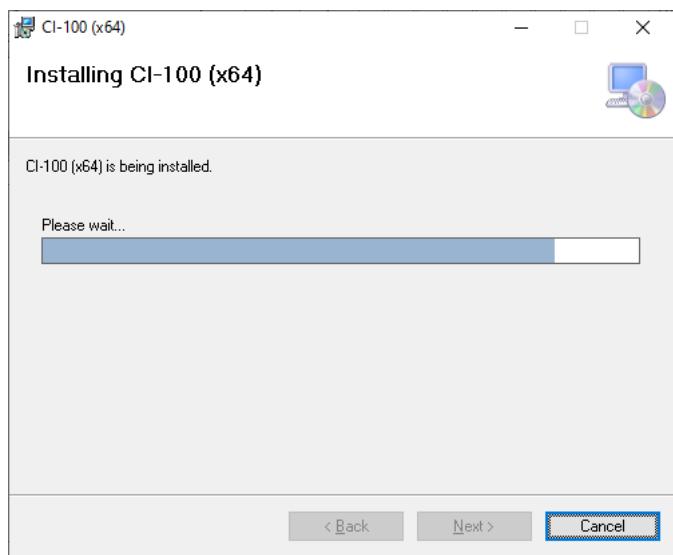
- 3.** Select [Next] and proceed to the next step.



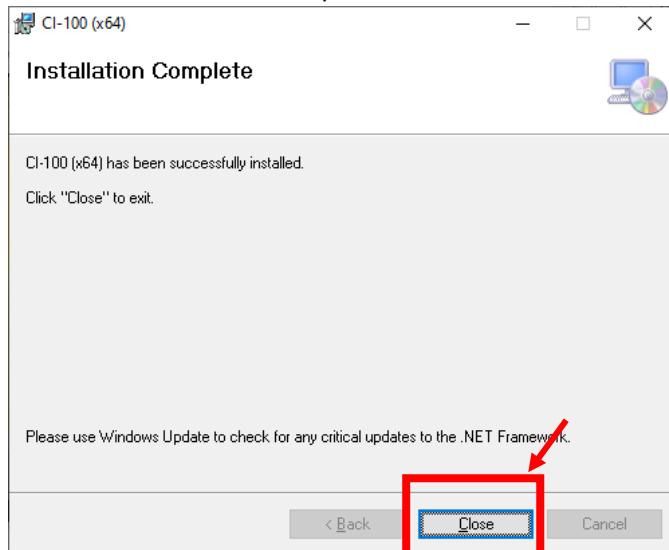
- 4.** Select [Next] and proceed to the next step.



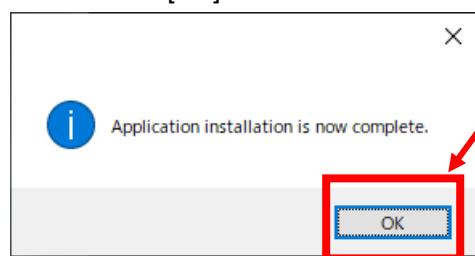
- 5.** The installation starts.



6. The installation is completed.



7. Click the [OK] button.



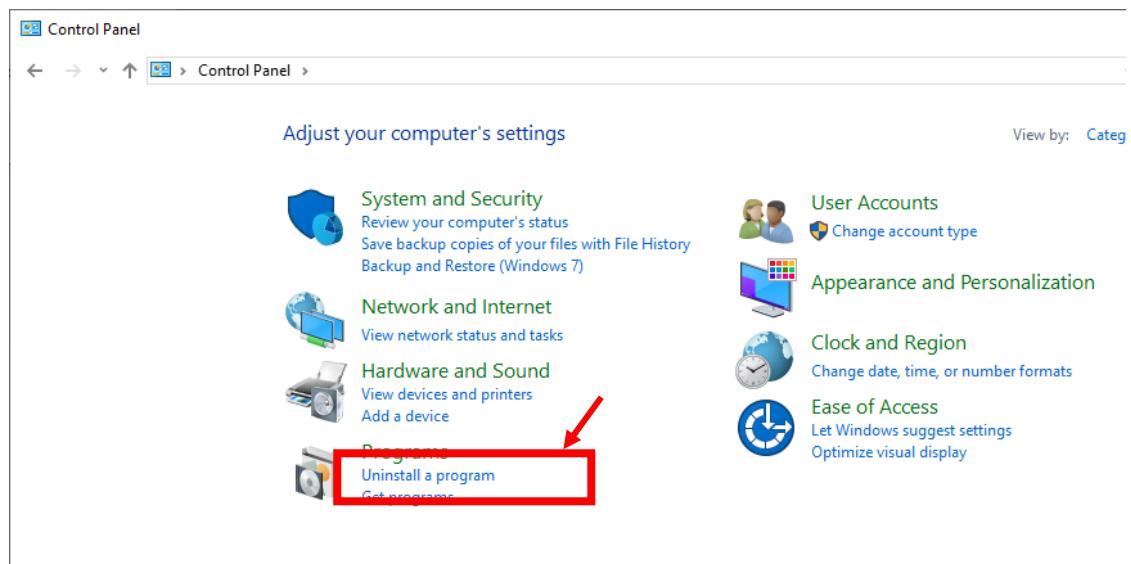
8. The shortcut for startup is created on the desktop.



1.2.3.2 Uninstallation

This chapter describes the procedure to uninstall the application software.

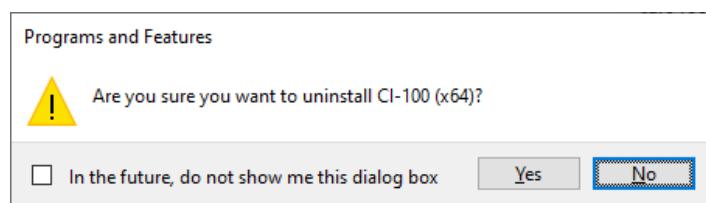
1. Display [Control Panel] of Windows and select [Uninstall a program].



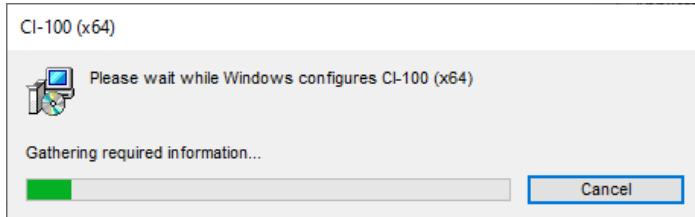
2. Select [CI-100 (x64)] from the displayed list and select [Uninstall].



3. A message box is displayed. Select [Yes].



4. The uninstallation starts. When this screen is closed, the uninstallation is completed.



5. Make sure that [CI-100 (x64)] disappears in the program's list.

 Memo

- Sometimes it takes several tens of seconds to complete the uninstallation. During the uninstallation, do not carry out other operations but wait until it is completed.
- After uninstallation is done, calibration data is not removed. To remove these data completely, please delete it by windows explorer.

1.3 Windows Setting

1.3.1 Jumbo Frame Setting

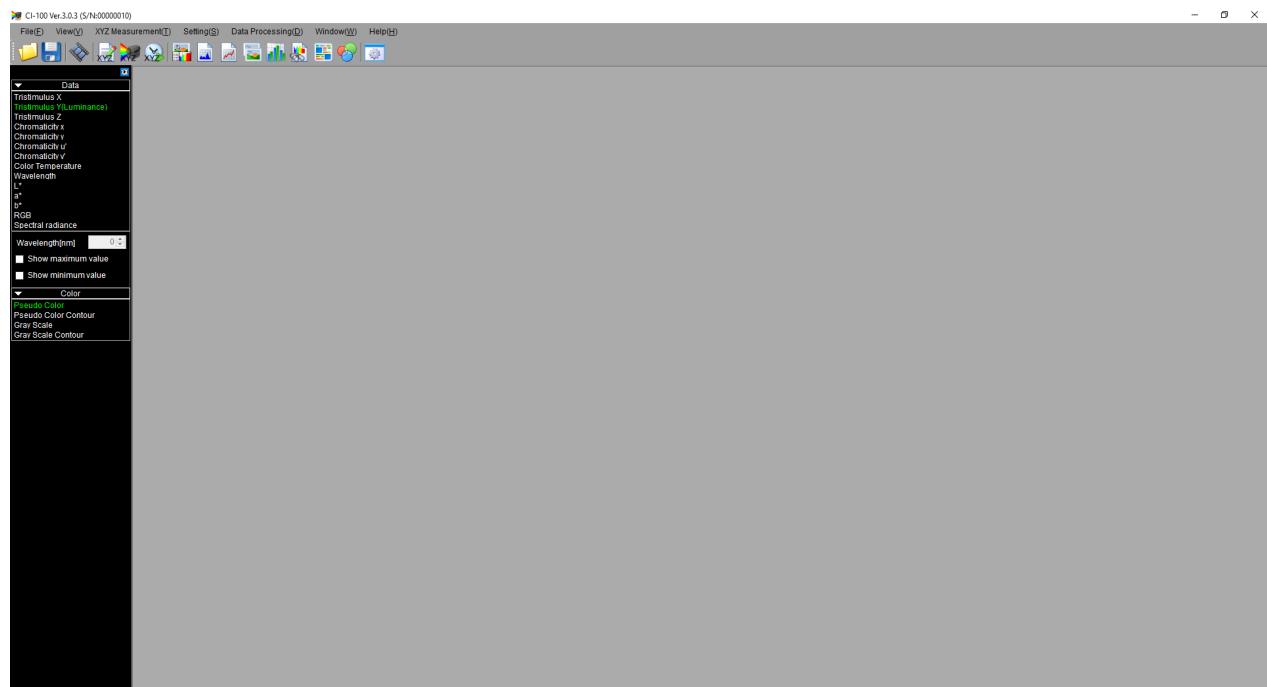
Depending on the PC and Windows you are using, jumbo frame settings are possible. If communication is likely to be interrupted, set Jumbo Frames to [Enabled].

1.3.2 Power Saving Setting

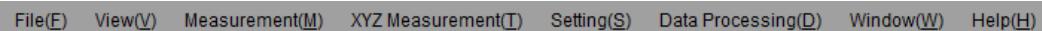
Depending on the PC you are using, if the power saving setting of the network adapter is set to [Enabled], this software may not work properly. Therefore, set the power saving setting to [Disabled].

1.4 Part Names and Functions in Window

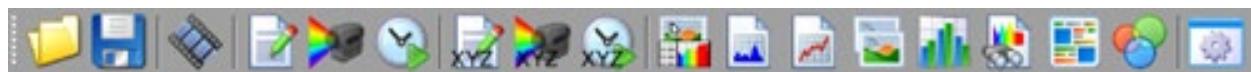
Names and functions of the parts displayed on the window are as follows.



1) Menu bar



2) Toolbar



3) Status bar



1.4.1 Menu Bar

Menus and the functions displayed on the Menu bar are as follows.

The Menu bar consists of main functions used in this software.

[File] Menu

This menu is related to the measurement image file operation. Functions set on the File menu are as follows.

Open Measurement

This function reads the saved measurement image file to be displayed.

☞ “7.1 Open Measurement Image”

Close Measurement

This function closes the currently displayed measurement image.

☞ “7.2 Close Measurement Image”

Save Measurement

This function saves the currently displayed measurement image.

☞ “7.3 Save Measurement Image”

Export

This function exports the currently displayed measurement image.

☞ “7.4 Export Measurement Image”

Exit

This function stops all the proceedings to exit the software.

☞ “2.2.2 Exit the Software”

[View] Menu

This menu is related to all functions of displaying the measurement images performed on this software. This menu is used to display the measurement image(s) using various views, graphs, data sheets. You can select the displaying methods to meet various requirements such as measurement data analysis. Functions set on the View menu and the associated functions are as follows.

Live View

This function displays the measurement object in real time. This function is mainly used to align the measurement object and the photo detector.

☞ “5.1 Live View Operation”

Pixel data view

Displays the data at each pixel of an image with graphs and lists.

☞ “5.13 Pixel Data View Operation”

Histogram

This function displays the measurement data in the longitudinal axis and the statistical graphs which indicate the frequency of the measurement data in the lateral axis.

☞ “5.14 Histogram Operation”

Cross section

This function displays the measurement data for the cross section set on the measurement image in vertical/horizontal graph form.

☞ “5.15 Cross Section Operation”

Measurement image comparison

This function compares two images and displays the difference as an image.

☞ “5.16 Measurement Image Comparison Operation”

Spot comparison

This function compares two spots and displays the difference on a graph.

☞ “5.17 Spot Comparison Operation”

Search spectrum

This function matches the reference spectrum with the spectrum in the measurement image and then, displays the result as an image.

☞ “5.18 Spectrum Search Operation”

Object color simulation

This function performs the simulation of the display color, using a measurement image, the measured white plate image when measuring and the measured white plate image when changing the light source.

☞ “5.19 Object Color Simulation Operation”

Color rendering

This function calculates the color rendering index of spots.

☞ “5.20 Color Rendering Operation”

List of measurement information

This function displays the read measurement data as a list.

☞ “5.21 Measurement Information List Operation”

[Measurement] [XYZ Measurement] menu

This menu is related to the measurement operation. Functions set on the measurement menu are as follows.

Find optimal condition

This function calculates automatically optimal integral time when measuring.

☞ "4.4 Calculate Optimal Values of Measurement Condition"

Start measurement

This function performs the measurement according to the settings of [Recipe setting].

☞ "4.1 Normal Measurement"

Start time series measurement

This function performs the measurement according to the settings of continuous measurement in [Recipe setting]. After the measurement, the result of time-series analysis is displayed.

☞ "4.3 Time-series Measurement"

[Setting] menu

This menu is related to the measurement operation. Functions set on the setting menu are as follows.

Recipe setting

This function performs all settings related to the measurement.

☞ "3 Recipe Setting"

Application setting

This function allows you to perform various settings commonly used in this application software. The setting content does not depend on the recipe type or the measurement object.

☞ "3.15 Application Common Setting"

Spectrum management

This function displays and edits the registered spectrum.

☞ "3.16 Spectrum Management"

[Data Processing] menu

This menu is related to the data processing operation. Functions set on the data processing menu are as follows.

Time series analysis

This function analyzes two or more measurement data chronologically and checks the spot change with passage of time.

☞ "6.1 Time-series Analysis Operation"

Batch CSV output

This function performs batch CSV output after the measurement.

☞ "6.2 Batch CSV Output Operation"

Back Light Simulation

This function eliminates the uniformity of light source (typically, it is back light of flat panel) and emphasizes characteristics of other parts.

☞ "6.3 Back Light Simulation"

[Window] menu

Cascade

This function overlaps and displays the currently-displayed windows.

 “8.1 Overlap and Display”

Tile

This function displays the currently-displayed windows side by side.

 “8.2 Arrange Side by Side”

[Help] menu

Manual

This function starts the PDF manual.

 “9.1 Display Manual”

Version info

This function displays the version information dialog box.

 “9.2 Check Version Information”

1.4.2 Tool bar

In the tool bar, the frequently-used icons are arranged so that they can be operated intuitively. The arranged icons and functions are as follows.



Icon	Menu	Function
	File	Opens the measurement image.
		Saves all measurement images.
	Display	Live view
	Setting	Recipe setting
	Measurement	Normal measurement
		Time-series measurement
	XYZ Setting	Recipe setting (XYZ)
	XYZ Measurement	XYZ measurement
		XYZ Time-series measurement
	Display	Pixel data view
		Histogram
		Cross section
		Comparison of measurement images
		Comparison of spots
		Spectrum search
		Object color simulation
		Color rendering
		Application setting

1.4.3 Shortcut Key

Frequently-used functions are allocated to shortcut keys.

The allocated shortcut keys and functions are as follows.

Shortcut key	Menu	Function
F1	Help	Displays the relevant help.
F3	Display	Live view
F4	Measurement	Finds the optimal measurement conditions.
F5		Starts measurement.
Shift+F5		Starts time-series measurement.
F6	Measurement	Finds the optimal XYZ measurement conditions.
F7		Starts XYZ measurement.
Shift+F7		Starts time-series XYZ measurement.
F8	Setting	Recipe setting
F9		Recipe setting(XYZ)
F10		Application setting
Ctrl+O	File	Opens the measurement image.
Ctrl+W		Closes the measurement image.
Ctrl+S		Saves the measurement image.
Alt+F4		Finishes the operation.

2. Measurement Operation

2.1 Measurement Operation Flowchart

The procedure for measuring by using the CI-100 is as follows,

Install the Device



Install the Detector

☞ “2.3 Installation”

Start the Software



☞ “2.2.1 Start the Software”

Setup of the Measurement Conditions



☞ “3 Recipe Setting”

”

Measurement



Normal Measurement
Time-series Measurement

☞ “4.1 Normal Measurement”

☞ “4.3 Time-series Measurement”

Analyze and Save the Data

Various Views Operation
File Menu Operation

☞ “6. Various Operations”

☞ “8. File Menu Operation”

2.2 Start and Exit the Software

2.2.1 Start the Software

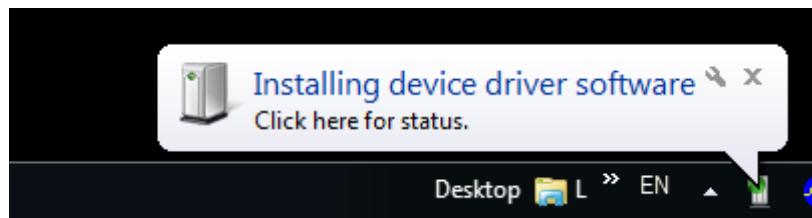
To start the CI-100 application software (hereafter, software), go through the following steps.



Note

When the PC in which this software has been installed is connected to this device with a cable and this device is turned ON, the software will start as standard mode. Otherwise, the software will start as View mode.

1. Connect the device and the PC where the software is installed with cable.
2. After connecting, insert the plug of the AC adapter into the outlet and turn ON the device.
3. Only at the first connection, the driver installation starts. Wait until the installation is finished.



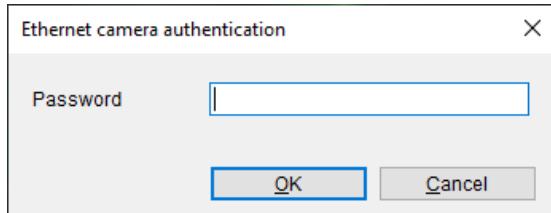
4. After the installation, double-click the icon on the desktop. The software starts and initialization starts.



Note

If any error occurs during the initialization, clear the cause of the error, turn ON/OFF the power and then restart the software.

5. Authentication is required when using an Ethernet camera. Enter the password "topcon" and click the [OK] button.

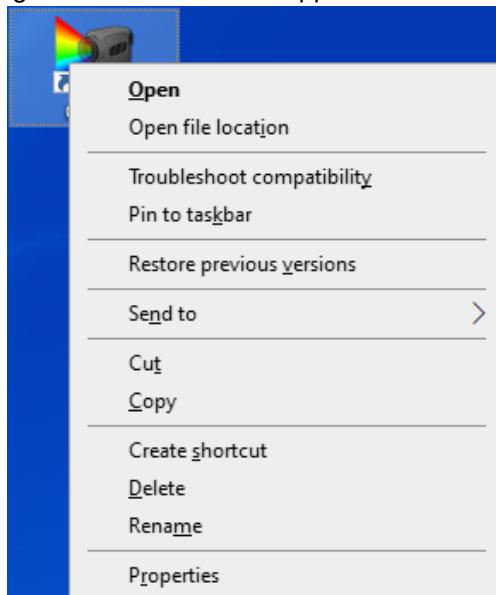


6. Once the initialization has been completed, the Main screen appears.

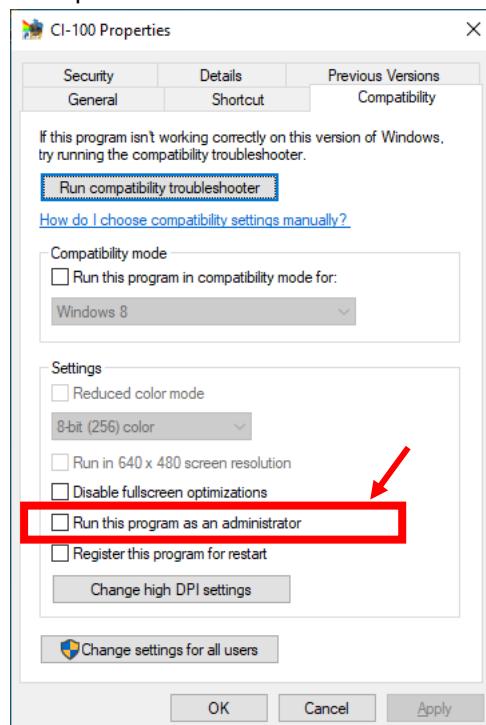
2.2.1.1 When It Cannot Start

When the software cannot start properly on Windows 10, Please try “Run this program as an administrator”.

1. Right click on the icon of application software and select [Property].



2. Set [Run this program as an administrator] check box to ON and click [OK] to go back to the desktop.



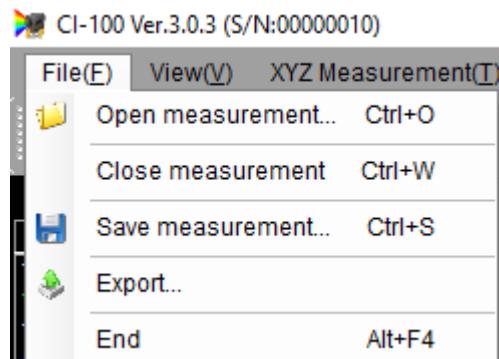
3. Double-click the icon on the desktop to start the software.

2.2.2 Exit the Software

The ending operation stops all of procedures to exit the software.

To exit the software, go through the following steps.

1. From the [File] menu, select [End].

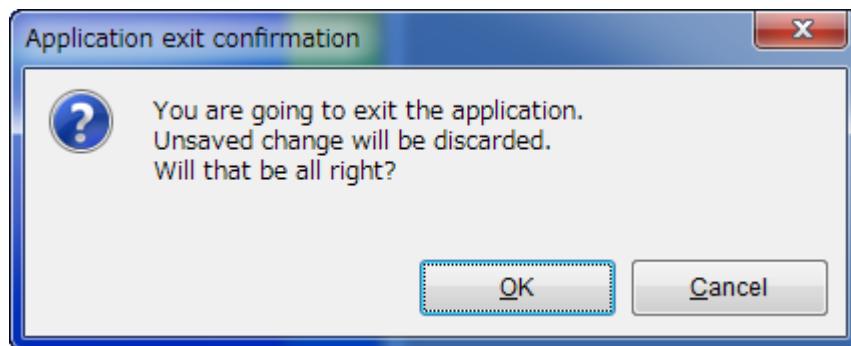


Clicking [x] on the title bar also enables you to exit the software.

2. If the measurement image to be saved is included in the saved measurement images, the following dialog box appears.

Selecting [OK] discards the changes of the measurement image to be saved and exits the software.

Selecting [Cancel] cancels the ending processing.

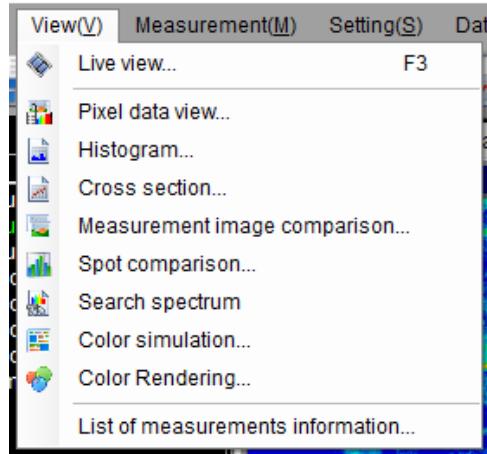


2.3 Installation

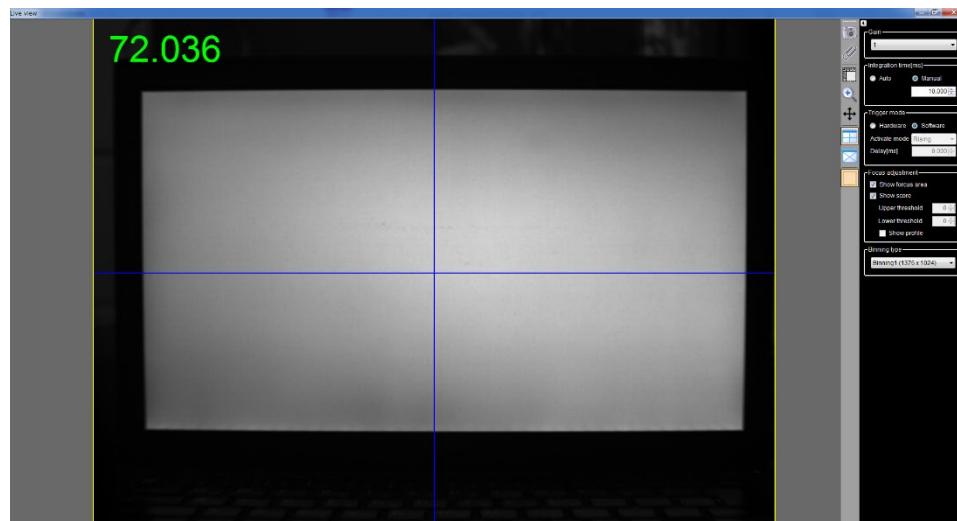
2.3.1 Live View

1. Launch the computer and start the application.
2. From the Menu bar, select the [View] – [Live View] sequentially.

Or, click  icon on the Tool bar.

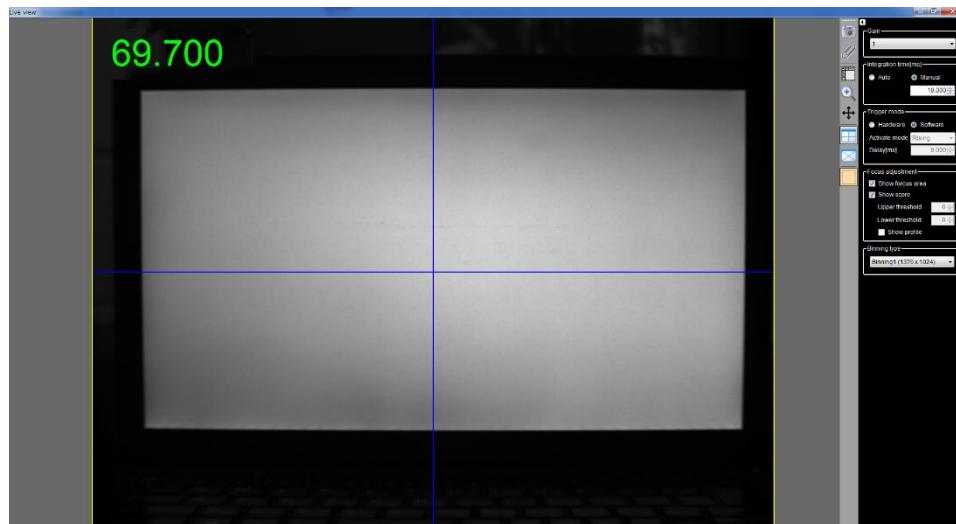


3. The Live View will appear.

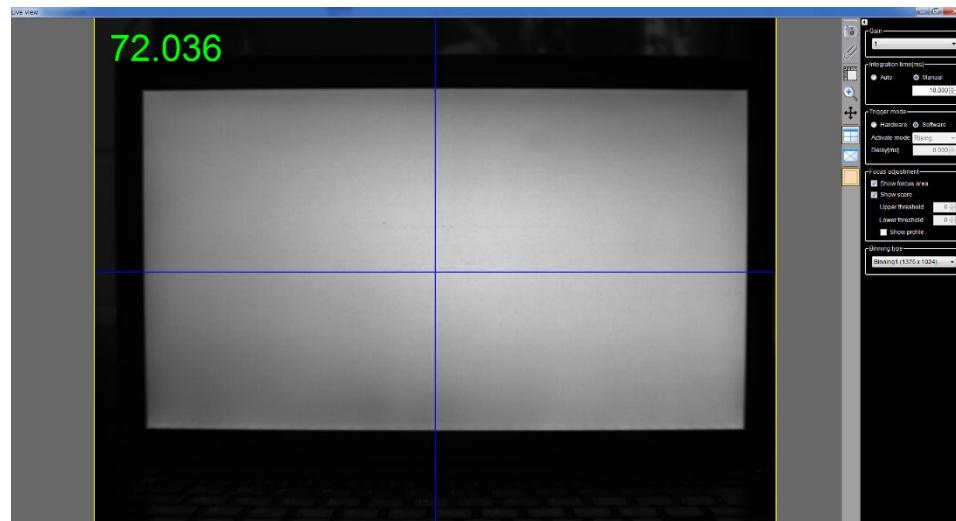


2.3.2 Collimation of Measurement Object

1. Adjust the position of the device or the measurement target so that the measurement target may fall within the Live View window.



2. While watching the Live View window, rotate the focus ring to focus on the measurement target. Adjust the focus as referring to the score, which is displayed at the upper left on the screen, as standard.



Note

When you focus on the measurement target, Striped patterns (called moire) sometimes appear on the measurement image. The interference between the FPD pixels and the elements of image sensor generates moire. For this reason, such striped pattern tends to be generated. If such moiré is found, adjusting the focus position slightly back and forth may clear the moire.

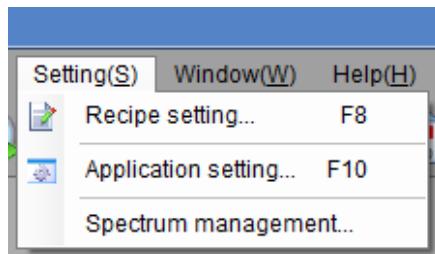
3. Recipe Setting

3.1 Open the Recipe Setting

To open the Recipe Setting, go through the following steps.

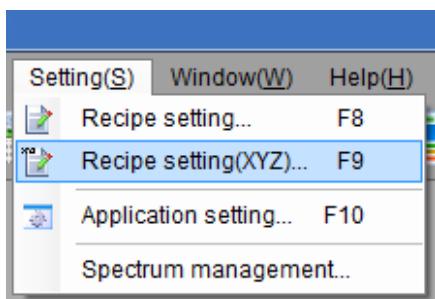
- From the Menu bar, select [Setting] - [Recipe Setting] sequentially. Or, press the “F8” key.

Or, click  icon on the Tool bar.



For the XYZ measurement, select [Setting] - [Recipe Setting (XYZ)] sequentially from the Menu bar. Or, press the “F9” key.

Or, click  icon on the Tool bar.

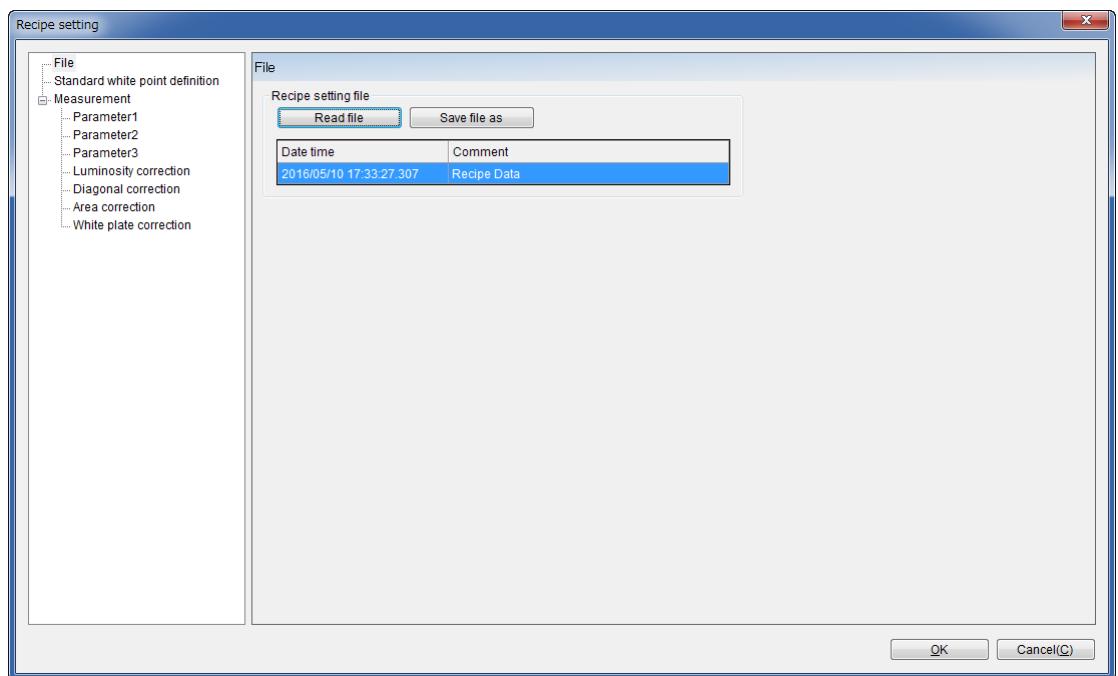


2. [Recipe Setting] dialog will open

All of the following buttons displayed on the [Recipe Setting Dialog] have the same functions.

[OK] Enables the setting and closes this window.

[Cancel] Disables the setting and closes this window.



Note

If Hardware is not connected, the [Parameters 1], [Parameters 2], [Parameters 3] are not displayed.

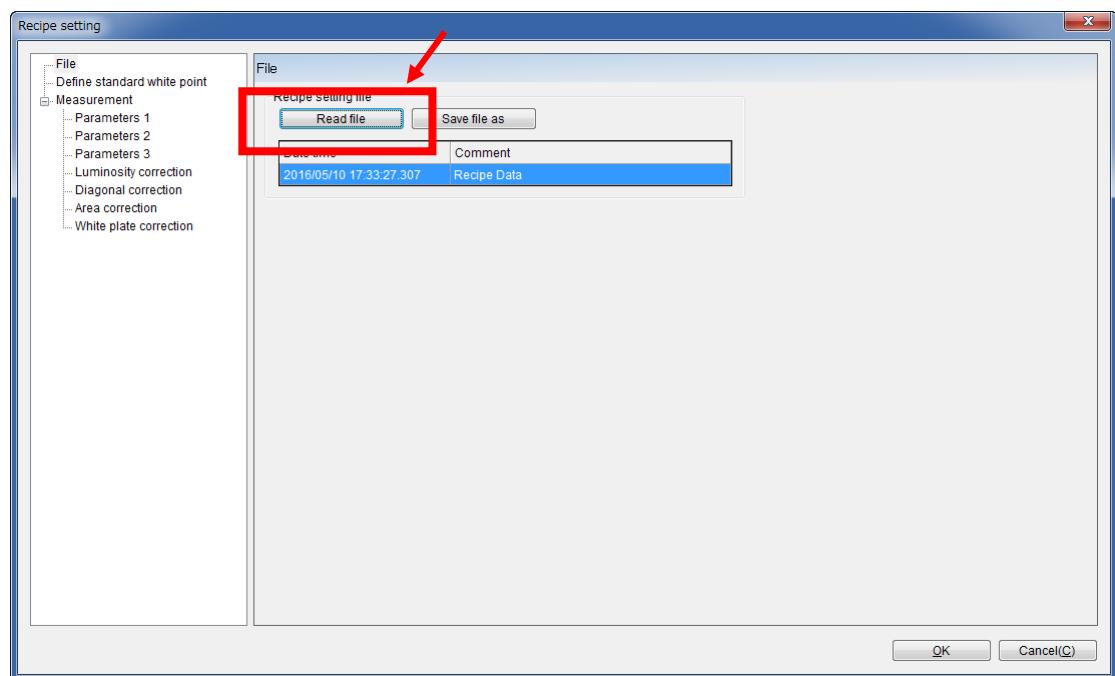
3.2 Select Recipe

3.2.1 Select Recipe File

Select a recipe file.

To select a recipe, go through the following steps. You can edit the active recipe file.

1. Open the [Recipe Setting] dialog and click [File].



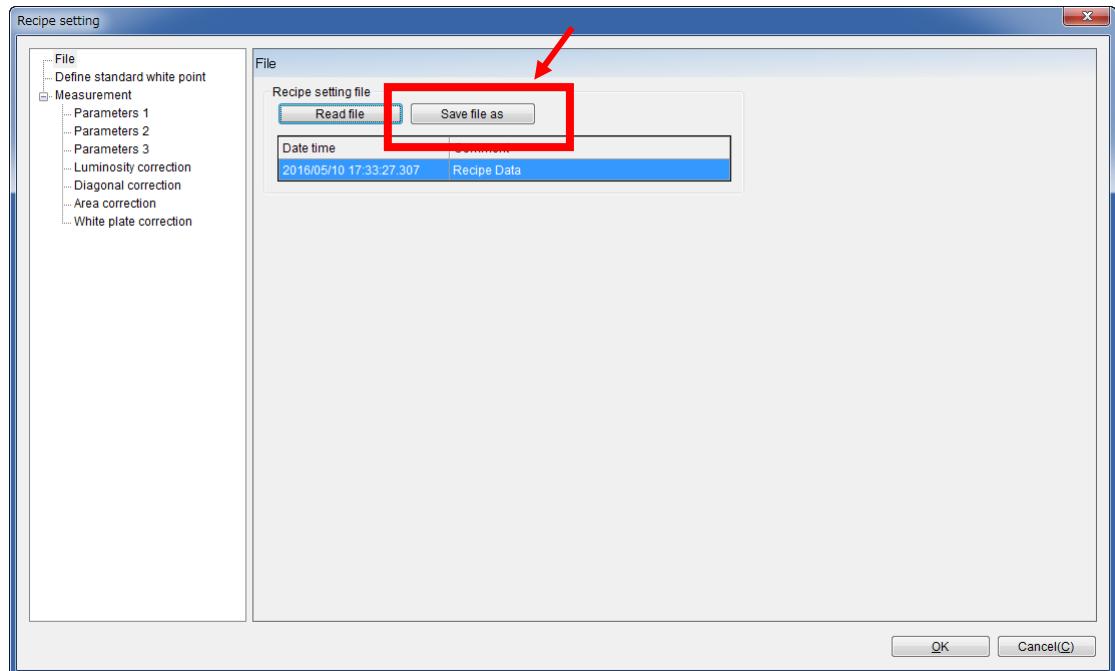
2. Click the [Read file] button and the [Open File] dialog will appear. Select a recipe file to be loaded. The loaded recipe file become enabled. (Hereafter called enabled recipe)

3.2.2 Save Recipe File

Saves the recipe file.

To save the recipe file, go through the following steps. The Recipe File can be used in SDK.

1. Open the [Recipe Setting] dialog and click [File].



2. Edit [Comment] if necessary. Save the recipe file with the [Save file as] button.

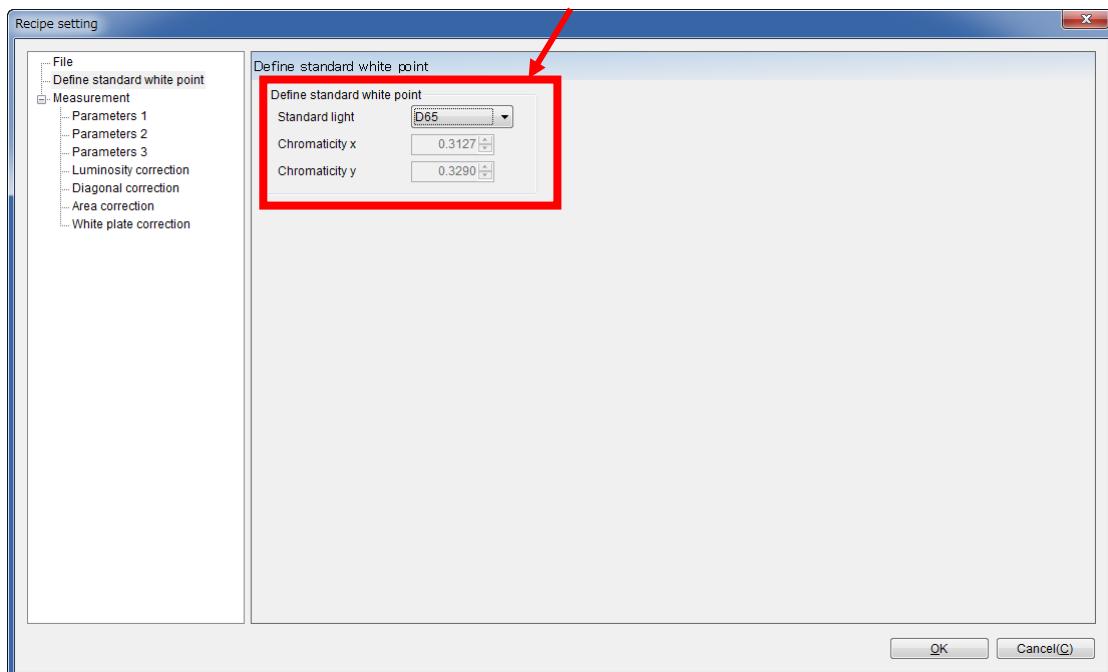
3.3 Change Standard White Point

Sets the definition of the standard white point, which is used in calculating the dominant wavelength and excitation purity.

To change the standard white point, go through the following steps.

Open the [Recipe Setting] dialog and click [Define Standard White Point].

Select the kind of standard light used as the standard white point from pull down menu in the [Standard light]



Standard light can be selected from A, B, C, D65, and User.

3.4 Setting Parameters 1

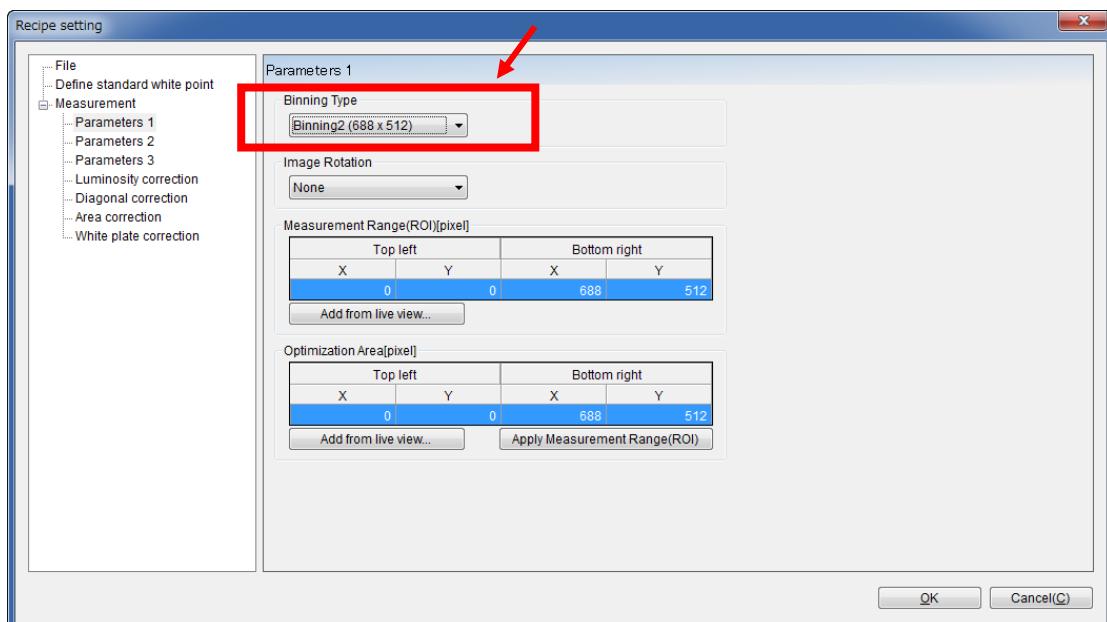
3.4.1 Binning Type

Selects the binning type.

To set the binning type, go through the following steps.

Open the [Recipe setting] dialog box and select [Parameters 1].

Select a type from the pull-down menu of the binning type.



Memo

When the binning type is changed, [Measurement range] under [Binning type] is initialized.

3.4.2 Image Rotation

Selects the image rotation type. If [Rotate 180 deg] is selected, measurement result images are created with 180-degree rotation.

To set the image rotation type, go through the following steps.

Open the [Recipe setting] dialog box and select [Parameters 1].

Select a type from the pull-down menu of the image rotation type.

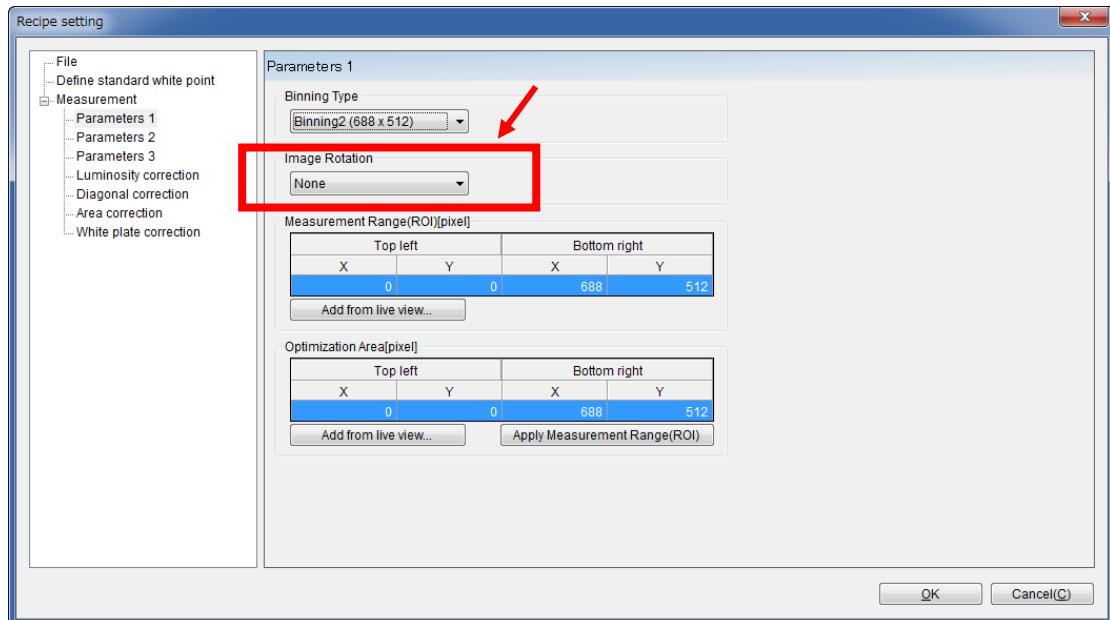


Image Rotation[None]

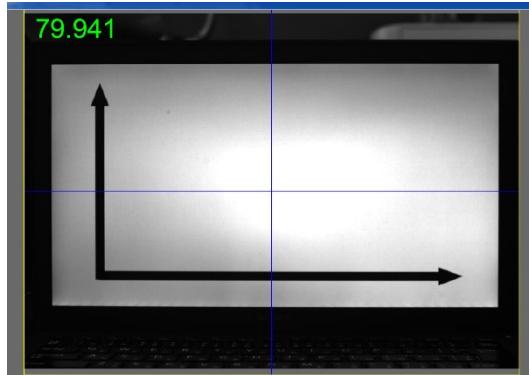
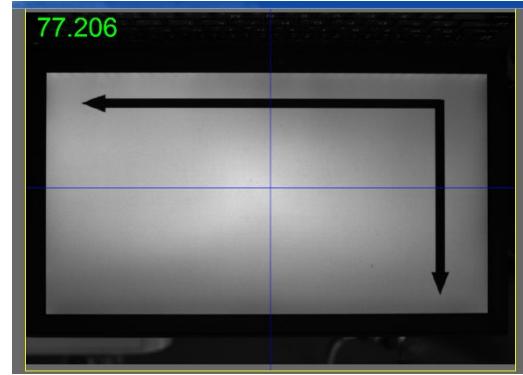


Image Rotation[Rotate 180 deg]

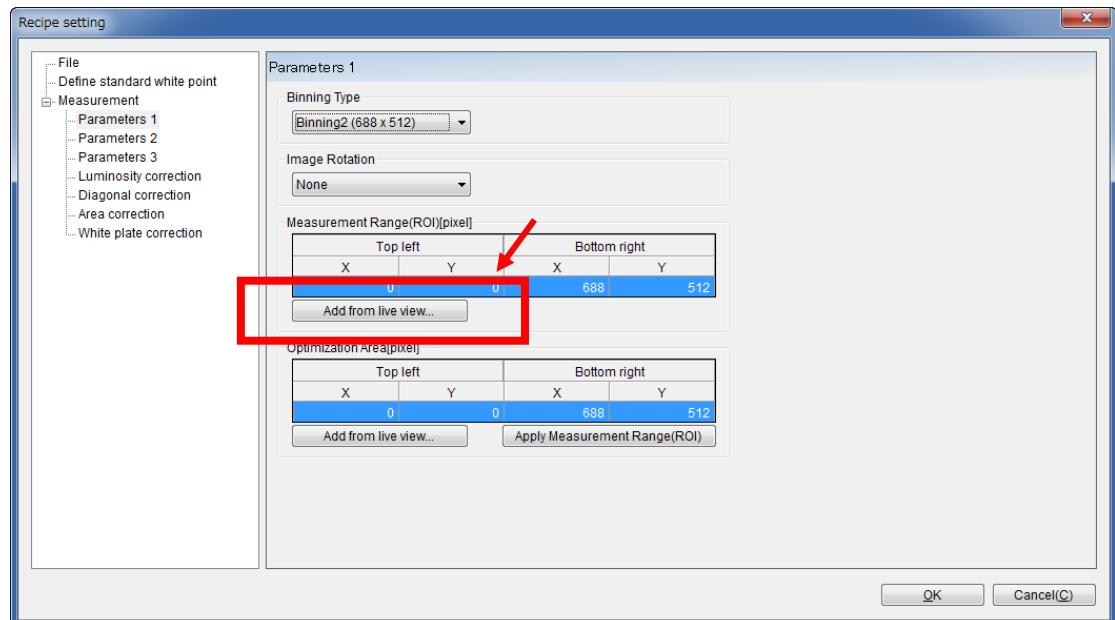


3.4.3 Measurement Range/Optimization Area

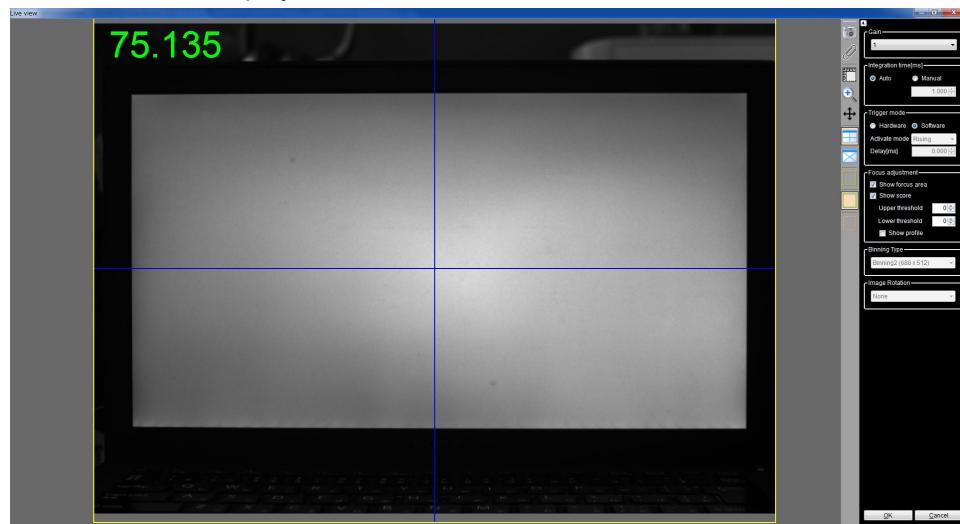
Edits the measurement range.

To edit the measurement range, go through the following steps.

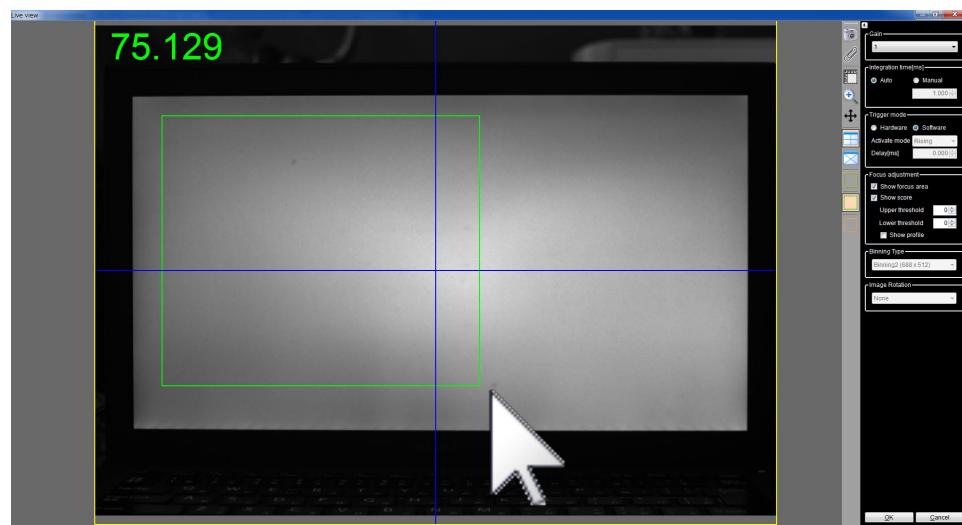
1. Open the [Recipe setting] dialog box, and select [Parameters 1]. Click the [Add from live view...] button to display the live view screen.



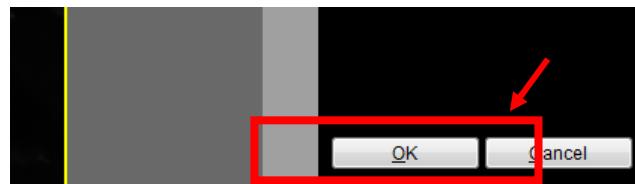
2. The Live view is displayed.



3. Click the start point of the area to be measured and drag the mouse over the area to determine the measurement area. Green line indicates measurement area.



4. Click [OK] on the bottom right of window to finish.



Memo

- [Optimization area] is the range where the gain and integration time are calculated automatically.
Switching between automatic and manual is set in [Parameters 3] in the recipe settings.
- Same operation works for [Optimization range].
- Optimization area is drawn by orange line.
- Click the [Apply Measurement Range (ROI)] button to set the optimization area to the same range as the measurement range.



Note

There are some constraints.

- Width and height are 16 or more.
- X of "Top left" is a multiple of 2. (It's automatically adjusted.)
- Width is a multiple of 4. (It's automatically adjusted.)

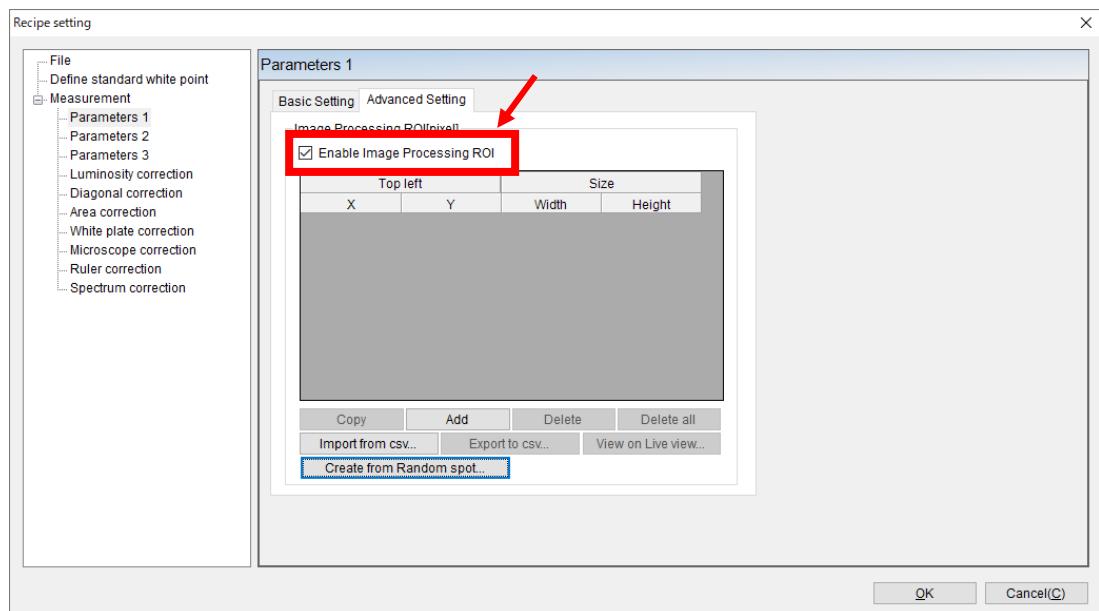
3.4.4 Image Processing ROI

Edits the Image Processing ROI.

When image processing ROI is enabled, data is measured only in the specified range.

To edit the Image Processing ROI, go through the following steps.

1. Open the [Recipe setting] dialog box, then select [Parameters 1] and [Advanced Setting].
2. Set the check box of [Enable Image Processing ROI], and then edit values.



The functions of buttons are described below.

[Import from csv]	Imports the list of Image Processing ROI form csv file.
[Export to csv]	Export the list of Image Processing ROI to csv file.
[Copy]	Adds a copy of selected column at the end of the list.
[Add]	Adds a new column at the end of the list.
[Delete]	Deletes selected column.
[Delete all]	Deletes all columns.
[View on Live view]	View Image Processing ROI on Live view window.
[Create from Random spot]	Creates from circuler/square spot of random spot.

The format of image processing ROI CSV is below.

x	y	width	height
100	200	20	20
1000	200	20	20
100	800	20	20
1000	800	20	20
...

← Data header

[x] [X of Top left]
[y] [Y of Top left]
[width] [Width of Size]
[height] [Height of Size]

3.5 Setting Parameters 2

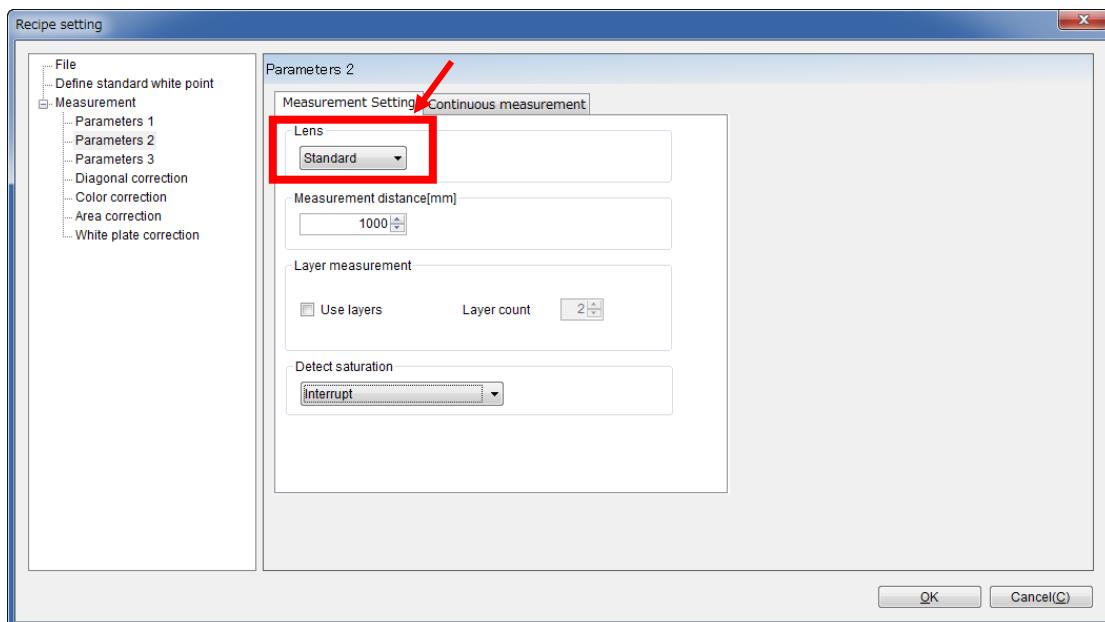
3.5.1 Objective Lens

Selects the objective lens type.

To set the objective lens type, go through the following steps.

Open the [Recipe setting] dialog box and select [Parameters 2].

Select a type from the pull-down menu of objective lens.



Note

When there is only one type of objective lens in the configuration, you cannot change the lens type.

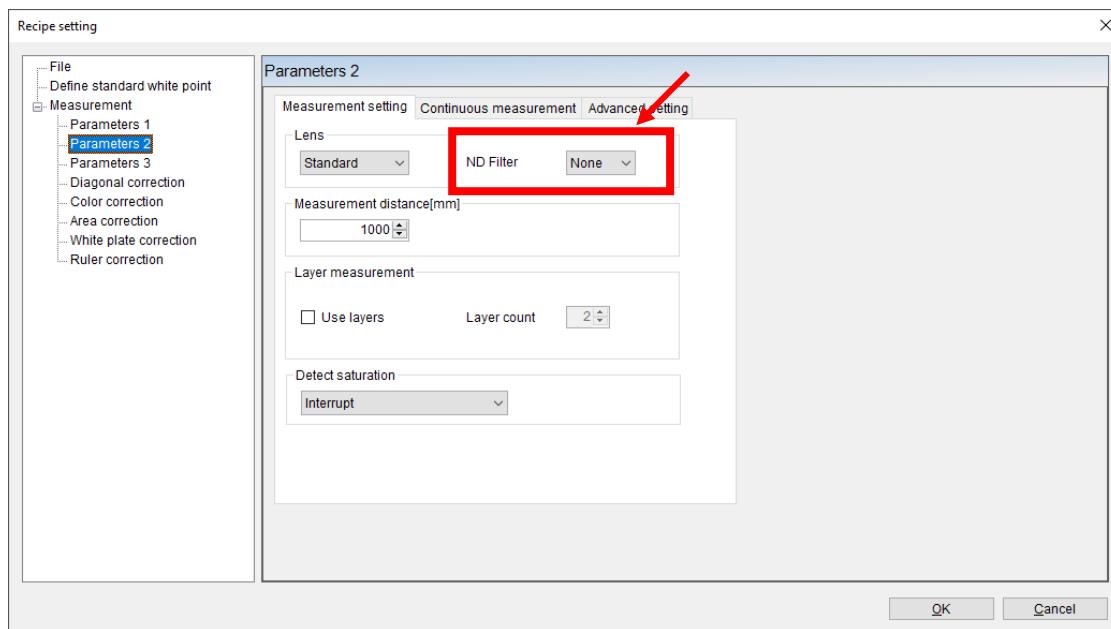
3.5.2 External ND filters

Set the ND filter to be used externally during measurement.

The setting of the external ND filter is as follows.

Open the [Recipe setting] dialog and select [Parameter 2].

Select the ND filter you want to use from the ND filter pull-down menu.



Memo

1. When using ND built into the product, separate settings are required.

☞ "3.6.4 ND Filter"

3.5.3 Measurement Distance

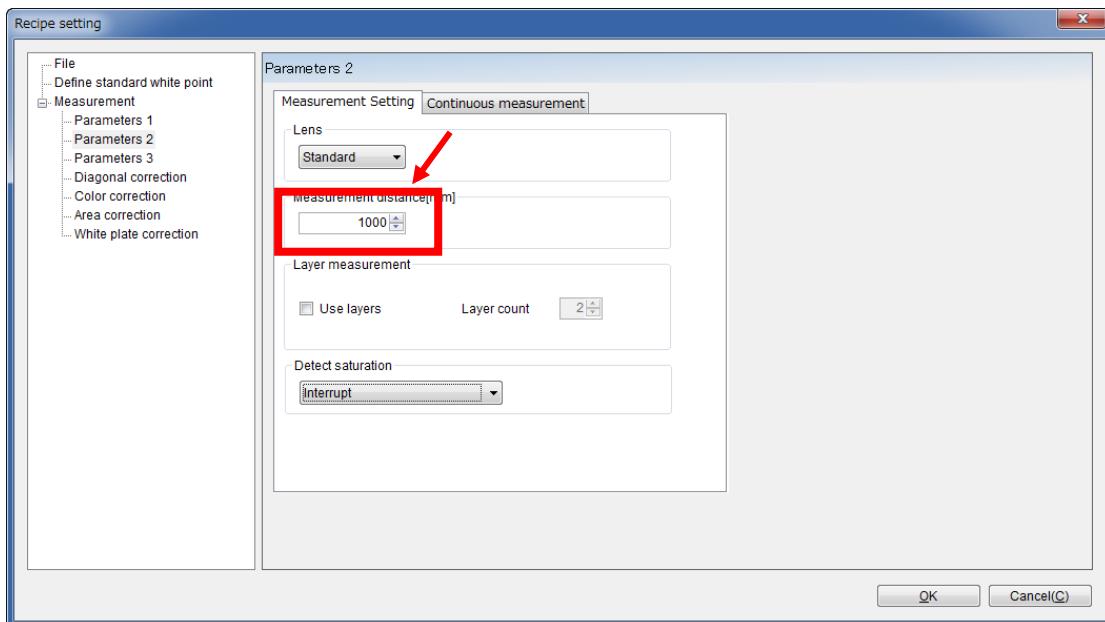
This function is used to set the distance between the device and the measurement target.
To set the measurement distance, go through the following steps.

Open the [Recipe setting] dialog and select [Parameters 2].

Enter the values of measurement distance in the [Measurement Distance] edit box.

The measurement distance is from tip of the objective lens unit of the device to the measurement target.

Valid range is 200[mm] – 100000 [mm].



Note

If entered values of this measurement distance is not appropriate, it may cause some error in all the result of dimensions calculation and may affect the area calculation of the measurement spot.

3.5.4 Layer Measurement

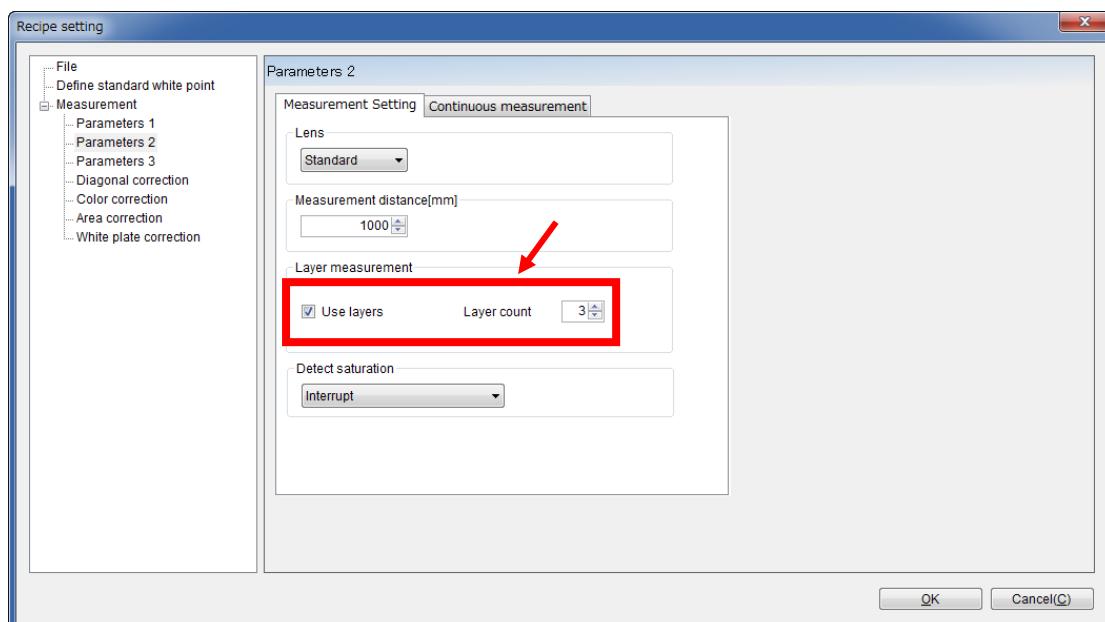
When high dynamic range measurement is necessary, layer measurement is useful. For the measurement of high luminance object, setting for the measurement need to be specified not to have saturation in high luminance area. As a result, measurement of low luminance area cannot be done properly. Layer measurement is the method to avoid this problem. In the process of layer measurement, integration time is adjusted automatically according to specified layer count. The software disposes saturated area in high luminance area and composites low luminance area that is not saturated.

To set the layer measurement, go through the following steps.

Open the [Recipe setting] dialog box and select [Parameters 2].

Set the check box of [Use layers] to ON and enter proper number in the edit box of [Layer count].

Valid layer count is 2 – 5.



Memo

- When the check box of [Use layers] is set to ON, setting for integration time is set to “Auto”.
- When the check box of [Use layers] is set to ON, the optimization area is changed to the same as the measurement range.
- The measurement time will be increased relative to the layer count

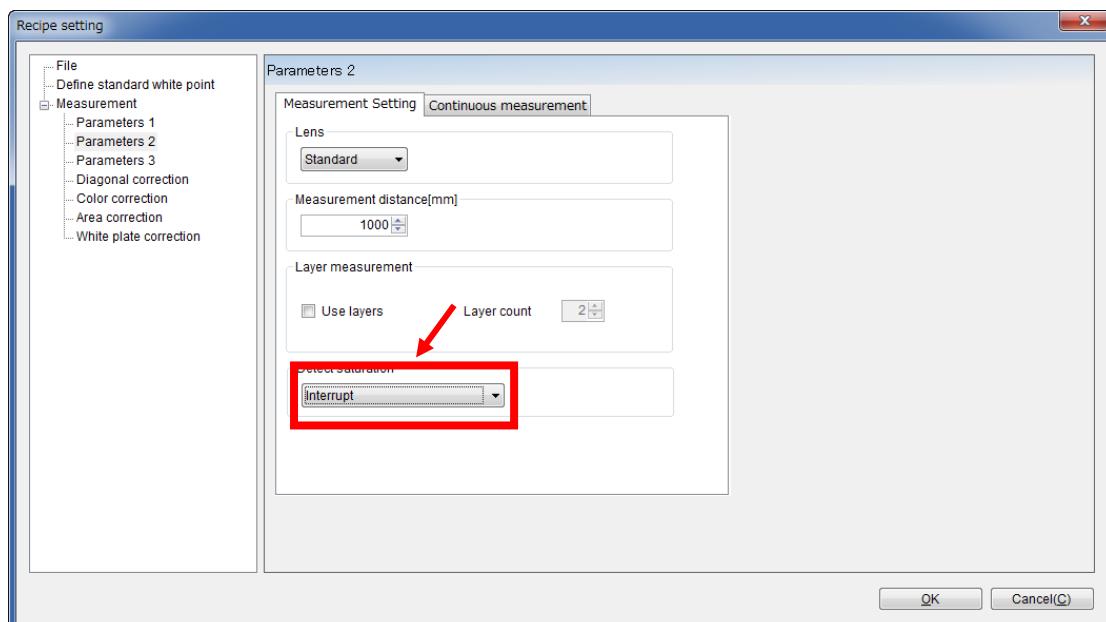
3.5.5 Saturation Detection

Sets the operation when saturation is detected during the measurement.

To set the saturation detecting operation, go through the following steps.

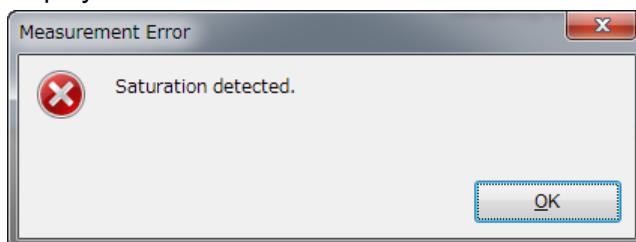
Open the [Recipe Setting] dialog and select [Parameters 2].

Select a value from the pull-down menu of [Detect saturation]. The contents of each mode are described below.

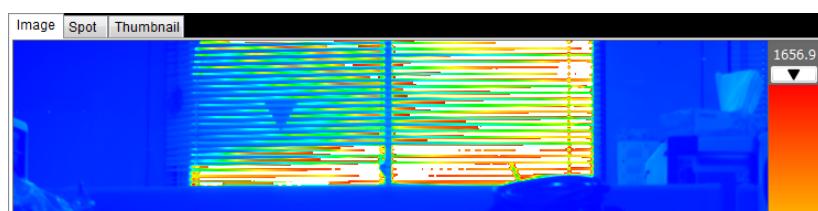


[None] Nothing happens even if saturation is detected during measurement.

[Interrupt] When saturation is detected during measurement, message below is displayed.



[Output on the image] When saturation is detected during measurement, measurement continues. Saturated pixels are colored in white like below, after measurement had done.



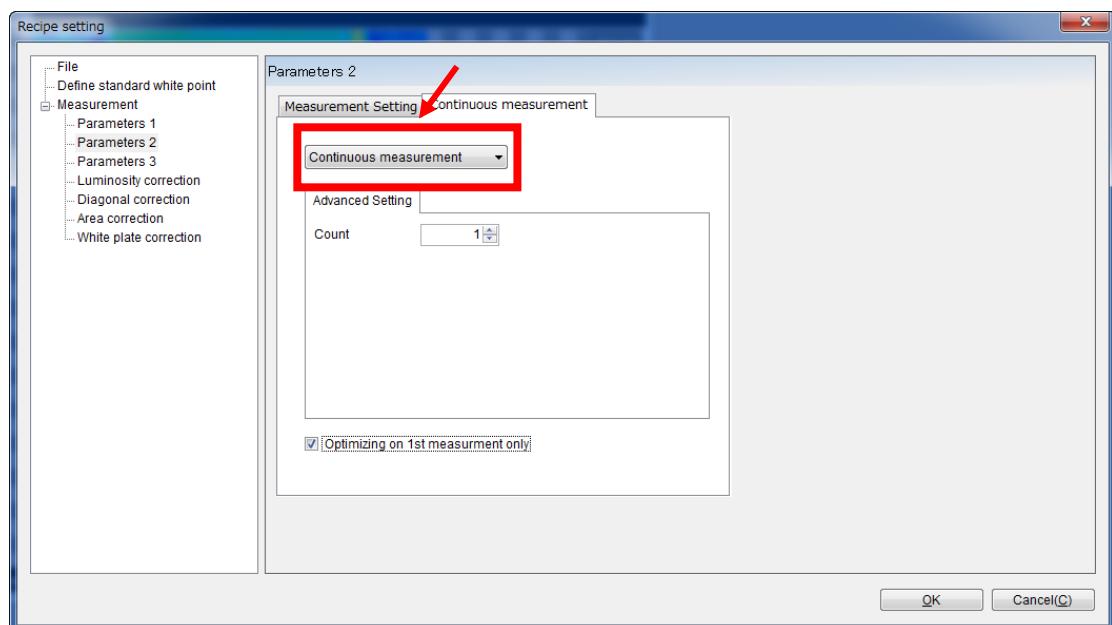
3.5.6 Continuous Measurement

Sets the number of times of the measurement and interval time for the continuous measurement and the Interval measurement.

To set the continuous measurement method, go through the following steps.

1. Open the [Recipe setting] dialog and select [Parameters 2]. Switch to [Continuous Measurement] tab.

Select the [Continuous measurement] or the [Interval measurement] in the continuous measurement setting.



2. When you select the [Continuous measurement], the edit box will become active. Enter the number of times of the measurement by using the keyboard or using the Spin button ▲▼.
Valid range of the number of times of the measurement is 1 - 999.
When the [Optimizing 1st measurement only] check box is on, the software optimizes a measuring setting at only first measurement in continuous and interval measuring.



Note

- When the [Optimizing 1st measurement only] check box is On, a measuring time for optimization from second measuring can be omitted.
- When the [Optimizing 1st measurement only] check box is On, accurate measured data cannot be obtained due to variation of luminance and color in the measurement target. When you measure a target, of which luminance and color vary large, remove the check and optimize measuring condition at each measuring.

3. When you select the [Interval measurement], you can specify the interval time and the number of times of the measurement. In condition 1 to 5, enter the [Interval Time] and the [Measurement Count] of each condition. Click each cell to activate cells.

Time Interval: 1 - 259200 [sec] (259200 seconds = 72 hours)

Measurement Count: 1 - 999 times

If the [Cancel Measurement if Measurement Time Exceeds Preset Time Interval] is checked, when it takes longer time to measure than the interval setting, next measurement is canceled.

 Note	<ul style="list-style-type: none"> The value of the interval time x measurement count cannot exceed the time of 259200 seconds (= 72 hours). Interval time may vary in several seconds from measuring conditions. Start measurement by [Time-series Measurement] button.
--	---

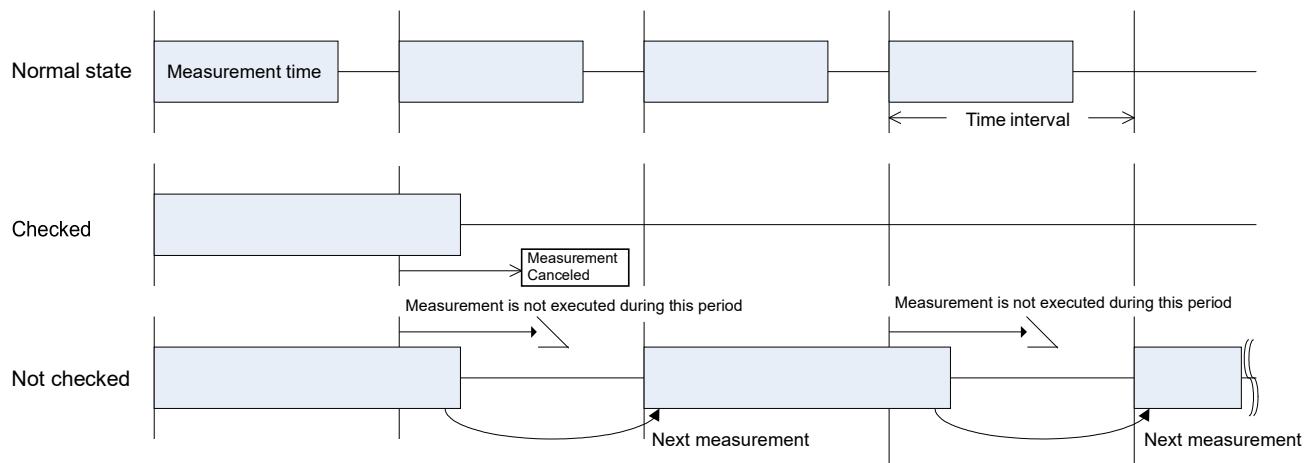
Operation when the measurement time in the interval measurement exceeds the interval time

– When this item is checked:

If the measurement time exceeds the next interval measurement starting time, the measurement is canceled at the next measurement starting time. The data obtained during the measurement are discarded.

– When this item is not checked:

If the measurement time exceeds the next interval measurement starting time, the measurement of the exceeded starting time is not executed and the operation goes to standby mode until the next measurement. This does not cause a misalignment in actual measurement time interval. The measurement count is limited to the actually-executed management and is lower than the preset count.



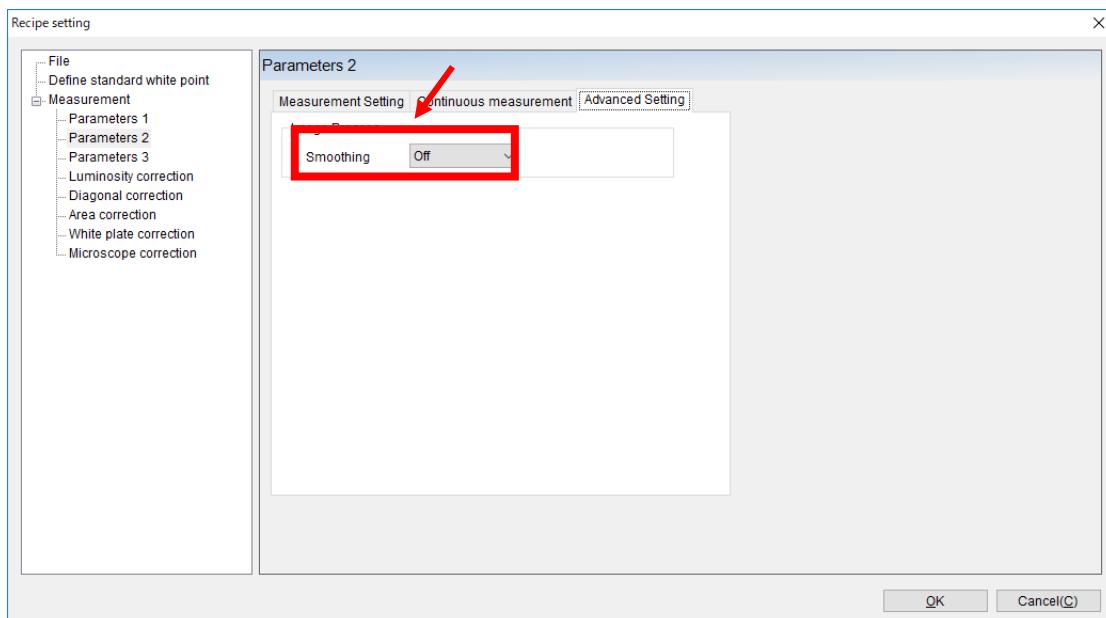
3.5.7 Smoothing

Sets the smoothing image process.

To set the smoothing image process, go through the following steps.

Open the [Recipe setting] dialog and select [Parameters 2] -[Advanced Setting].

Select a process from the pull-down menu of [Smoothing]. The contents of each mode are described below.



[On] Runs the smoothing image process.

[Off] Does not run the smoothing image process.



The smoothing can get to stable measurement data as can be reduced the noise component contained in the measurement data.

3.6 Setting Parameters 3

3.6.1 Gain

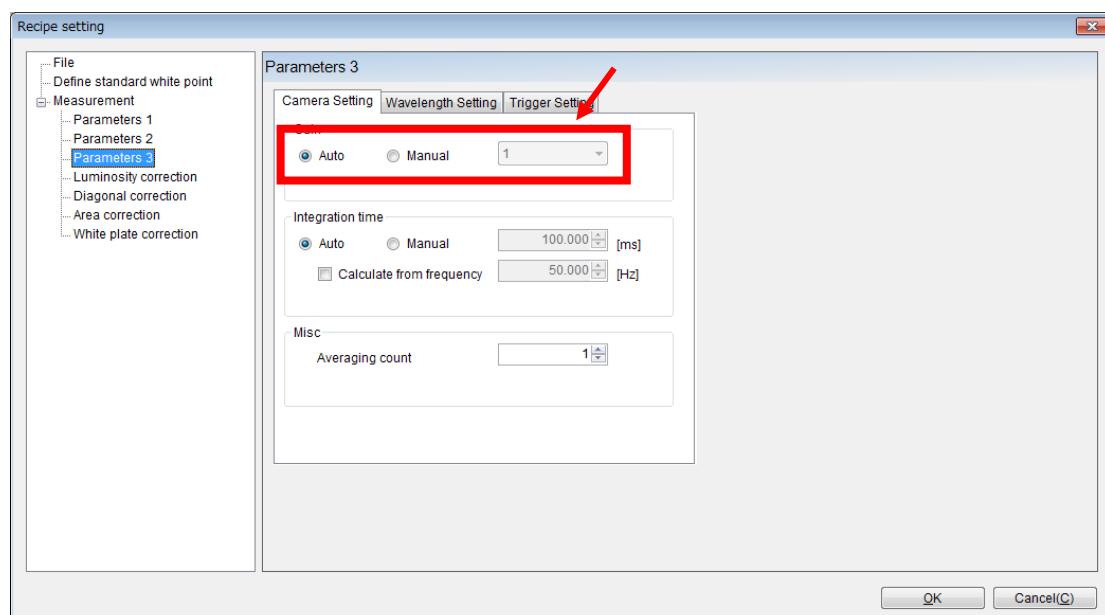
Sets the gain that is used in measurement.

To set gain, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Select [Auto] or [Manual] for [Gain].

When you select [Auto], the gain is automatically calculated in each measurement and measurement is performed.

When you select [Manual], measurement is performed by the specified gain. When you select [Manual], select a value from the pull-down menu of gain.



Memo

- Gain is amplification factor in image sensor. When a high value is set for gain, the measuring time is shortened.
- It can be set to [Auto] when [Integral Time] is [Auto].
- Enables filters to be used in XYZ measurement.

☞ “3.6.2 Integral Time”

☞ “3.6.9 Filters To Use”

3.6.2 Integral Time

Sets the integral time that is used in measurement.

To set the integral time, go through the following steps.

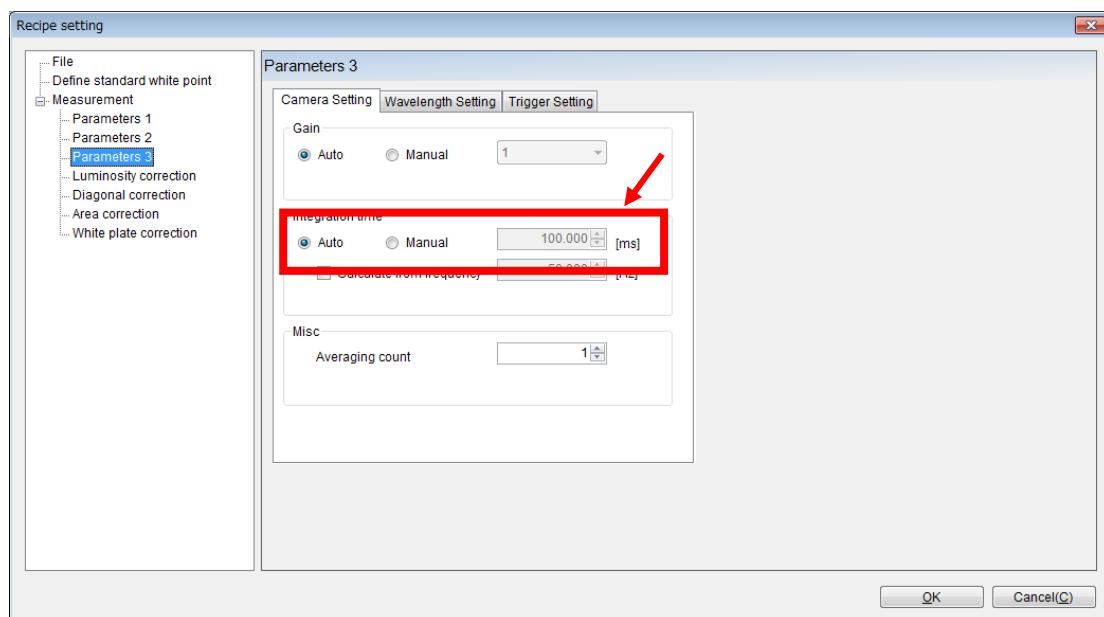
1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Select [Auto] or [Manual] for [Integration time].

When you select [Auto], the integral time is automatically calculated in each measurement and measurement is performed.

When you select [Manual], measurement is performed by the specified integral time. When you select [Manual], the edit box is valid and it is possible to set the desired integral time.

The setting range is as follows.

Integral time: 0.05 [ms] - 4000 [ms] (SR-5000)
0.029 [ms] - 10000 [ms] (SR-5100)
0.04 [ms] - 1000 [ms] (UA-20)



Memo

- Integral time indicates the time as to how long light should enter the image sensor.
- The optimal integral time can be determined in advance. Execute [Measurement] - [Find optimal condition] on the menu bar or press the [F4] key.

☞ "4.4 Calculate Optimal Values of Measurement Condition"

3.6.3 Frequency Setting

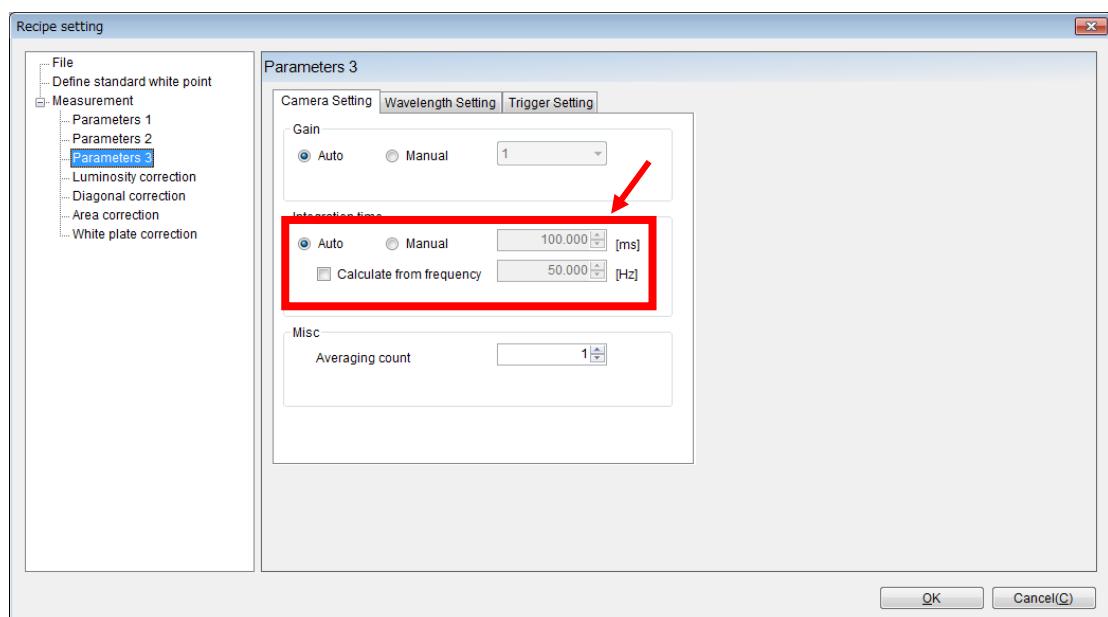
When [Auto] is selected in [Integration time], the integration time can be calculated from frequency value. When measurement object has periodical blinking, this functionality can reduce the influence of periodical blinking.

To set integration time by frequency, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Select [Auto] for [Integration time].
3. Set ON to [Calculate from frequency] check box and enter frequency of measuring object in the [Frequency [Hz]] edit box.

The setting range is as follows.

Integral time: 4 [Hz] - 20000 [Hz]



Memo

- This is the function to keep consistency between integration time and frequency.
- This is NOT function to find frequency of measuring object automatically.

3.6.4 ND Filter

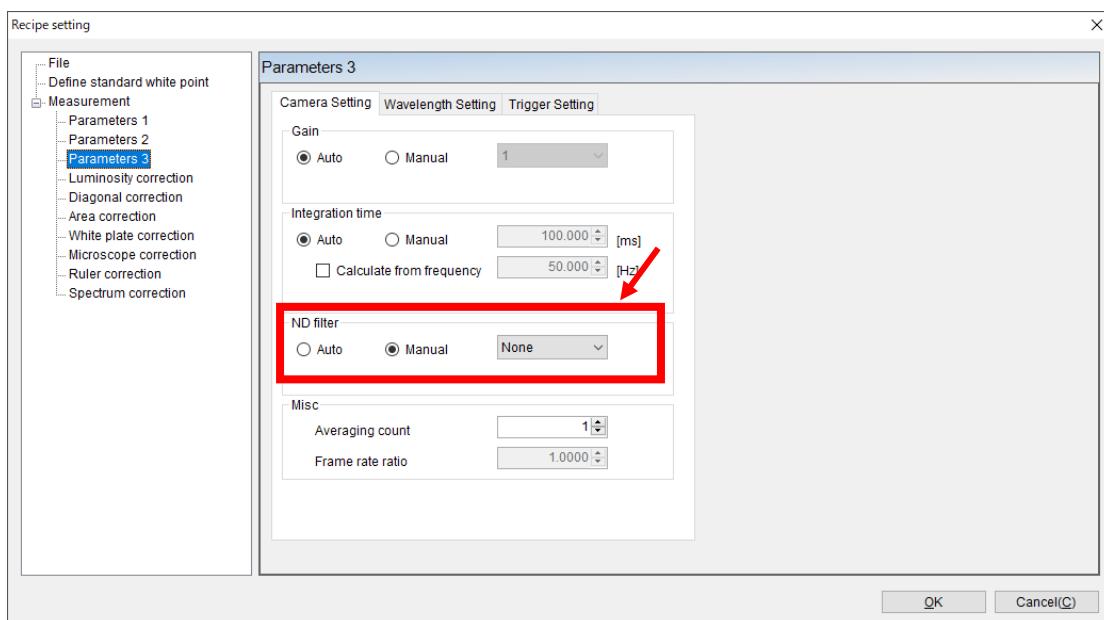
Sets the ND filter that is used in measurement.

To set the ND filter, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Select [Auto] or [Manual] for [ND Filter].

When you select [Auto], the ND filter is automatically calculated in each measurement and measurement is performed.

When you select [Manual], measurement is performed by the specified ND filter. When you select [Manual], select a filter from the pull-down menu of ND filter.



Memo

- This is the function to use for the measurement of high luminance object.
- If device is not equipped with ND filter, [ND filter] is not displayed.
- It can be set to [Auto] when [Integral Time] is [Auto].

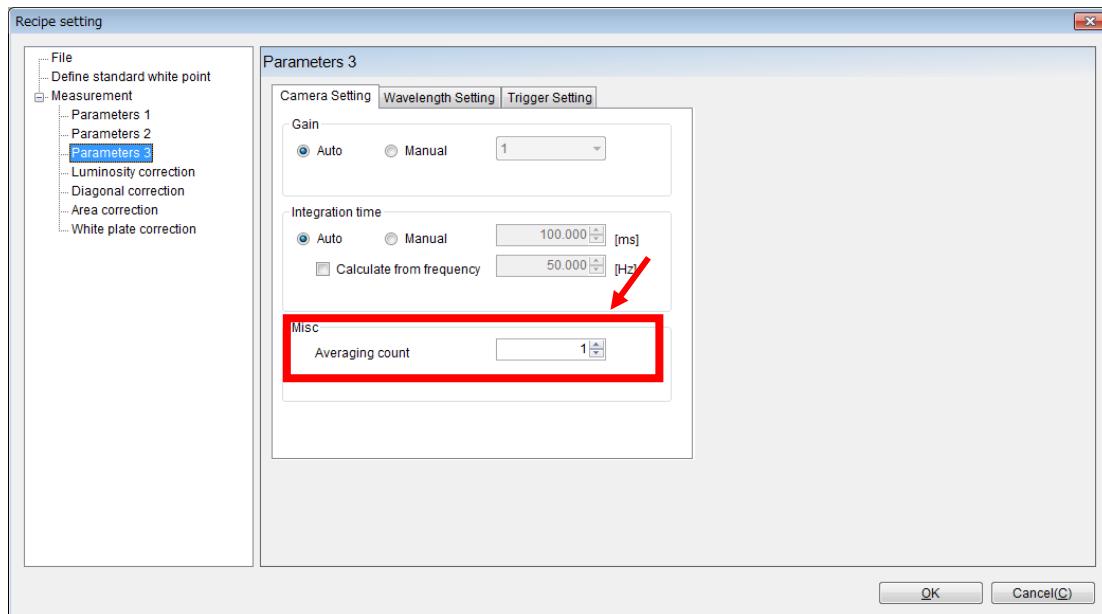
“3.6.2 Integral Time”

3.6.5 Averaging Count

Sets the averaging count that is used in measurement.

To set the averaging count, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Enter a proper value in the edit box of averaging count.
Valid range of averaging count is 1-50.



Memo

- In case measurement result, cannot be stable because of the influence of frequency blinking, it is possible to make it stable by repeating same shot multiple times and averaging those results.
- The measurement time will be increased relative to the averaging count.

3.6.6 Scan Mode

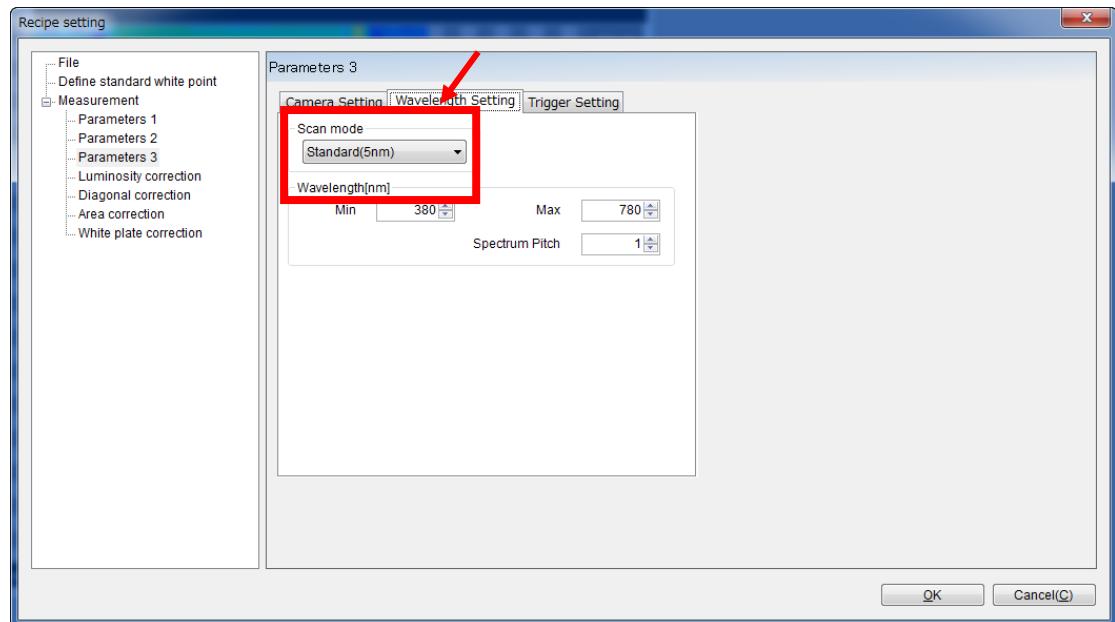
Sets the spectral pitch in measurement. This function sets how the hardware should split light into multiple beams.

To set the scan mode, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Switch to the [Wavelength setting] tab.
3. Select a mode from the pull-down menu of [Scan mode].

The contents of each mode are described below.

[Standard]	Splits light into multiple beams by 5nm. This is general setting.
[High speed]	Splits light into multiple beams by 10nm. Data can be obtained at high speed but the accuracy is lowered.
[High precision]	Splits light into multiple beams by 1nm. Data with high accuracy can be obtained but this processing takes longer time than other modes.
[Custom]	Splits light into multiple beams by value which you set. Accuracy and processing time depend on the value. Value range: 0.5 [nm] - 20.0 [nm]

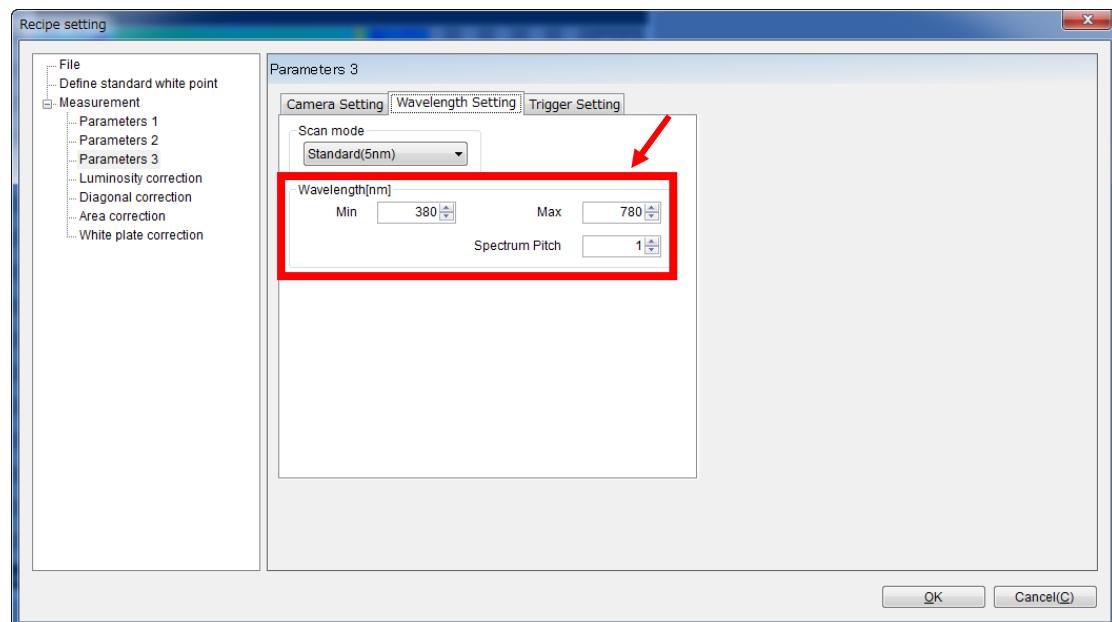


3.6.7 Measurement Wavelength

Sets the wavelength range for measuring (splitting into beams). In addition, this function sets how the measurement result data should be saved.

To set the measurement wavelength, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Switch to the [Wavelength setting] tab.
3. Enter proper values to the [Min] and [Max] edit boxes of [Wavelength]. Enter a proper value to [Spectrum pitch].



Memo

- [Spectrum pitch] sets how the software should save data.
- When you want to decrease the data size, enter a high value. For example, when the measurement range is [380 - 780] and "5" is input for [Spectrum pitch], the spectral data is saved by 5 steps. The next to 380nm data is the 385nm data. The data between 380nm and 385nm are discarded.

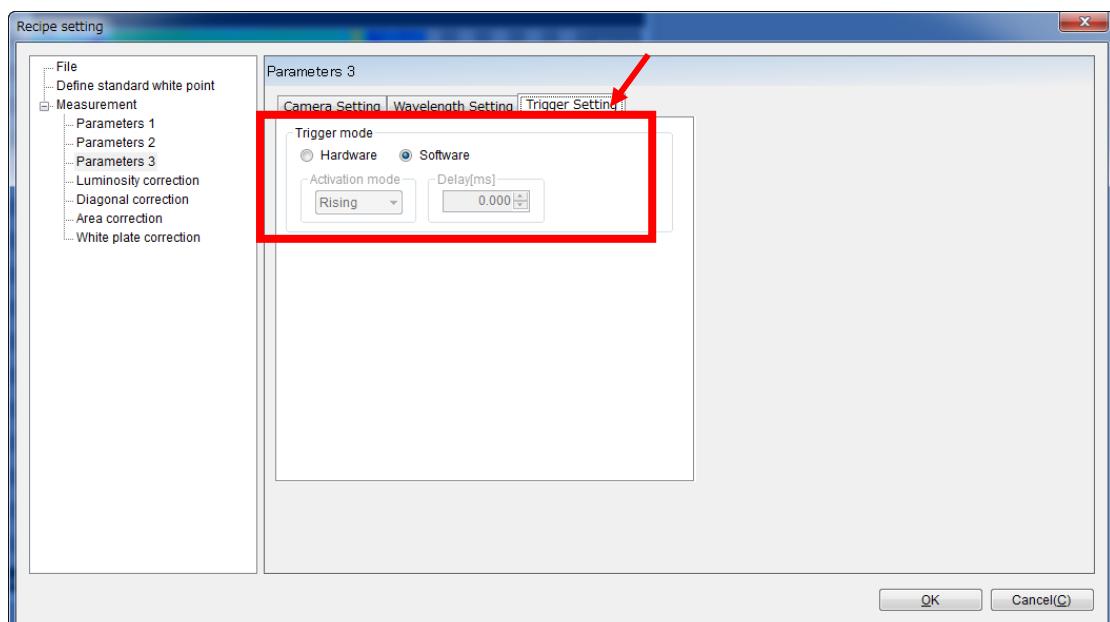
3.6.8 Trigger Mode

Sets whether hardware or software should decide the time when the camera takes a picture. Some of the devices that are the targets to be measured have a function to output an electric signal to outside. Connect such a device with the SR-5000 series through hardware and perform measurement as synchronizing them. It is possible to measure the target under stable condition even if the target emits light periodically.

To set the trigger mode, go through the following steps.

Software mode is used in normal case.

1. Open the [Recipe setting] dialog box and select [Parameters 3].
2. Switch to the [Trigger setting] tab.
3. Select [Hardware] or [Software] for [Trigger mode].



4. When you select [Hardware], set [Activation mode] and [Delay].

[Activation mode] Sets whether synchronization should be done at the time when the external signal is changed to "HI" or "LO".

[Rising] Synchronizes when changed to "HI".

[Falling] Synchronizes when changed to "LO".

[Delay] Sets the waiting time after the signal status is changed. The unit is "millisecond".

The setting range is 0.001 (1 microsecond) to 1000 (1 second).



Note

Please select "Software" when the hardware signal is not connected.

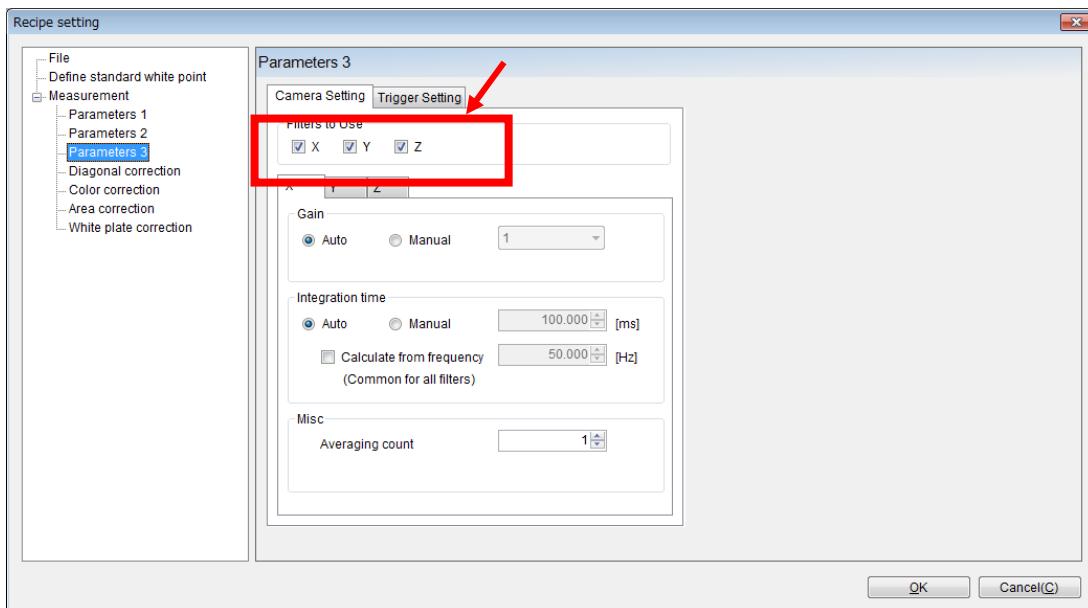
3.6.9 Filters To Use

Enables filters to be used in XYZ measurement.

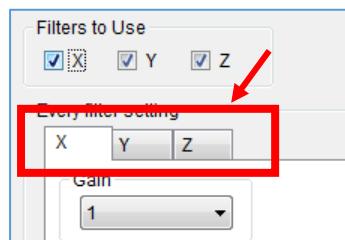
To enable filter, go through the following steps.

Open the [Recipe setting] dialog box and select [Parameters 3].

Set each of check box [X, Y, Z] to ON if it is necessary.



Switch tab page in center of dialog and set parameters for each filter.



Memo

- Unless all of XYZ filters are selected, chromaticity and other measurement data will not be generated.
- For color filter type sensors, there is no tab for XYZ.

3.7 Luminosity Factor Correction

3.7.1 Outline

The tristimulus values XYZ of light source color are obtained by the following formula.

$$X = K \int_{380}^{780} S(\lambda) \bar{x}(\lambda) d\lambda$$

$$Y = K \int_{380}^{780} S(\lambda) \bar{y}(\lambda) d\lambda$$

$$Z = K \int_{380}^{780} S(\lambda) \bar{z}(\lambda) d\lambda$$

$S(\lambda)$: Amount of radiation of light source
 $\bar{x}(\lambda), \bar{y}(\lambda), \bar{z}(\lambda)$: Color matching function in XYZ color system

From “CIE No. 15.2” and “JIS Z8701”

The luminosity factor correction changes the color matching function to an optional one. In the above formula, “ $x(\lambda)$ ”, “ $y(\lambda)$ ” and “ $z(\lambda)$ ” can be changed to the values read from an external file.

This correction is effective for the following cases.

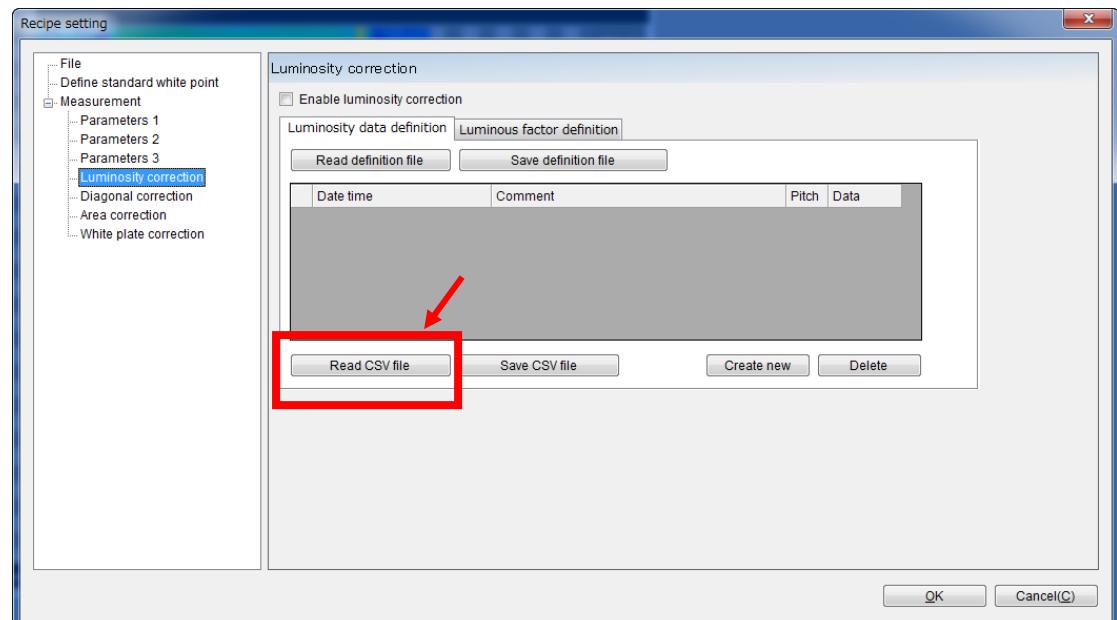
- When you want to use the color matching function based on 10-degree visual field instead of the one based on 2-degree visual field that is normally used.
- When you want to use the color matching function that is different according to age because the human eye's sensitivity is changed by age.

3.7.2 Setting of Luminosity Factor Correction

Sets the luminosity factor (spectral visibility efficiency) in measurement.

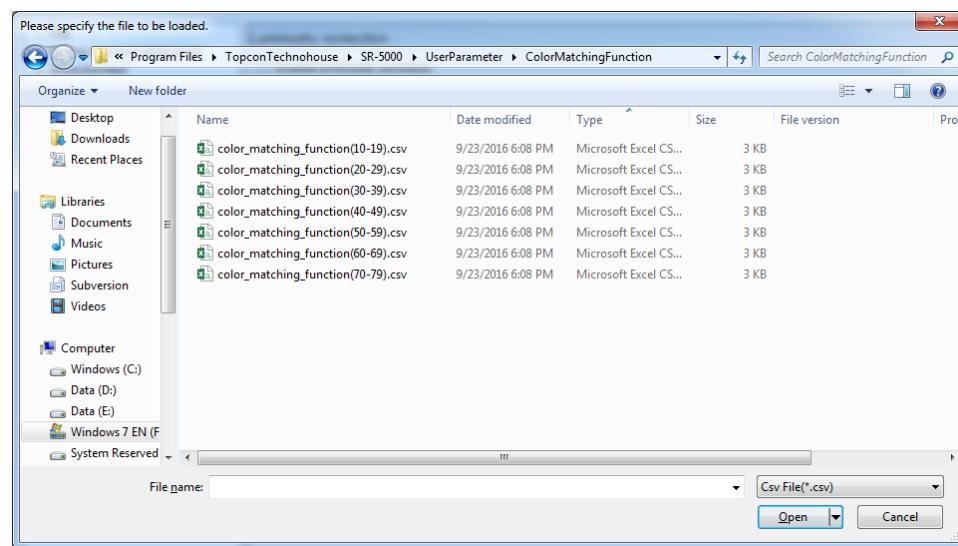
To set the luminosity factor, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Luminosity correction]. In the initial condition, nothing is displayed in [Luminosity data definition]. It is necessary to create new data or read data from CSV file. For instruction, here, Click [Read CSV file].



2. The file selection screen appears. Read the CSV file of luminosity data.

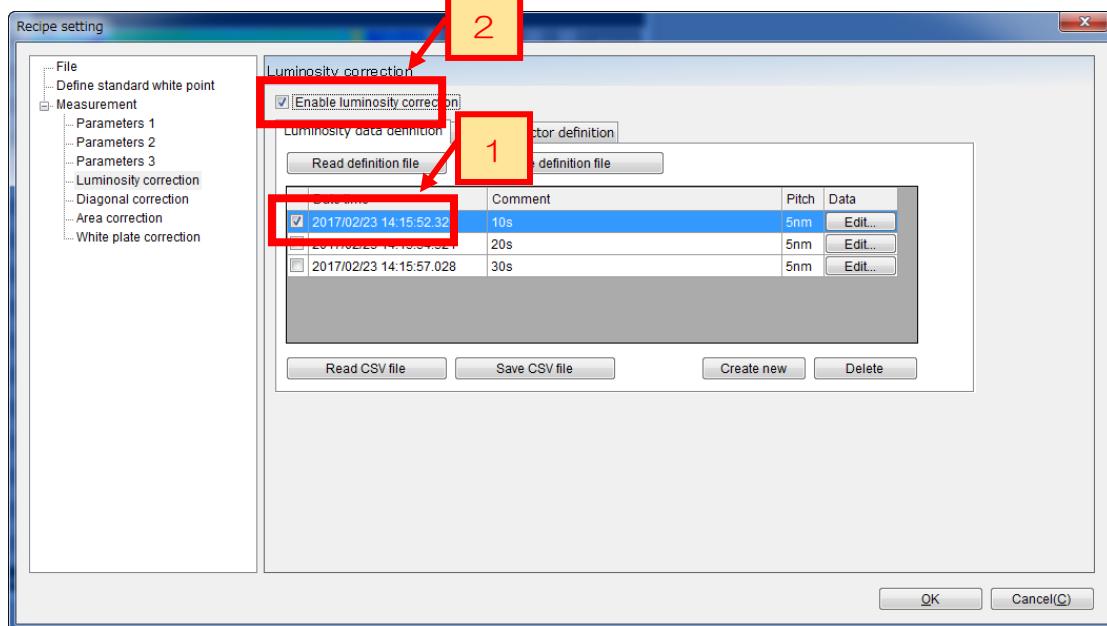
C:\Users****\TOPCON TECHNOHOUSE\SR-Series\user_parameters\color_matching_function



Memo

- By repeating the procedures of Step 1 and Step 2, it is possible to read two or more CSV files.

3. The read data is displayed in the [Luminosity data definition] list. Select one data from the list and set the check box to ON. Then, set the [Enable luminosity correction] check box to ON.



The setting items of [Luminosity correction] are described below.

[Luminosity data definition]

- [Read definition file] Reads the file saved by [Save definition file].
- [Save definition file] Saves the whole luminosity factor data as a file. Includes all definition data and the valid/invalid status.
- [Read CSV file] Reads one luminosity factor data from CSV file.
- Examples of luminosity data CSV are stored in folder below.
“C:\Users\08053\TOPCON TECHNOHOUSE\SR-Series\user_parameters\color_matching_function”
- [Save CSV file] Saves one luminosity data as CSV file.
- [Create new] Creates a new luminosity factor data.
- [Delete] Deletes one luminosity factor data.
- [Edit] Edits directly the values of one luminosity factor data on spread sheet.

The format of luminosity data CSV is below.

Luminosity data			
10s			
Pitch(nm)	5		
	X	Y	Z
380	0.001368	0.002723	0.00645
385	0.002236	0.004295	0.01055
390	0.004243	0.00673	0.02005
395	0.00765	0.01012	0.03621
...
770	0	3.31E-05	0
775	5.87E-05	2.34E-05	0
780	4.15E-05	1.65E-05	0

- ← Data header
← Comment
← Pitch of wavelength (1 or 5)
← Values for wavelength and tristimulus value

3.7.3 Setting of Luminous Coefficient

The luminous coefficient is used when luminosity factor is corrected. Use this coefficient when “ $\bar{x}(\lambda)$ ”, “ $\bar{y}(\lambda)$ ” and “ $\bar{z}(\lambda)$ ” in the formula of “3.7 Luminosity Factor Correction” is changed not by changing values directly but by multiplying them by the coefficient.

The operation is the same as the luminosity factor operation of “3.7.2 Setting of Luminosity Factor Correction”. In the same way as luminosity factor, it is possible to read data from files, save data to files, create, delete and edit data.

☞ “3.7.2 Setting of Luminosity Factor Correction”

The format of luminosity factor data CSV is below.

Luminosity factors			
factors			
Pitch(nm)		5	
		XYZ	
380	1		
385	1		
390	1		
395	1		
...	...		
770	1		
775	1		
780	1		

← Data header
← Comment
← Pitch of wavelength (1 or 5)
← Values for wavelength and tristimulus value.
If these are common for XYZ, only 1 column exists.

Luminosity factors			
factors			
Pitch(nm)	5		
	X	Y	Z
380	1	1	1
385	1	1	1
390	1	1	1
395	1	1	1
...
770	1	1	1
775	1	1	1
780	1	1	1

← Data header
← Comment
← Pitch of wavelength (1 or 5)
← Values for wavelength and tristimulus value.
If these are for each X, Y, Z 3 columns exist.

3.8 Diagonal Correction

3.8.1 Outline

This function is effective when converting the image, which has been measured at a tilting angle, to a rectangle.

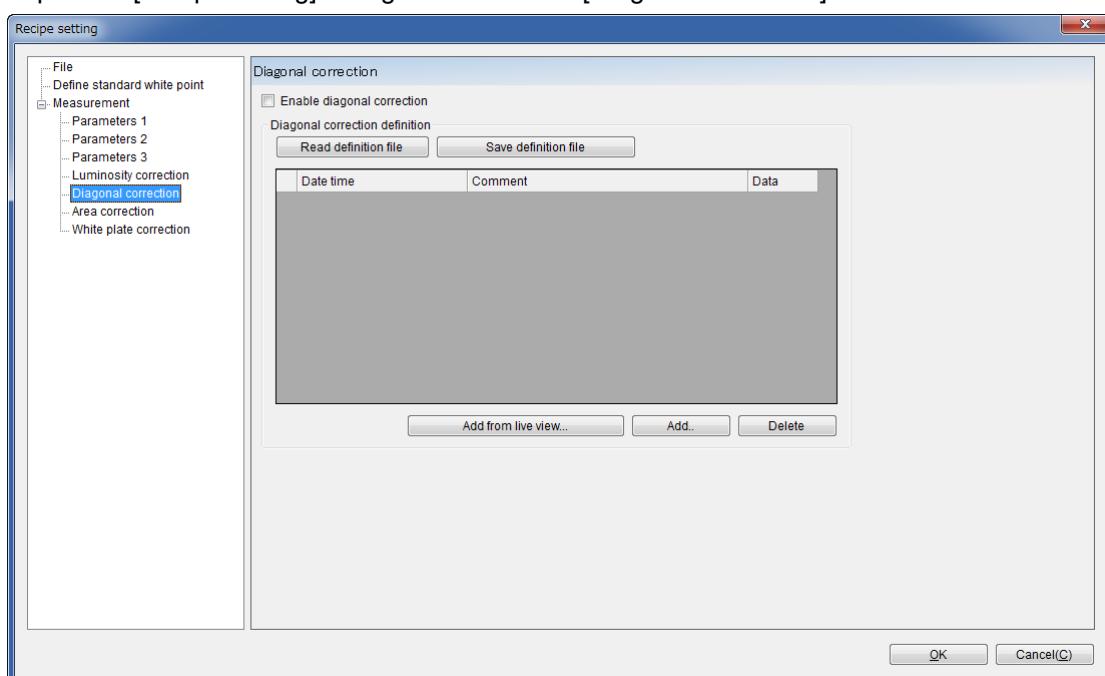
3.8.2 Setting of Diagonal Correction

Sets the selection and application of the diagonal correction file.

When there is not a diagonal correction file, create and edit it.

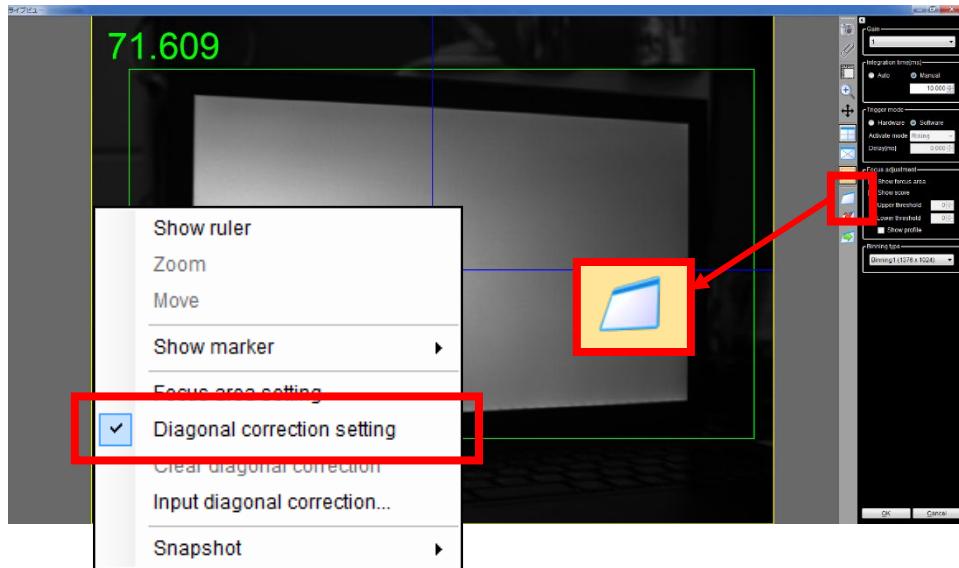
To set the diagonal correction, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Diagonal correction].

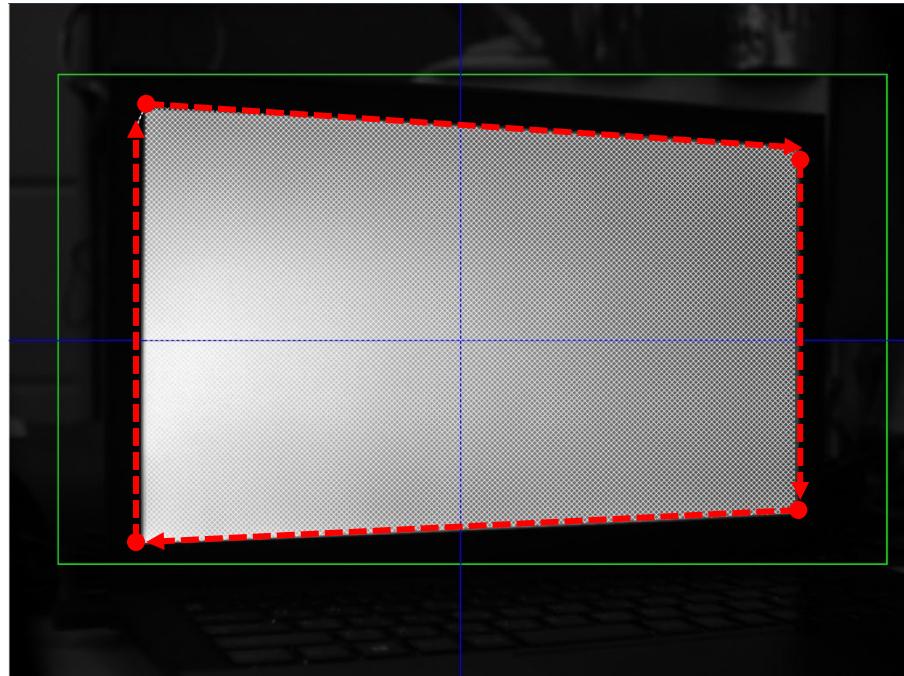


2. Open the dialog box with the [Read definition file] button, select and read the diagonal correction file. If there is not a diagonal correction file, perform editing by the procedure on and after Step 3.
3. When there is not a definition file, click the [Add from live view...] button to display the live view screen.

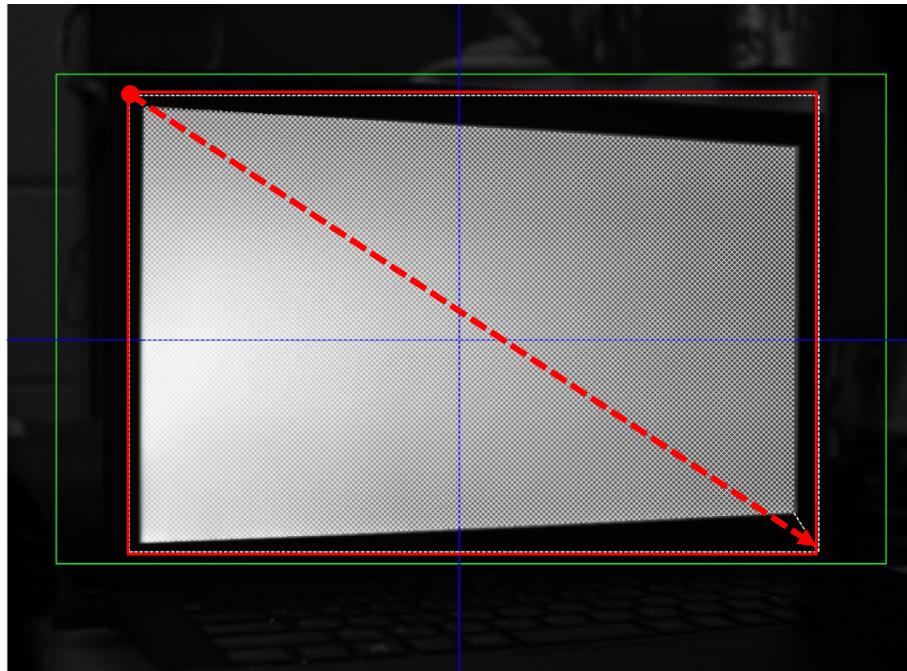
4. After the live screen appears, click [Diagonal correction setting] on the pop-up menu or the [Diagonal correction setting] icon on the tool bar at the right side on the screen to start setting of diagonal correction. When the setting of diagonal correction starts, update of the live image is suspended. The setting is carried out by using the still image captured at the start.



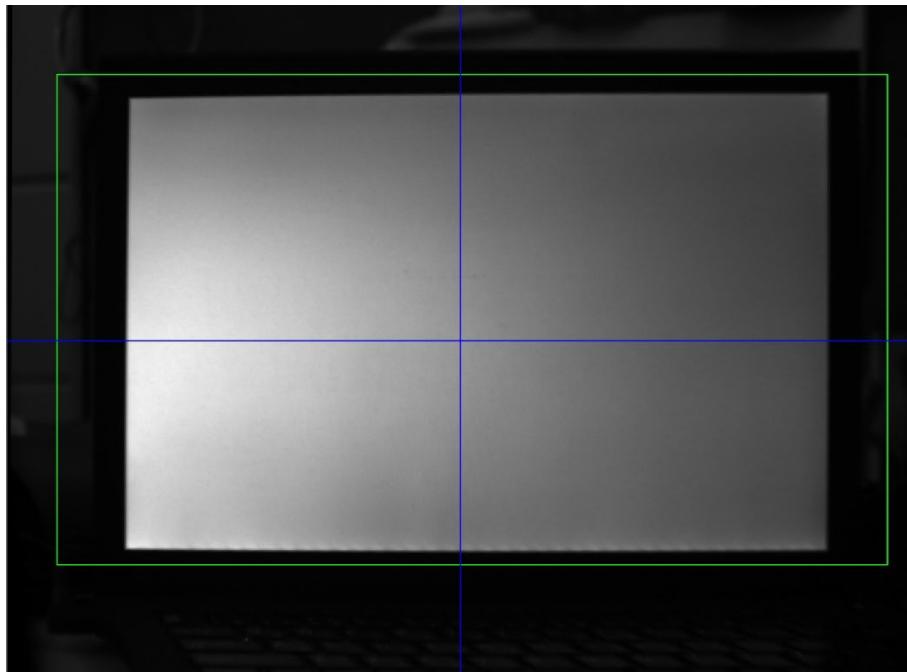
5. Specify four points of an area to be corrected diagonally by mouse. Specify points clockwise from the first point on the top left corner in turn.



6. Specify two points of a rectangular area after diagonal correction by mouse. A rectangle connecting the specified points is generated.



7. The diagonally corrected live image is displayed on the specified rectangular area.

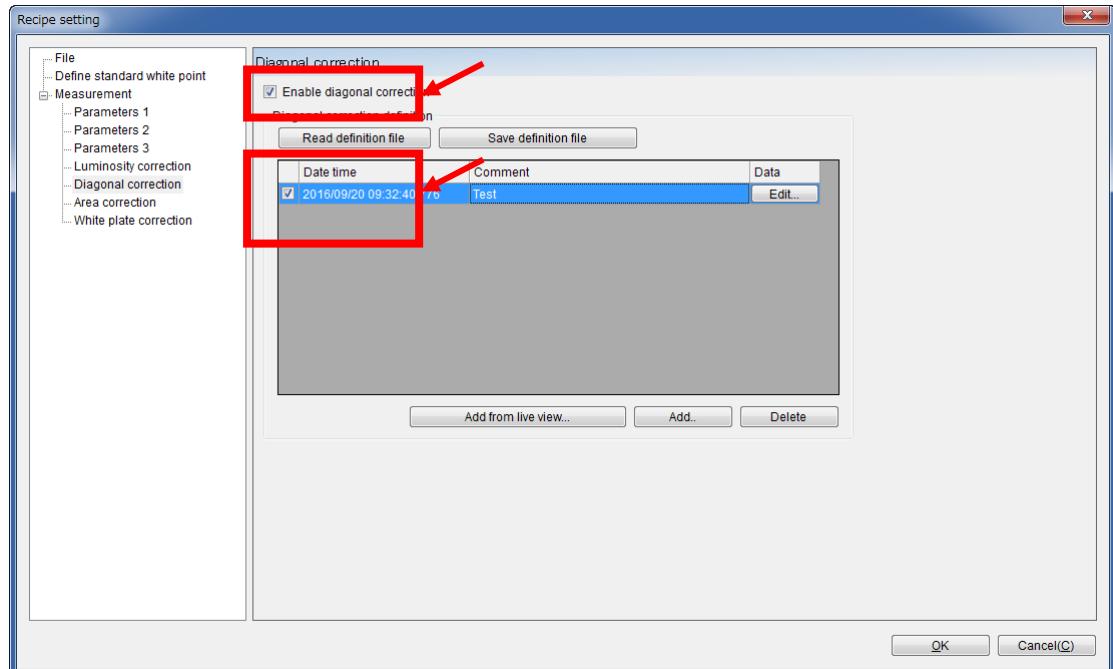


8. The setting by using a live image is completed. Clicking the [OK] button at the lower right on the screen, go back to the [Recipe setting] screen.



9. The setting is added to the list at the center of the screen. Set the check box at the left side of [Date time] to ON and the [Enable diagonal correction] check box to ON.

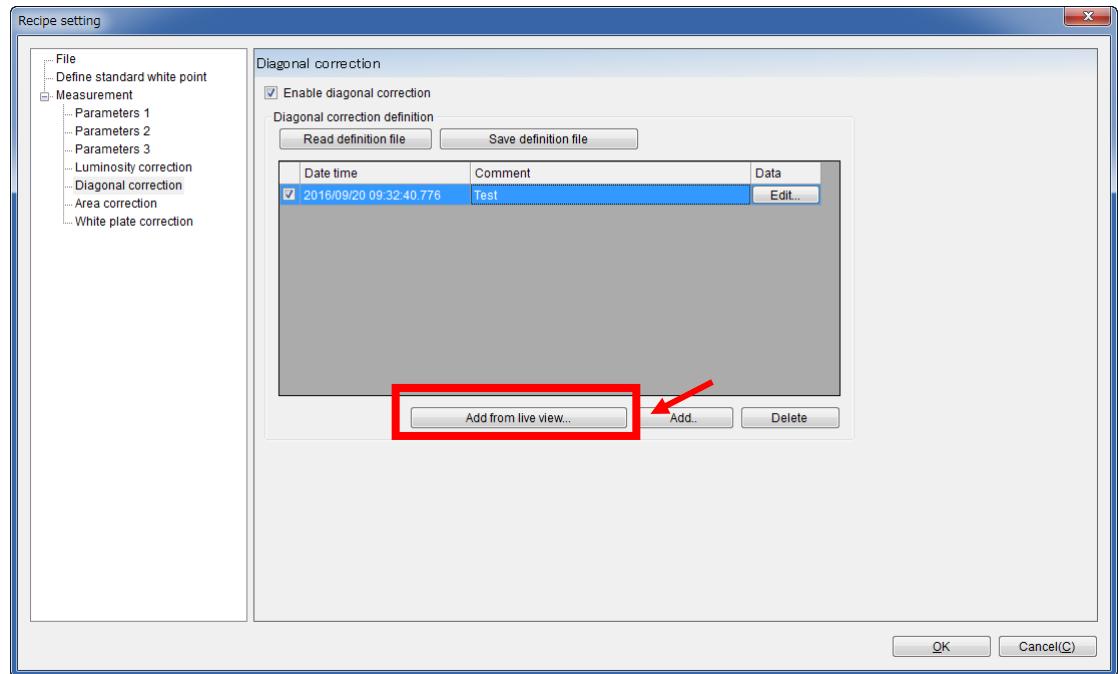
It is possible to add two or more settings to the list at the center of the screen. Select one of them and use it for measurement.



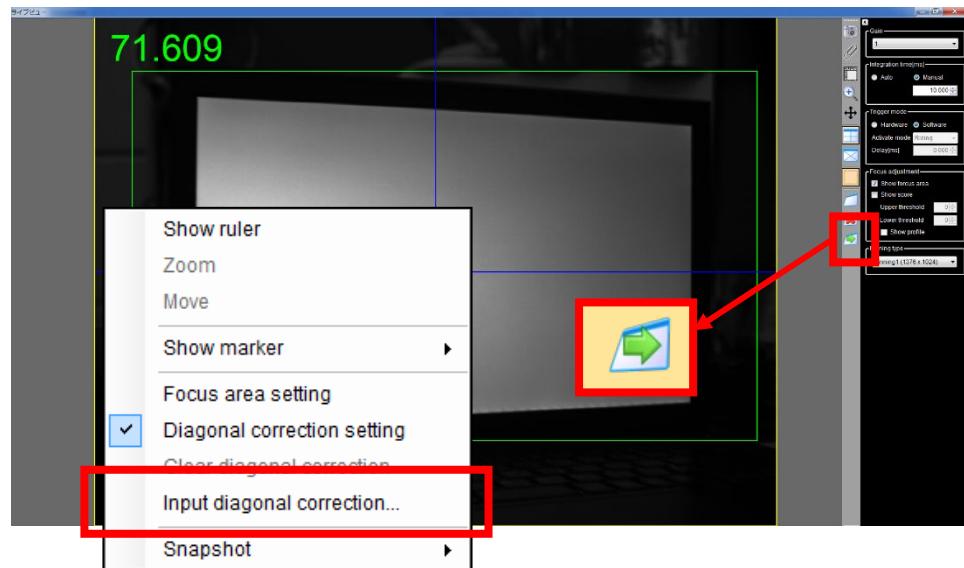
3.8.3 Input of Values for Diagonal Correction

The setting data of diagonal correction can be edited not by operating the mouse but by inputting values. Inputting values is effective when fine adjustment, which cannot be done well by mouse, is needed. To input values for diagonal correction, go through the following steps.

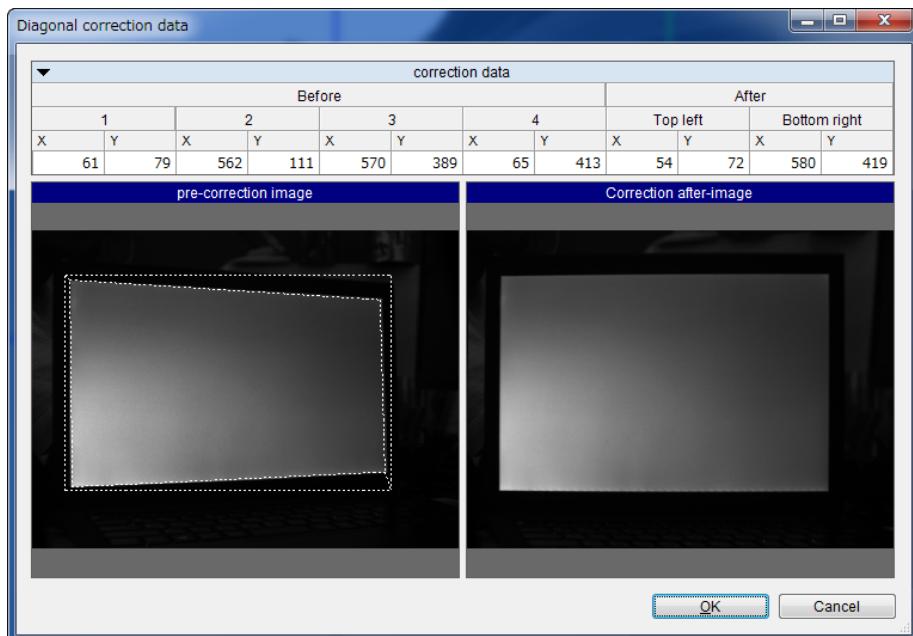
1. Open the [Recipe setting] dialog box and select [Diagonal correction].
2. Click the [Add from live view...] button to display the live view screen.



3. After the live screen appears, click [Input diagonal correction...] on the pop-up menu or the [Input diagonal correction] icon on the tool bar at the right side of the screen to start the setting of diagonal correction.



4. The [Diagonal correction data] screen appears. Edit directly the values of [Before] and [After] at the center of the screen. After editing the values, the image on [Correction after-image] is updated.



3.9 Color Correction

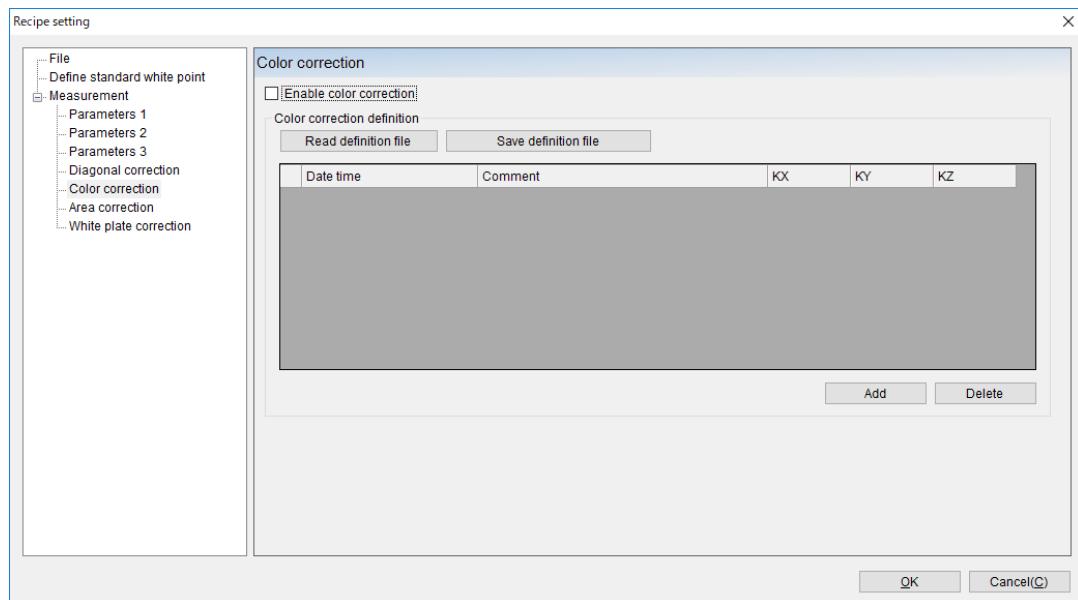
3.9.1 Outline

This function can set the coefficient of the color correction which apply to XYZ measurement result.

3.9.2 Setting of Area Correction

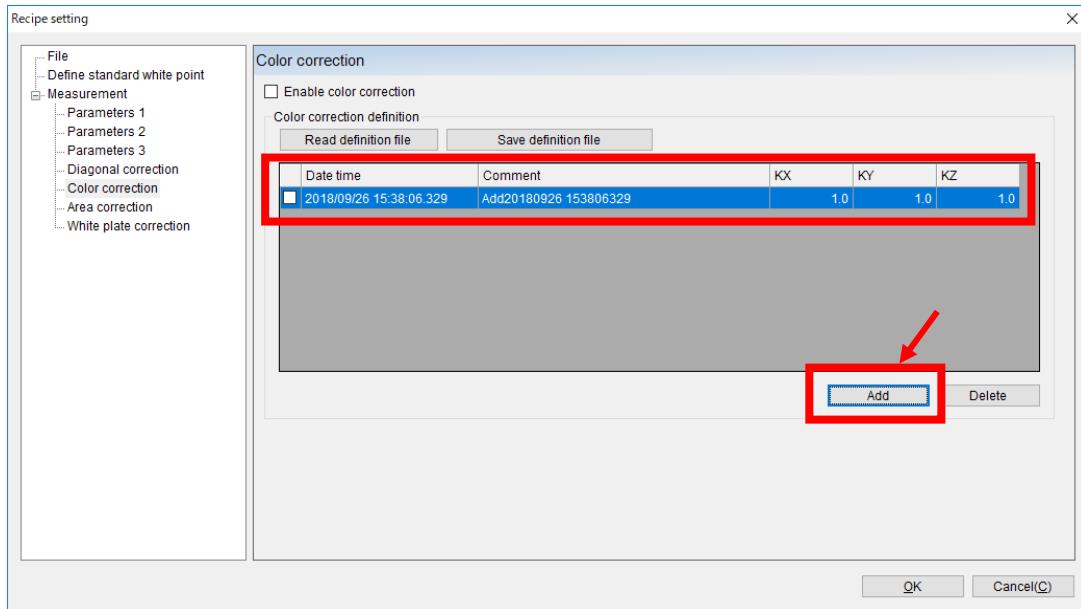
Sets the coefficient of the color correction which apply to XYZ measurement result.

1. Open the [Recipe setting] dialog box and select [Color correction].



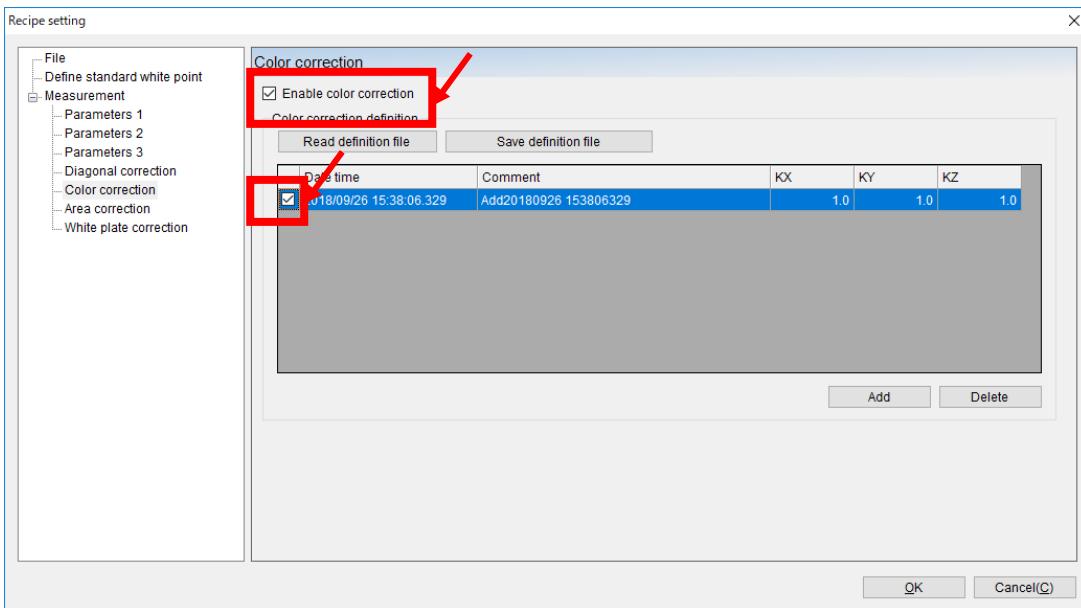
2. Open the dialog box with the [Read definition file] button, select and read the color correction file. If there is not a color correction file, editing by the procedure on and after Step 3.

3. Click the [Add] button. The setting is added to the list at the center of the screen. Set the [KX], [KY] and [KZ].



4. Set the check box at the left side of [Date time] to On and the [Enable color correction] check box to ON.

It is possible to add two or more settings. Select one or more settings which apply XYZ measurement result.



3.10 Area Correction

3.10.1 Outline

This function can split the measured image into grids and multiply the tristimulus values X, Y and Z of each split area by correction factor. Create a new area correction factor file where the correction factor is set and edit the existing area correction factor file.

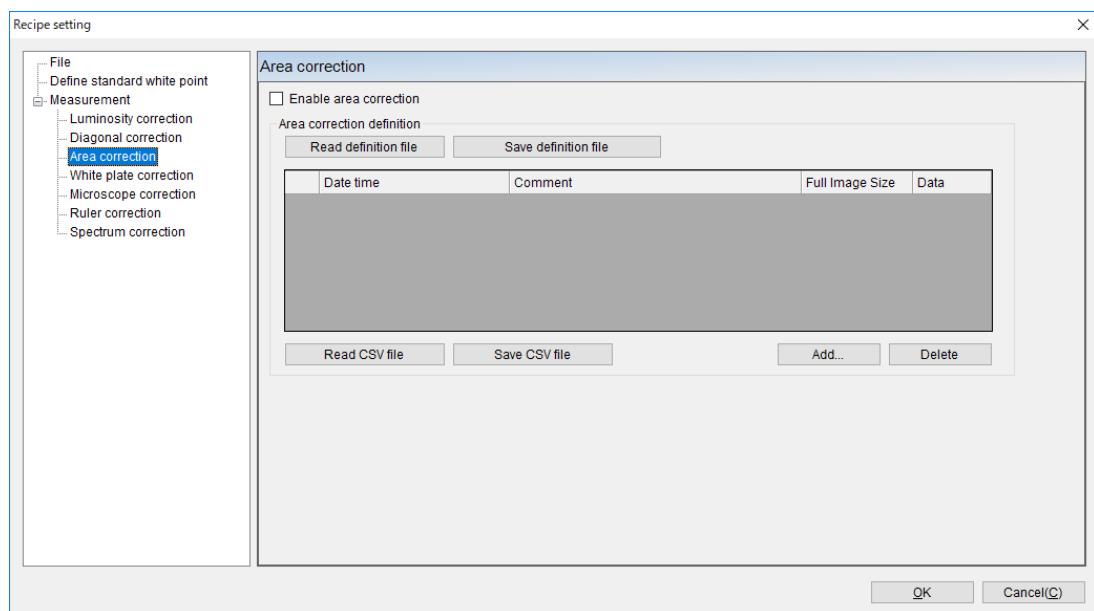
3.10.2 Setting of Area Correction

Sets the selection and application of the area correction file.

When there is not an area correction file, create and edit it.

To set area correction, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Area correction].

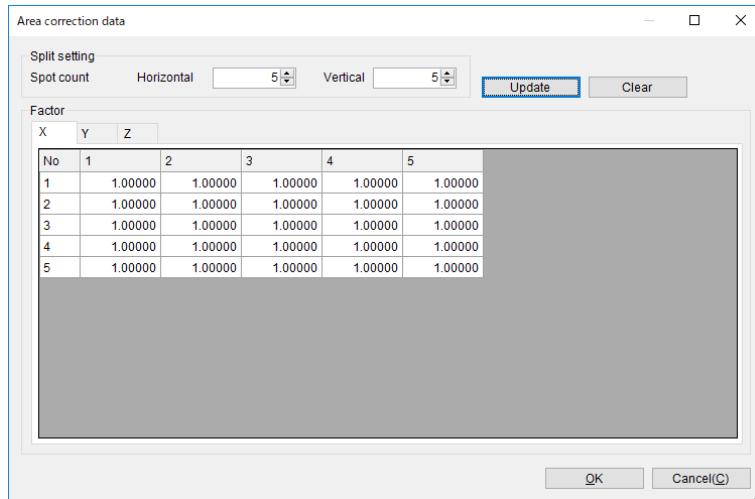


2. When there is not a correction data, open the dialog box with the [Add...] button and edit values directly.

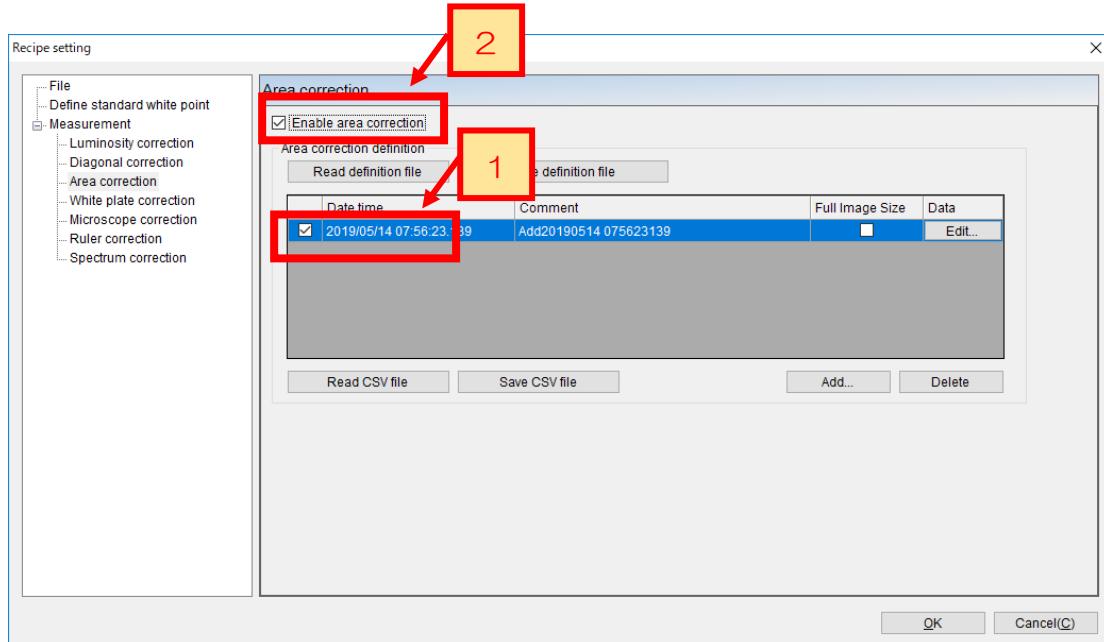
Input proper values for [Vertical] and [Horizontal] of [Spot count]. Then, click [Update].

By editing the values on the cells of spread sheet, it is possible to edit the correction factor directly.

By changing the tabs of [X], [Y] and [Z], it is possible to edit the correction factors individually for tristimulus values X, Y and Z.



3. Go back to the previous screen with [OK]. Select one data from the list and set the check box to ON. Then, set the [Enable area correction] check box to ON.

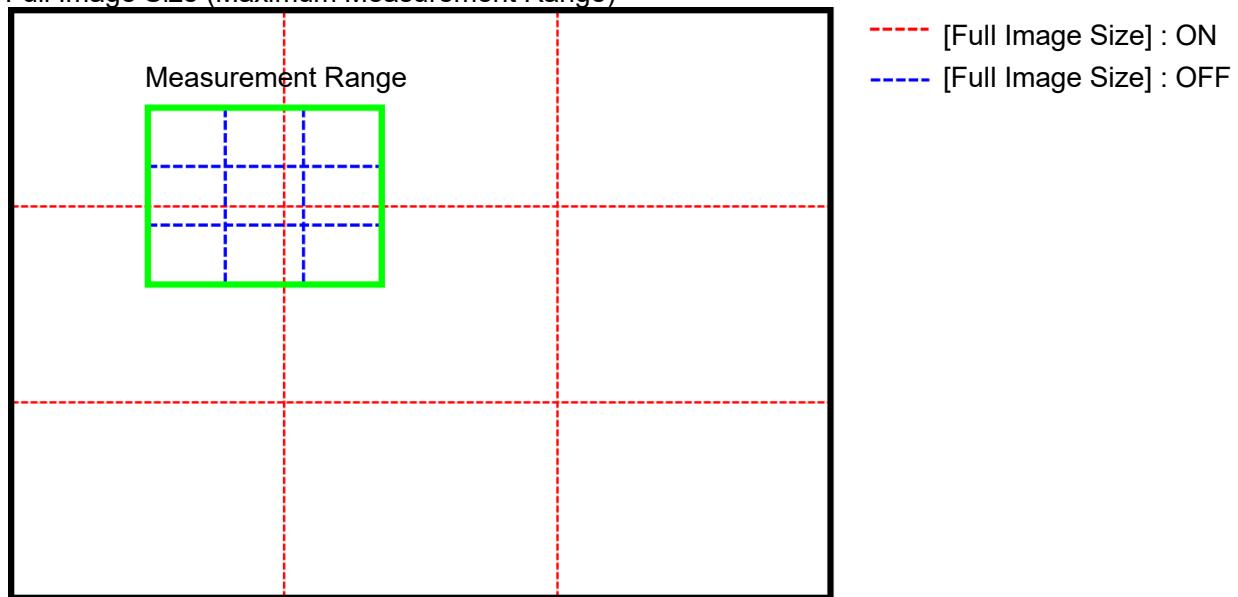


The setting items of [Area correction] are described below.

[Area correction definition]

- | | |
|------------------------|--|
| [Read definition file] | Reads the file saved by [Save definition file]. |
| [Save definition file] | Saves the whole area correction data as a file. Includes all definition data and the valid/invalid status. |
| [Read CSV file] | Reads one area correction data from CSV file. |
| [Save CSV file] | Saves one area correction data as CSV file. |
| [Add] | Creates a new area correction data. |
| [Delete] | Deletes one area correction data. |
| [Edit] | Edits directly the values of one area correction data on spread sheet. |
| [Full Image Size] | If this check box is set to ON, correction areas are defined in not Measurement Range but full image size (maximum Measurement Range). |

Full Image Size (Maximum Measurement Range)



3.11 White Plate Correction

3.11.1 Outline

Sets the light source data which is applied to calculate the object color.

When you use white plate image, it is necessary to measure a white plate by the normal method and save the data in advance. When you use white point data, white plate image is not necessary.

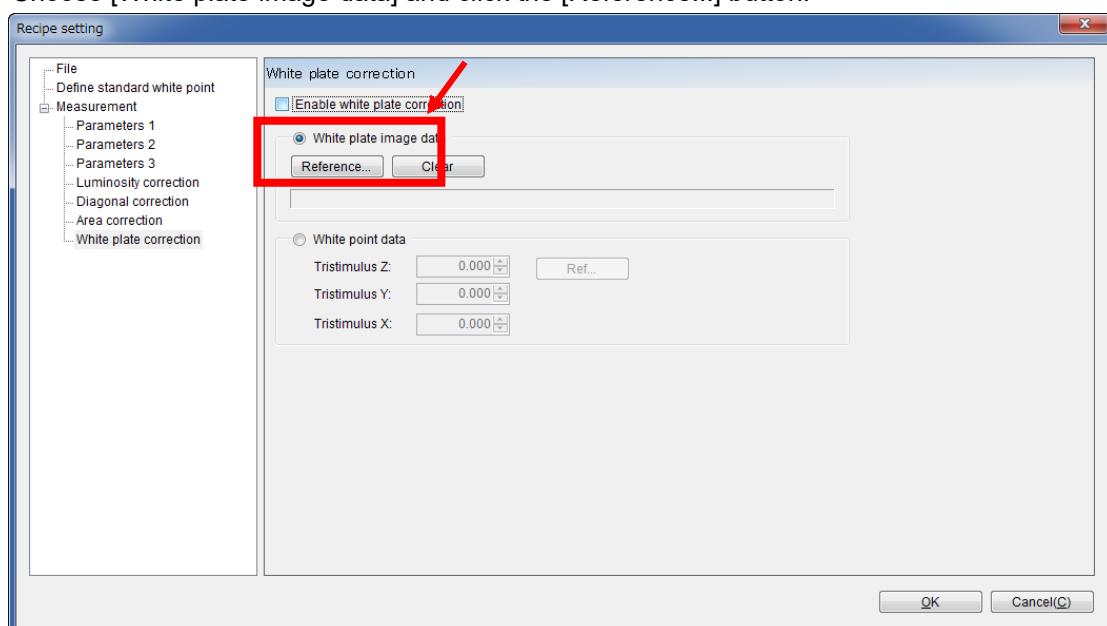
3.11.2 Setting of White Plate Correction

Sets the selection and application of the white plate correction file.

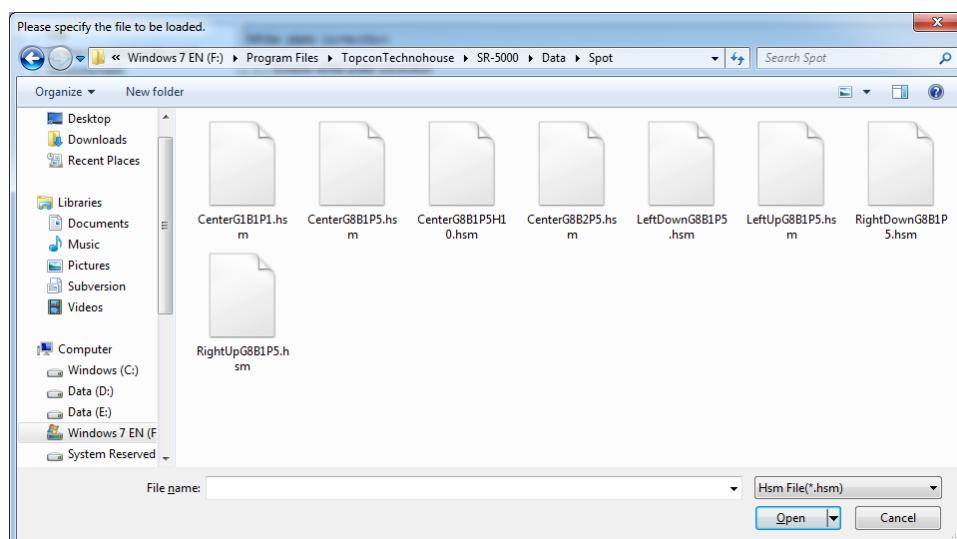
When there is not a white plate correction file, create it.

To set white plate correction, go through the following steps.

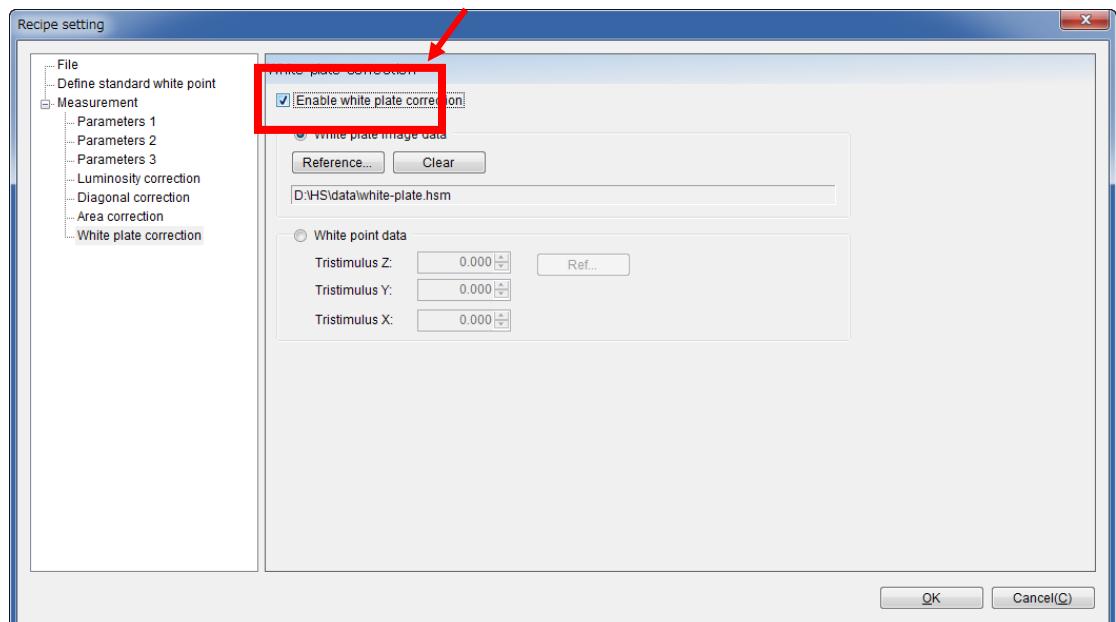
1. Open the [Recipe setting] dialog box and select [White plate correction].
2. Choose [White plate image data] and click the [Reference...] button.



3. Select the measurement result of the white plate which has been measured in advance.



4. The file path of the white plate data is displayed in the edit box at the center of the screen.
Set the [Enable white plate correction] check box to ON.

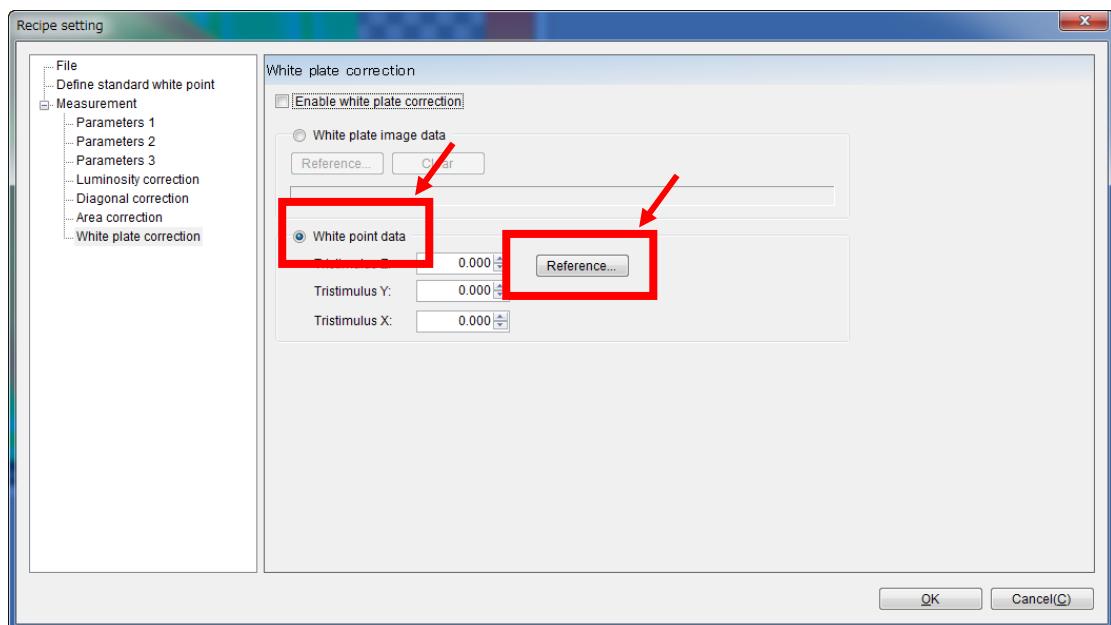


3.11.3 Setting of White Plate Correction (White Point)

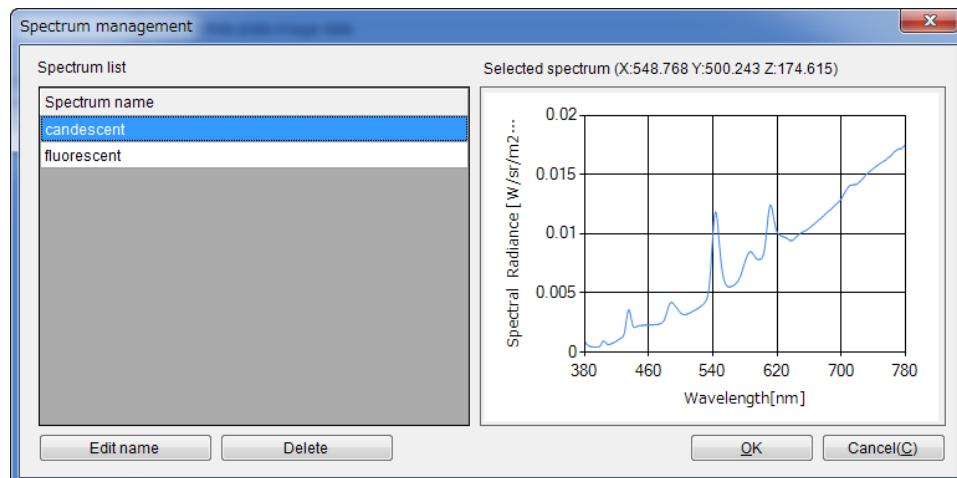
Sets the application of the white point correction data.

To set white plate correction, go through the following steps.

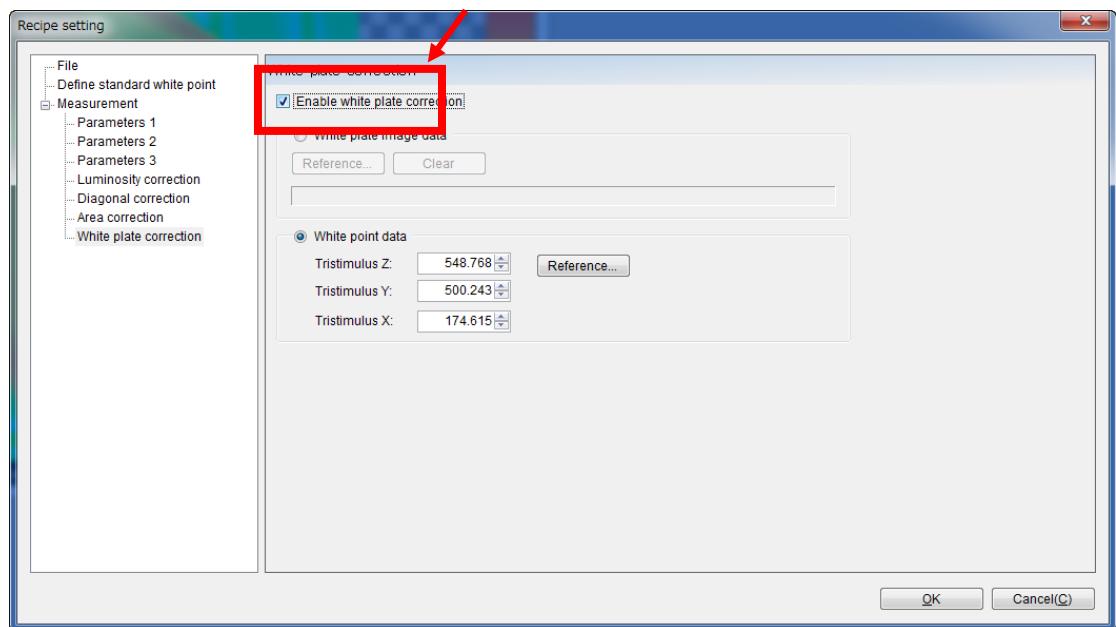
1. Open the [Recipe setting] dialog box and select [White plate correction].
2. Choose [White point data] and click the [Reference...] button. Or can directly input into Tristimulus X/Y/Z edit box.



3. [Spectrum management] screen appers. Select the spectrum which has been measured and registered in advance.



4. The white point data is updated in the edit box at the center of the screen. Set the [Enable white plate correction] check box to ON.



3.12 Microscope Correction

3.12.1 Outline

Sets microscope correction condition which is applied when measuring with your microscope.

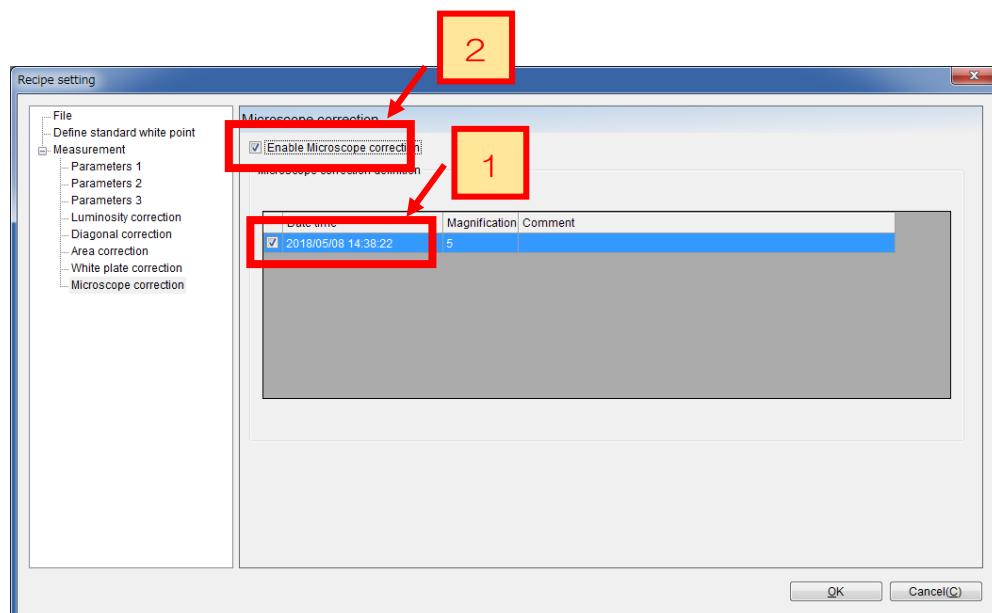
It is necessary to create correction value with Microscope Corrector in advance.

 Note	This function does not support XYZ measurement.
--	---

3.12.2 Setting of Microscope Correction

Sets the microscope correction.

- Available microscope correction values are displayed in the [Microscope correction definition] list. Select a value from the list and set check box to ON. Then set the [Enable microscope correction] check box to ON.



- Microscope correction values are saved in following directory. To use microscope correction values on another PC, clone the 「user_parameters」 folder.

C:\Users****\TOPCON TECHNOHOUSE\SR-Series\user_parameters

3.13 Ruler Correction

3.13.1 Outline

Sets ruler correction condition.

In the ruler correction, set the numerical values (pixel number or the “mm” size equivalent to the pixel number) of the show ruler.



When ruler correction is performed, it affects all [mm] dimensions, area calculation of measurement spots, and so on.

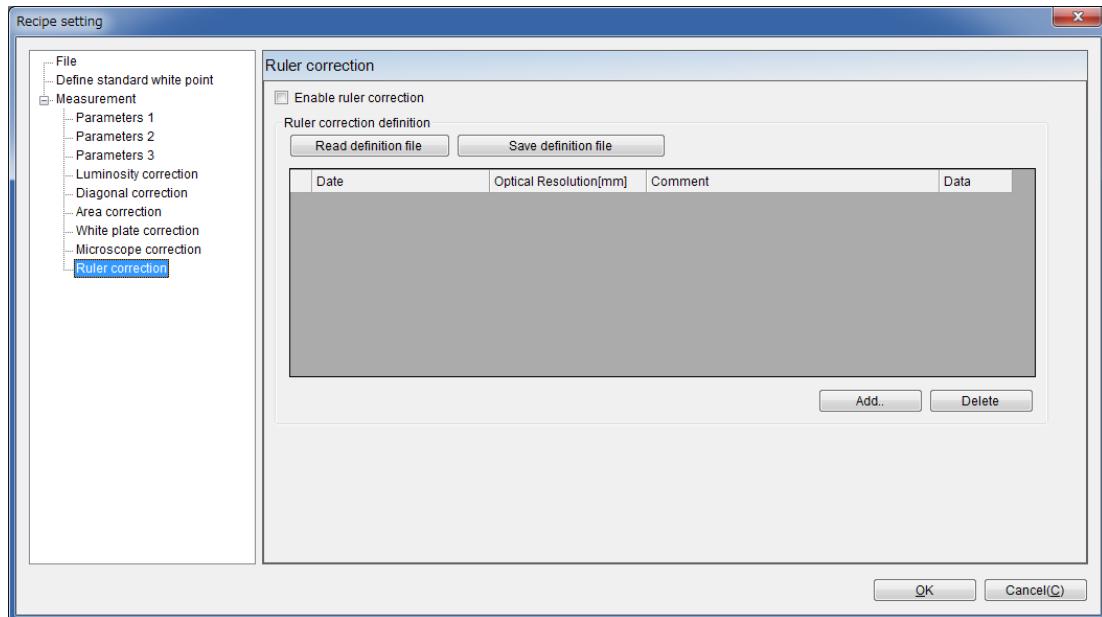
3.13.2 Setting of Ruler Correction

Sets the selection and application of the ruler correction file.

When there is not a ruler correction file, create and edit it.

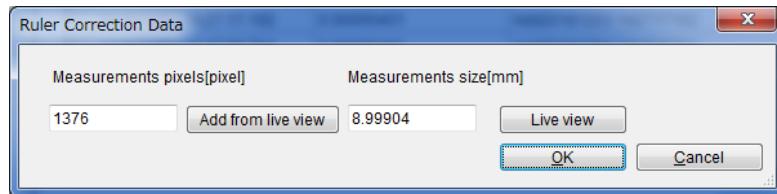
To set the ruler correction, go through the following steps.

1. Open the [Recipe setting] dialog box and select [Ruler correction].

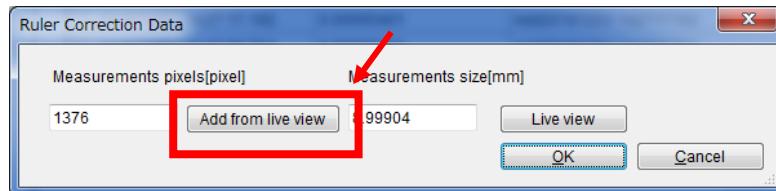


2. Open the dialog box with the [Read definition file] button, select and read the ruler correction file. If there is not a ruler correction file, perform editing by the procedure on and after Step 3.
3. When there is not a definition file, click the [Add...] button.

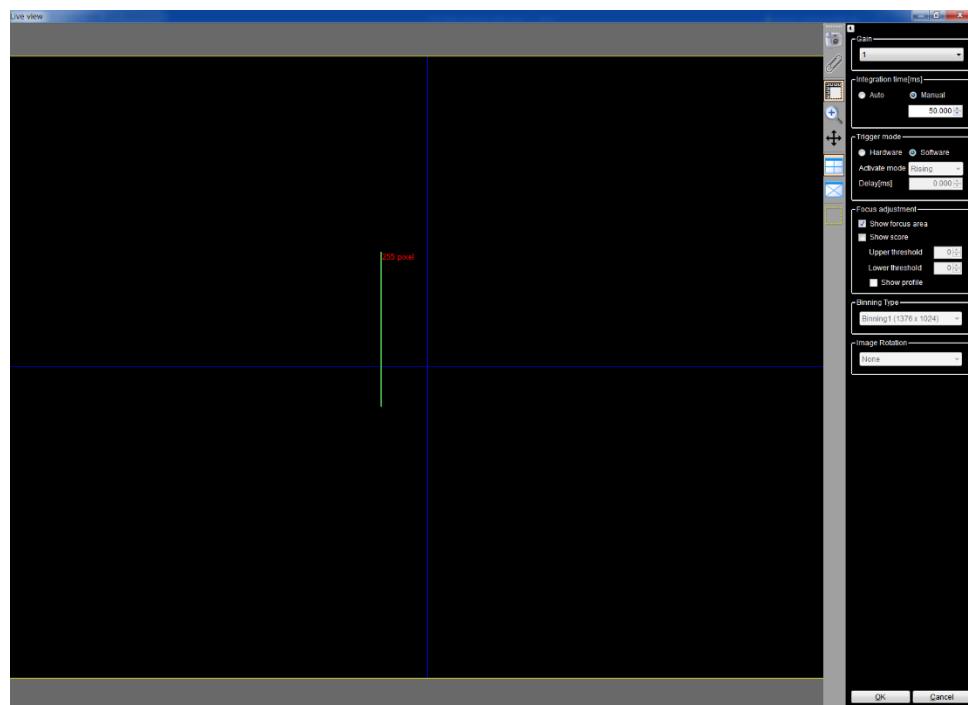
4. The [Ruler correction data] screen appears. Edit directly the values of [Measurements pixels[pixel]] and [Measurements size[mm]].



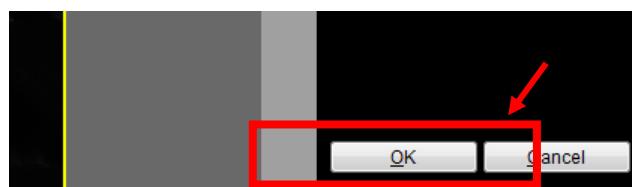
5. Click the [Add from live view] button to display the live view screen.



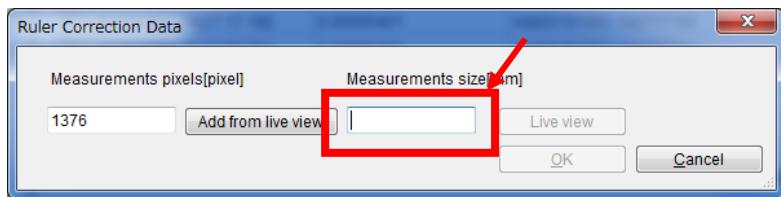
6. When the live screen is displayed, specify two points with the mouse.



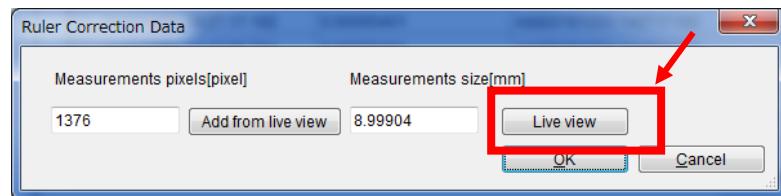
7. The setting by using a live image is completed. Clicking the [OK] button at the lower right on the screen, go back to the [Ruler correction data] screen.



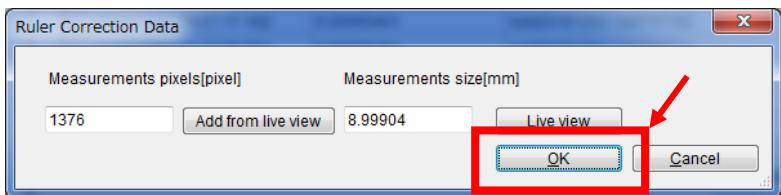
8. The [Measurement pixel [pixel]] is reflected on the screen [Ruler Correction Data]. Edit directly the values of [Measurement size [mm]].



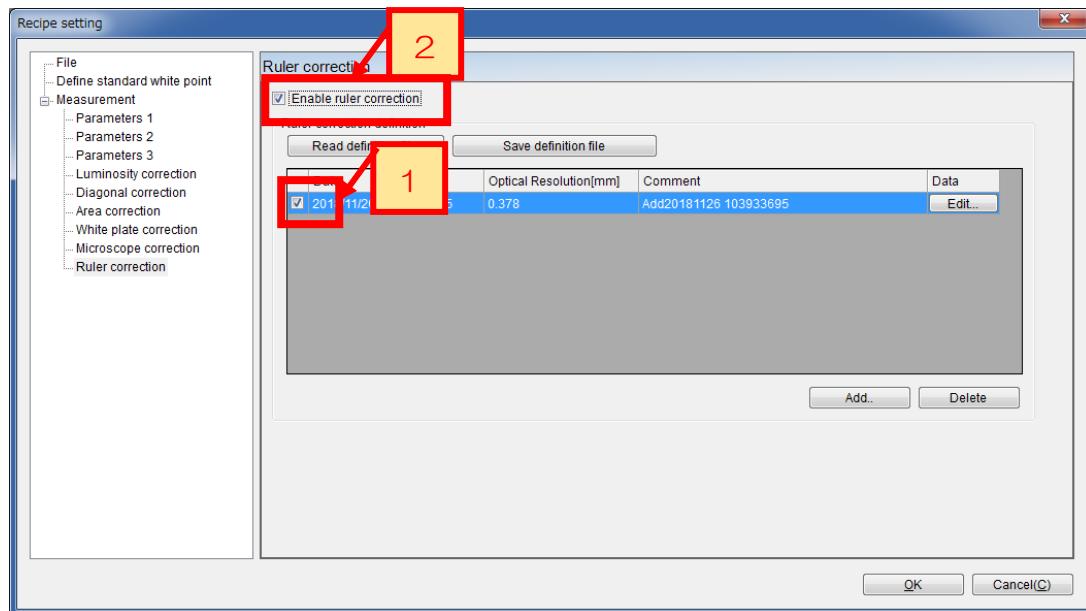
9. Click the [Live view] button to display the live view screen. You can check the setting.



10. Clicking the [OK] button at the lower right on the screen, go back to the [Recipe setting] screen.



11. The setting is added to the list at the center of the screen. Set the check box at the left side of [Date time] to ON and the [Enable ruler correction] check box to ON.



12. The edited data can be saved by [Save definition file]. Specify the file name and save the file with the [Save definition file] button. The definition file saved here can be read by the procedure of Step 2.

3.14 Spectrum Correction

3.14.1 Outline

Spectral radiance is corrected by below equation.

$$S'(\lambda) = V_1(\lambda) \cdot S(\lambda - V_3(\lambda)) + V_2(\lambda)$$

$S'(\lambda)$: Spectral radiance after correction

$S(\lambda)$: Spectral radiance before correction

$V_1(\lambda), V_2(\lambda), V_3(\lambda)$: Correction values



Note

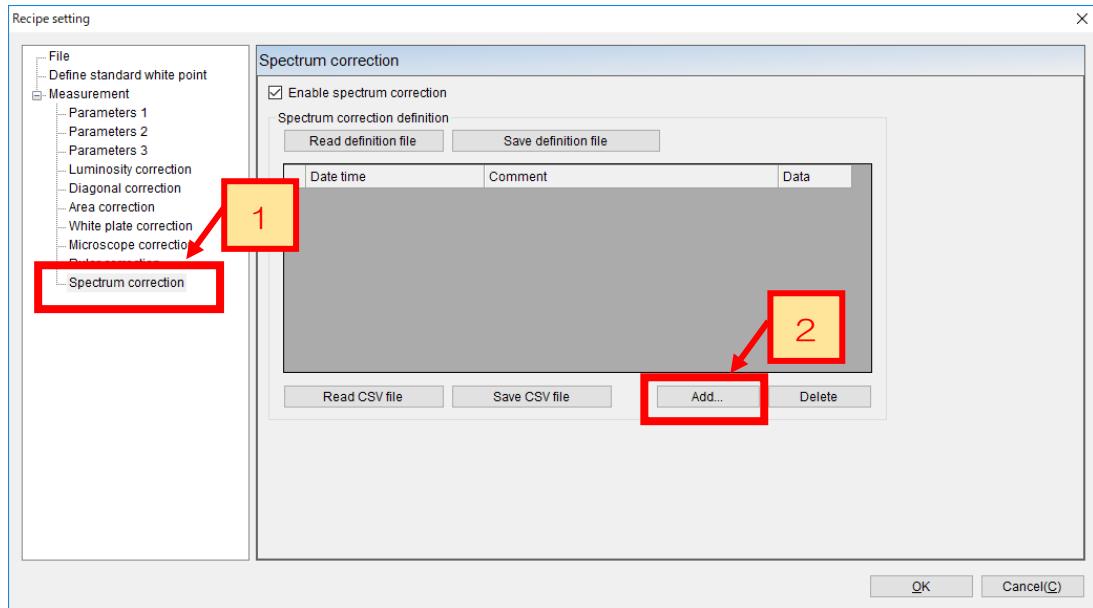
This function does not support XYZ measurement.

3.14.2 Setting of Spectrum Correction

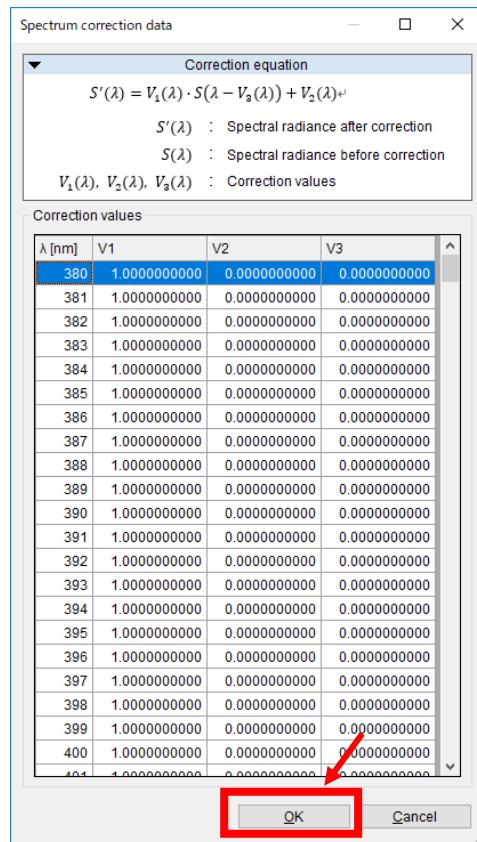
Sets the spectrum correction.

To set the spectrum correction, go through the following steps.

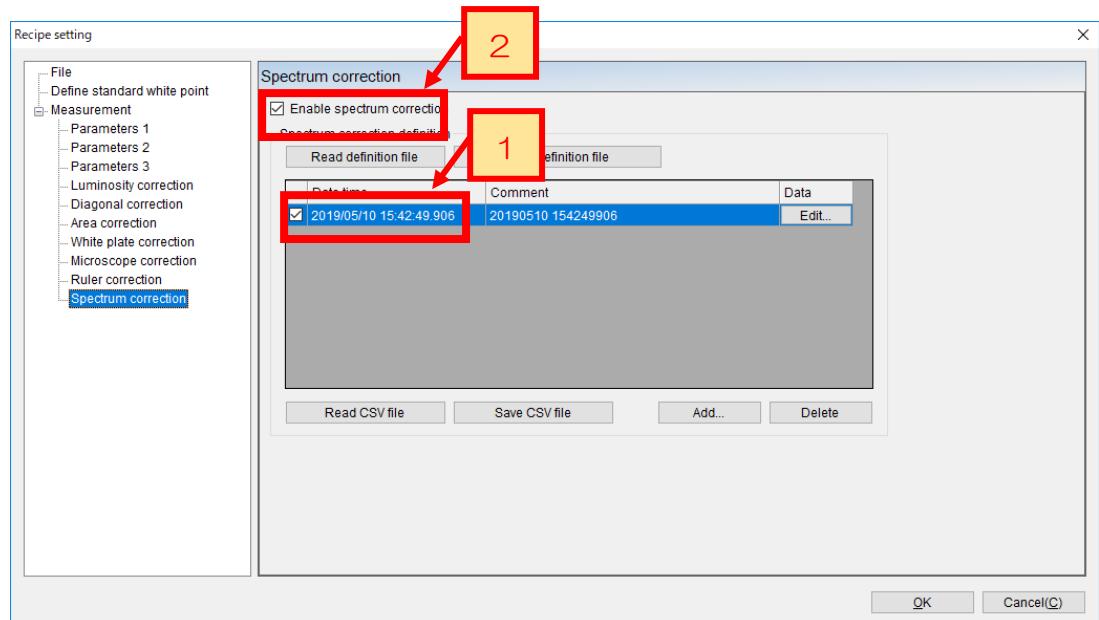
1. Open the [Recipe setting] dialog box and select [Spectrum correction]. Then click [Add...] button.



2. [Spectrum correction data] dialog box appears. Edit correction values. Go back to the previous screen with [OK] button.



3. Set a check box in [Spectrum correction definition] list to ON. Then, set the [Enable spectrum correction] check box to ON.



The setting items of [Spectrum correction] are described below.

[Spectrum correction definition]

- [Read definition file] Reads the file saved by [Save definition file].
- [Save definition file] Saves the whole spectrum correction data as a file. Includes all definition data and the valid/invalid status.
- [Read CSV file] Reads one spectrum correction data from CSV file.
- [Save CSV file] Saves one spectrum correction data as CSV file.
- [Create new] Creates a new spectrum correction data.
- [Delete] Deletes one spectrum correction data.
- [Edit] Edits directly the values of one spectrum correction data on spread sheet.

The format of spectrum correction data CSV is below.

Spectrum correction data			
comment			
	V1	V2	V3
380	1.00000	0.00000	0.00000
381	1.00000	0.00000	0.00000
382	1.00000	0.00000	0.00000
...
779	1.00000	0.00000	0.00000
780	1.00000	0.00000	0.00000

3.15 Application Common Setting

3.15.1 Outline

Sets various settings commonly used in this software.

The setting contents do not affect the recipe type or the measurement target.

To open [Application setting], go through the following steps.

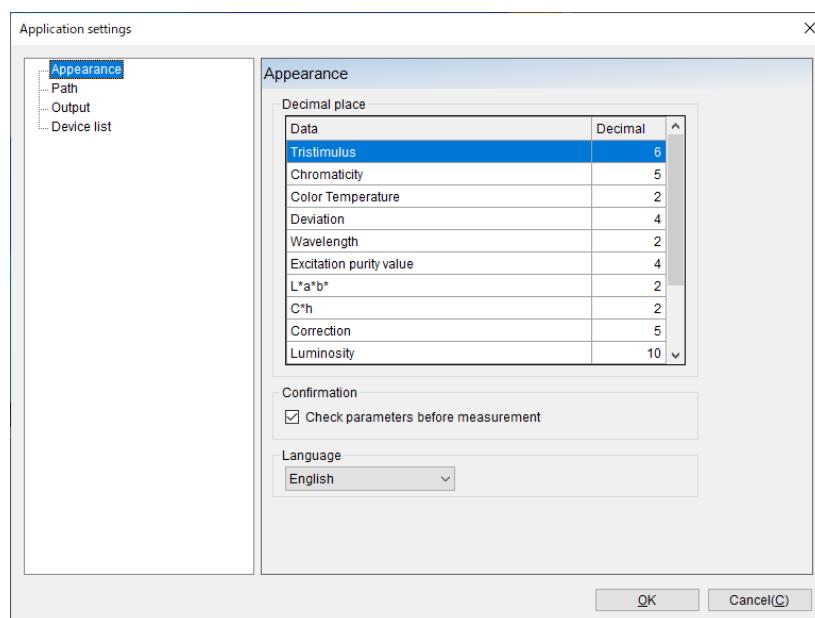
1. Select [Setting] - [Application setting] or press the [F10] key or click the  icon on the menu bar.

2. The [Application setting] dialog box will open.

All of the following buttons displayed on the [Application setting] dialog box has the same functions.

[OK] Enables the setting and closes this screen.

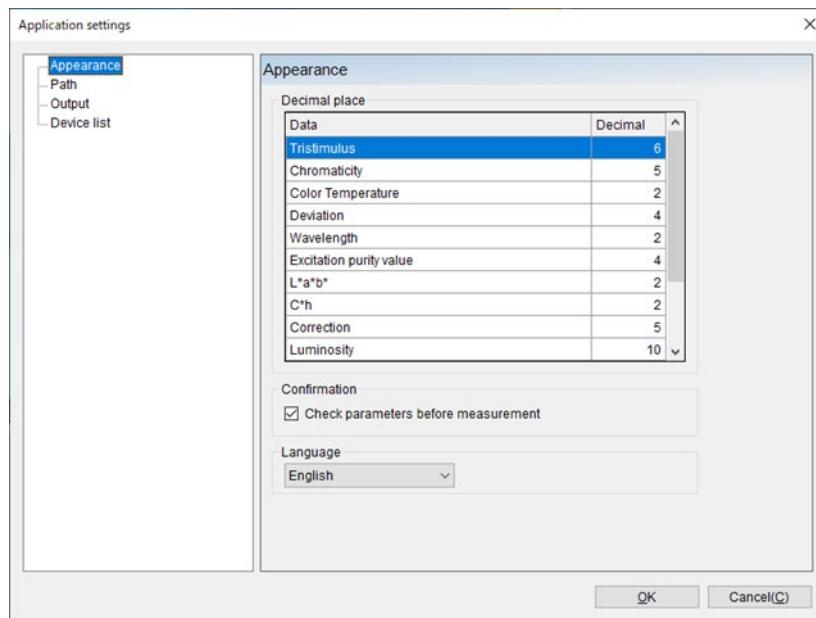
[Cancel] Disables the setting and closes this screen.



3.15.2 Set Display

To perform the setting of display, go through the following steps.

Open the [Application setting] dialog. Select [Appearance].



3.15.2.1 Displayed Decimal Digits

Sets the decimal place of the measurement data values displayed on the cells of each data sheet. This setting affects the data sheet and the output CSV file. Graphs and various property dialogs are not affected.

The setting range is shown below.

Data	Setting range
Tristimulus value	0 - 6 (Default: 6)
Chromaticity	1 - 5 (Default: 5)
Color temperature	0 - 2 (Default: 2)
Deviation	1 - 4 (Default: 4)
Dominant wavelength	0 - 2 (Default: 2)
Excitation purity	1 - 4 (Default: 4)
L*a*b*	0 - 2 (Default: 2)
C*h	0 - 2 (Default: 2)
Correction	0 - 8 (Default: 5)
Luminosity	0 - 10 (Default: 10)
Spot Stdev	1 - 6 (Default: 6)
Spot Stdev / Avg	1 - 6 (Default: 6)
Spot Max / Min	1 - 6 (Default: 6)

**Note**

To ensure the reliability of the measurement data, the number of digits displayed in this software is up to 7 digits, including the digits after the decimal point. Therefore, the number of digits after the decimal point set by [Decimal place] may not be displayed depending on the measurement data.

Example: When 6 digits are set in the [Decimal place]

- When the measurement data is less than 10: 7 digits in total (1 integer digit and 6 decimal digits) are displayed.

1.234567

- When the measurement data equals or is higher than 10: 7 digits in total (2 integer digits and 5 decimal digits) are displayed.

12.34567

- When the measurement data equals or is higher than 100: 7 digits in total (3 integer digits and 4 decimal digits) are displayed.

123.4567

When 3 digits are set in [Decimal place]

- When the measurement data is less than 10: 4 digits in total (1 integer digit and 3 decimal digits) are displayed.

1.234

- When the measurement data equals or is higher than 10: 5 digits in total (2 integer digits and 3 decimal digits) are displayed.

12.345

- When the measurement data equals or is higher than 100: 6 digits in total (3 integer digits and 3 decimal digits) are displayed.

123.456

3.15.2.2 Confirmation Message

Sets ON/OFF for [Check parameters before measurement].

When OFF is set, the check screen is not displayed before starting measurement. Measurement start at once.

3.15.2.3 Language

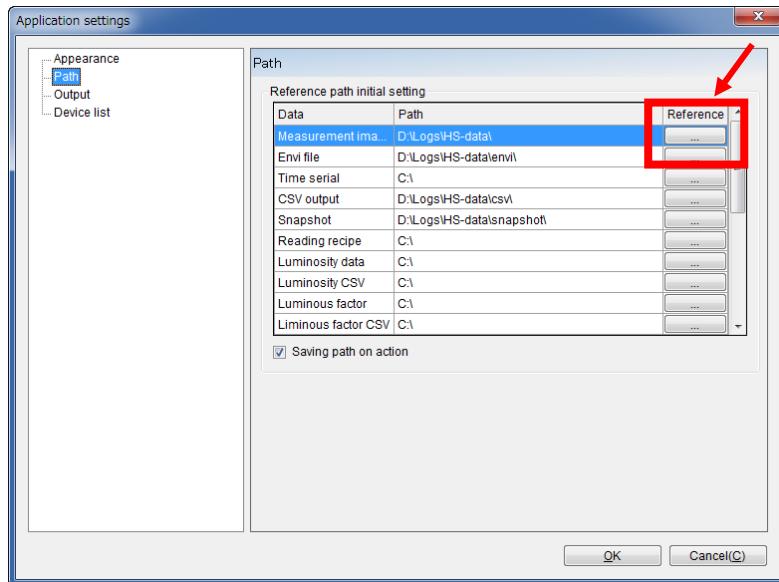
Selects language of application software. [Japanese] and [English] are available.

3.15.3 Path Setting

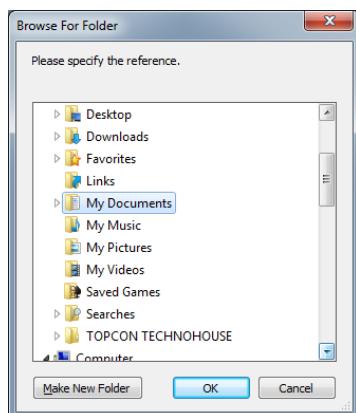
In various operations, the file or folder places are sometimes specified. In such a case, set which folder will be displayed as the initial condition.

To set the path, go through the following steps.

1. Open the [Application setting] dialog box and select [Path].
2. Click the [...] button displayed on the [Reference] column.



3. The [Folders] screen appears. Select an optional folder.



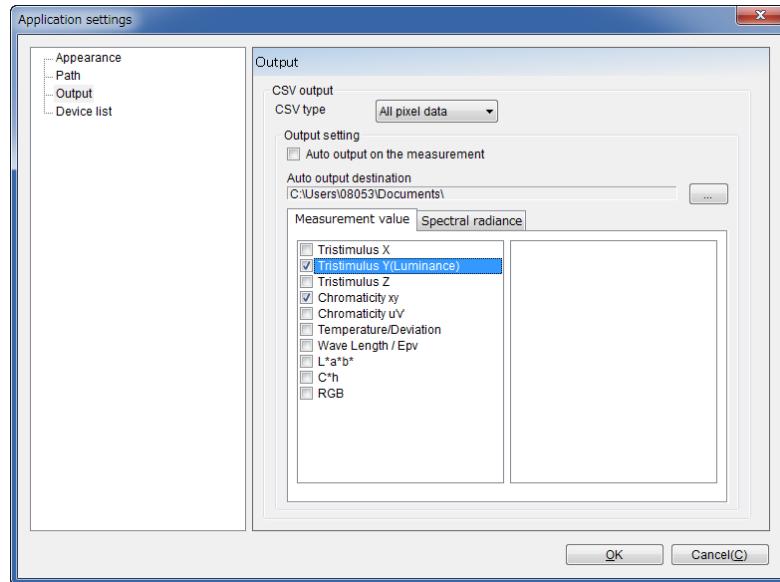
Memo

When setting the [Saving path on action] check box to ON, the path is updated for each operation and it is not necessary to change the setting at every operation time.

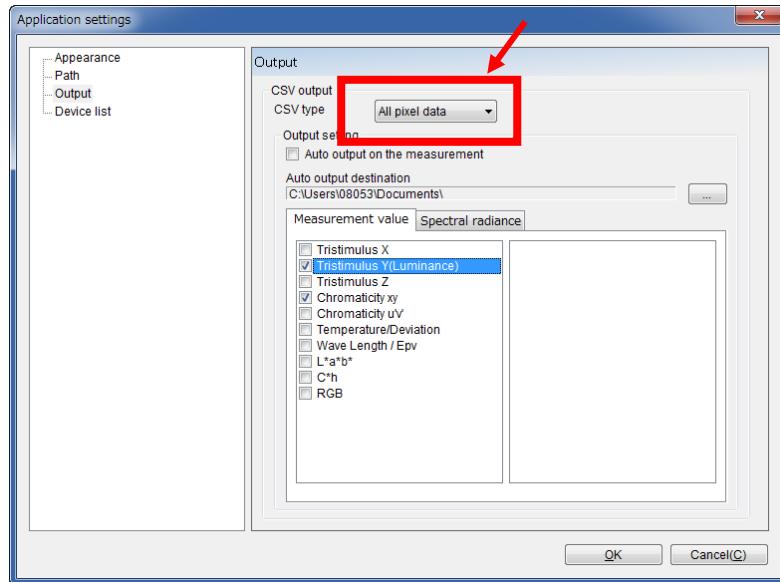
3.15.4 Output Setting

Sets the items to be output when outputting the measurement data by CSV format. Set the CSV output items for each file to be output. To set the output items for the operation by selecting [Popup menu] - [CSV output] in each view, go through the following steps.

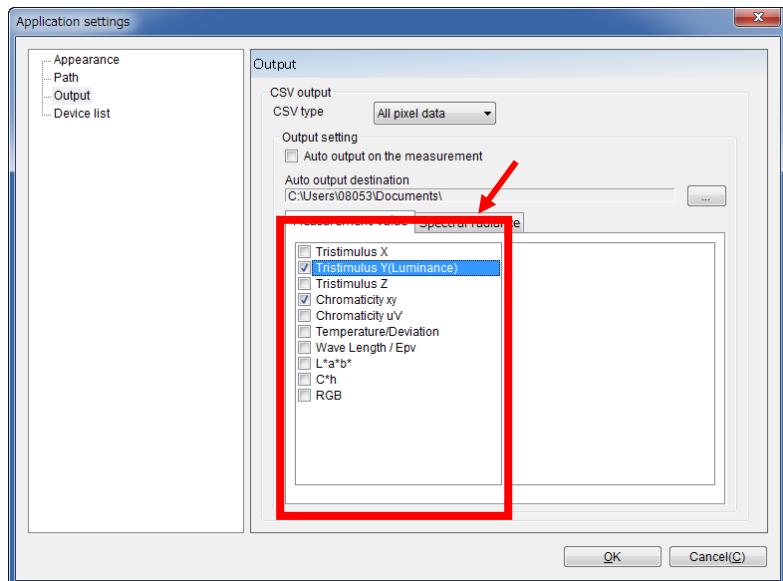
1. Open the [Application setting] dialog box and select [Output].



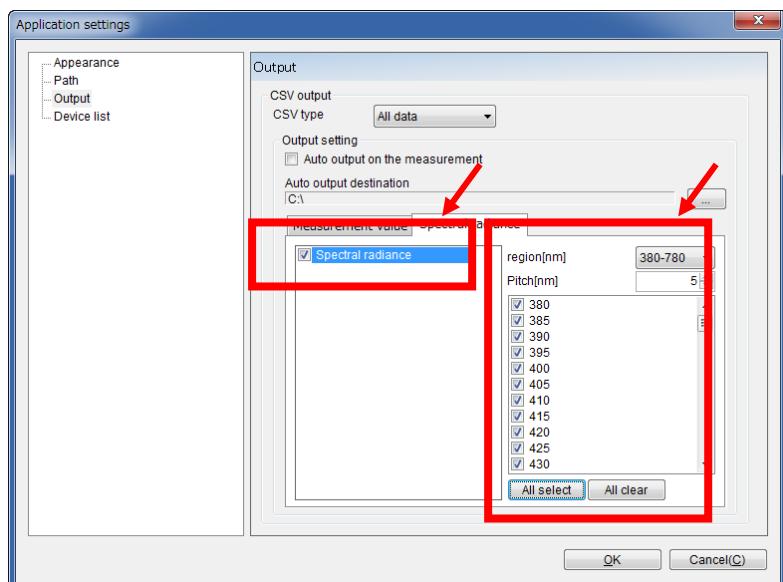
2. Select a type from the [CSV type] pull-down menu. For example, select [All pixel data].



3. Select the [Measurement value] tab. Select the necessary data items.



4. Select the [Spectral radiance] tab and then select the [Spectral radiance] check box. Next, select the necessary wavelength range.



Memo

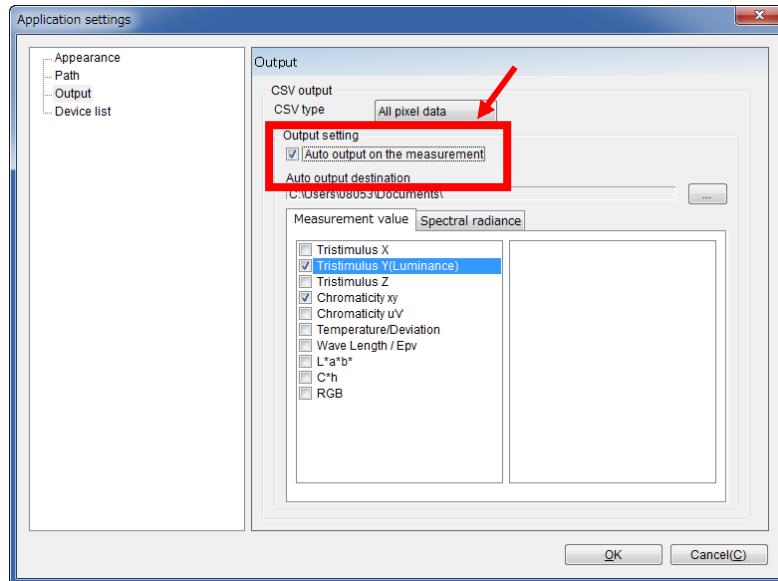
It is possible to perform the CSV output automatically during measurement. Set the [Auto output on the measurement] check box to ON and set a proper place in [Auto output destination].

3.15.5 Output Setting (Auto Saving)

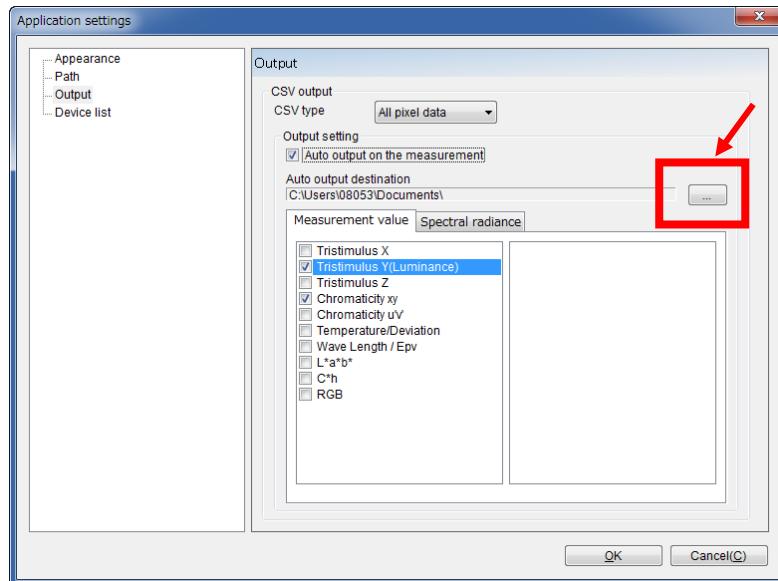
It is possible to perform the CSV output automatically during measurement.

To set the auto output setting, go through the following steps.

1. Set the [Output setting]-[Auto output on the measurement] check box to ON.



2. Click [...] on the right of [Auto output destination] to show [File Name Convention] screen.



Refer to the operation of file name convention for the following steps.

☞ “3.15.6 Output Setting (File Name Convention)”

3.15.6 Output Setting (File Name Convention)

Sets the output destination for the auto output of CSV files during the measurement. By giving file name convention to these files, each file can include date time of the measurement and/or sequential number in continuous measurement, arbitrary character string in its name.

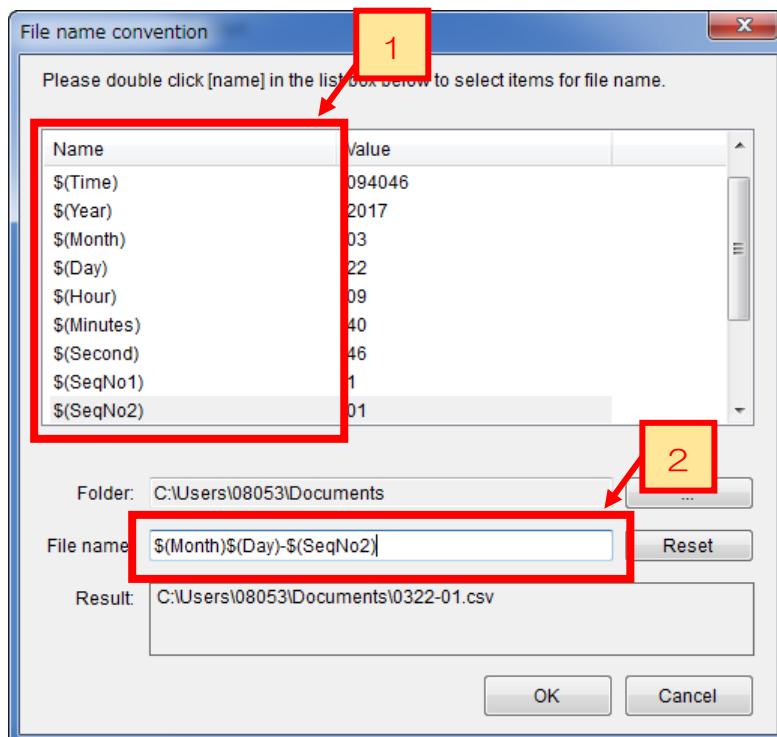
This functionality can come from auto saving of the measurement image and CSV and batch CSV output after measurement.

☞ “3.15.5 Output Setting (Auto Saving)”

☞ “4.2 Change of Measurement Parameters”

☞ “7.2 Batch CSV Output Operation”

1. In [File Name Convention] screen, items that can be used for the file name is listed on the left column of list box. By double clicking this item, characters in [File name] edit box. The result of file name editing is shown in [Result] edit box. Characters in [File name] edit box can be edited by keyboard input



2. If you need to change output destination, click [...] on the right and select proper folder. When editing is done, click [OK] to go back to previous screen.

Items that can be used as [Name] are described in the table below.

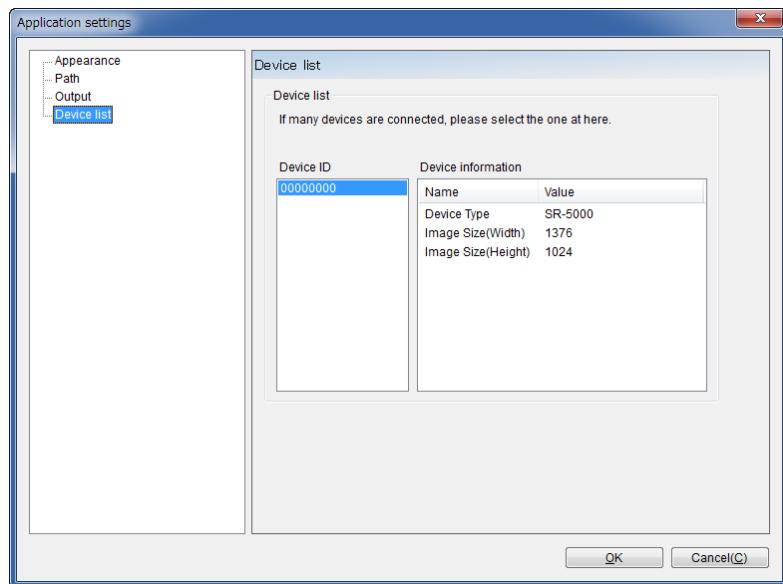
Name	Note
\$(DataFileName)	When other files than measurement data file will be created, same name as measurement data (hsm file) can be used. When the measurement data file name is unknown in setting dialog, alternative "DATA-FILE-NAME" string is used.
\$(Date)	Year, month and day is used. (ex:170331)
\$(Time)	Time, minute and second is used. (ex:135253)
\$(Year)	Year is used. (ex:2017)
\$(Month)	Month is used. (ex:03)
\$(Day)	Day is used. (ex:31)
\$(Hour)	Time is used. (ex:13)
\$(Minute)	Minute is used. (ex:52)
\$(Second)	Second is used. (ex:53)
\$(SeqNo1)	A sequential number is used. (ex:1, 10, 100)
\$(SeqNo2)	A sequential number padded with 2 zeros is used. (ex:01, 10, 100)
\$(SeqNo3)	A sequential number padded with 3 zeros is used. (ex:001, 010, 100)
\$(SeqNo4)	A sequential number padded with 4 zeros is used.
\$(SeqNo5)	A sequential number padded with 5 zeros is used.

3.15.7 Device List

The list of the usable devices is displayed. Only when two or more devices are connected, it is possible to change the device to be controlled.

To change the devices, go through the following steps.

1. Open the [Application setting] dialog box and select [Device list].
2. Select the desired device ID from the IDs displayed on [Device ID].

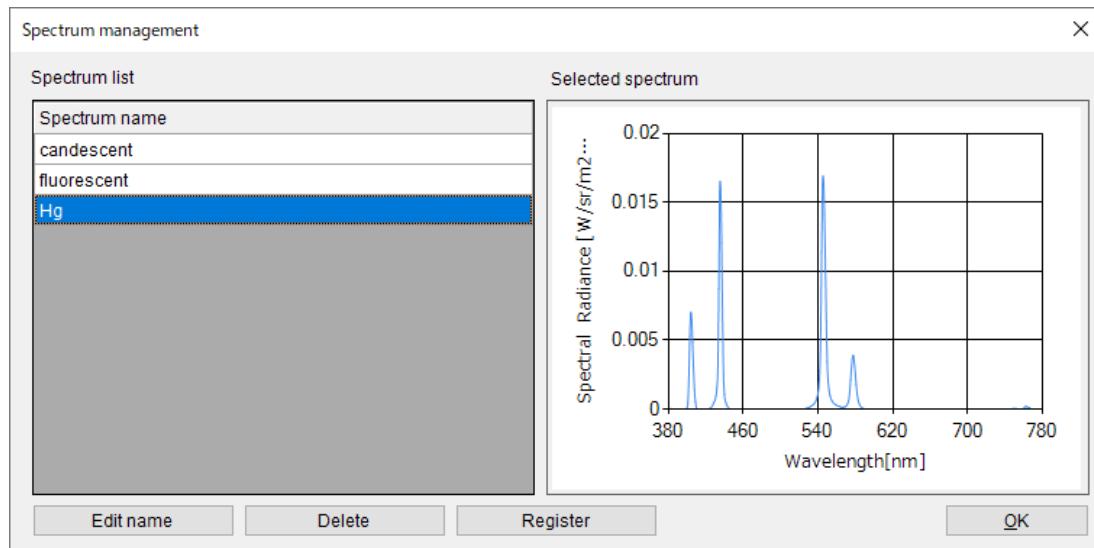


3.16 Spectrum Management

Changes the names of the registered spectrums or deletes them.

To manage the spectrums, go through the following steps.

1. Select [Setting] - [Spectrum management...].
2. The [Spectrum management] screen appears. The currently registered spectrums are displayed on [Spectrum list].



[Spectrum list]

This is the registered spectrums list. Select a name, and the spectral graph displayed at the right side is changed.

[Edit name]

Changes the name of the selected spectrum.

[Delete]

Deletes the selected spectrum.

[Register]

Registers the spectrum from csv file.

The csv file format for register is described below.

Spectrum data	
380	3.595E-006
381	2.408E-005
382	2.532E-005
...	...
779	5.608E-006
780	5.761E-006

← Data header
← Values for wavelength



- Register spectrums through [Register spectrum] on the data sheet.
 “5.7.4 Register Spectrum”
- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the pop-up menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the pop-up menu appeared by right-click.

4. Measurement

4.1 Normal Measurement

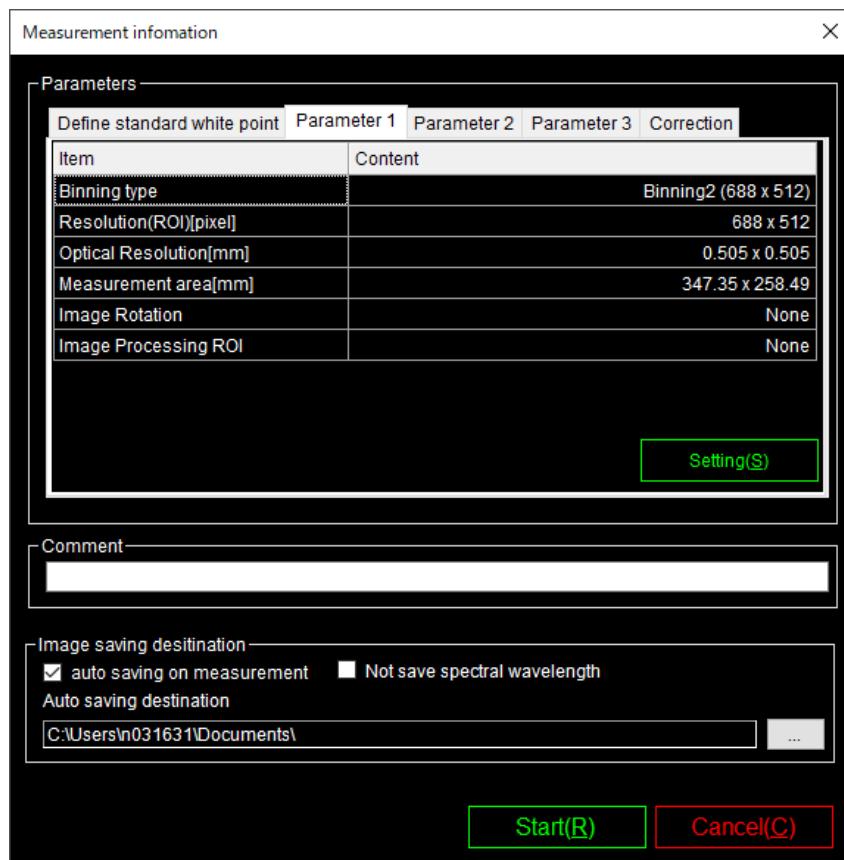
This is a basic measurement in the software. The device conducts the measurement according to the settings in [Recipe setting]. After the measurement, the measurement image is displayed.

To perform the normal measurement, go through the following steps.

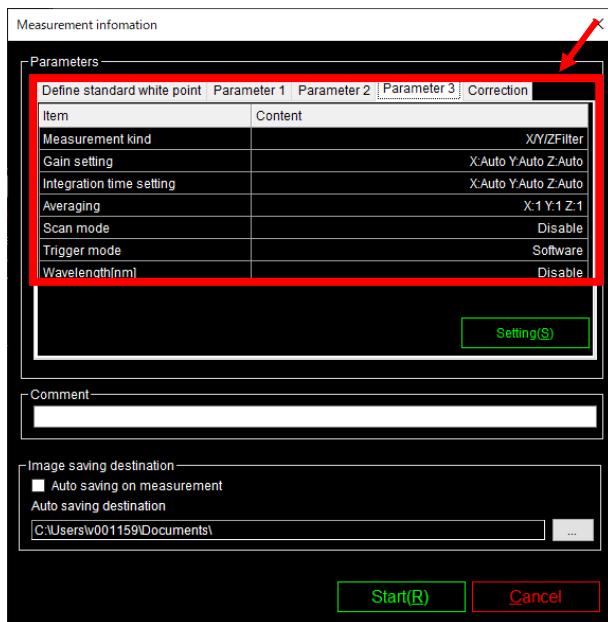
1. Select [Measurement] - [Start measurement...] or press the [F5] key or click the  icon on the tool bar.

For the XYZ measurement, select [XYZ Measurement] - [Start XYZ measurement...] or press the [F7] key or click the  icon on the tool bar.

2. The [Measurement information] screen appears. To check the contents and start the measurement, click the [Start] button. To stop the measurement, click [Cancel].



For the XYZ measurement, area for [measurement parameter 3] differs from normal measurement. Start the measurement, click the [Start] button. To stop the measurement, click [Cancel].

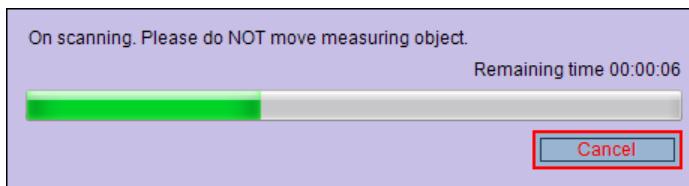


Memo

- When [Check parameters before measurement] in [Setting] - [Application setting] is set to OFF, the measurement will start without displaying the [Measurement information] dialog box.
☞ “3.15.2.2 Confirmation Message”
- It is also possible to change various settings from this screen.
☞ “4.2 Change of Measurement”

- Click [Start], and the status check dialog box is displayed.

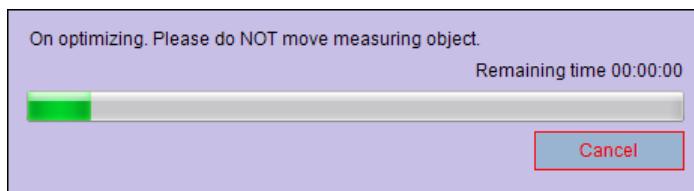
To cancel the measurement, click [Cancel].



– Optimization of measurement condition

The following dialog box is displayed during the automatic calculation of measurement conditions. When [Auto] is selected after selecting [Parameters 3] - [Integration time], the software calculates the optimum values of measurement conditions. When [Manual] is selected, the software conducts measurement by the integral time set by the recipe without this processing.

If [Auto] is selected in [Integration time], the optimal values of measurement conditions are calculated every time continuous and interval measurements are performed.



 **Memo**

- When you measure the same kind of targets with the same luminance continuously, obtain the optimal values by executing [Find optimal condition] and set them into the recipe. The measurement time can be shortened.
- When measuring continuously, select [Recipe setting] - [Parameters 1] and set the [Optimizing on 1st measurement only] check box to ON. You can decrease the optimal setting measurements and shorten the total measurement time.

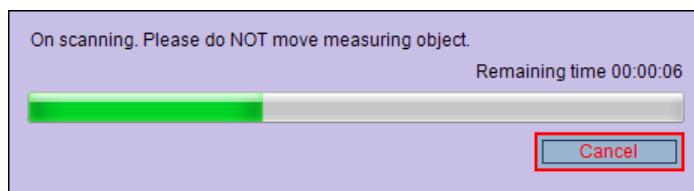


Note

During optimization of measurement conditions, do not move the target to be measured.

– Measurement

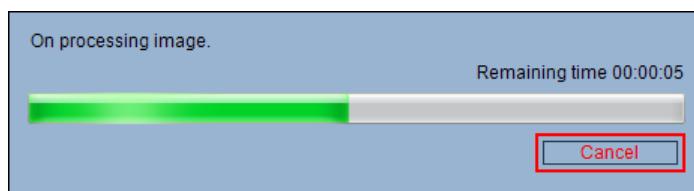
The measurement starts after auto calculating of the measurement condition. Measurement is performed in accordance with the recipe setting.



Note

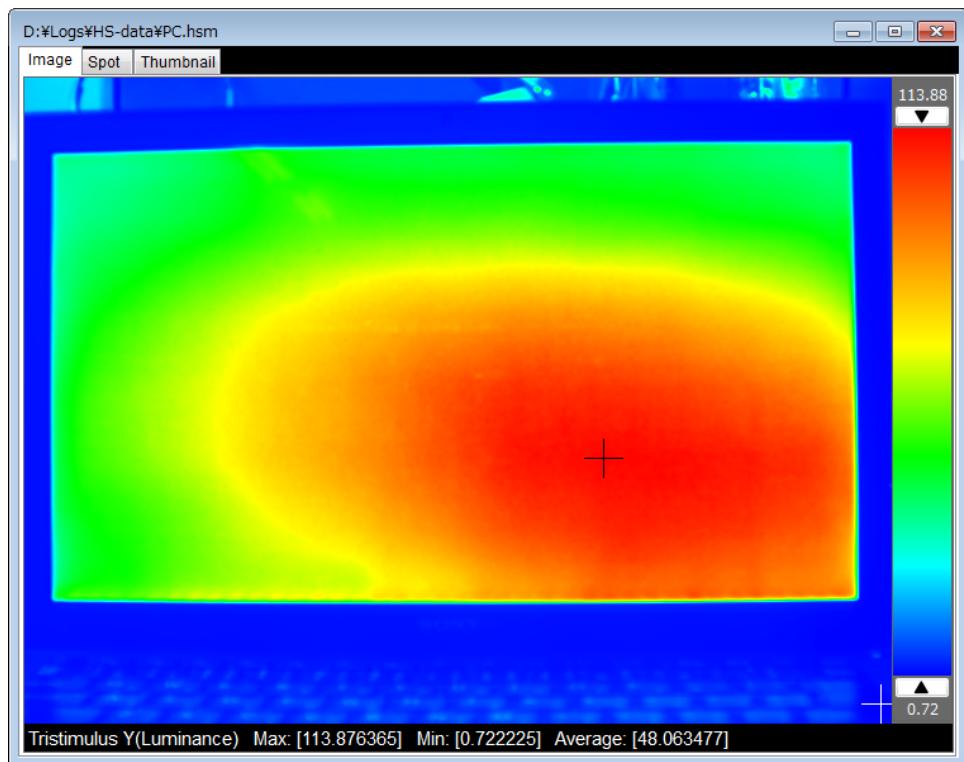
During measurement (scanning), do not move the target to be measured.

After the measurement, the screen indicating that an image is being created appears. This processing is performed on the connected personal computer and you can move the target to be measured.



- When the measurement is completed, the result is displayed.

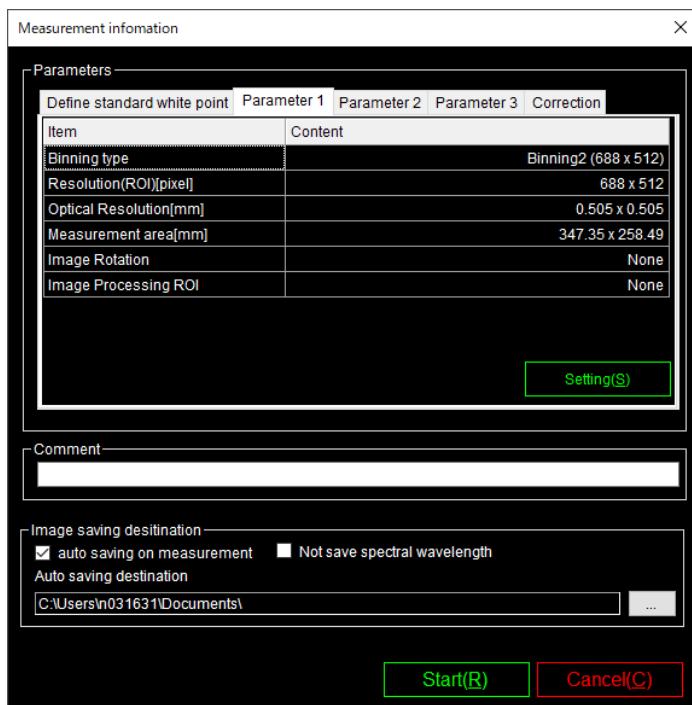
When continuous measurement or interval measurement is performed, the last measurement result is displayed. Other results are saved in the auto-save destination specified at the start of continuous measurement.



4.2 Change of Measurement Parameters

In the [Measurement information] dialog box before measurement, you can change the settings if necessary.

Click the [Setting] button at the center right on the screen to shift to the measurement condition screen for recipe setting or the correction setting screen. For various setting, refer to "3 Recipe Setting".



[Comment]

This should be used to enter memo about the contents of measurement. Enter an optional comment if necessary.

[Image saving destination]

This function saves the measurement result automatically. Set the [Auto saving on measurement] check box to ON and specify a folder on [Auto saving destination]. The measurement result is automatically saved in the specified save folder.

Set the [Not save spectral wavelength] check box to ON, the result of deleting the spectral data from the measured data is saved. This makes it possible to reduce the storage size of measurement data.

☞ “3.15.6 Output Setting (File Name Convention)”

Memo

When “2” or higher is set as the times of continuous measurement, the [Auto saving on measurement] check box is set to ON as default. **If this check box is set to OFF, the last measurement data will be shown in main window only.**

4.3 Time-series Measurement

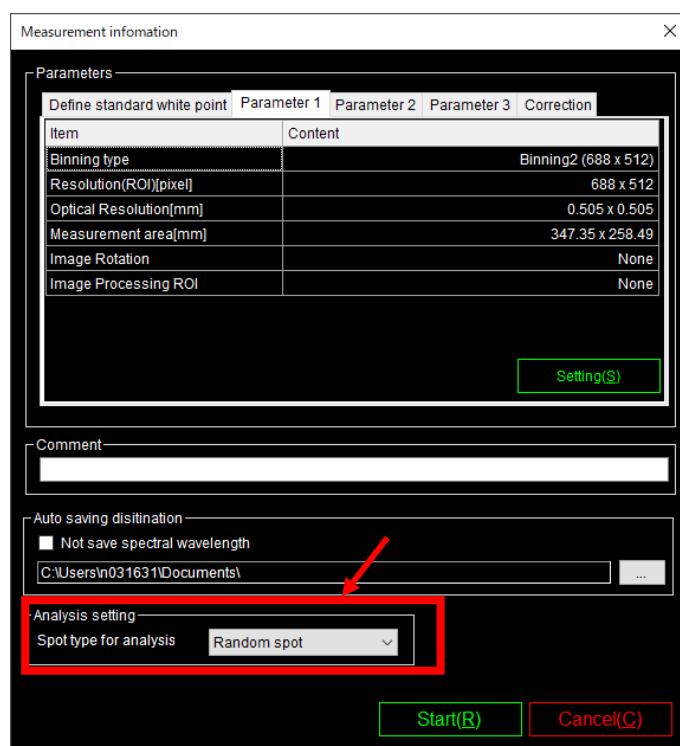
Use this function when measuring a target that changes with passage of time. After measurement, time-series analysis is executed. To help you visually check the time variation at any time, the measurement data is displayed as the line graph and data sheet. To perform the time-series measurement, go through the following steps.

1. Select [Measurement] - [Start time series measurement...] or press the [Shift+F5] keys or click the  icon on the tool bar.

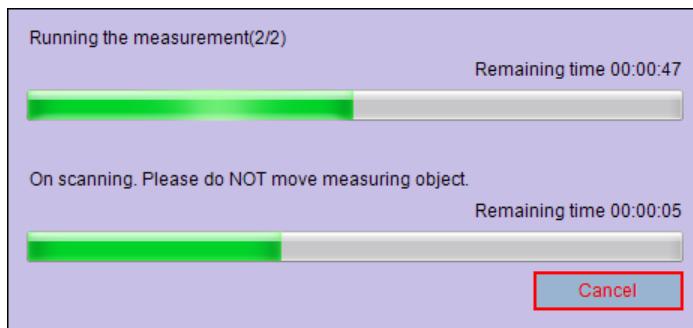
For the XYZ measurement, select [XYZ Measurement] - [Start XYZ time series measurement...] or press the [Shift+F7] keys or click the  icon on the tool bar.

2. The [Measurement information] screen appears. To check the contents and start measurement, click the [Start] button. To stop measurement, click [Cancel].

The contents of [Measurement information] are the same as normal measurement. [Analysis setting] is displayed at the lower left on the screen. Select the type of a spot that will be used in analysis after measurement from the [Spot type for analysis] pull-down menu.

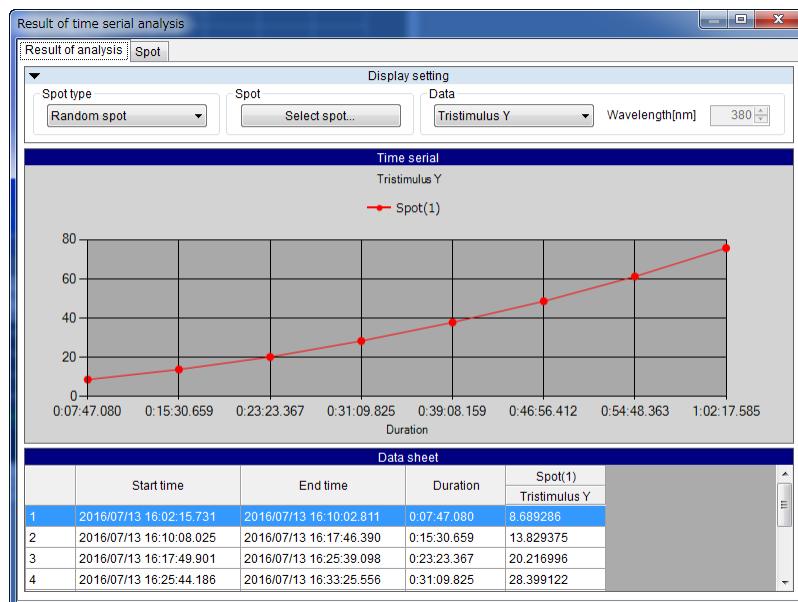


3. During measurement, the status check dialog box is displayed as normal measurement. The progress bar indicating the whole progress is displayed at the top of the dialog box.



4. When measurement is completed, time-series analysis starts. After the analysis is finished, the analysis result screen appears. For operating the time-series analysis result, refer to "6.1 Time-series Analysis Operation".

"6.1 Time-series Analysis Operation"



4.4 Calculate Optimal Values of Measurement Condition

Calculates automatically the optimal value of the integral time that will be applied to measurement.

To acquire the stabilized measurement data, you need to set the optimal integral time depending on the luminance of the measurement target. Integral time will affect the measurement accuracy and measurement time. Here, we will actually perform measurement to automatically calculate the optimal integral time. Especially when the target has relatively small luminance variation or when measuring two or more targets having almost the same luminance, it is possible to shorten the measurement time by calculating the optimal integral time beforehand.

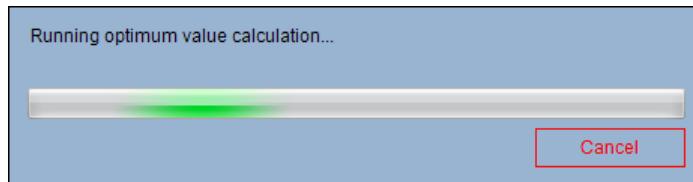
To calculate the optimal value of measurement condition, go through the following steps.

1. Select [Measurement] - [Find optimal condition] or press the [F4] key.

For the XYZ measurement, select [XYZ Measurement] - [Find XYZ optimal condition...] or press the [F6] key.



2. The status check dialog box is displayed and the optimal value of measurement condition is calculated. To stop the operation, click [Cancel].



3. Once the calculation of the optimal value is completed, the calculated result is displayed in the [Result of optimization] dialog box.

Click [Apply] to apply the calculated optimal value to [Integration time] of [Parameters 3].

Click [Cancel] to discard the calculated result and finish the optimal value calculation.

For the XYZ measurement, the calculated result is displayed for each selected filter.

For color filter type sensors, there is no display for each filter.

Integration time	Gain
5.832	16

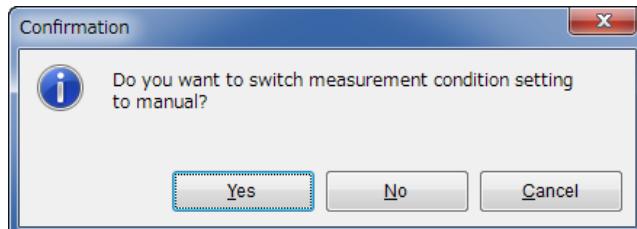
Filter	Integration time	Gain
X	7.530	16
Y	5.200	16
Z	26.800	16

However, when [Integration time] is set to “auto” in recipe, the following check dialog box will appear.

When you click [Yes], [Integration time] is forcedly switched to [Manual] and the calculated optimal value is applied to the integral time. Then, the operation is completed.

When you click [No], the operation is ended without applying the calculated optimal value.

When you click [Cancel], the screen returns to the 1[Result of optimization] dialog box.

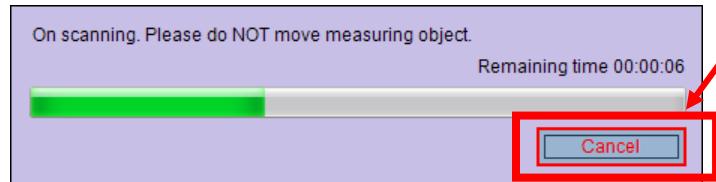


4.5 Cancel Measurement

Interrupts forcibly the normal measurement, time-series measurement or calculation of optimal value of measurement condition. If measurement is canceled, the currently measured data is discarded.

To cancel measurement, go through the following steps.

During measurement, the following status check dialog box is displayed. Click the [Cancel] button at the lower right on the screen.



4.6 About Practical Measurements

Measurement examples are shown below. Please use these examples for your reference.

4.6.1 Performing More Stable Measurement

When you measure the target with low-luminance or conduct measurement with short integral time, the measurement value may not be stabilized even if the value is within the specification of the accuracy. Increasing the averaging count may make it possible to stabilize the measurement value.

4.6.2 Shorten Measurement Time

To acquire stabilized measurement data, you need to set the optimal measurement condition depending on the luminance of the measurement target. This optimal measurement condition will affect the measurement accuracy and measurement time.

In continuous measurement and interval measurement, when the target has relatively small luminance variation or when measuring two or more targets having almost the same luminance, measurement is done continuously under almost the same measurement conditions. Optimizing at each measurement will lengthen the measurement time. Selecting [Measurement] - [Find optimal condition] and executing [Apply] beforehand will cut the measurement condition calculation time to shorten the measurement time.

☞ “3.5.6 Continuous Measurement”

☞ “3.6.2 Integral Time”

☞ “4.4 Calculate Optimal Values of Measurement Condition”

The target image size will also affect the measurement time. As the size of the image to be captured is larger, it takes longer time to measure the target. Setting the binning type or measurement range properly enables you to shorten the measurement time.

☞ “3.4.1 Binning Type”

☞ “3.4.3 Measurement Range/Optimization Area”

The wavelength range to be measured will also affect the measurement time. If there is unnecessary wavelength area, it is possible to remove the area from the target wavelength. For example, when the wavelength of less than 400 is not needed, set the target wavelength start to “400”. The spectral range is decreased to shorten the measurement time.

☞ “3.6.7 Measurement Wavelength”

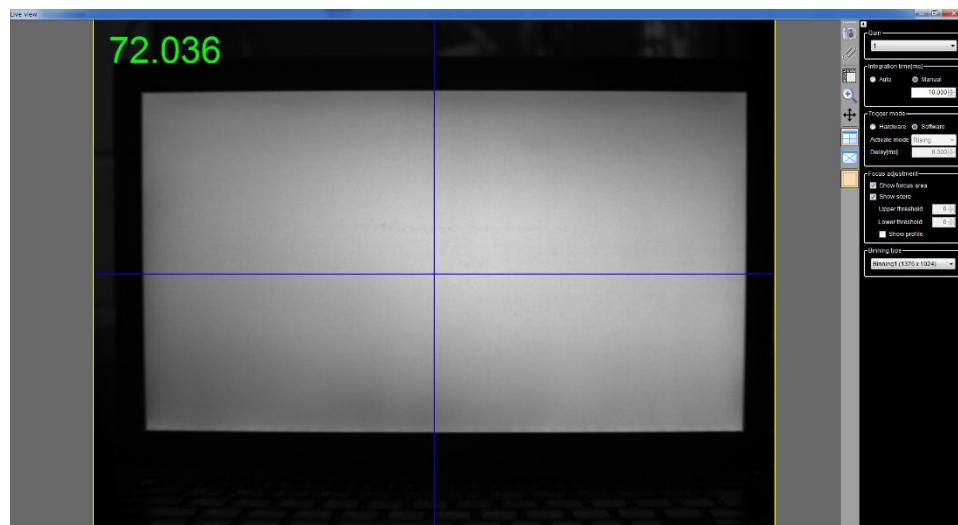
5. Various Operations

5.1 Live View Operation

5.1.1 Open Live View

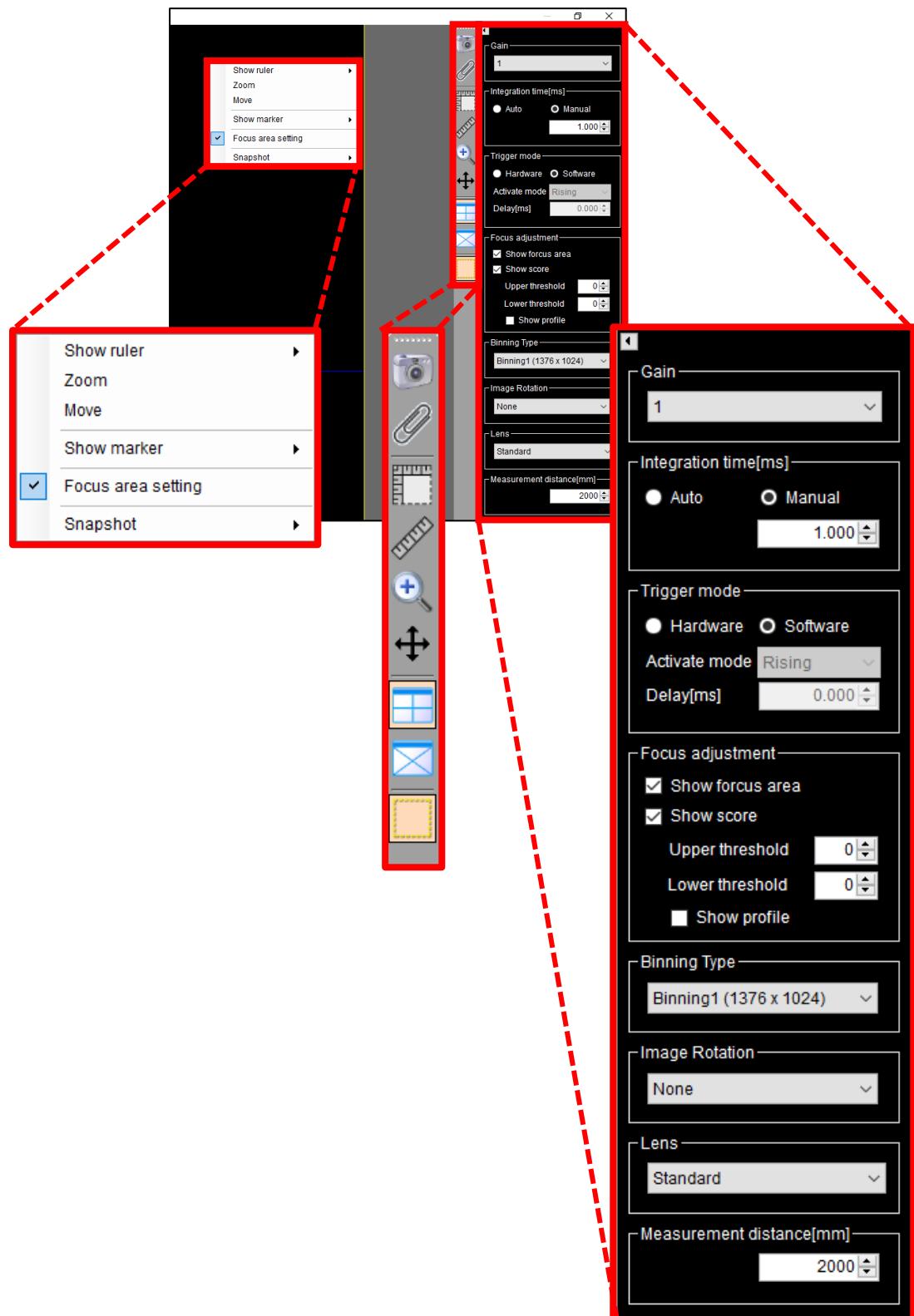
Displays the measurement object in real time. This function is used to confirm the position of the target and adjust the focus of the measurement object. To open the [Live View], go through the following steps.

1. Select [View] - [Live view...] or press the [F3] key or click the  icon on the tool bar.
2. [Live View] is opened. At the same time, the live image is reproduced.



5.1.2 Setting of Live View

In "Live View", there are auxiliary functions to carry out positioning or focus adjustment of the measurement target easily. You can use these functions through the tool box at the right side on the screen, the tool bar and the pop-up menu which is displayed by right-clicking.



5.1.3 Gain

Select gain from the pull-down menu of [Gain] at the right side on the screen. By selecting this, the live image brightness is changed.

5.1.4 Integral Time

Select [Auto] or [Manual] at [Integration time] at the right side on the screen.

When you select [Auto], the integral time for live view is automatically calculated and the live image is displayed.

When you select [Manual], the live image is displayed by the set integral time. When you select [Manual], the edit box is valid and it is possible to set time. The setting range is shown below.

Integral time:	0.05 [ms] to 4000 [ms]	(SR-5000)
	0.029 [ms] to 10000 [ms]	(SR-5100)
	0.04 [ms] to 1000 [ms]	(UA-20)

5.1.5 Trigger Mode

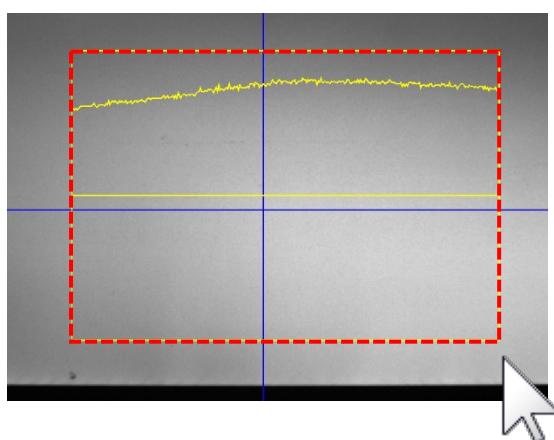
Set the trigger mode for live view at [Trigger mode] at the right side on the screen. The details of each setting item are the same as the trigger mode in measurement. Refer to the following section in this manual.

☞ “3.6.8 Trigger Mode”

5.1.6 Focus Adjustment

Set the items at [Focus adjustment] at the right side on the screen.

Set [Show focus area] to ON, and a yellow frame is displayed in the screen. Focus score is calculated by using the image part within this frame. You can change the area by dragging the mouse left button. When a special area is not set, the whole screen is the target to calculate the focus score.



Set [Show score] to ON, and a numerical value indicating the score is displayed at the upper left on the screen. The numerical value of focus score shows whether the target is in focus or not. As the value approaches “100”, focus is set more accurately.



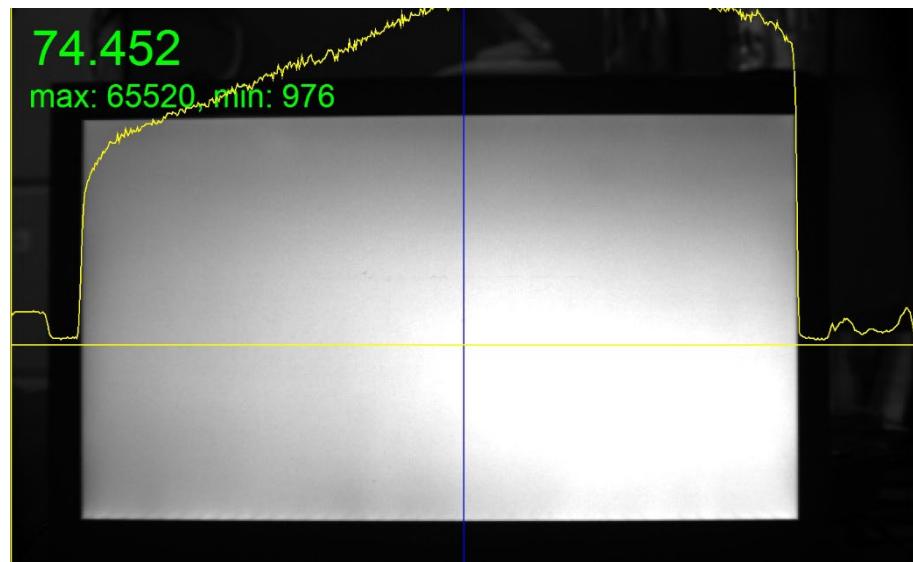
Note

- This score is changed depending on illumination conditions. When the luminance of a live image is changed by changing gain or integral time, readjust the focus ring to set focus at the position of the highest score.
- When the measurement target is changed, also perform readjustment.

When [Upper threshold] and [Lower threshold] are set and the focus score is between these values, [OK] is displayed beside the score. When the focus score is out of this range, [NG] is displayed.



Set [Show profile] to ON, and the value of the sensor on the horizontal line at the focus area center is displayed with profile. Moreover, the maximum and minimum values within the area are displayed under the score.



5.1.7 Binning Type

To change [Binning type], select an item from the pull-down menu. The image size (resolution) will be changed.

5.1.8 Image Rotation

To change [Image rotation], select an item from the pull-down menu.

5.1.9 Objective Lens

To change [Objective Lens], select an item from the pull-down menu. The metric value of Ruler function will be changed.

5.1.10 Measurement Distance

Set [Measurement Distance]. The metric value of Ruler function will be changed.

5.1.11 Show Ruler

By the following operation, the numerical values (pixel number or the "mm" size equivalent to the pixel number), which are displayed by dragging the mouse left button, remain on the screen.

- Select [Rectangle] / [Line] from [Show Ruler] of the pop-up menu.
- Select one of [Rectangle ruler] and [Line ruler] on the tool bar.



5.1.12 Enlargement/Movement

Select [Zoom] from the pop-up menu or tool bar. It is possible to zoom in an optional place of the live image by dragging the mouse left button. Select [Move]. It is possible to move the live image position by dragging the mouse left button. The enlargement/movement operation is the same as the measurement image view.

5.1.13 Show Marker

By the following operation, it is possible to change the show marker at the live image center.

- Select [Cross]/ [Diagonal]/ [Hide] from [Show Marker] of the pop-up menu.
- Select one of [Cross marker] and [Diagonal marker] on the tool bar or do not select any of them.

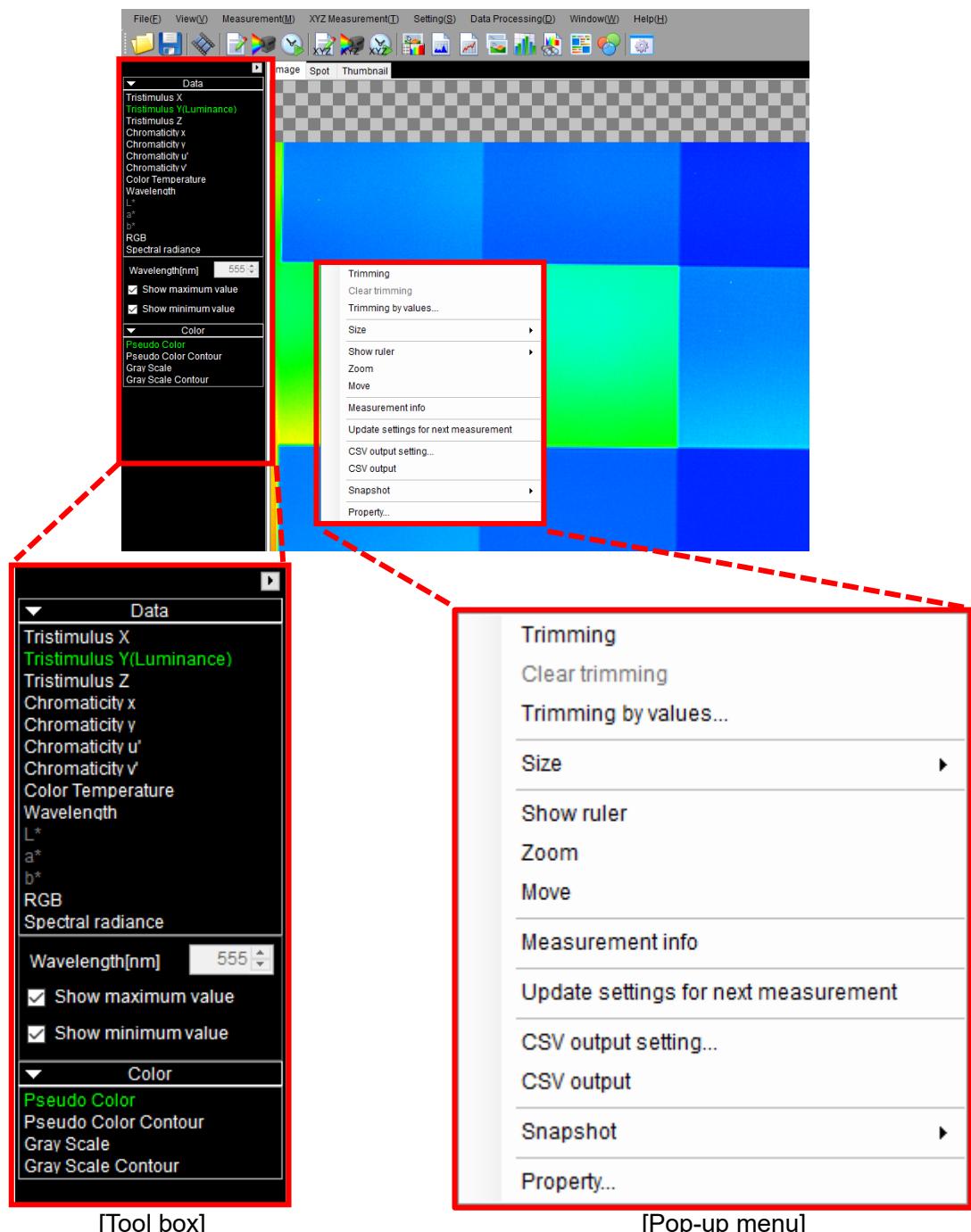
5.1.14 Snapshot

It is possible to select [Save to file] or [Copy to clipboard] for the displayed live image.

5.2 Measurement Image View Operation

After measurement is completed or after a measurement image file is opened, [Measurement Image View] is displayed. In [Measurement Image View], you can check how a measurement target is seen and whether there is unevenness on the image by using the pseudo color display which arranges arbitrary colors to measurement data, the gray scale display and the RGB display.

To operate [Measurement Image View], use the tool box at the left (or right) side on the screen and the pop-up menu which is displayed by right-clicking.



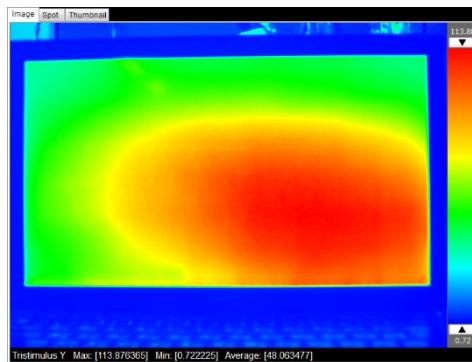
5.2.1 Change Display Data

Changes the view display data. The display data can be selected from tristimulus values XYZ, chromaticity xyu'v', Color Temperature, Wavelength, L*a*b*, RGB and spectral radiance.

To change the display data, select an optional data from [Data] on the tool box.

When [Tristimulus], [Chromaticity],[Temperature],[Wavelength] and [L*a*b*] are selected

Tristimulus X
Tristimulus Y(Luminance)
Tristimulus Z
Chromaticity x
Chromaticity y
Chromaticity u'
Chromaticity v'
Color Temperature
Wavelength
L*
a*
b*
RGB
Spectral radiance



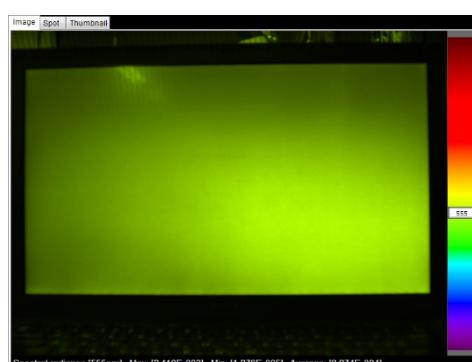
When [RGB] is selected

Tristimulus X
Tristimulus Y(Luminance)
Tristimulus Z
Chromaticity x
Chromaticity y
Chromaticity u'
Chromaticity v'
Color Temperature
Wavelength
L*
a*
b*
RGB
Spectral radiance



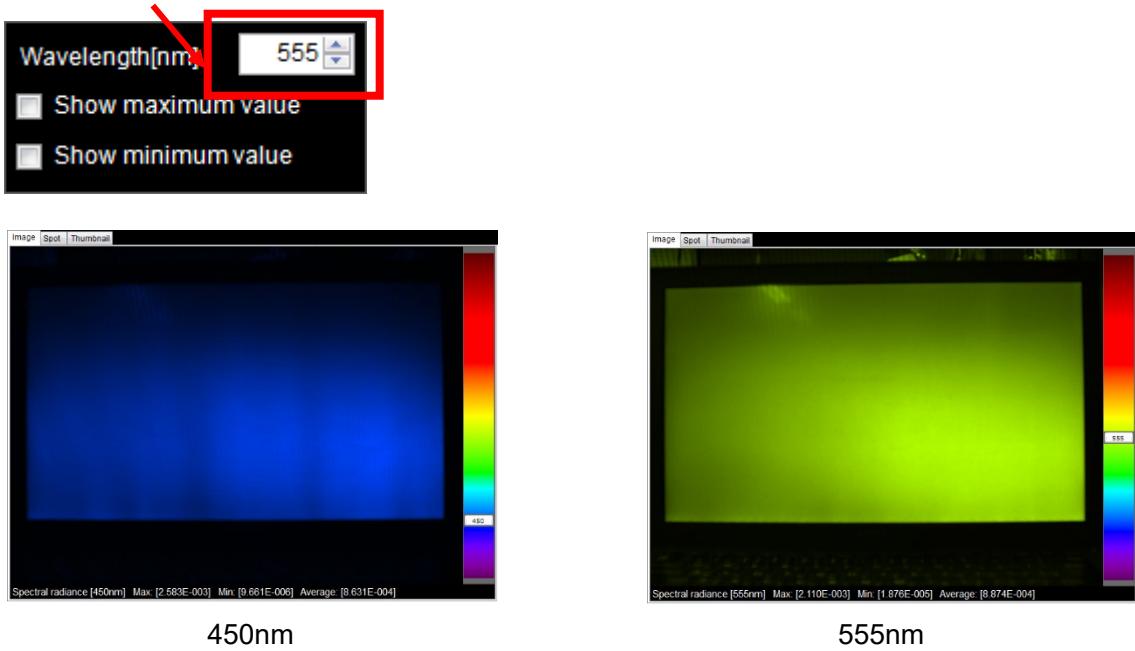
When [Spectral radiance] is selected

Tristimulus X
Tristimulus Y(Luminance)
Tristimulus Z
Chromaticity x
Chromaticity y
Chromaticity u'
Chromaticity v'
Color Temperature
Wavelength
L*
a*
b*
RGB
Spectral radiance

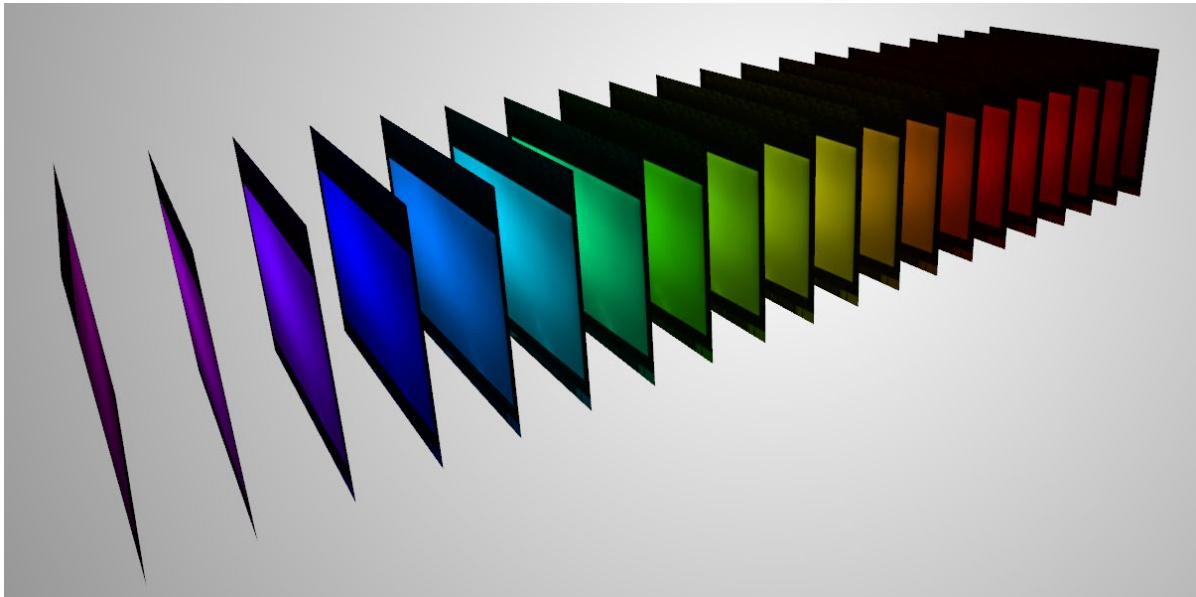


Display data depends on measurement condition.

When [Spectral radiance] is selected on [Data], you can change the wavelength of the displayed spectral radiance image by inputting a value to the [Wavelength] edit box.



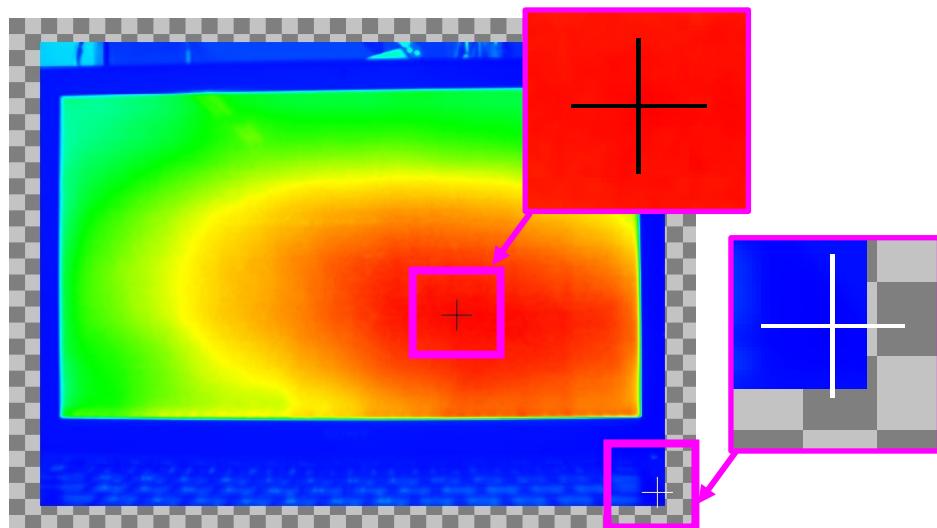
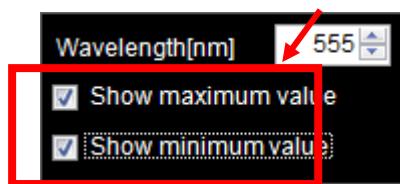
As the result of two-dimensional beam splitting operation, the spectral radiance at each wavelength is saved as an image as shown below. By specifying wavelength, you can check the wavelength image.



Memo

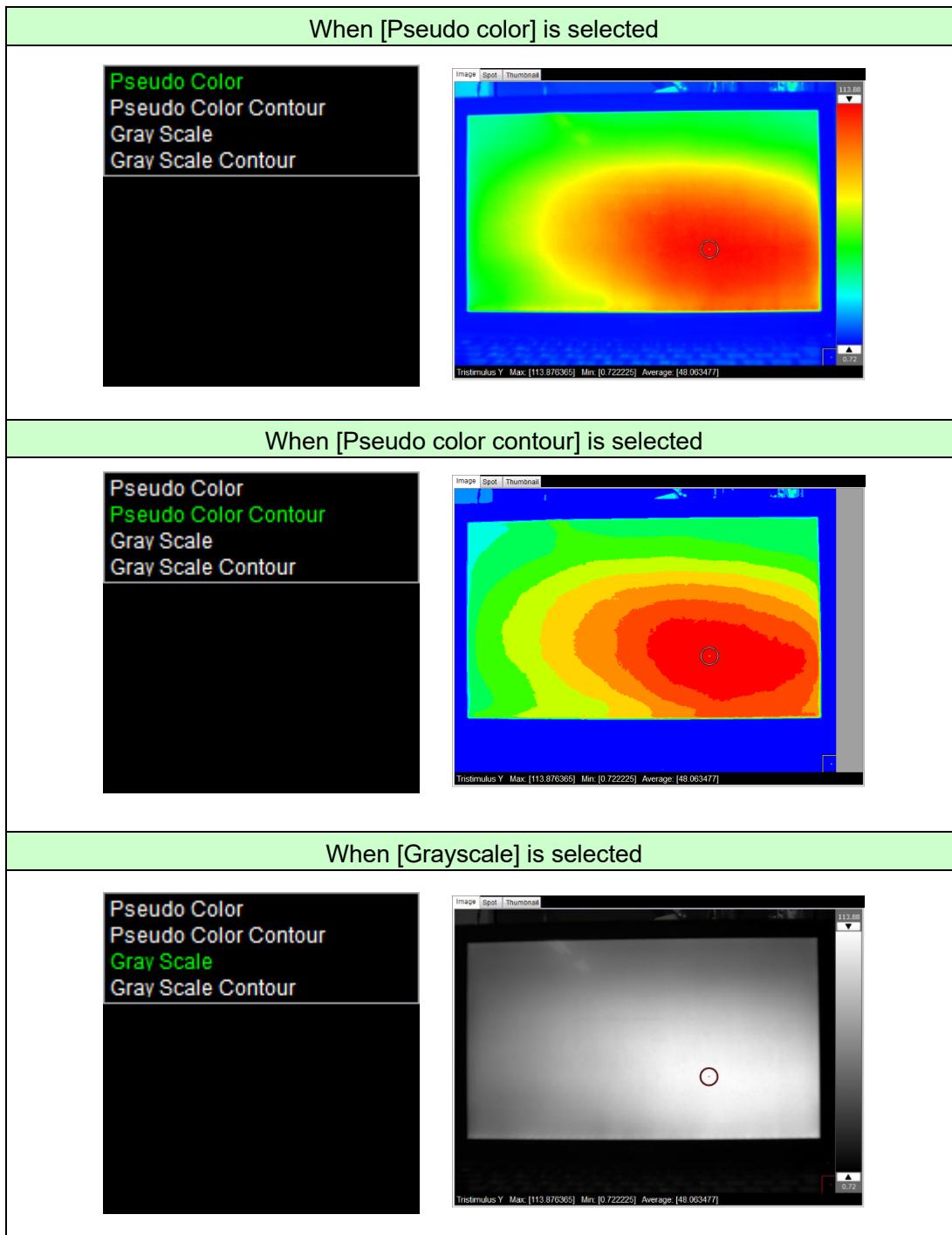
You can also specify wavelength with the color bar at the right side on the screen.

Set the [Show maximum value] and [Show minimum value] check boxes to ON. The maximum and minimum value places are displayed on the displayed image.

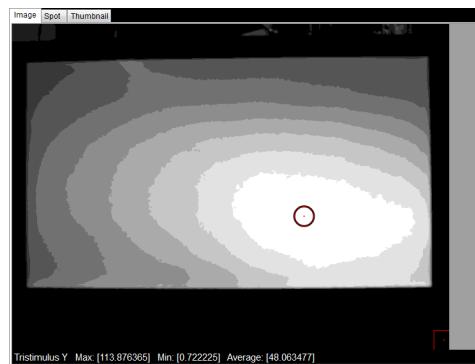
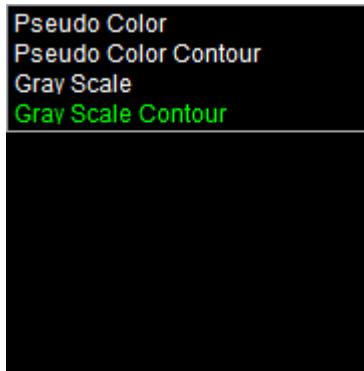


5.2.2 Change Display Color

Changes the view display color. The display color can be selected from two types: pseudo color and gray scale, and besides, contour display of each type can be selected. The usable display color type is changed depending on the selected display data. To change the display color, select an optional color from [Color] on the tool box. The usable display color is changed depending on the selected display data.



When [Grayscale contour] is selected



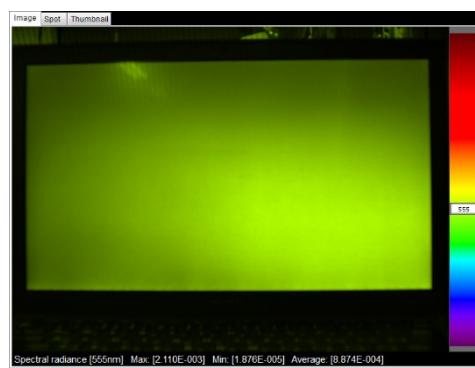
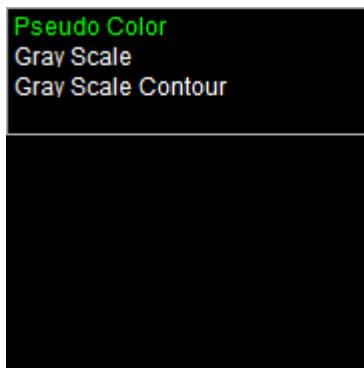
When [RGB] is selected



- When [RGB] is selected on [Data], only [RGB] can be selected for [Color].

When [Pseudo color] is selected

(When [Spectral radiance] is selected on [Data])



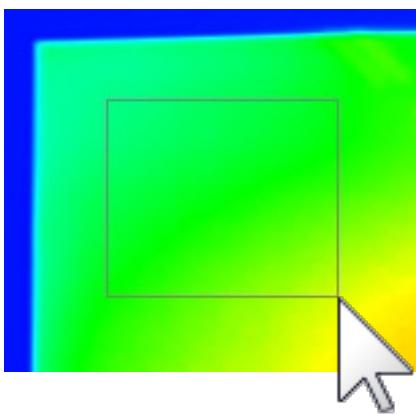
5.2.3 Trimming of Measurement Image (Mouse Operation)

Trims an optional area. Trimming in this software is to discard unnecessary parts of a measurement image and emphasize necessary parts. After trimming, the trimmed image is redrawn to be color-coded. To perform the trimming by using mouse, go through the following steps.

1. Right-click on [Measurement Image View] to display the pop-up menu. Select [Trimming] from the pop-up menu.

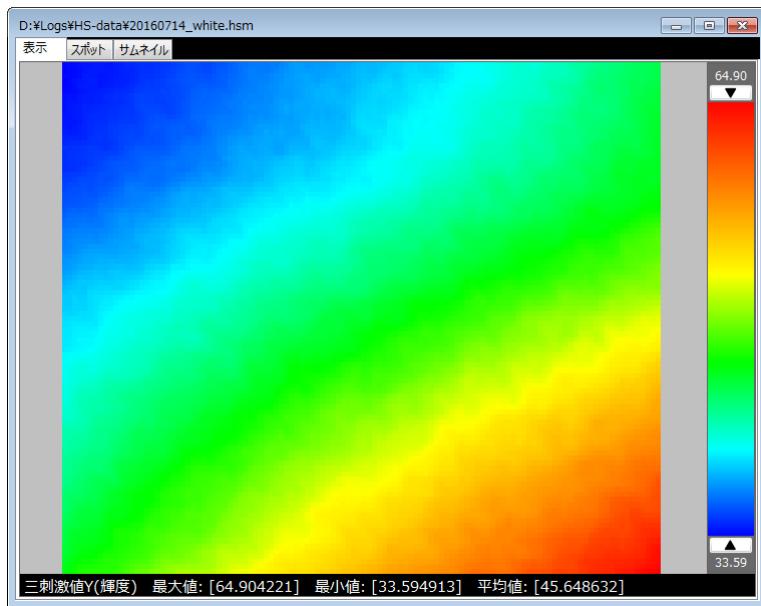


2. Click the start point of the area to be trimmed and drag the mouse over the area to determine the trimming area.



- Only the specified area is displayed.

When you see the same point on the view, the color may be different between the whole-area image and the trimmed image. This is because the maximum values and minimum values for the whole area are different from those of the trimmed image. When the area is trimmed, the display colors are allotted in accordance with the measurement data within the trimmed area, allowing you to check the minute differences of local points.



5.2.4 Trimming of Measurement Image (Direct Input)

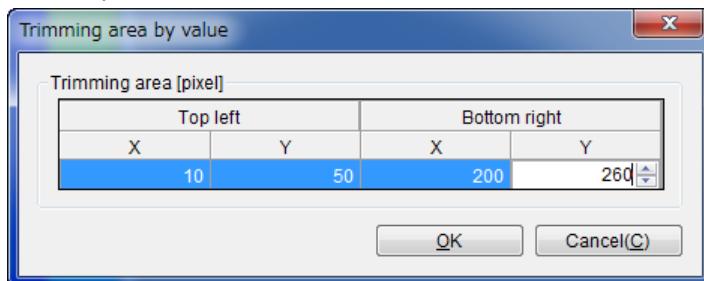
Trims image optionally. If trimming is performed, the trimmed image is redrawn to be color-coded. To perform trimming by entering values, go through the following steps.

1. Right-click on the view to display the pop-up menu. Select [Trimming by values...] from the pop-up menu.

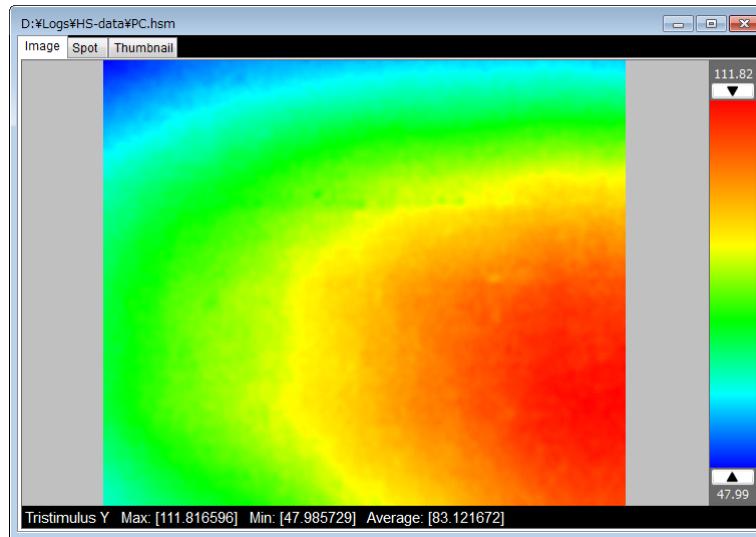


2. The [Trimming area by values] dialog box is displayed.

Set the pixel coordinate for the start and size, and then click [OK].



3. Only the specified area to be trimmed is displayed.



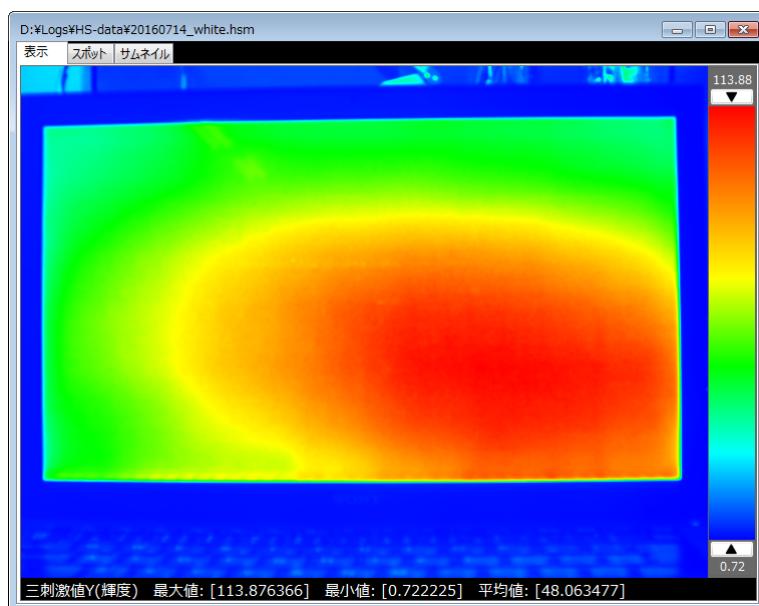
5.2.5 Cancel Trimming

Restores the trimmed image to the original image. To cancel the trimming, go through the following steps.

1. Right-click in the status where a measurement image is trimmed to display the pop-up menu. Select [Clear trimming] from the pop-up menu.



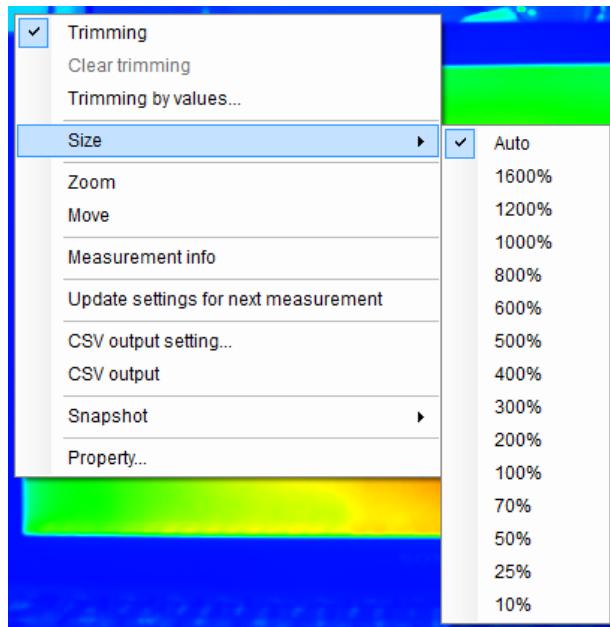
2. The trimming is canceled, and the measurement image before trimming is displayed.



5.2.6 Change Display Size

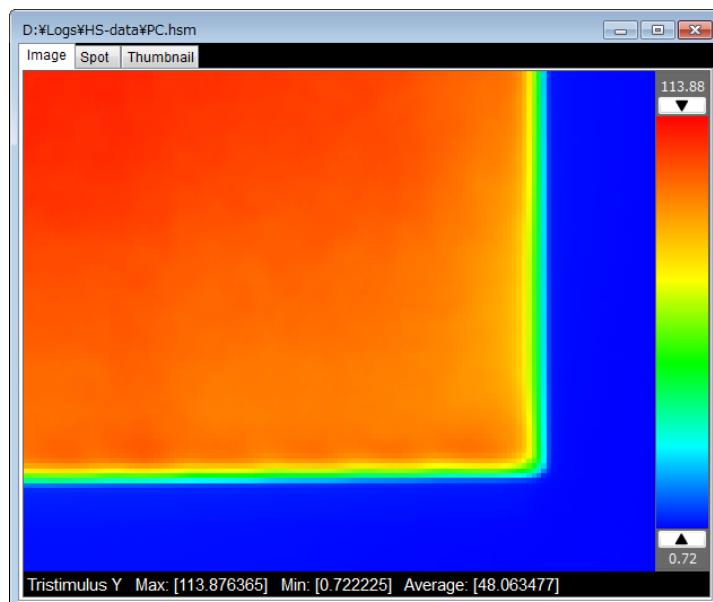
Changes the view display size. The display size can be selected from fixed magnification values ranging from 10% to 1600% or automatic magnification. To change the display size, go through the following steps.

1. Right-click on the view to display the pop-up menu. Select [Zoom] from the pop-up menu to display the magnification list. Select a magnification from the list. If [Auto] is selected, the measurement image is magnified automatically to fit in the window size. The changeable size range is automatic magnification and the range from 10% to 1600%.



2. The measurement image is magnified by the specified size. When a large magnification is selected, the whole image cannot be displayed within the view window. Use the [Move] mode to move to a desired place.

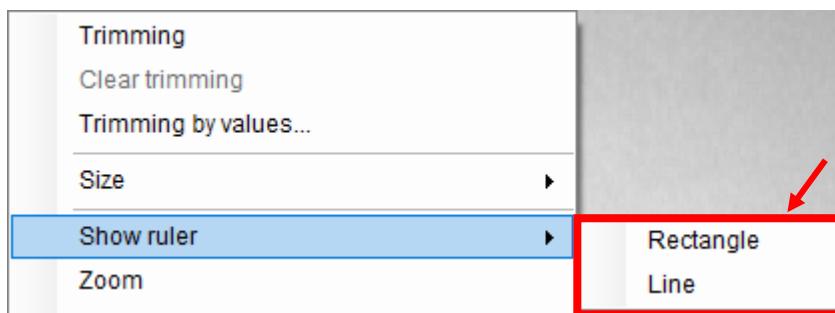
☞ “6.2.8 Enlargement/Movement”



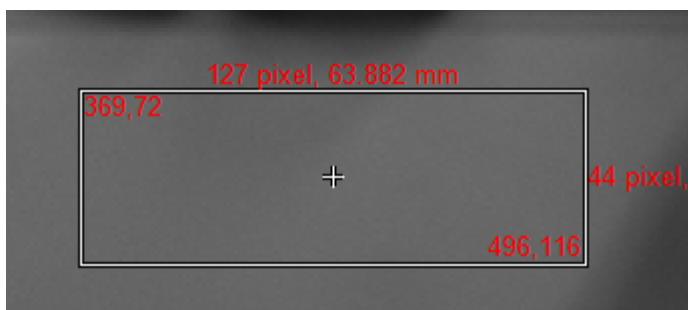
5.2.7 Show Ruler

Select [Show ruler] from the pop-up menu. The numerical values (pixel number or the “mm” size equivalent to the pixel number), which are displayed by dragging the mouse left button, remain on the screen.

1. Right-click on the view to display the pop-up menu. Select [Rectangle] / [Line] from [Show Ruler] of the pop-up menu.



2. Drag the point with the mouse.



5.2.8 Enlargement/Movement

Enlarges or moves the measurement image on the view by using mouse.

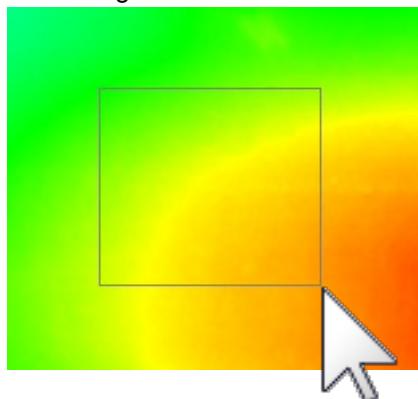
To enlarge/move the image, go through the following steps.

– Enlarging

1. Right-click on the view to display the pop-up menu. Select [Zoom] from the pop-up menu.



2. Click the start point of the area to be enlarged. Drag the point with the mouse to determine the enlarged area.



Memo

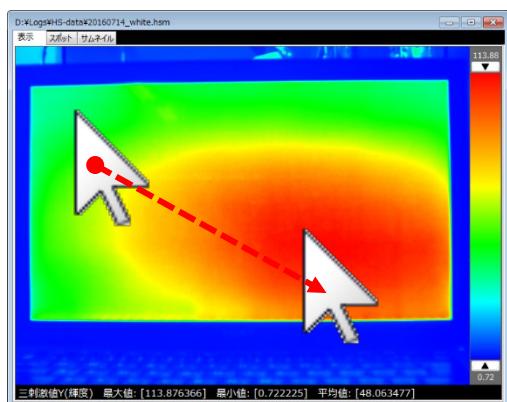
- You can also change the display magnification by rotating the mouse wheel.
- When changing the magnification with the mouse wheel, it is possible to display the image with more minute magnification than the fixed magnification on the menu.
- When using the mouse, enlarging can be done up to 1600%.
- The enlarged status can be canceled by left-clicking.

– Moving

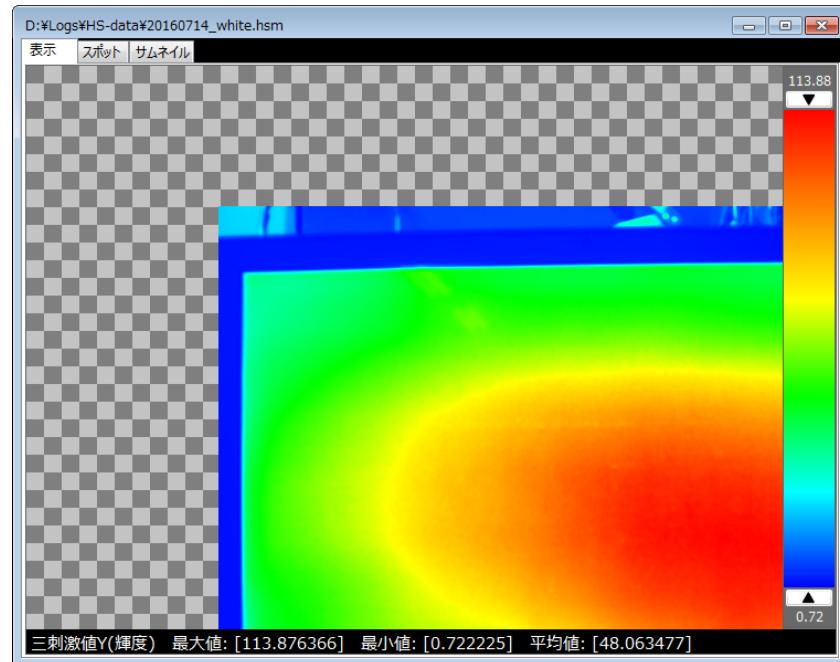
1. Right-click on the view to display the pop-up menu. Select [Move] from the pop-up menu.



2. Click the start point of the area to be moved. Drag the mouse to start moving.



3. The image moves according to dragging.

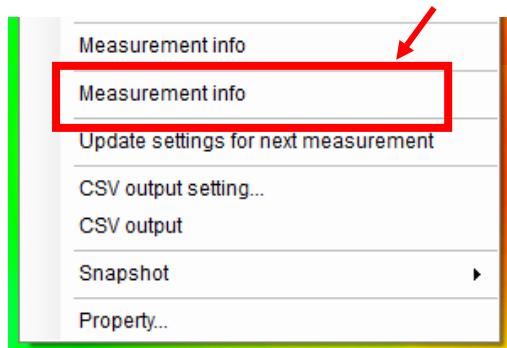


5.2.9 Check Measurement Information

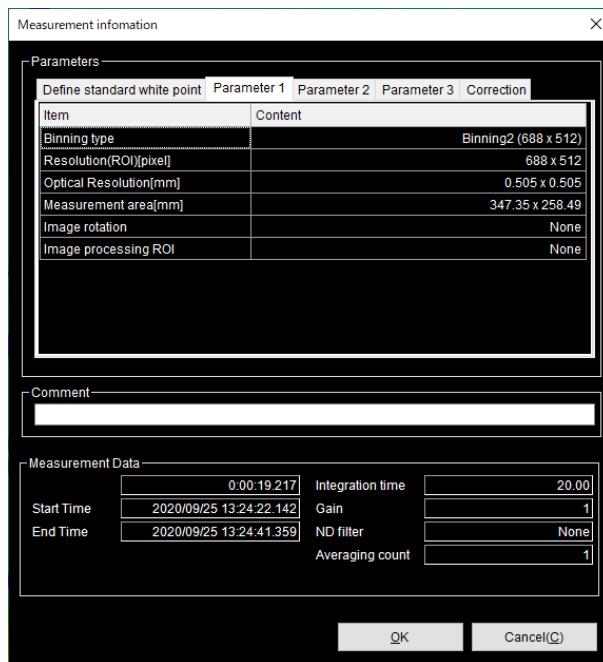
You can check the condition setting when the image on the view has been measured.

To check the measurement information, go through the following steps.

1. Right-click on the view to display the pop-up menu. Select [Measurement information] from the pop-up menu.



2. The [Measurement information] dialog box is displayed. The measurement conditions and time that have been set before measuring are displayed.



Memo

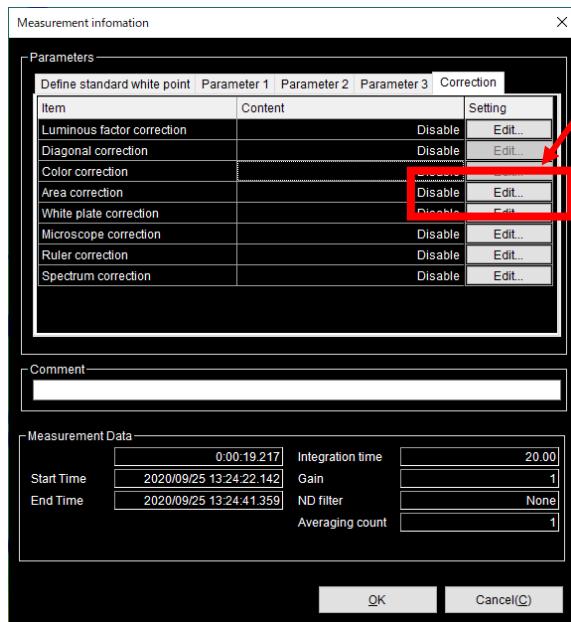
- For the items of measurement conditions, refer to the description of each item in “3 Recipe Setting”.
- The setting of the item whose [Edit...] button is valid in [Correction] tab can be changed even after measuring.
- The integral time used when measuring is displayed on [Integration time (ms)] of [Measurement time]. The integral time that has been calculated automatically by calculating the optimal value is also displayed here.

5.2.10 Edit Measurement Information

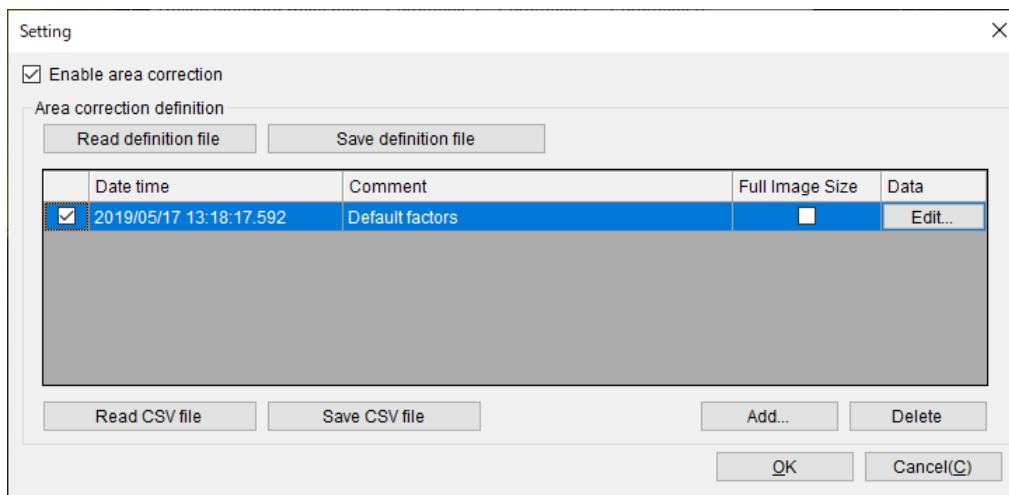
You can change partly the condition setting when the image on the view has been measured. The settings related to correction can mainly be changed.

To edit the measurement information, go through the following steps.

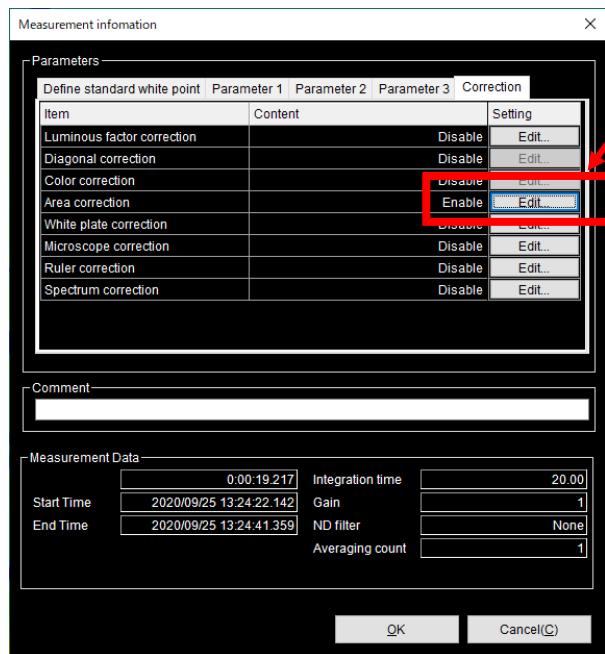
1. Display the [Measurement information] dialog box according to “5.2.9 Check Measurement Information”.
2. Click the item whose [Edit...] button is valid in the [Measurement information] dialog box.
For example, select [Area correction].



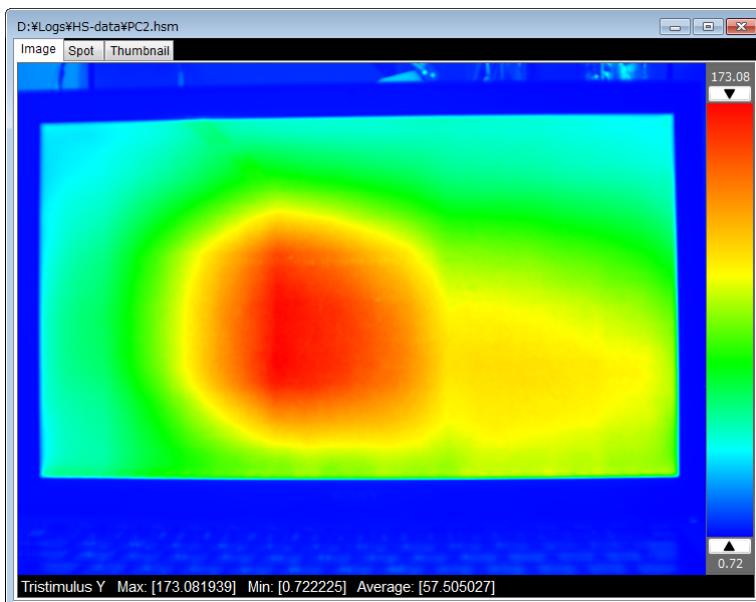
3. The [Area correction setting] dialog box is displayed. Edit the information if necessary and set the [Enable area correction] check box to ON. Return to the previous screen with [OK].
For details of area correction, refer to “3.10 Area Correction”.



4. The [Area correction] status on the [Measurement information] dialog box is changed. Click the [OK] button to return to the previous screen.



5. The image in which the correction is applied is displayed.



Memo

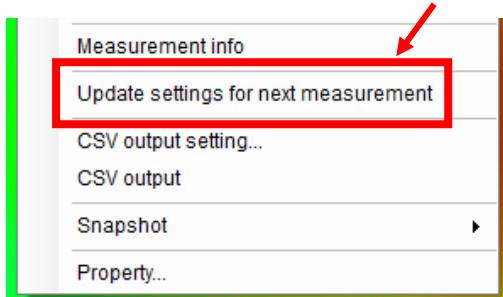
- You can change the setting of [Luminosity correction] and [White plate correction] in the same way.
- The setting of [Diagonal correction] cannot be changed after measuring.
- [Comment] can also be edited after measuring.

5.2.11 Update Data for Next Measurement

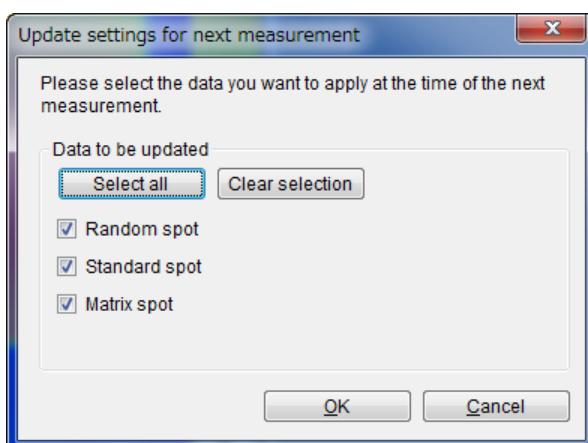
Editing the measurement spot in “6.3 Spot View Operation” and sequent chapters is performed for the measured image. It is possible to use the edited data in the next and sequent measurements. This work is needed when you have created a complicated random spot.

To update the data for next measurement, go through the following steps.

1. Right-click on the view to display the pop-up menu. Select [Update settings for next measurement] from the pop-up menu.



2. The [Update settings for next measurement] dialog box is displayed. Select the items to be updated if necessary and click the [OK] button to return to the previous screen.



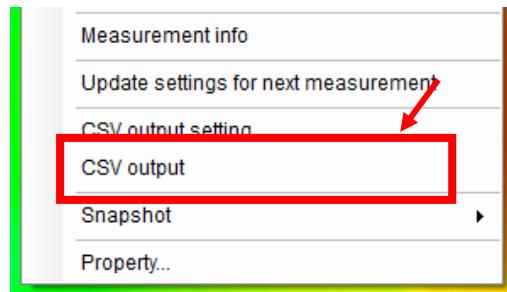
3. After returning, anything is not changed. Then, start measurement normally. The updated spot information is reflected on the image displayed after measuring.

5.2.12 Save Measurement Data in CSV File Format

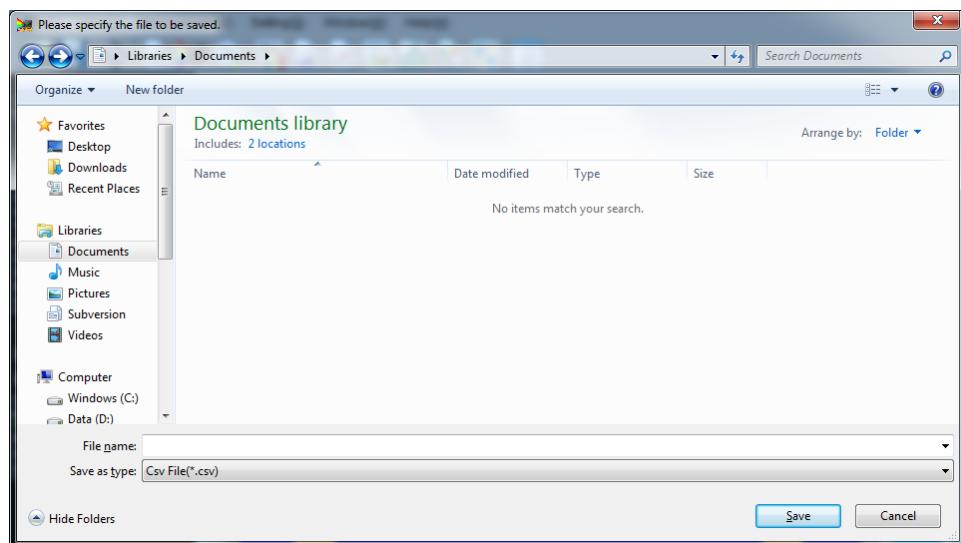
Saves the measurement data within the view in CSV file format.

To save the measurement data within the view in CSV file format, go through the following steps.

1. Right-click on the view to display the pop-up menu. Select [CSV output] from the pop-up menu.

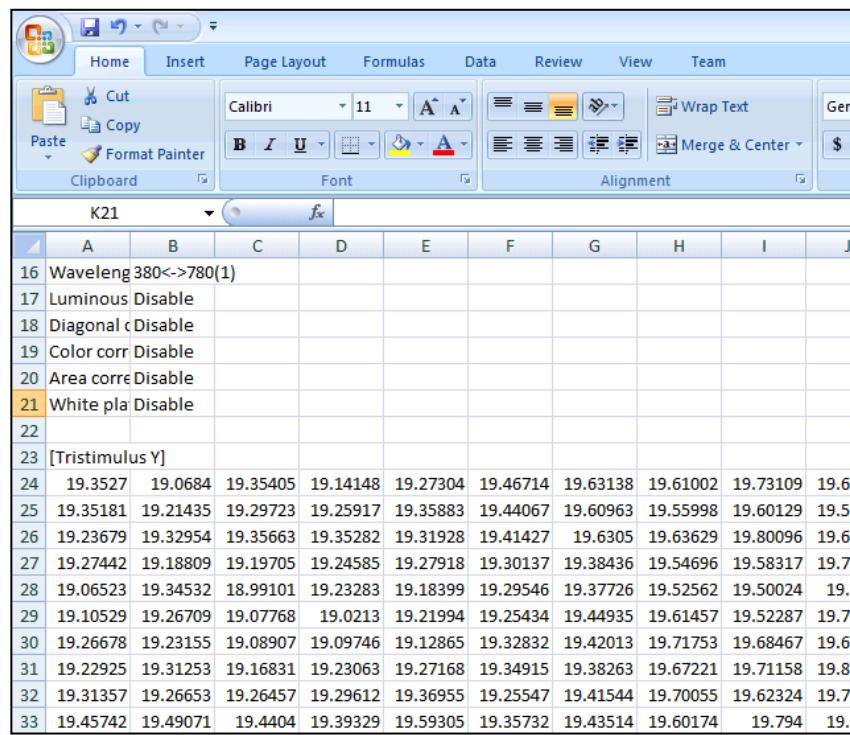


2. The Explorer window opens. Specify the path, file name and file format to be saved and save the data.



Display Format of All Data CSV Files

Only the checked items in [All data] of [CSV type] set by selecting [Application setting] - [Output] are output. The unchecked items are not output and the next item are output.



The screenshot shows a Microsoft Excel spreadsheet titled 'K21'. The ribbon at the top includes tabs for Home, Insert, Page Layout, Formulas, Data, Review, View, and Team. The Home tab is selected. The ribbon also contains icons for Cut, Copy, Paste, and Format Painter. Below the ribbon is the clipboard section. The font section shows 'Calibri' and '11'. The alignment section includes 'Wrap Text' and 'Merge & Center'. The formula bar shows 'fx'. The data starts with row 16 containing 'Waveleng 380<->780(1)'. Rows 17 through 21 are labeled 'Luminous Disable', 'Diagonal c Disable', 'Color corr Disable', 'Area corre Disable', and 'White pla Disable' respectively. Row 23 is labeled '[Tristimulus Y]'. Rows 24 through 33 contain numerical data. Row 33 is highlighted with a yellow background.

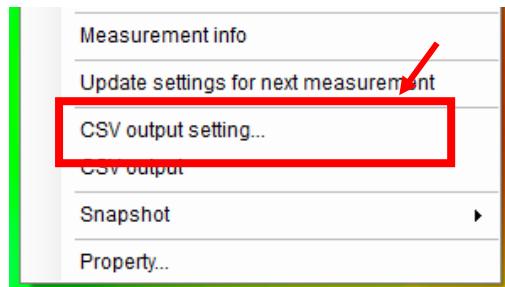
	A	B	C	D	E	F	G	H	I	J
16	Waveleng 380<->780(1)									
17	Luminous Disable									
18	Diagonal c Disable									
19	Color corr Disable									
20	Area corre Disable									
21	White pla Disable									
22										
23	[Tristimulus Y]									
24	19.3527	19.0684	19.35405	19.14148	19.27304	19.46714	19.63138	19.61002	19.73109	19.6
25	19.35181	19.21435	19.29723	19.25917	19.35883	19.44067	19.60963	19.55998	19.60129	19.5
26	19.23679	19.32954	19.35663	19.35282	19.31928	19.41427	19.6305	19.63629	19.80096	19.6
27	19.27442	19.18809	19.19705	19.24585	19.27918	19.30137	19.38436	19.54696	19.58317	19.7
28	19.06523	19.34532	18.99101	19.23283	19.18399	19.29546	19.37726	19.52562	19.50024	19.
29	19.10529	19.26709	19.07768	19.0213	19.21994	19.25434	19.44935	19.61457	19.52287	19.7
30	19.26678	19.23155	19.08907	19.09746	19.12865	19.32832	19.42013	19.71753	19.68467	19.6
31	19.22925	19.31253	19.16831	19.23063	19.27168	19.34915	19.38263	19.67221	19.71158	19.8
32	19.31357	19.26653	19.26457	19.29612	19.36955	19.25547	19.41544	19.70055	19.62324	19.7
33	19.45742	19.49071	19.4404	19.39329	19.59305	19.35732	19.43514	19.60174	19.794	19.

5.2.13 Set Output Items for CSV File Format

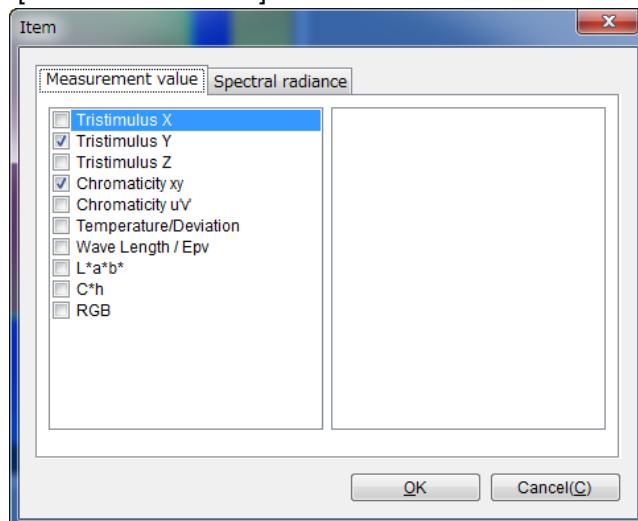
Sets output items for CSV file format.

To set output items for CSV file format, go through the following steps.

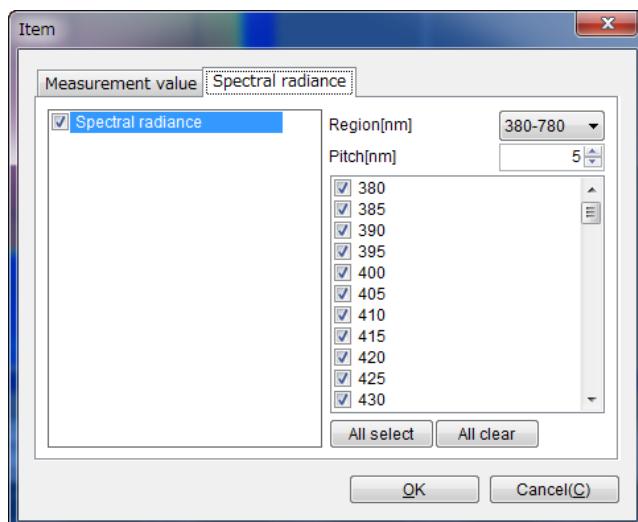
1. Right-click on the view to display the pop-up menu. Select [CSV output setting] from the pop-up menu.



2. The [Item] screen appears. Set the check boxes of the items that should be output to ON in [Measurement value].



3. Select the [Spectral radiance] tab to change the display. Set [Pitch (nm)] of wavelength and set the check box of the wavelength that should be output to ON.



 Memo

- The setting for CSV output is available from [Application setting]-[Output]-[All pixel data].
- The output data items of CSV file be outputted measurement condition only outputable.

 “3.15.4 Output Setting”

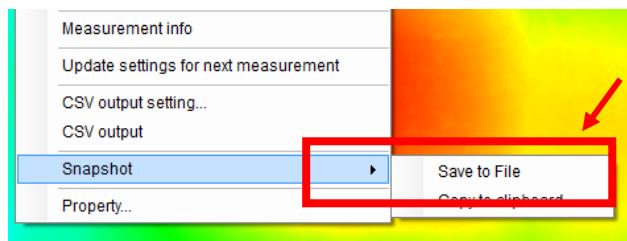
5.2.14 Save Snapshot

Saves the displayed view in a specified file format. For the file format, you can select [BMP], [JPG] or [PNG]. It is also possible to copy the view data in clipboard and paint or paste the data in software such as Word, Excel, etc.

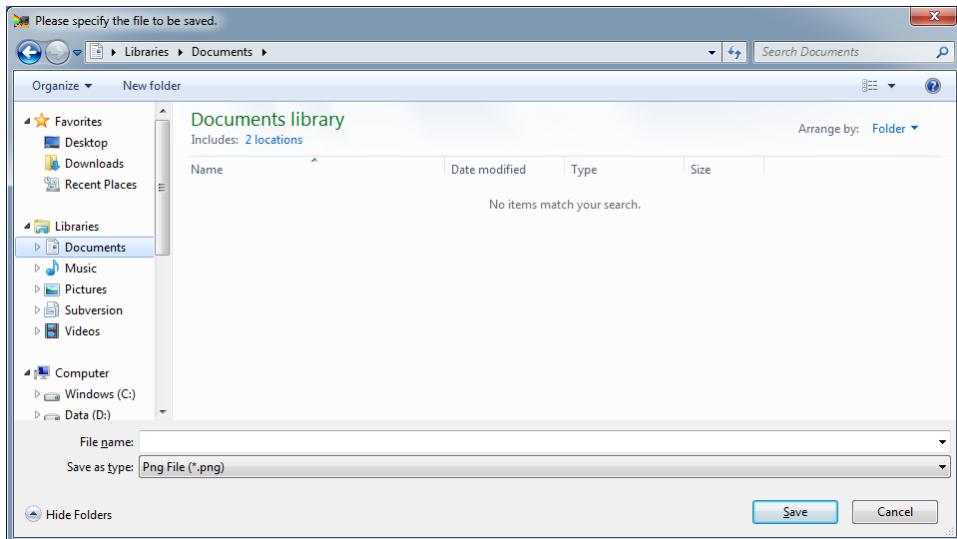
To save snapshot, go through the following steps.

– To save in a file

1. Right-click on the view to display the pop-up menu. Select [Snapshot] - [Save to file] from the pop-up menu.



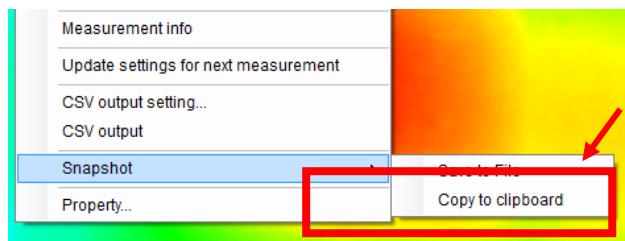
2. The file save dialog box is displayed. Enter a proper name to [File name] and click the [Save] button.



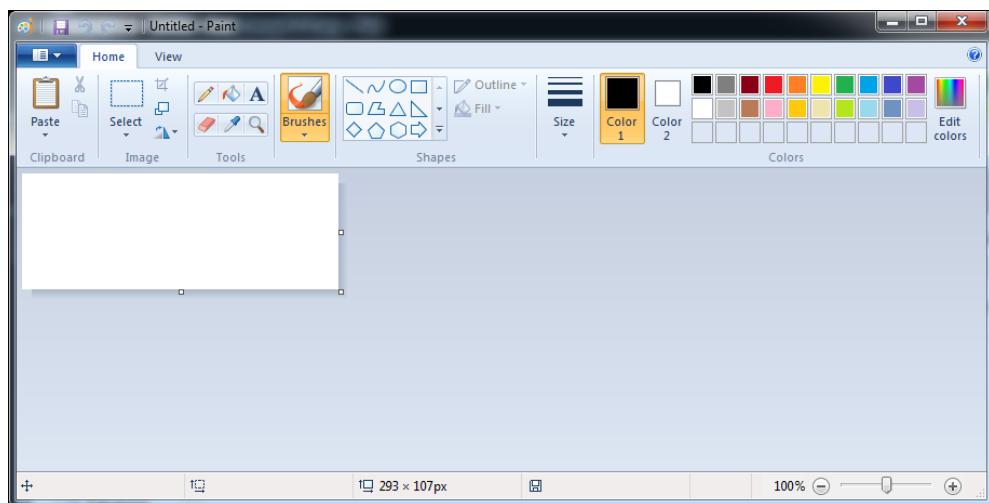
You can select [BMP], [JPG] and [PNG] from the file types.

– To copy into clipboard

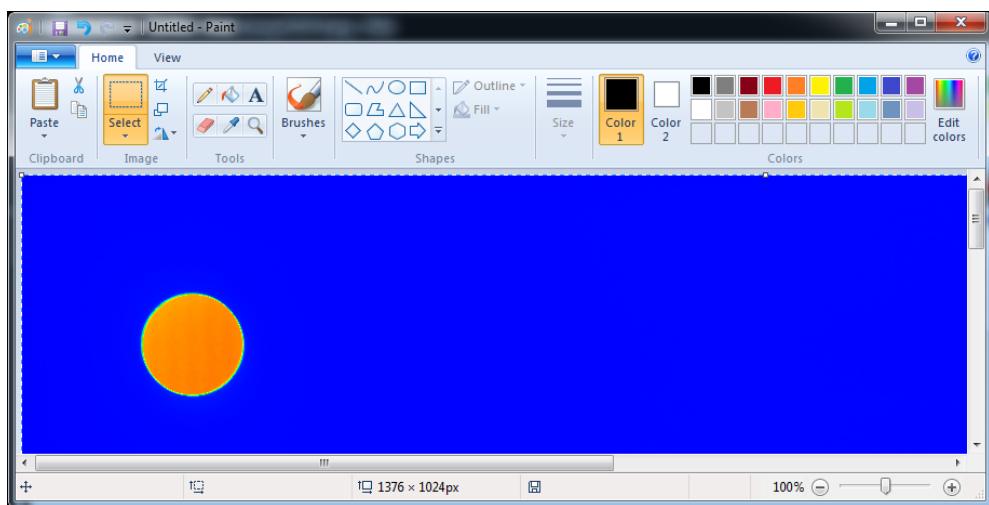
1. Right-click on the view to display the pop-up menu. Select [Snapshot] - [Copy to clipboard] from the pop-up menu.



2. Start the software to paste. For example, start "Paint brush".



3. Paste the data with the [Paste] button or [Ctrl+V].

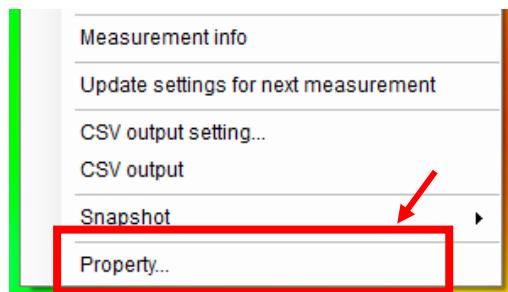


5.2.15 Open Property Window (Pseudo Color)

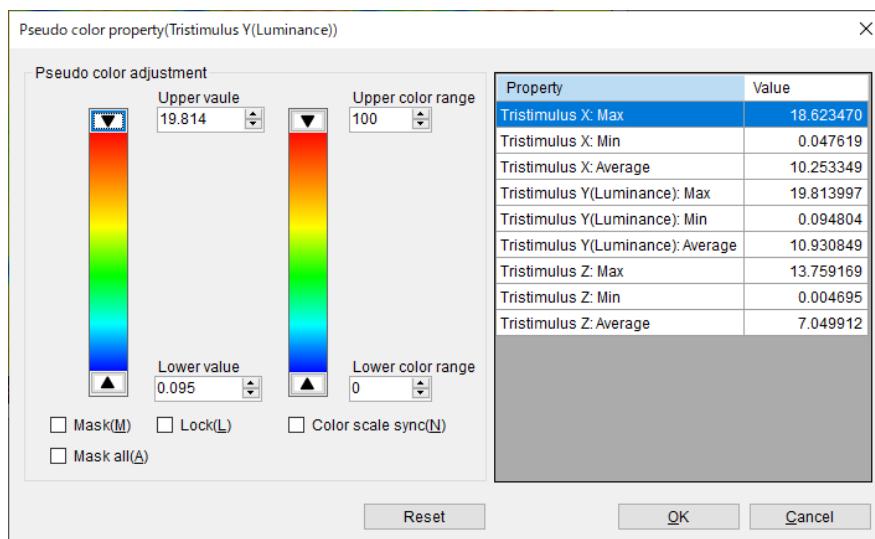
Adjusts the display color of the view displayed on the Pseudo Color.

To open [Pseudo color property], go through the following steps.

1. Select any other data except [RGB] and [Spectral radiance] in [Data]. Select [Pseudo color] in [Color].
2. Right-click on the view to display the pop-up menu. Select [Property...] from the pop-up menu.



3. The [Pseudo color property] screen appears.



The maximum, minimum, and average values of the tristimulus values X, Y, Z or the chromaticity xy, u'v' of the measurement image are displayed on the table-format sheet at the right side on the screen.

To finish setting, click any button.

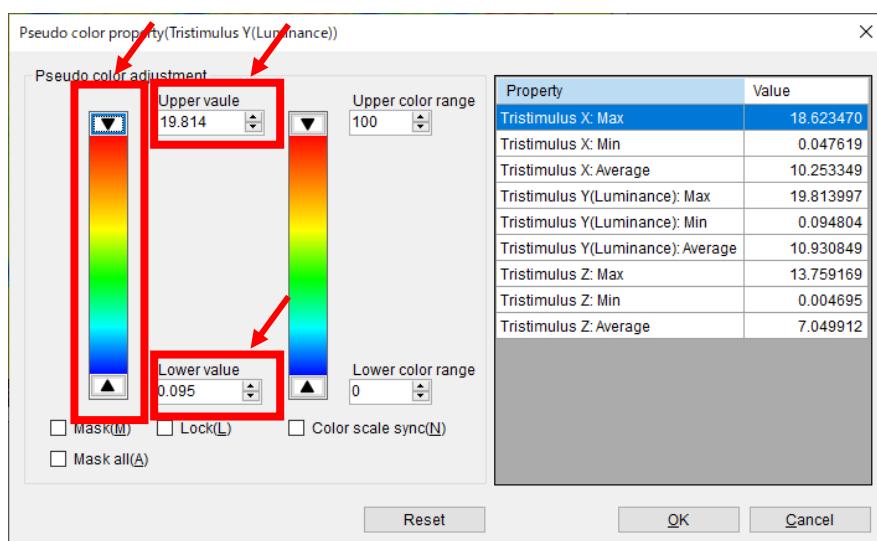
- | | |
|----------|--|
| [OK] | Enables the setting and closes this window. |
| [Cancel] | Disables the setting and closes this window. |
| [Reset] | Resets the setting to the initial status. This operation does not close this window. |

5.2.16 Set Upper Limit/Lower Limit Value of Pseudo Color Adjustment

Specifies the upper limit value rendered in red and the lower limit value rendered in blue.

The measurement image within the upper and lower limits are rendered in colors. The upper limit or higher measurement values are rendered in red, and the lower limit or lower measurement values are rendered in blue. Specifying the upper limit and lower limit values enables you to minutely render the colors in an arbitrary range so that slight differences in measurement image can be emphasized. The valid range is from the minimum to the maximum value of the measurement data. When changing measurement items of default, Tristimulus values or chromaticity, the upper limit value and the lower limit value are set to the maximum value and minimum value, respectively. To set the upper limit and lower limit values of the pseudo color, go through the following steps.

1. Open the [Pseudo color property] screen according to “5.2.15 Open Property Window (Pseudo Color)”.
2. Set the upper and lower limit values by using the [Upper/Lower values] slide bar while observing the color variation of [Pseudo color view]. Or, enter directly the value in the edit box at the right side of the [Upper/Lower values] slide bar.
- 3.

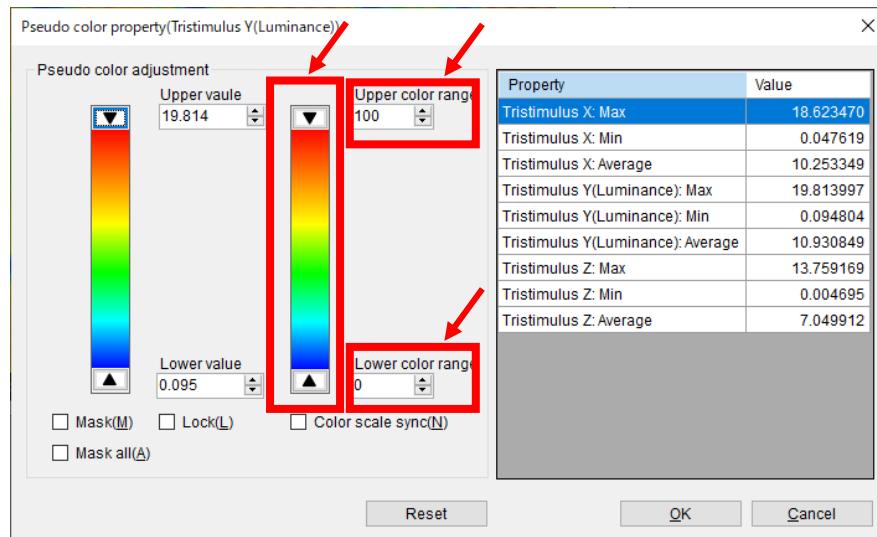


5.2.17 Adjust Color Range in Pseudo Color View

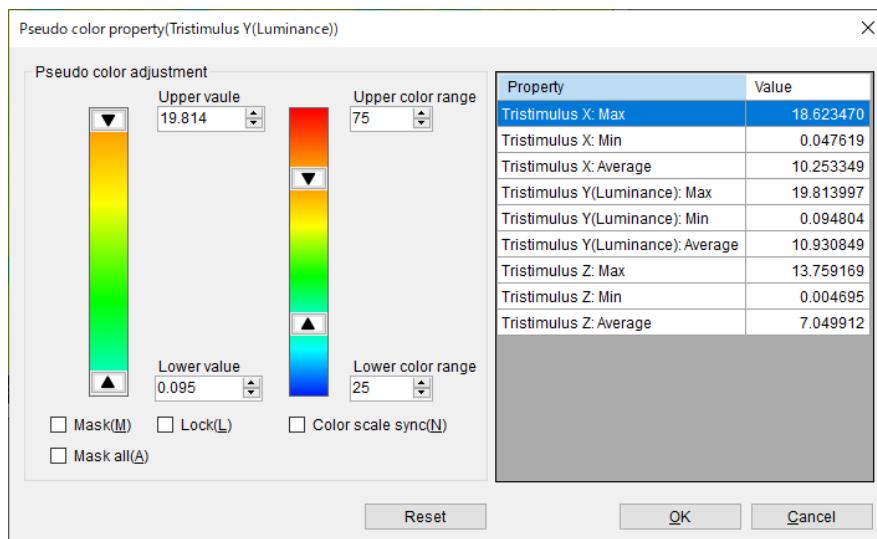
Specifies the pseudo color range as keeping the upper and lower limits.

To specify the color range, go through the following steps.

1. Open the [Pseudo color property] screen.
2. Set the color range with the [Color range] slide bar as observing the color variation of [Pseudo color view] and the slide bar color range. Or, enter directly the value in the edit box at the right side of the [Upper color range]/ [Lower color range] slide bar.



As you move the [Color range] slide bar, the pseudo color of the [Upper/Lower values] slide bar is changed according to the movement.

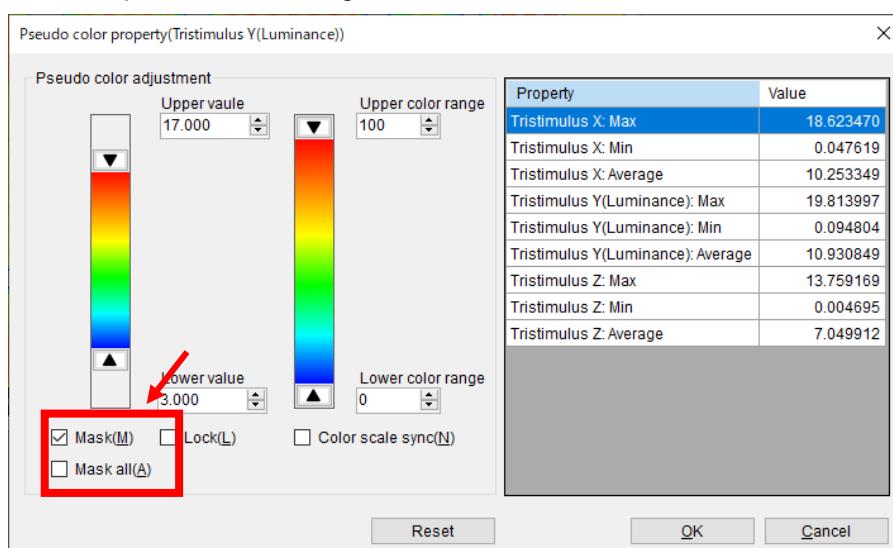


5.2.18 Masking to the Outside of the Pseudo Color

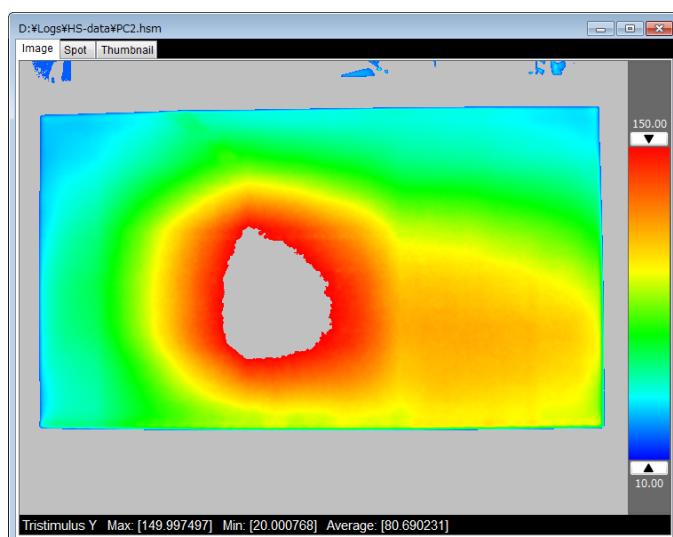
Masks the measurement image where measurement values are out of the upper or lower limit set by the [Pseudo Color Property]. Masking the image where measurement values are outside of the upper and lower limit enables you to plot and display the arbitrary range.

To mask the image, go through the following steps.

1. Open the [Pseudo Color Property].
2. Adjust the [Set Upper Limit/Lower Limit] slide bar while observing the color variation of the [Pseudo Color View], or directly enter the value in the edit box at the right side of the [Set Upper Limit/Lower Limit] slide bar.
3. Check the [Mask] or [Mask All] checkbox. Click the [OK] button to apply the masking to the measurement image where measurement values are outside of the upper limit or lower limit. When [mask all] is selected, the Tristimulus X / Y / Z, Chromaticity x / y / u' / v', Color temperature, Wavelength, and L * a * b * are masked at the same time.



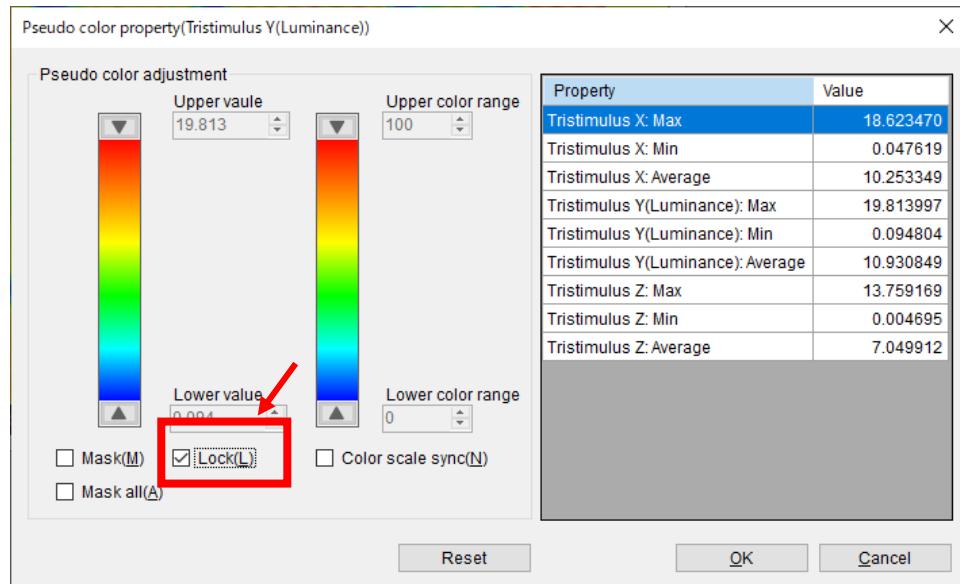
4. The measurement image where measurement values are out of the upper limit or lower limit are masked and only the measurement image where measurement values are within the upper and lower limits are displayed. If you save the measured data in a CSV file with the masking on, the measurement data with image displaying only are saved.



5.2.19 Lock Pseudo Color Adjustment

Locks the upper and lower limit values set on the [Pseudo Color Property]. The measurement image where measurement values are within the upper and lower limits are rendered in pseudo color by locking the upper limit and lower limit values. To lock the setting of upper and lower limits, go through the following steps.

1. Open [Pseudo Color Property].
2. Check the [Lock] checkbox. Once you check the checkbox, the [Set Upper Limit/Lower Limit] slide bar, [Set Upper Limit/Lower Limit] edit box and [Color Range] slide bar become disable, and the current setting values are fixed.

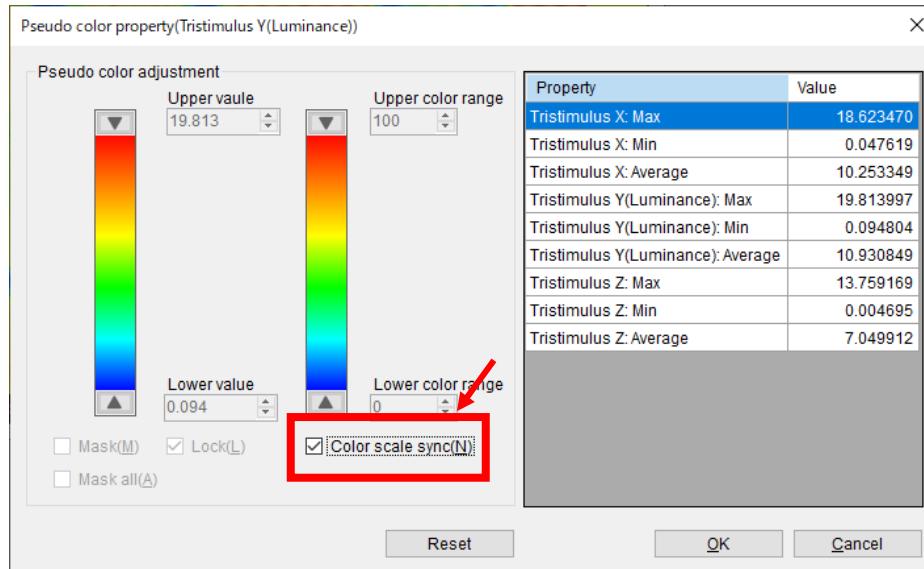


5.2.20 Synchronize Color Adjustment

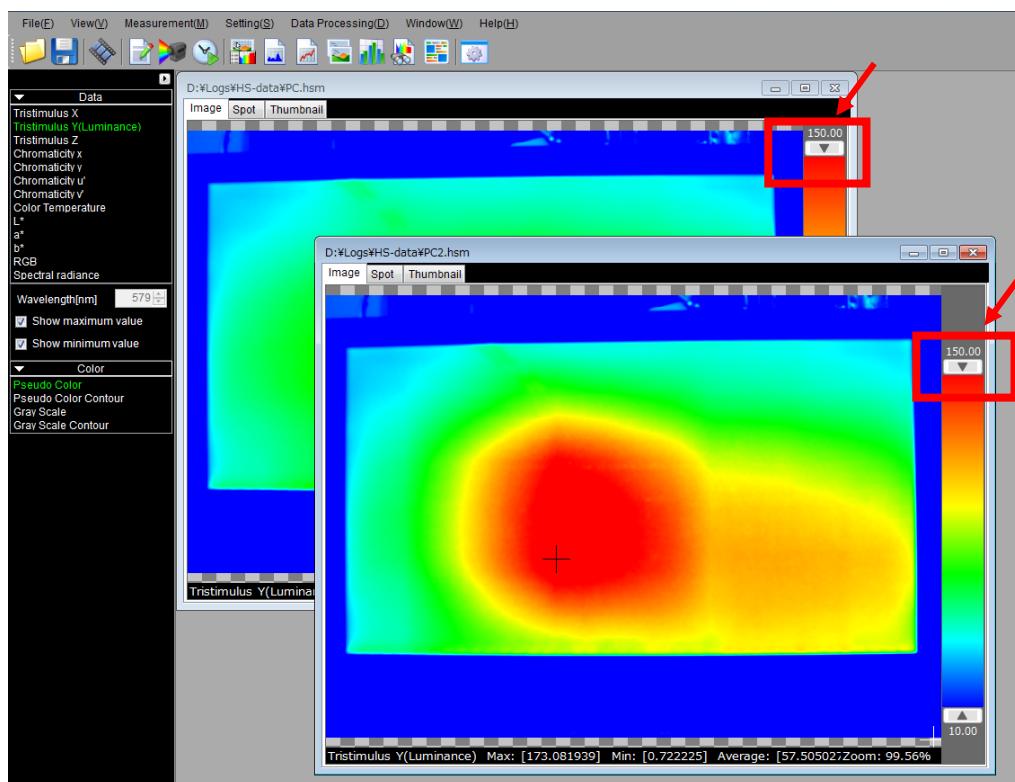
Color adjustments on the [Pseudo Color Property] can be applied for all loaded images. This is called "Color Scale Sync".

To synchronize color adjustments, go through the following steps.

1. Open [Pseudo Color Property].
2. Modify color adjustments if necessary. Check the [Color scale sync] check box and click [OK] to go back to previous window.



3. Color adjustments that was set in previous step are applied for all loaded images in main window. Colors in these images are changed corresponding to adjustments.

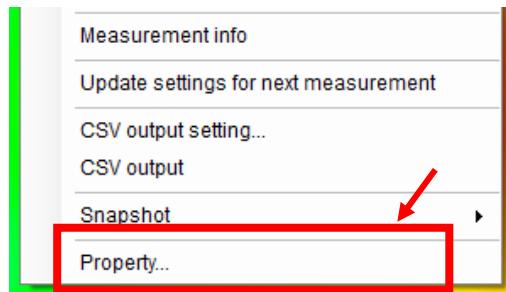


5.2.21 Change Number of Contour Lines

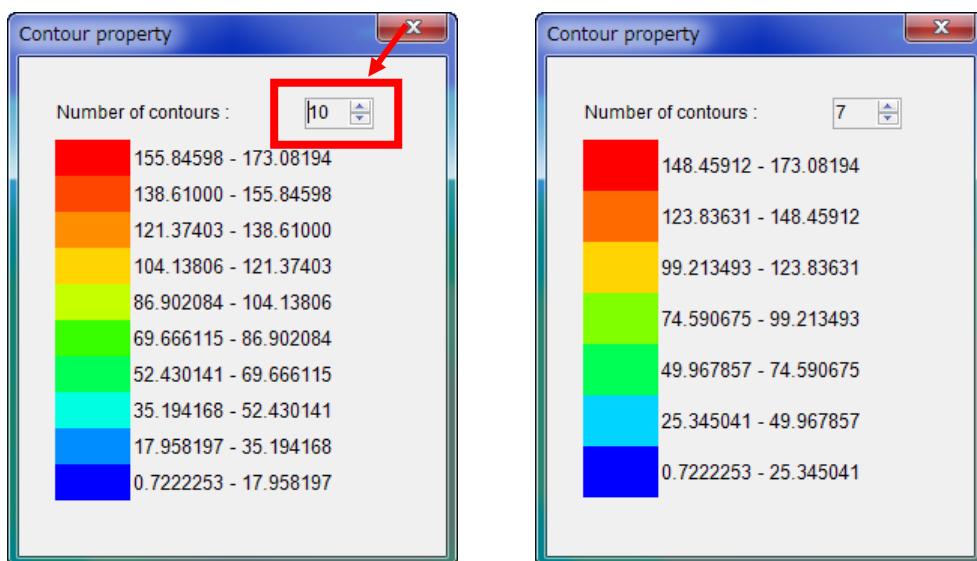
Adjusts the display color of the view which is displayed with pseudo color (contour).

To open [Contour property], go through the following steps.

1. Select any other data except [RGB] and [Spectral radiance] in [Data] and select [Pseudo color contour] in [Color].
2. Right-click on the view to display the pop-up menu. Select [Property...] from the pop-up menu.



3. The [Contour property] screen appears. By using [\blacktriangle] and [\blacktriangledown], set the number of contour lines to divide. The default number of contour lines is 10, and the setting range is 2 to 20.



Memo

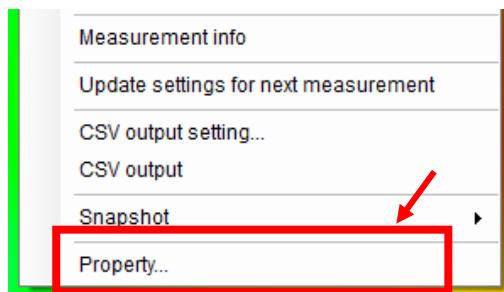
The contour lines equally divide the maximum to the minimum values.

5.2.22 Change RGB Balance

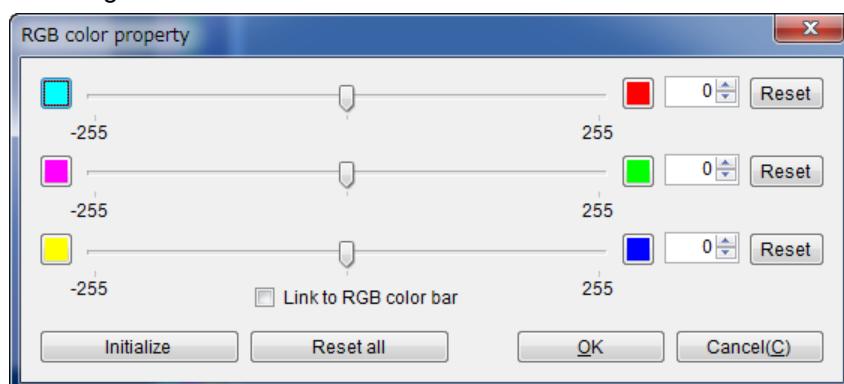
You can adjust the balance of the displayed RGB.

To change the RGB balance, go through the following steps.

1. Select [RGB] in [Data] and select [RGB] in [Color].
2. Right-click on the view to display the pop-up menu. Select [Property...] from the pop-up menu.



3. The [RGB property] screen appears. By using the slide bar, set the RGB balance as observing the variation of the RGB display color. Or, enter directly the value in the edit box at the right side of the slide bar.



The functions of buttons are described below.

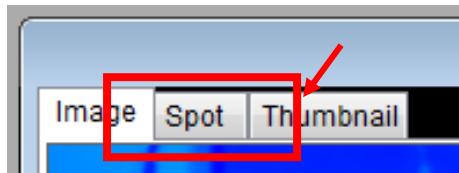
[OK]	Enables the setting and closes this screen.
[Cancel]	Disables the setting and closes this screen.
[Reset]	Resets the value of each bar.
[Initialize]	Returns the values of all bars to those when this screen appears first.
[Reset all]	Resets the values of all bars.

5.3 Spot View Operation

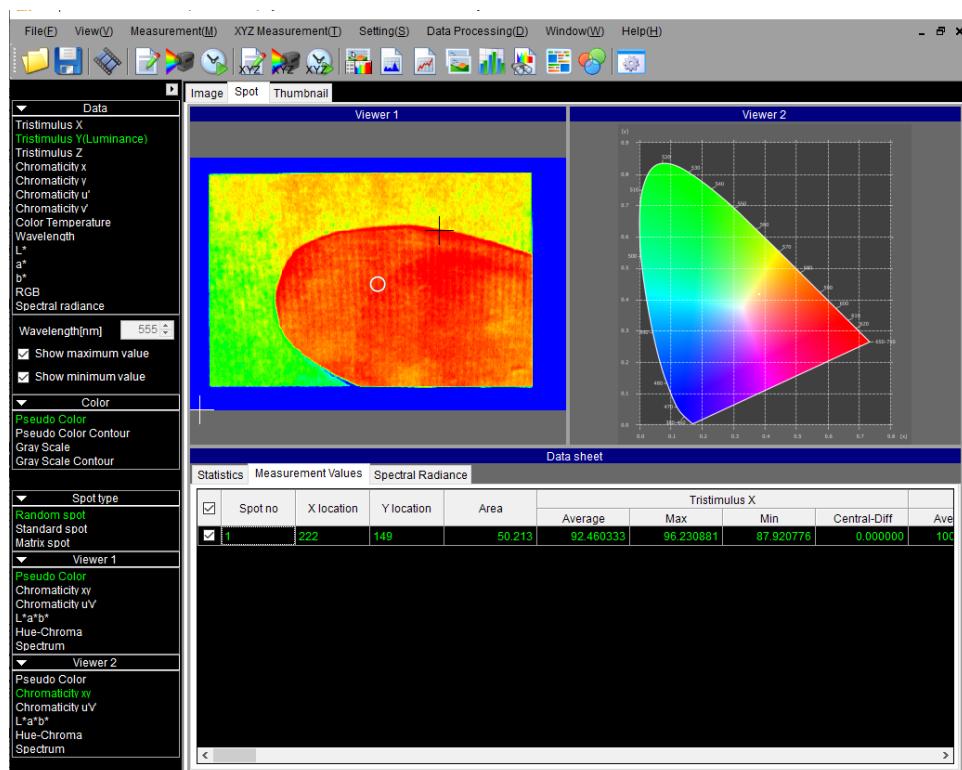
Spot is a local area which can be created within a measurement image. By creating a spot, you can total data or display spectrum of the area to be noticed.

To change to the spot view, go through the following steps.

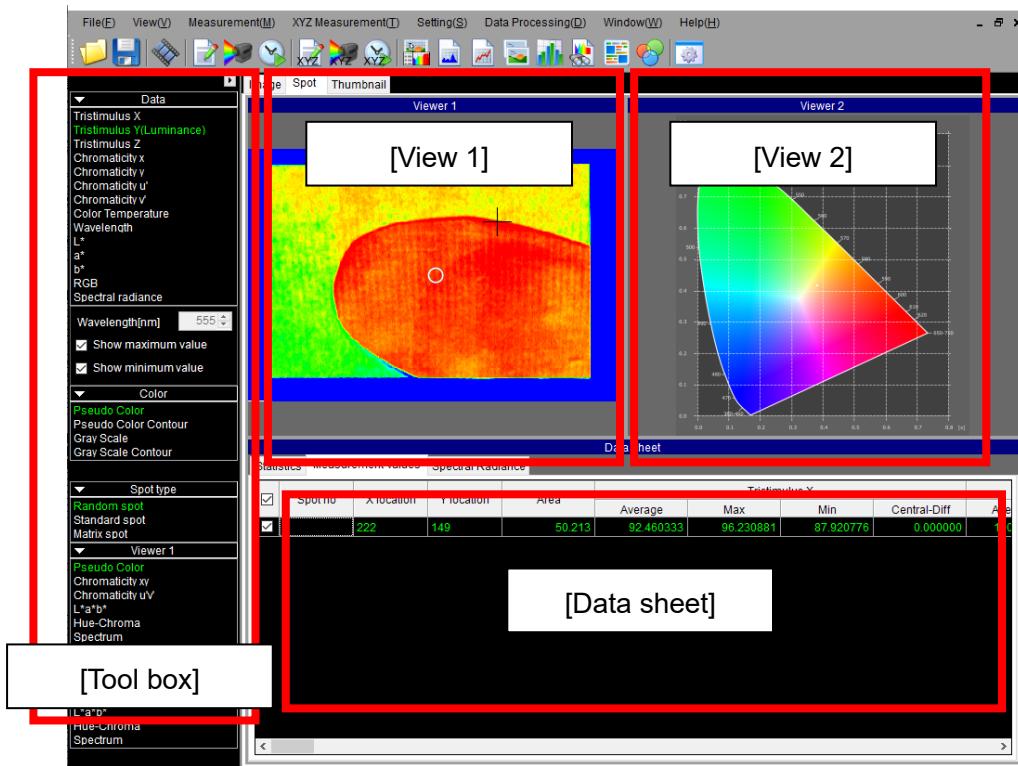
1. Select the [Spot] tab from the tabs at the upper left of the measurement image view.



2. The spot view appears.



On the spot view, by using two views and a data sheet, you can analyze the spot characteristics. By using the tool box at the left side on the main screen, you can change the spot type or view.



The functions of windows are described below.

[Tool box]

[Data] Selects the type of the image to be displayed when [Pseudo color] is displayed on [Viewer 1-2]. How to use is the same as [Measurement image view].

[Color] Selects the color of the image to be displayed when [Pseudo color] is displayed on [Viewer 1-2]. How to use is the same as [Measurement image view].

[Spot type] Changes the type of the spot to be displayed. You can select one of three types, [Random spot], [Standard spot] and [Matrix spot].

[Viewer 1-2] You can change a view to be displayed on [Viewer 1-2]. You can select one of [Pseudo color], [Chromaticity xy], [Chromaticity u'v'], [L*a*b*], [Hue-Chroma] and [Spectrum].

[Viewer 1-2]

[Pseudo color]	Displays the measurement image selected on [Data] and draws the spot diagram on the image.
[Chromaticity xy]	Plots the chromaticity x and y of the measurement spot on the CIE chromaticity diagram.
[Chromaticity u'v']	Plots the chromaticity u' and v' of the measurement spot on the CIE chromaticity diagram.
[L*a*b*]	Plots the L*a*b* of the measurement spot on the CIE chromaticity diagram.
[Hue-Chroma]	Plots the measurement spot on a graph according to JIS Z8721.
[Spectral radiance]	Displays the spectral radiance of the measurement spot as a line graph. Displays the spectrums of all spots at a time.

[Data sheet]

Displays the measured values of a measurement spot on the spread sheet. By setting ON/OFF of the check box at the left end, you can set whether the measurement spot should be displayed on the views and graph.

<input checked="" type="checkbox"/>	Spot no
<input checked="" type="checkbox"/>	1
<input type="checkbox"/>	2
<input checked="" type="checkbox"/>	3

The Max and Min values of the Wavelength data displayed on the [Measurement Values] tab are the values excluding the complementary wavelength value, and the Average is the value including the complementary wavelength (complementary wavelength is expressed as a negative number). If the Average is the complementary wavelength, the equation of the Central-Diff will be "error".

The numbers displayed on the [Statistics] tab are the values calculated from all the measurement spots. If the value of a spot is error, the spot is not included in the statistics.

Also, if the check box for each spot is set to uncheck, that spot will not be included in the statistics. The wavelength data shows the numerical value calculated by excluding the complementary wavelength.



Right-click on each view, and the pop-up menu is displayed. The operations of [Zoom], [Move] and [Snapshot] displayed on the pop-up menu are the same as those of [Measurement image view] if there is not any special explanation.

“5.2.8 Enlargement/Movement”

“5.2.14 Save Snapshot”



Maximum number of spots is recommended value for stable operation. When number of spots is over it, operation may become unstable.

5.4 Random Spot View Operation

5.4.1 Open Random Spot View

The Random Spot function enables you to freely place measurement spots at up to 999 points, and enables you to flexibly customize the pattern and the size of the measurement spot. Carry out the operation for the spot from the pop-up menu.

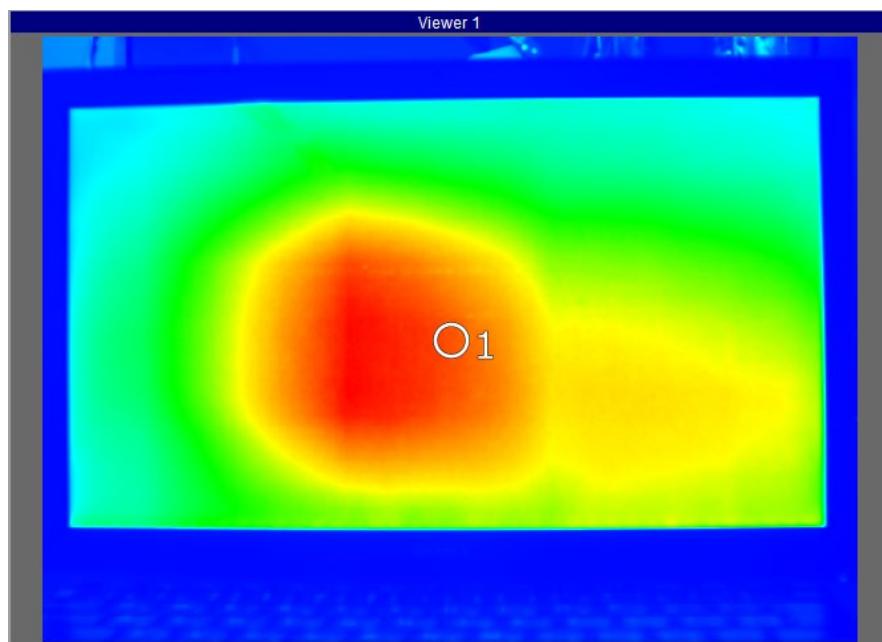
Arranging the center of the measurement spot or deselecting all spots can be done by selecting the corresponding functions from the Pop-up menu at the flip of a switch. If there is no definition for the initial display and applicable measurement spot arrangement, the measurement spot is set only to the center.

To open the [Random Spot View], go through the following steps.

1. Select [Random spot] in [Spot type] and select [Pseudo color] on one of [Viewer 1] and [Viewer 2].



2. [Random spot view] is displayed. The measurement image is displayed on the view and the diagram of the random spot is drawn on the image.

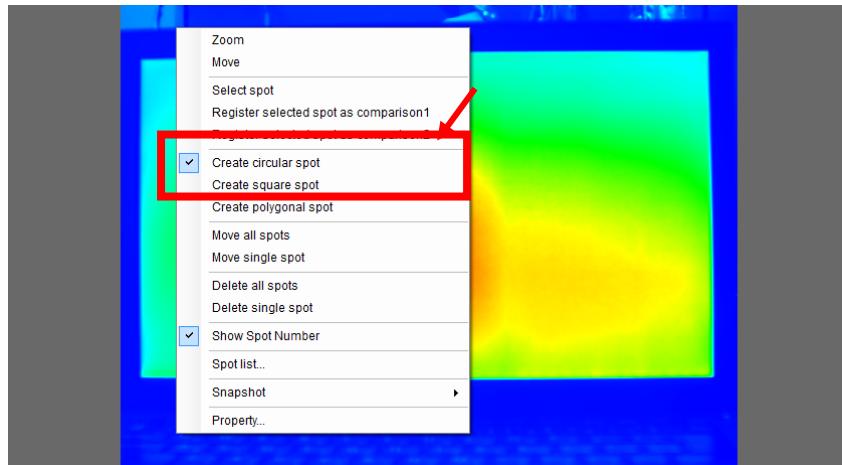


5.4.2 Set Measurement Spot (Circle/Square)

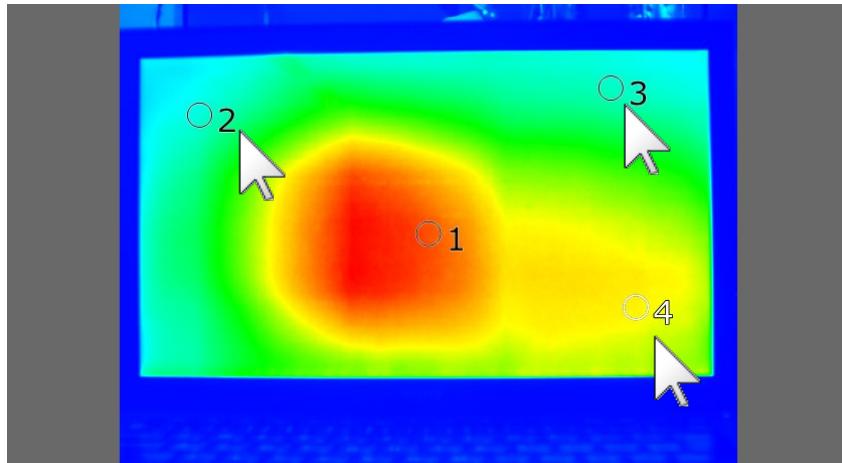
This function enables you to freely arrange and measure up to 999 measurement spots in the measurement image.

To set circle and square measurement spots, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Create circular spot] or [Create square spot].



2. Click a place on which you want to put a measurement spot on [Random spot view] with the mouse. By clicking, a measurement spot is set.



Memo

Initial spot shape and size are specified via the [Random Spot Property]

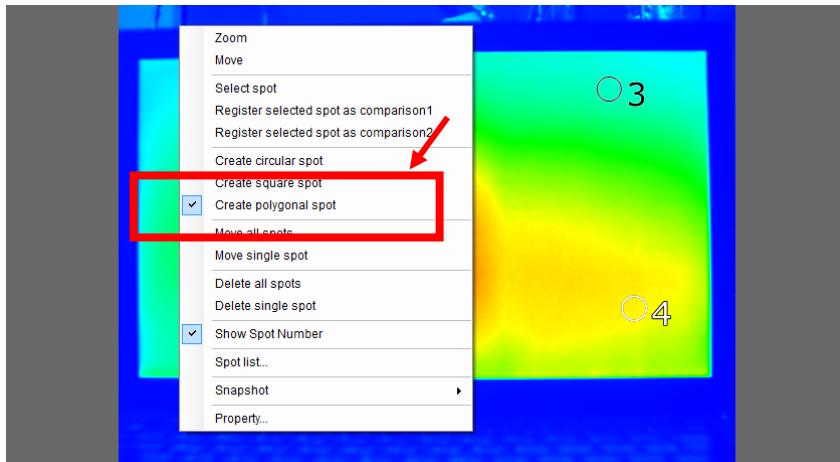
☞ “5.4.15 Display Random Spot Property”

5.4.3 Set Measurement Spot (Polygon)

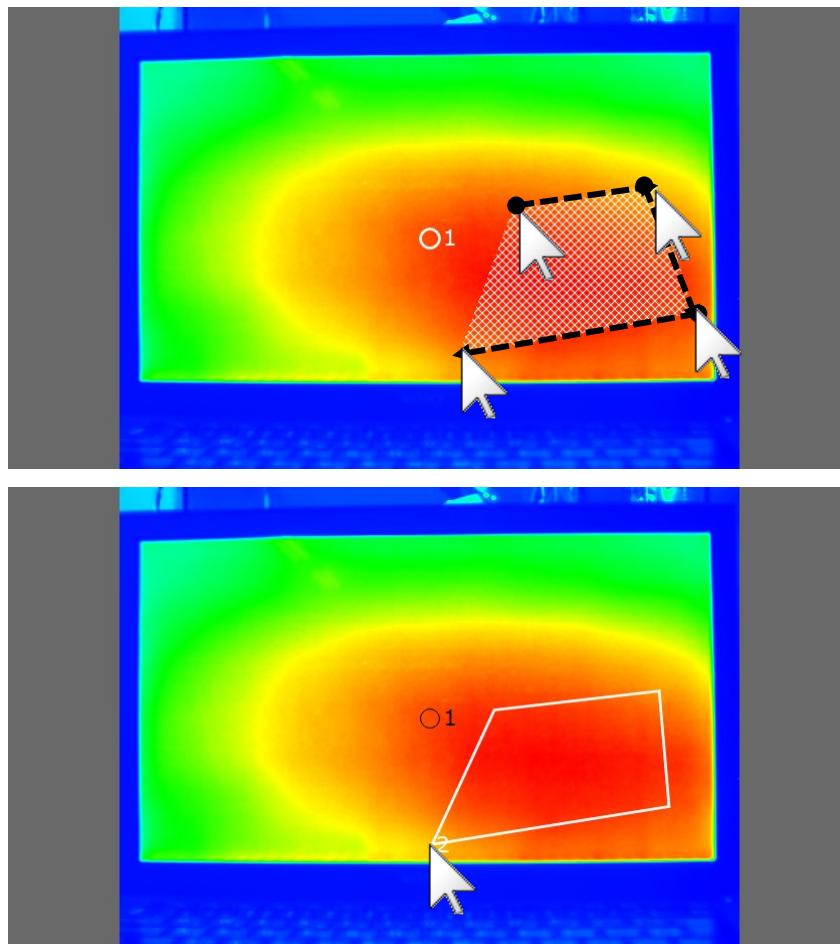
This function enables you to freely arrange and measure up to 999 measurement spots in the measurement image.

To set polygon measurement spots, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Create polygonal spot].



2. On [Random spot view], click the mouse where you want to put the vertex of a polygon measurement spot in sequence. Double-click at the last vertex point to set the measurement spot.



 Memo

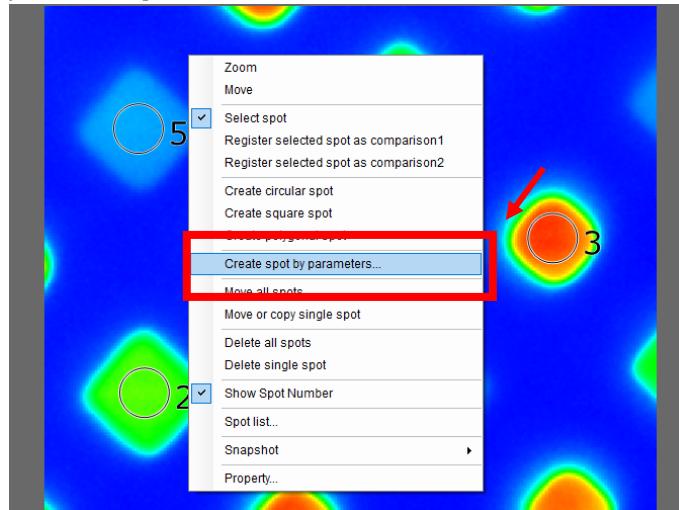
- Up to 127 vertexes of a polygon can be set.
- Measurement spot can be laid to overlap.
- Press “Esc” key in the keyboard to return to the previous operation.

5.4.4 Set Measurement Spot (by Parameters)

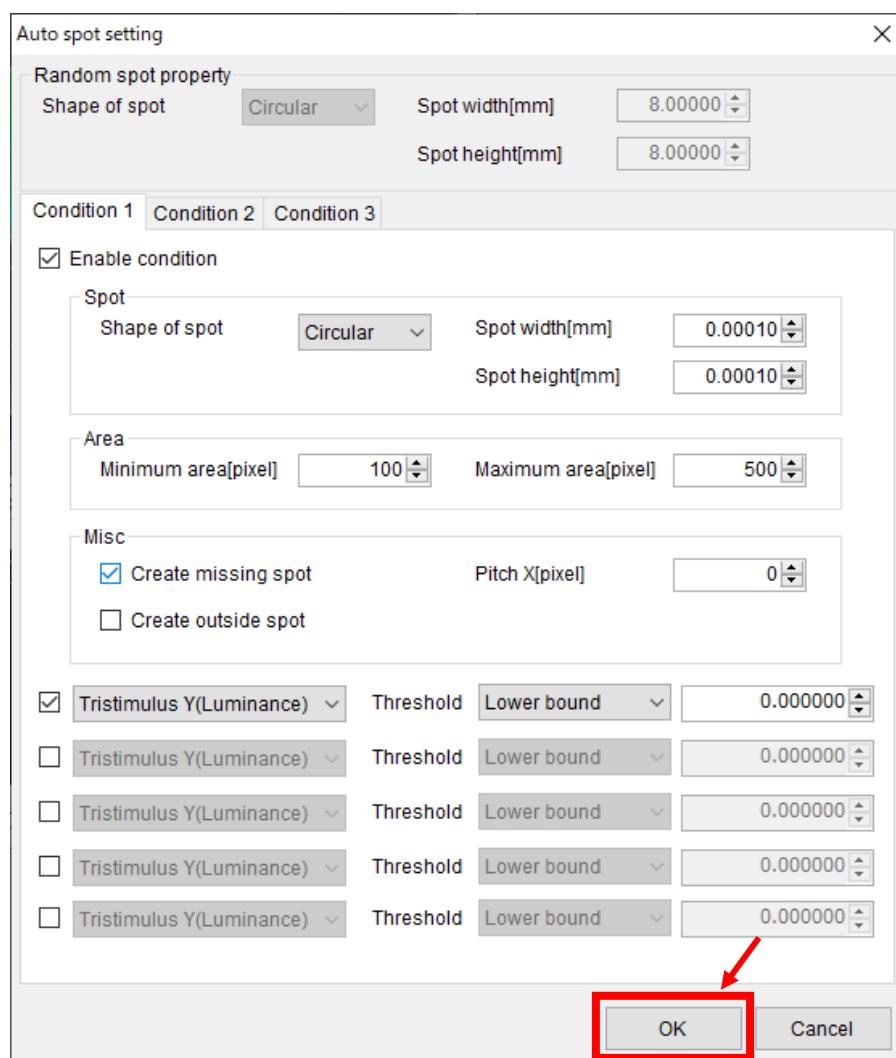
This function enables you to create spots by parameters automatically.

To create spots automatically, go through the following steps.

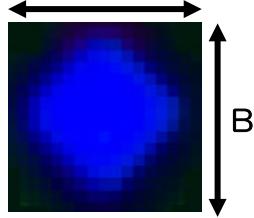
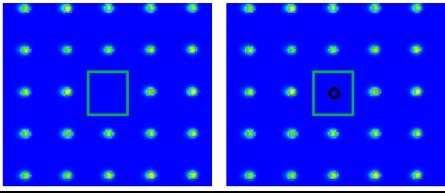
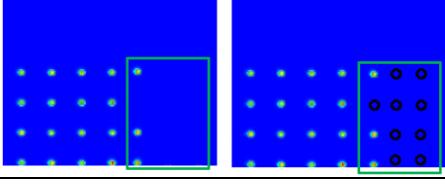
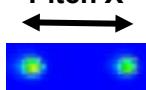
1. Right-click on [Random spot view] to open the pop-up menu. Select [Create spot by parameters].



2. Set parameters and then click the [OK] button to create spots.



The contents of setting for the items are described below.

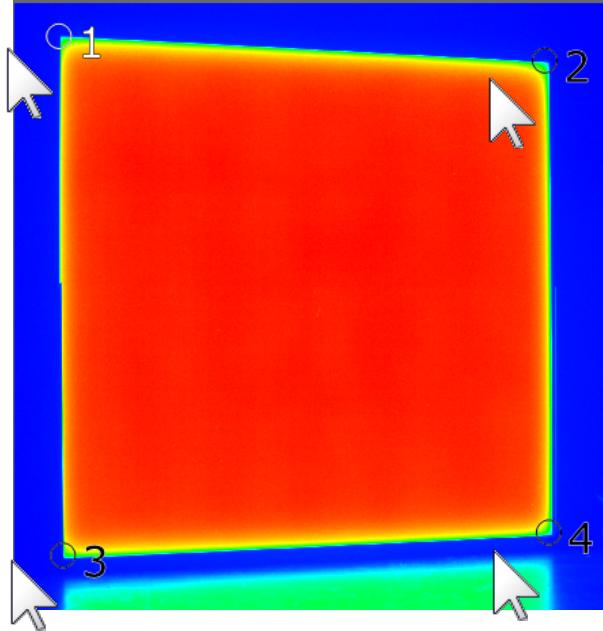
Item	Contents of setting
[Condition1/2/3]	Up to 3 spot conditions can be set Ex.) Condition1: Spot setting for R Condition2: Spot setting for G Condition3: Spot setting for B
[Enable condition]	To enable condition, set the check box to ON.
[Shape of spot]	Selects the measurement spot pattern.
[Spot width] • [Spot height]	Inputs the measurement spot size directly.
[Minimum area] • [Maximum area]	Inputs the minimum and maximum area of spot.  <p>The minimum and maximum area are calculated by the following formula. $A \times B \times 0.5 = \text{minimum area}$ $A \times B \times 2.0 = \text{maximum area}$</p>
[Create missing spot]	Creates missing spot when light sources lie horizontally in the same pitch. 
[Create outside spot]	Creates outside spot when light sources lie horizontally in the same pitch. 
[Pitch X]	Inputs the horizontal pitch of spots to create missing spots. 
[Threshold]	Selects the threshold type and inputs threshold value.

5.4.5 Set Measurement Spot (on Mesh)

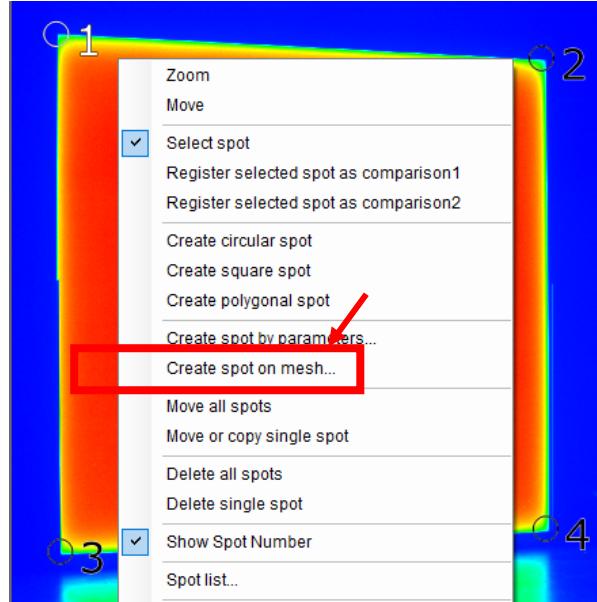
This function enables you to create spots on mesh.

To create spots on mesh, go through the following steps.

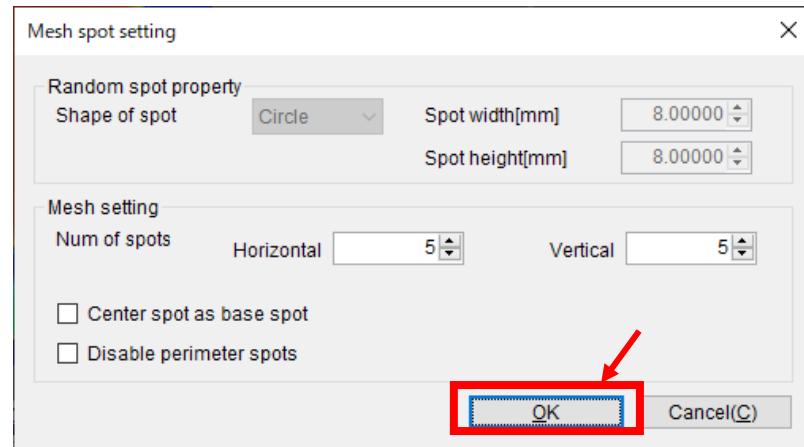
1. Create spots at the four corners following the steps described in “5.4.2 Set Measurement Spot (Circle/Square)”.



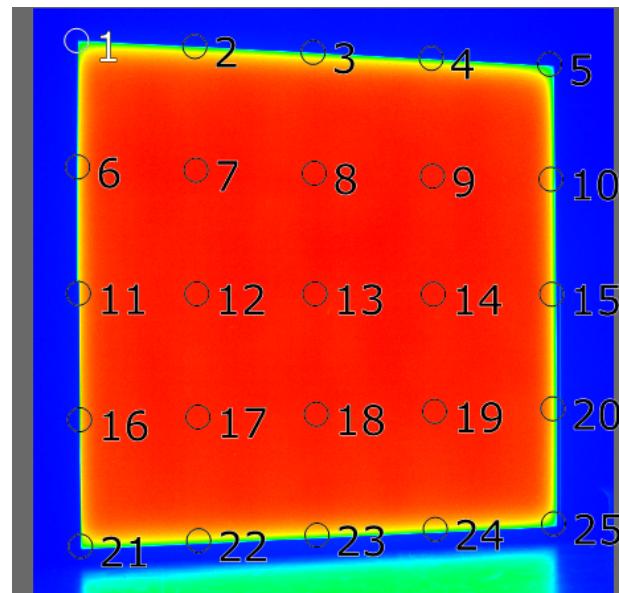
2. Right-click on [Random spot view] to open the pop-up menu. Select [Create spot on mesh].



3. Set parameters and then click the [OK] button.



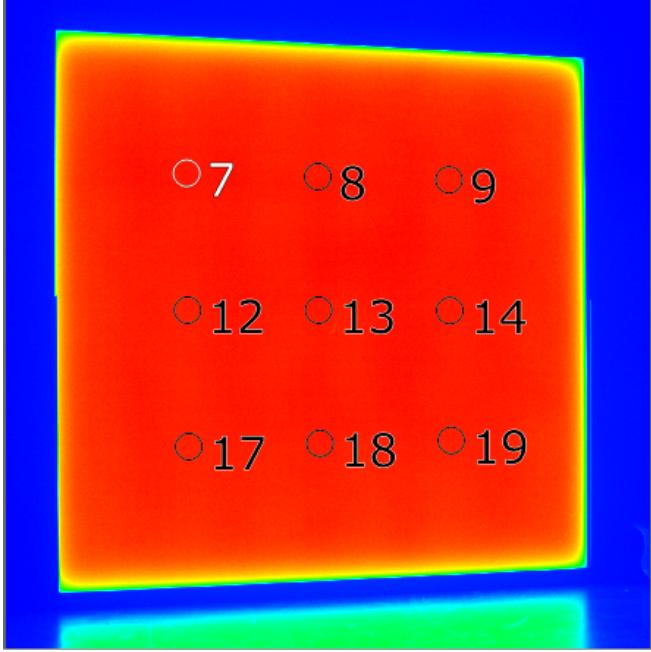
4. Spots are created on mesh.



Memo

- The spots at the four corners are decided as the nearest spots from the four corners of the image. If the nearest spots overlap, spots are not created correctly on mesh.

The contents of setting for the items are described below.

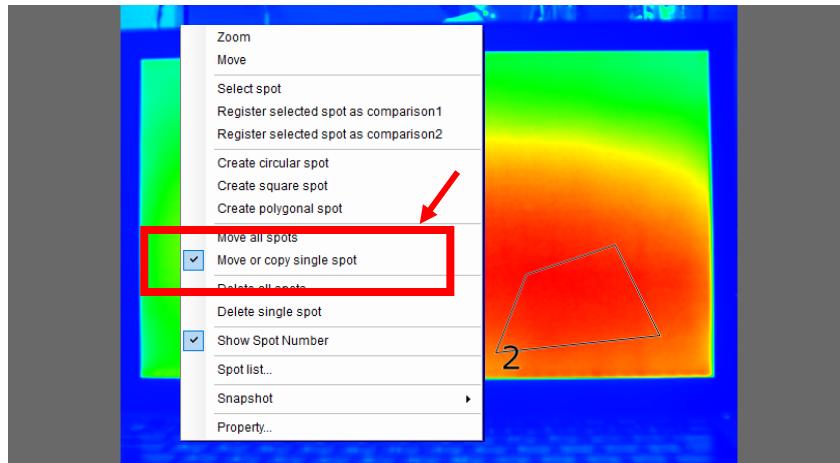
Item	Contents of setting
[Num of spots]	Horizontal and vertical number of spots Maximum value Horizontal: 160 Vertical: 120
[Center spot as base spot]	Sets the center spot as base spot. Enabled when both [Num of spots] are odd number.  “5.4.11 Display Random Spot List”
[Disable perimeter spots]	Disable the perimeter spots. Ex) 

5.4.6 Move or Copy Measurement Spot

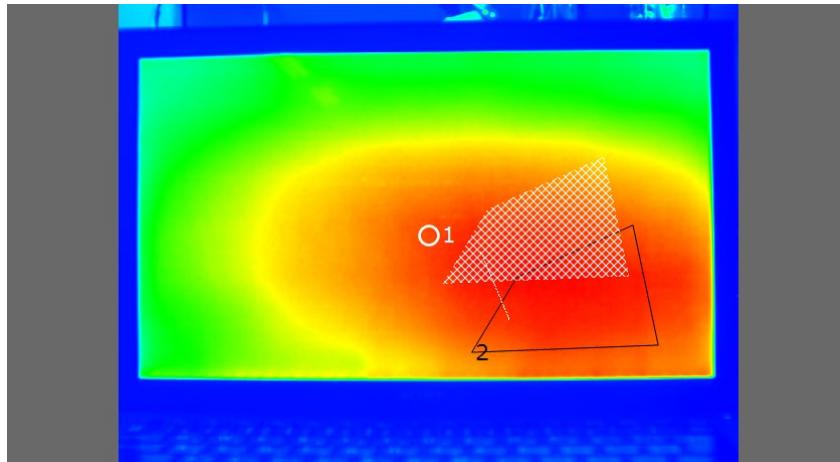
Moves measurement spots freely. The operation of [Move all spots] is the same as that of [Move or copy single spot].

To move measurement spots, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Move or copy single spot].



2. Click a measurement spot to be moved on [Random spot view] and drag it. The measurement spot can be moved. Release the mouse at the desired place, and the measurement spot is moved there.



Memo

- Press “Esc” key in the keyboard before confirming the moving to cancel the moving.
- Press “Ctrl” key in the keyboard to duplicate spots.
- Press “Shift” key in the keyboard to select multiple spots.
- Coordination of measurement spot can be specified via the [Random Spot List]

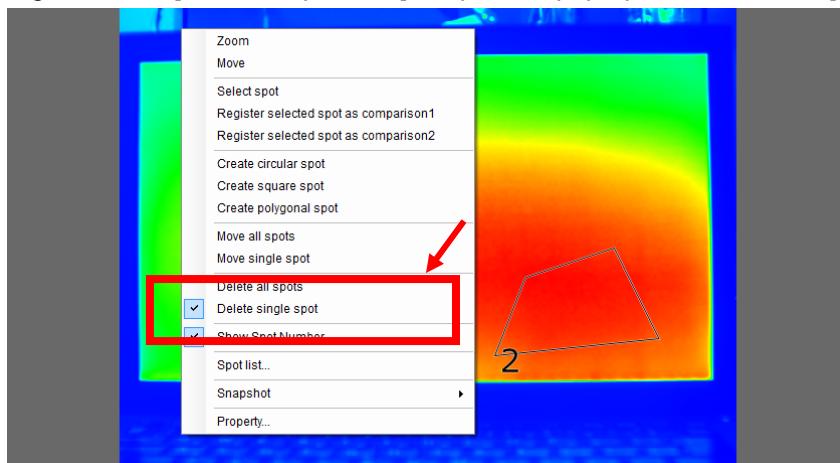
“5.4.11 Display Random Spot List”

5.4.7 Delete Measurement Spot

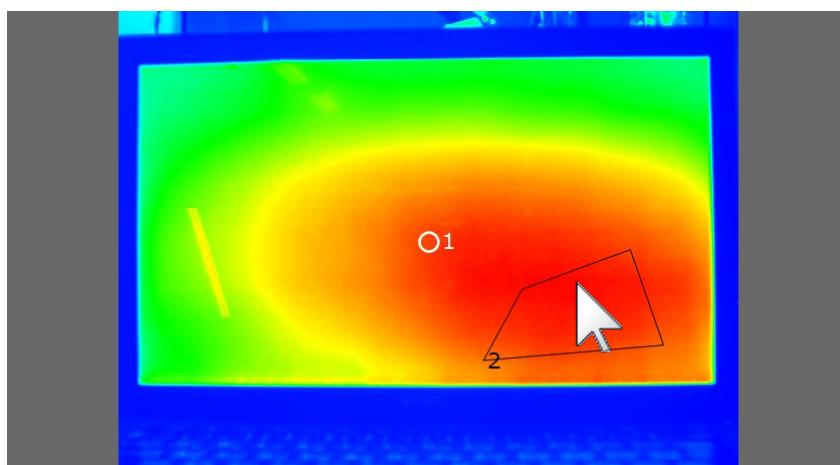
Deletes the specified measurement spot.

To delete a measurement spot, go through the following steps.

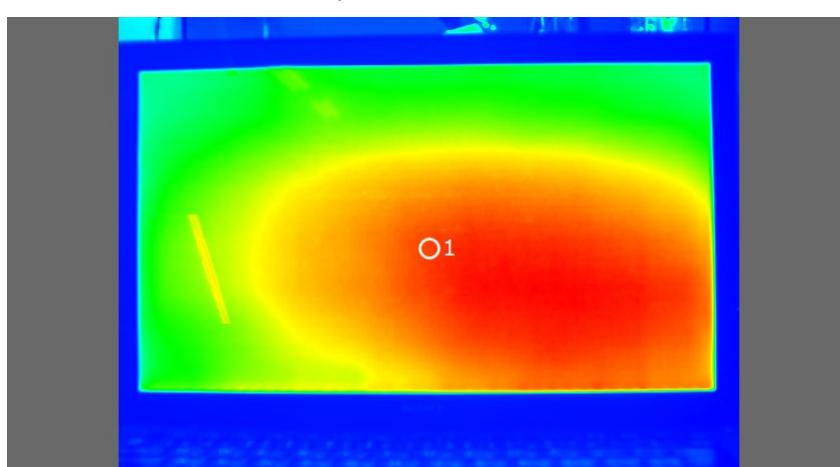
1. Right-click on [Random spot view] to open the pop-up menu. Select [Delete single spot].



2. Click the measurement spot to be deleted on [Random spot view].



3. The clicked measurement spot is deleted.

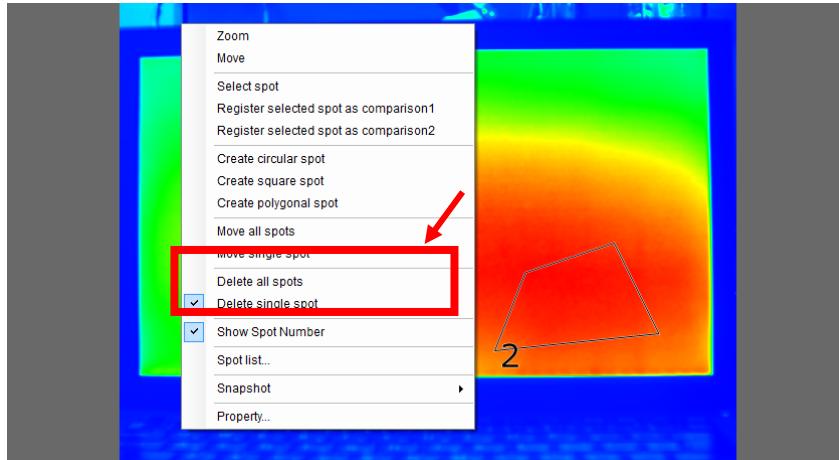


5.4.8 Delete All Measurement Spots

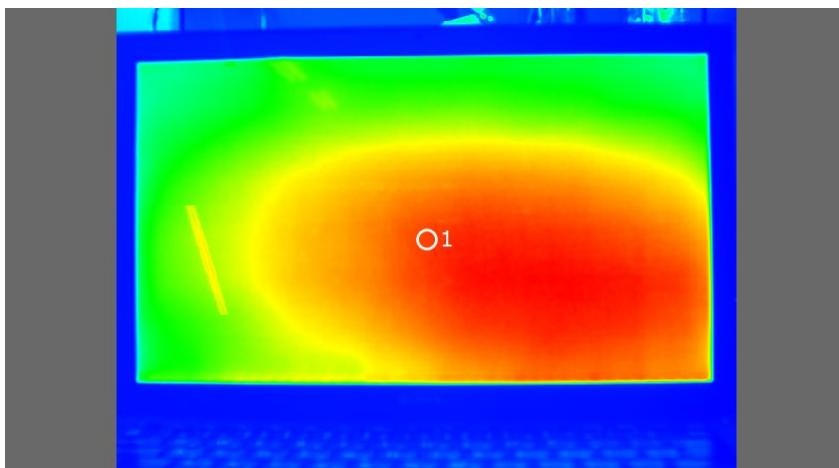
Deletes all measurement spots.

To delete all measurement spots, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Delete all spots].



2. Measurement spots are deleted.



Memo

- After deleting all the spots, one spot as an initial spot is created at the screen center.
- The shape and size of the initial spot can be specified through [Random spot property].

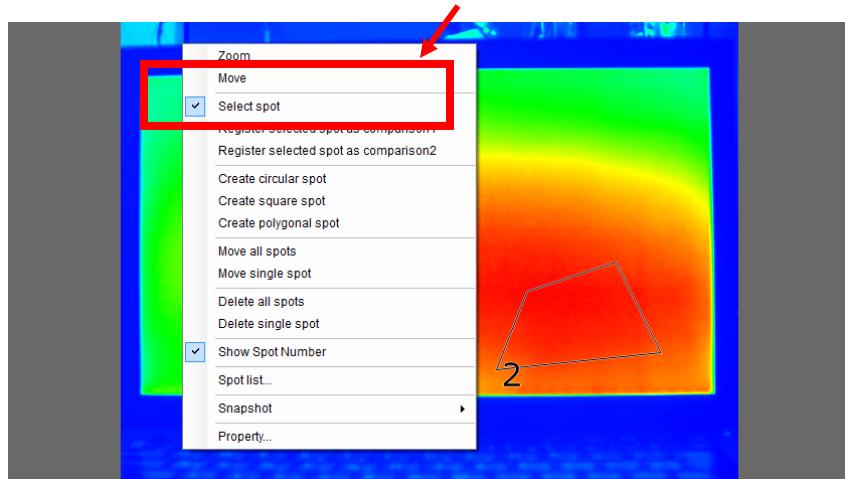
☞ “5.4.15 Display Random Spot Property”

5.4.9 Select Measurement Spot

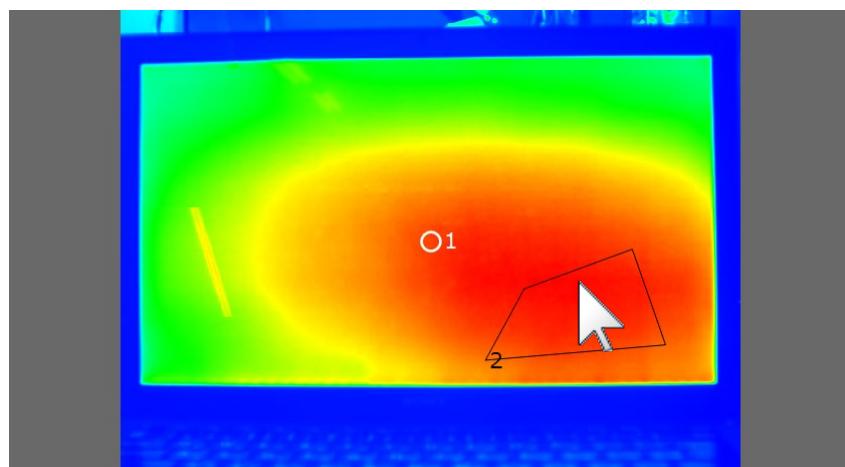
Selects the specified measurement spot. The selected spot is displayed in the emphasized status on a data sheet or view.

To select a measurement spot, go through the following steps.

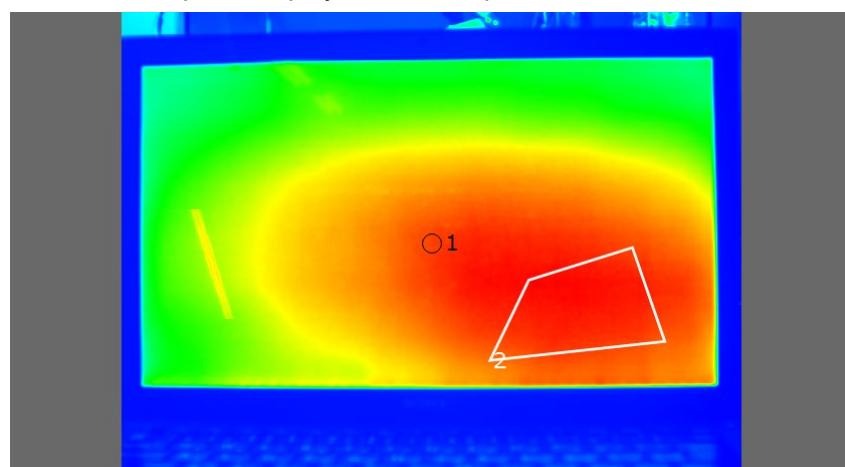
1. Right-click on [Random spot view] to open the pop-up menu. Select [Select spot].



2. Click a measurement spot to be selected on [Random spot view].



3. The selected spot is displayed in the emphasized status.

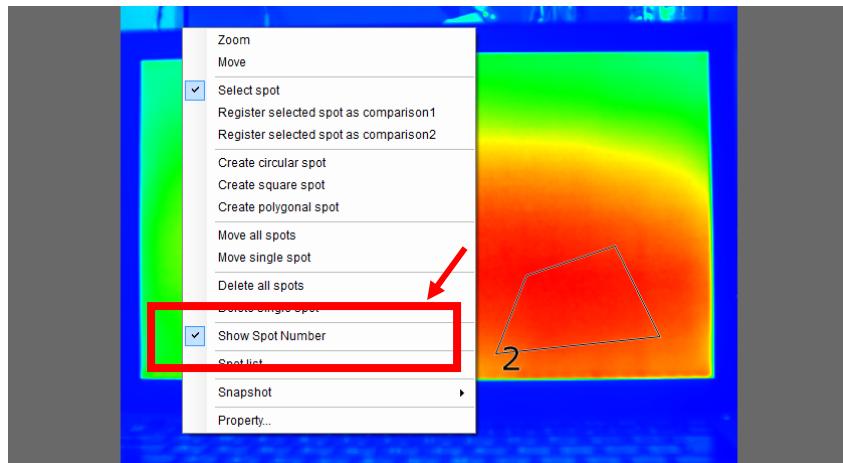


5.4.10 Showing/Hiding Spot Number

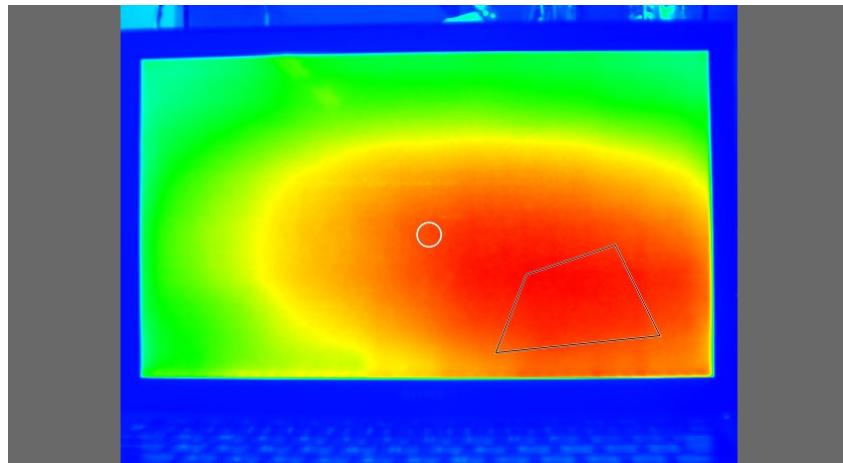
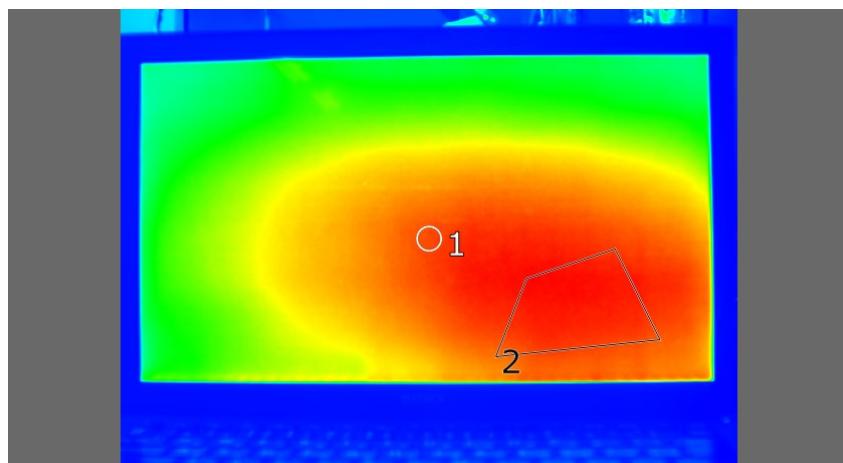
Shows or hides random spot number on the viewer.

To show or hide the random spot number, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Show Spot Number].



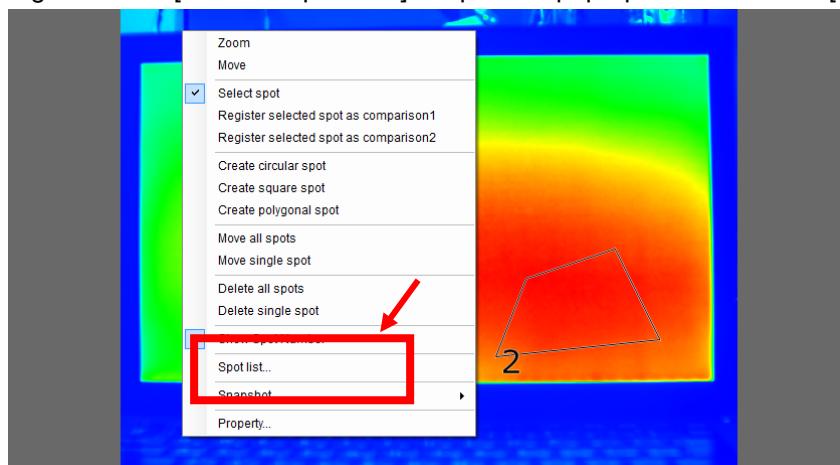
2. Repeating this steps can switch showing of numbers



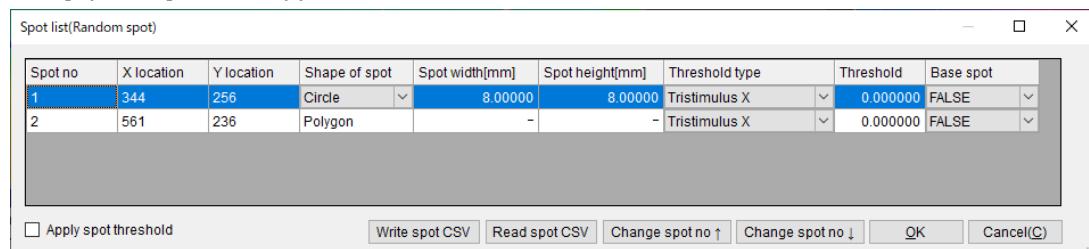
5.4.11 Display Random Spot List

Displays the random spot list. You can set shape, size, etc. of measurement spots individually. To display the random spot list, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Spot list...].



2. The [Spot list] screen appears.



You can set directly [X location], [Y location], [Shape of spot], [Spot width], [Spot height], [Threshold type], [Threshold] and [Base spot]. The contents of setting for the items are described below.

Item	Contents of setting
[X location] • [Y location]	Inputs the measurement spot coordinate directly.
[Shape of spot]	Selects the measurement spot pattern. It is not possible to change the shape to [Polygon].
[Spot width] • [Spot height]	Inputs the measurement spot size directly.
[Threshold type]	Selects the type of the tristimulus values to be applied to measurement spots. The applied threshold value must be one of tristimulus values X, Y and Z so as not to extract (mask) a different area according to tristimulus values.
[Threshold]	Inputs directly a value to be a threshold value.
[Base spot]	Sets a standard spot to calculate the center difference of measurement spots. You can select only one spot as the standard spot in the list.

The settable items are changed depending on the spot shape. Be careful.

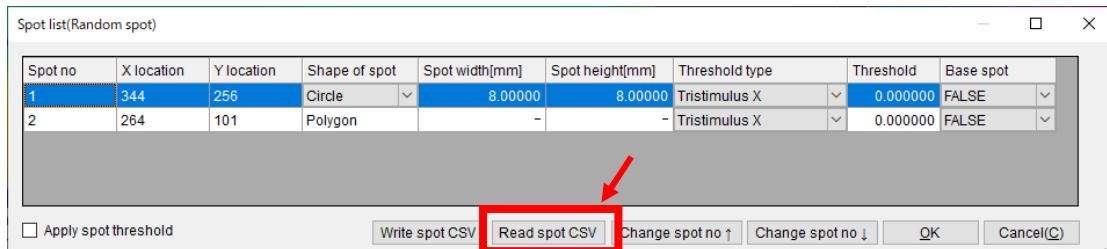
Item	[Circle/Square]	[Polygon]
[X location] • [Y location]	○	×
[Shape of spot]	○	×
[Spot width] • [Spot height]	○	×
[Threshold type]	○	○
[Threshold]	○	○
[Base spot]	○	○

5.4.12 Read/Write Spot Coordinate CSV

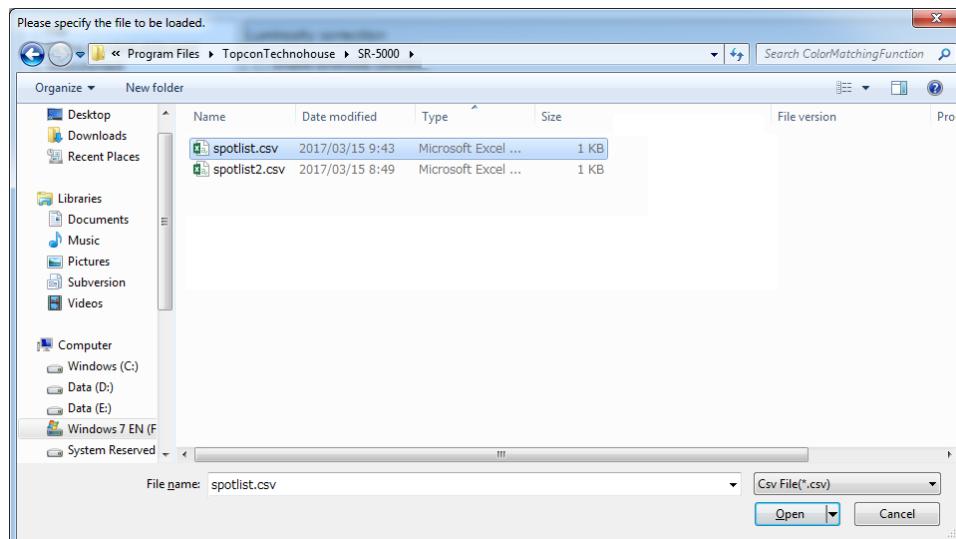
Some parts of spot list can be read from CSV file. This CSV file should be created in the format described later in this chapter in advance.

To read spot coordinate CSV file, go through the following steps.

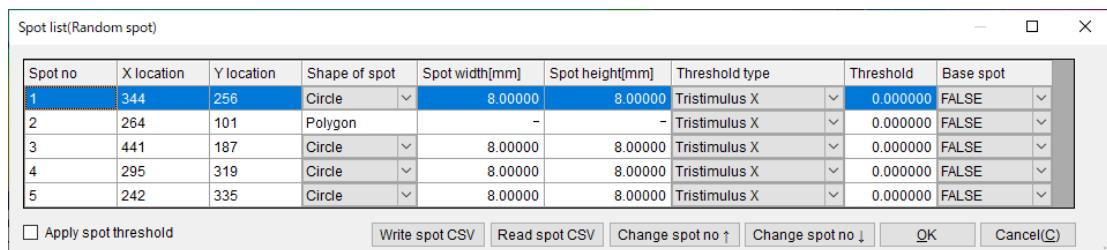
1. Show [Spot list] following the steps described in “5.4.11 Display Random Spot List”.
2. Click [Read spot CSV].



3. Read a CSV file.



4. [Spot list] is updated. Items that cannot be included in the CSV file is initialized.



The format of spot coordinate CSV file is below.

id	shape	x(mm)	y(mm)	size(mm)	
0	CIRCLE	0	0	8	8
1	CIRCLE	80	0	8	8
2	CIRCLE	0	80	15	15
3	SQUARE	-80	0	8	8
4	CIRCLE	0	-80	8	8

←

header

General text editor like notepad can read this file.

```
id,shape,x(mm),y(mm),size(mm)
0,CIRCLE,0,0,8,8
1,CIRCLE,80,0,8,8
2,CIRCLE,0,80,15,15
3,SQUARE,-80,0,8,8
4,CIRCLE,0,-80,8,8
```

Contents of each column is below.

Row	Header	Content
1	id	This is sequential number of each spot that starts from 0.
2	shape	“CIRCLE”, “SQUARE” or “POLYGON” to specify shape of each spot.
3	x(mm)	X coordinate of each spot in mm. (CIRCLE/SQUARE) X coordinate of the first vertex in mm. (POLYGON)
4	y(mm)	Y coordinate of each spot in mm. (CIRCLE/SQUARE) Y coordinate of the first vertex in mm. (POLYGON)
5	size(mm)	Width of each spot in mm. (CIRCLE/SQUARE) X coordinate of the second vertex in mm. (POLYGON)
6		Height of each spot in mm. (CIRCLE/SQUARE) Y coordinate of the second vertex in mm. (POLYGON)
7		X coordinate of the third vertex in mm. (POLYGON)
8		Y coordinate of the third vertex in mm. (POLYGON)
9~		X or Y coordinate of vertexes after the fourth in mm. (POLYGON)

 Memo

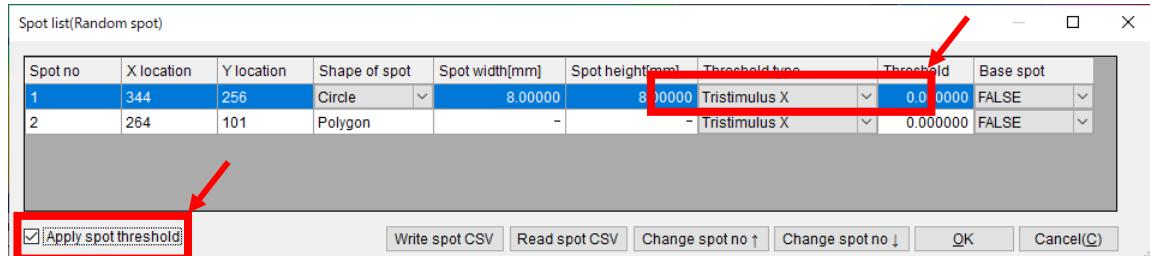
- Coordinate (0, 0) will be located in the center of image.
- Positive direction of X is right, Y is up.
- Values in mm is converted to pixel in the process of reading. Y coordinate is inverted when it is converted to pixel.
- The measurement distance associated with the measurement data is used for conversion. Unless this measurement distance is correct, coordinate conversion cannot be done correctly.
- It is possible to write a readable csv file via [Write spot file].

5.4.13 Set Threshold in Measurement Spot

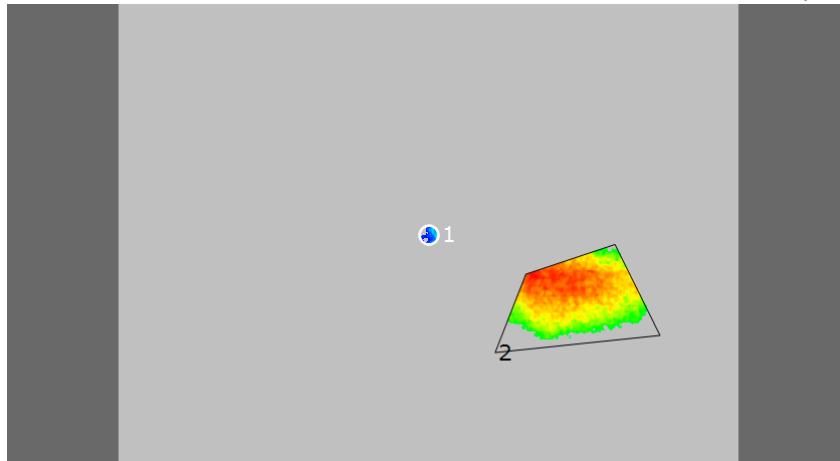
Sets the spot threshold in Random spot.

The spot threshold can help extract bright area on the random spot view. To set the spot threshold in the Radom spot, go through the following step.

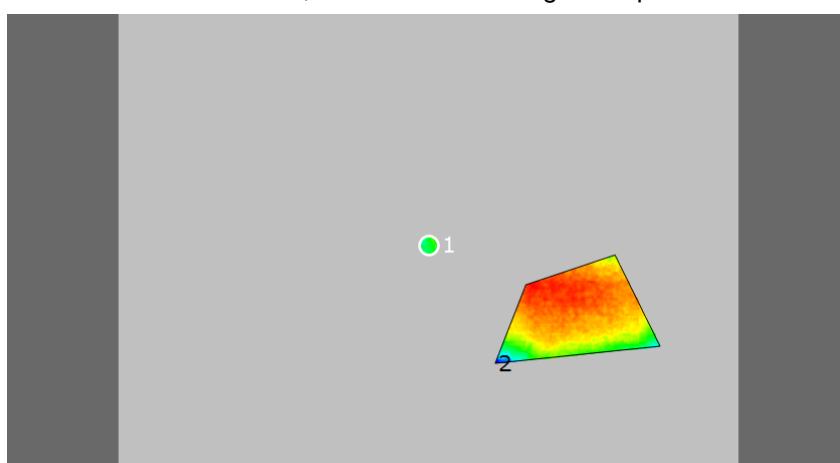
1. Display the [Spot list] screen according to “5.4.11 Display Random Spot List”.
2. Select [Threshold type] and input a value to [Threshold]. Then, set the [Apply spot threshold] check box to ON and click the [OK] button to go back to the previous screen.



3. The threshold value set in [Spot list] is applied to the measurement image. When a threshold value is set, the data below the threshold value within the random spot are masked.



When the threshold is “0”, all areas of the image except the measurement spot are masked.



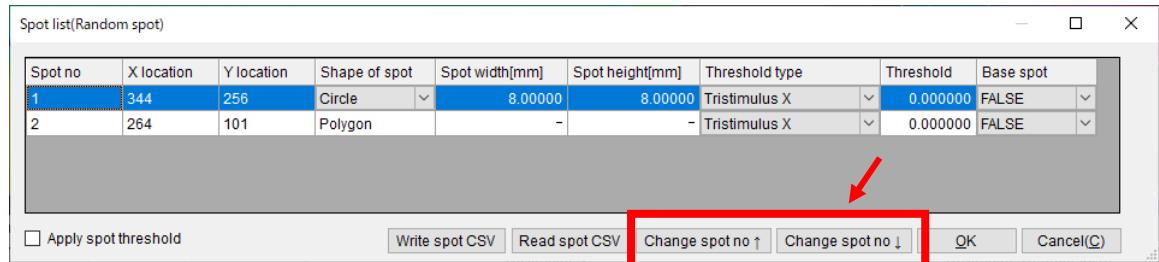
 Memo

To cancel the spot threshold, set uncheck the [Apply spot threshold] check box on [Spot list].

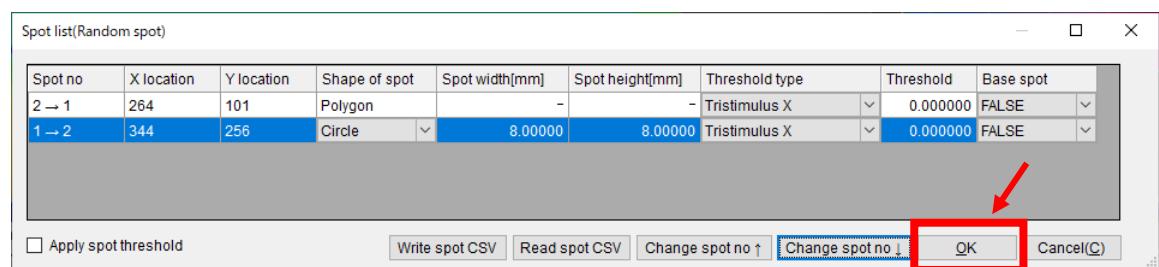
5.4.14 Change the spot number of random spots.

Change the spot number of random spots, go through the following step.

1. Display the [Spot list] screen according to “5.4.11 Display Random Spot List”.
2. Click [Change spot no ↑] or [Change spot no ↓].



3. Click the [OK] button to change the spot number on the “View” and “Data Sheet” screens.

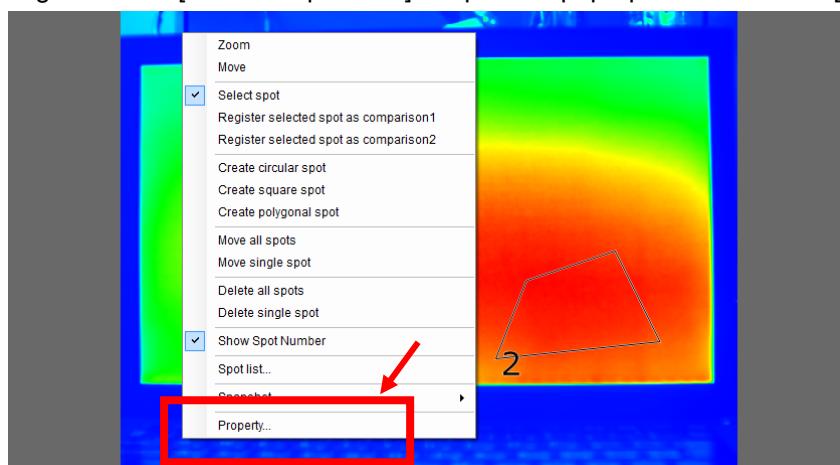


5.4.15 Display Random Spot Property

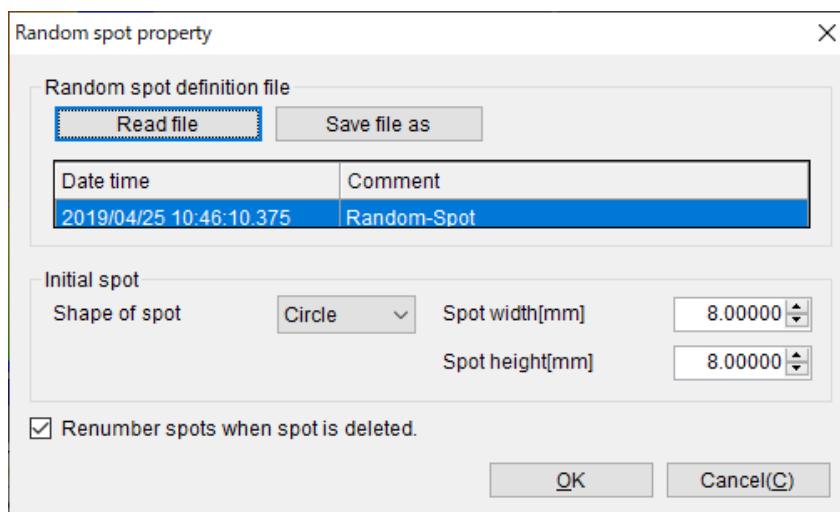
Defines the spot pattern and spot size of random spot.

To open the random spot property, go through the following steps.

1. Right-click on [Random spot view] to open the pop-up menu. Select [Property...].



2. [Random spot property] is displayed.



The contents of the items are described below.

[Read file]/[Save file as]

Saves the random spot definition as a file and reads the definition from a file.

☞ “5.4.17 Save/Read Random Spot File”

[Comment]

Sets an optional comment.

[Initial spot]

Sets initial information when creating a spot.

☞ “5.4.16 Set Initial Spot Pattern and Spot Size”

[Renumber spots when spot is deleted]

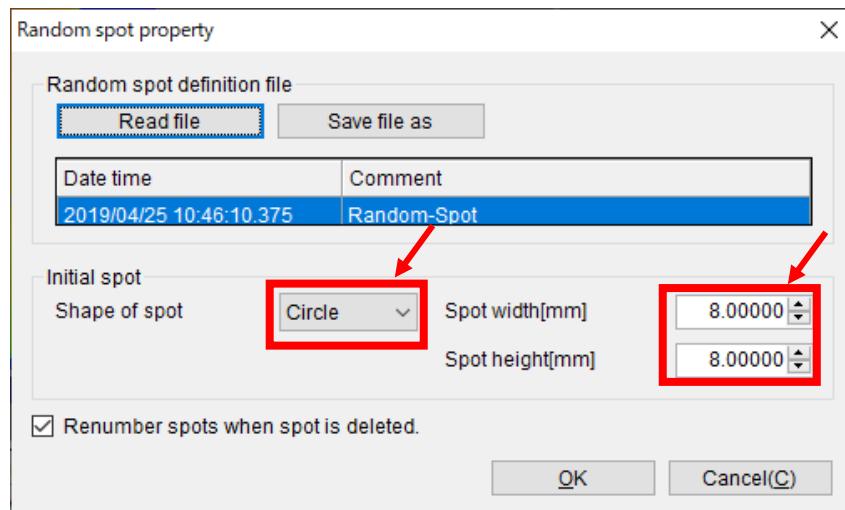
When setting numbers to spots again after deleting a spot, set this check box to ON.

5.4.16 Set Initial Spot Pattern and Spot Size

Sets the measurement spot definition of random spot. The setting is applied to the measurement image which is being displayed.

To set the measurement spot definition of random spot, go through the following steps.

1. Display [Random spot property] according to “5.4.15 Display Random Spot Property”.
2. Select a pattern from the pull-down menu of [Shape of spot] under [Initial spot]. You can select [Circle] and [Square].
3. Input a value for [Spot width] and [Spot height], then click the [OK] button to go back to the previous screen.



Memo

- The spot pattern and size set here are applied to a measurement spot which will be newly created.
- You can change the pattern and size of each measurement spot via the random spot list.

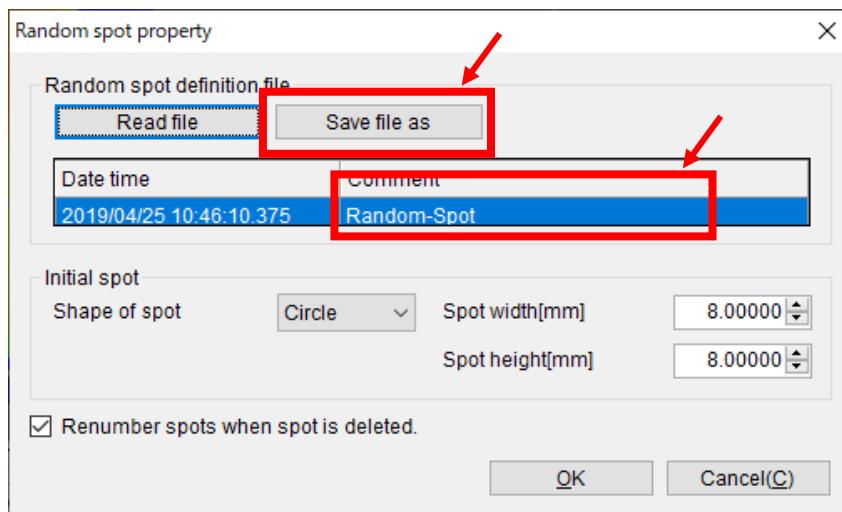
☞ “5.4.11 Display Random Spot List”

5.4.17 Save/Read Random Spot File

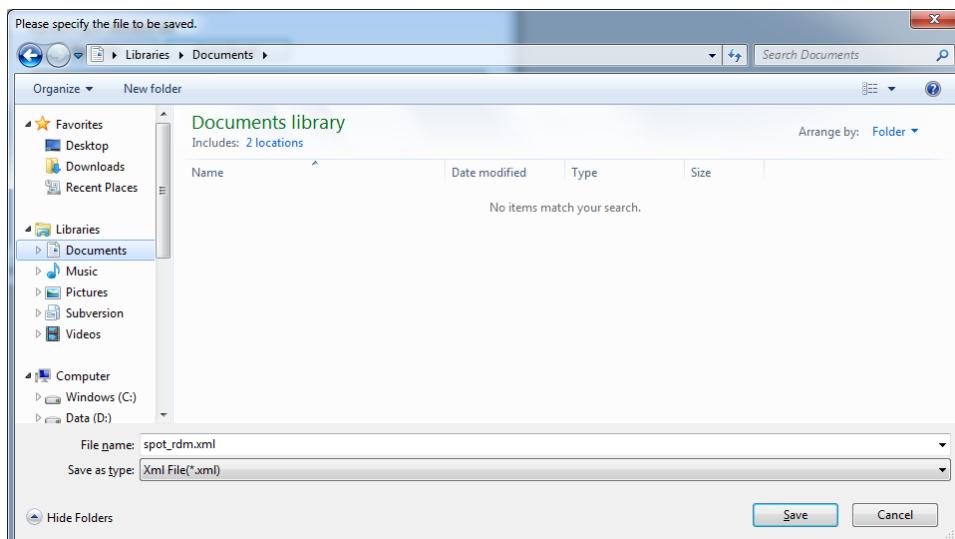
Saves the random spot file. It is possible to read the random spot file later. Moreover, the random spot file can be used for the standard accessory SDK.

To save the random spot file, go through the following steps.

1. Display the [Random spot property] according to "5.4.15 Display Random Spot Property".
2. Edit the comment if necessary. Then, click [Save file as].



3. Specify the save destination file.



It is possible to read the random spot file saved here via [Read file].

5.5 Standard Spot View Operation

In the standard spot features can make standard spot measurement data from measurement image just one-click.

The preset standards comply with JEITA standard (EIAJ ED-2522/ED-2710) and other three standards are preset by Topcon Technohouse. And, you can specify the pattern and the number of the measurement spot.

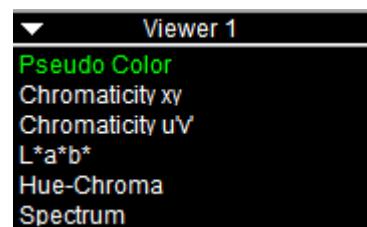
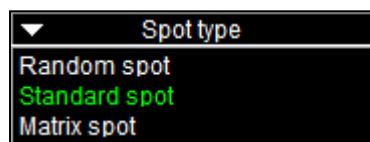
Although the JEITA standard is formatted by default, the measurement spot size is 10mm, which can be changed depending on the number of pixels in the measurement target. (In the JEITA standard, measuring spots must be measured in an area of 500 pixels or more pixels.)

In the JEITA standard measurement method, the vertical direction-based measurement is specified. However, the 2D measurement has an angle to the measurement spots except the center spot, therefore the measurement data are affected by directivity characteristics of the light emitted from the measurement target.

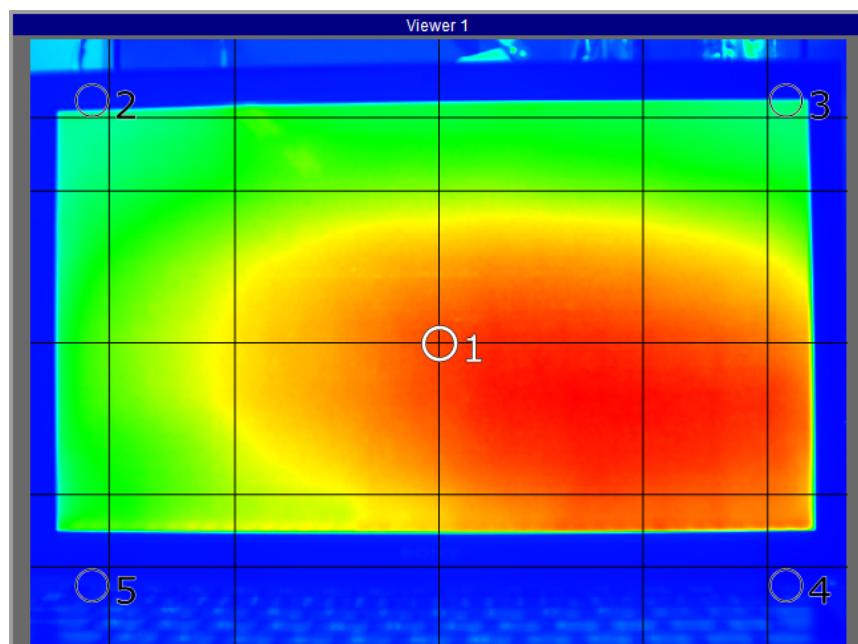
5.5.1 Open Standard Spot View

To display [Standard spot view], go through the following steps.

1. Select [Standard spot] on [Spot type]. Select [Pseudo color] on one of [Viewer 1] and [Viewer 2].



2. [Standard spot view] is displayed. A measurement image is displayed on the view and the standard spot diagram is drawn on the image.

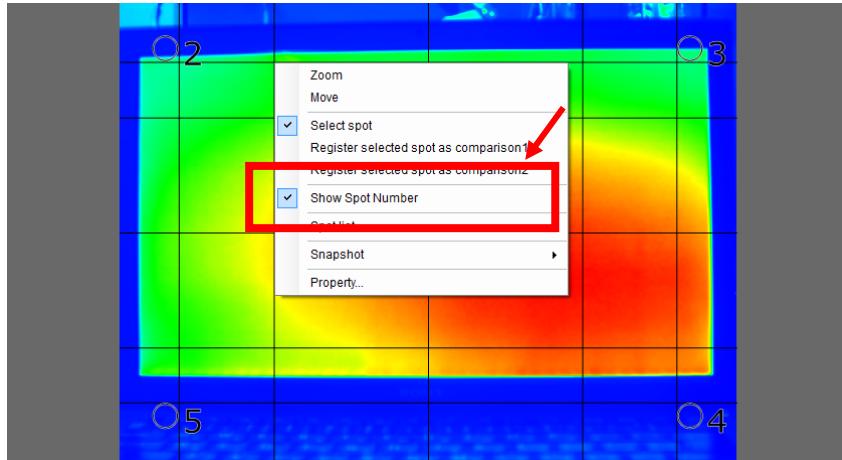


5.5.2 Showing/Hiding Spot Number

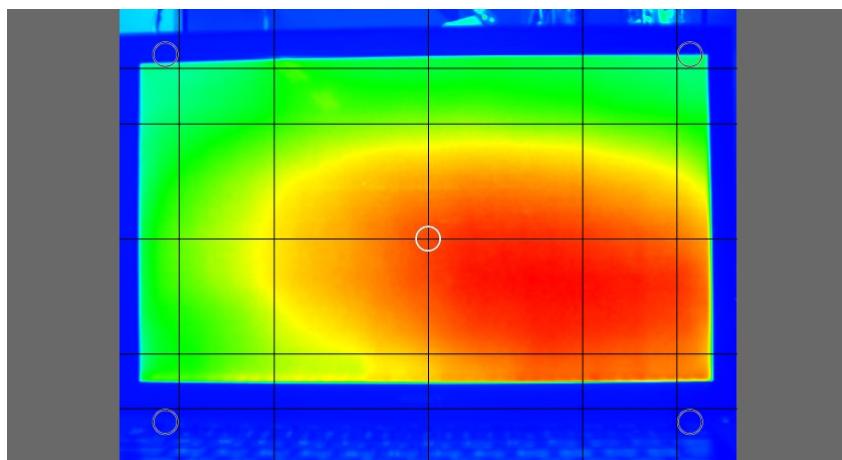
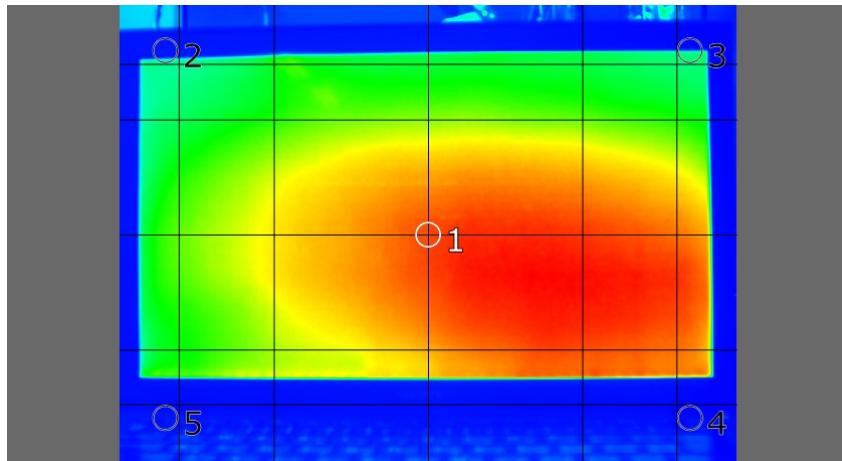
Shows or hides standard spot number on the viewer.

To show or hide the standard spot number, go through the following steps.

1. Right-click on [Standard spot view] to open the pop-up menu. Select [Show Spot Number].



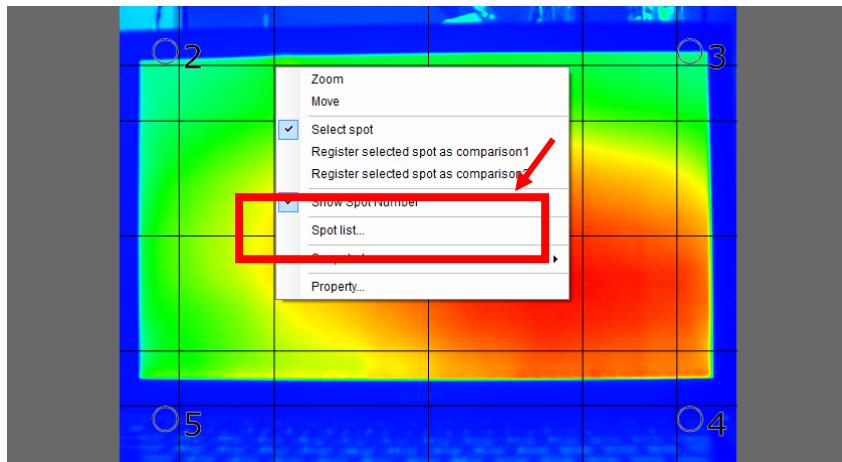
2. Repeating this step can switch showing of numbers



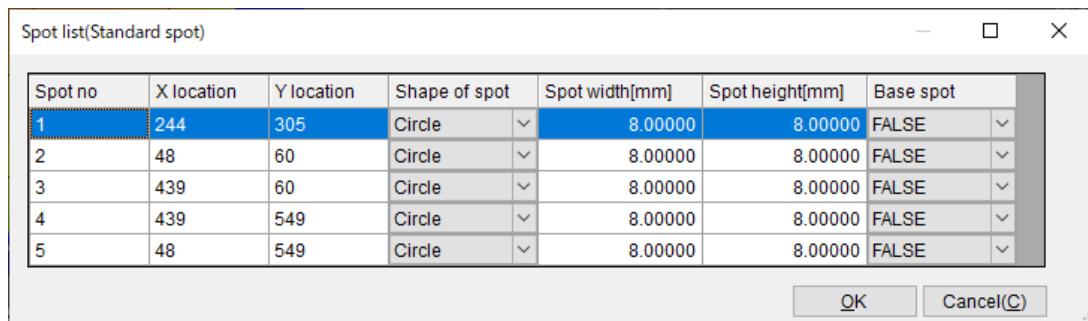
5.5.3 Display Standard Spot List

Displays the standard spot list. It is possible to set pattern, size, etc. of measurement spots individually. To display the standard spot list, go through the following steps.

1. Right-click on [Standard spot view] to open the pop-up menu. Select [Spot list...].



2. The [Spot list] screen appears.



You can set directly [Shape of spot], [Spot width], [Spot height] and [Base spot]. The contents of setting for the items are described below.

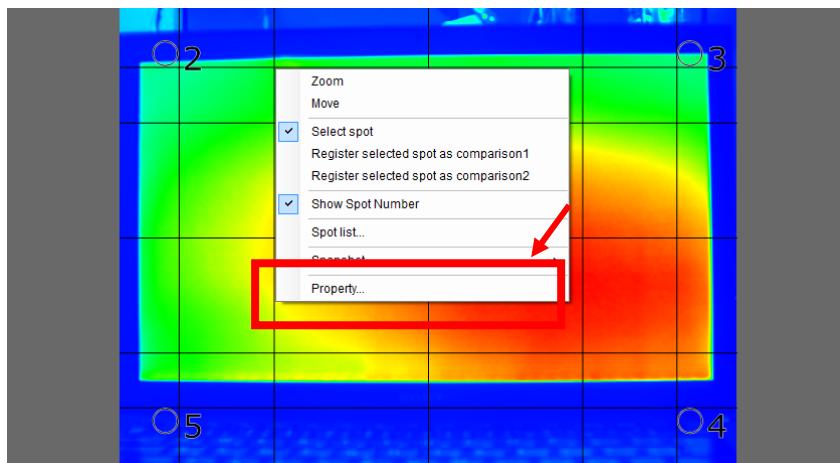
Item	Contents of setting
[Shape of spot]	Selects the measurement spot pattern. Select one of [Circle] and [Square].
[Spot width] • [Spot height]	Inputs the measurement spot size directly.
[Base spot]	Sets a standard spot to calculate the center difference of measurement spots. You can select only one spot as the standard spot in the list.

5.5.4 Display Standard Spot Property

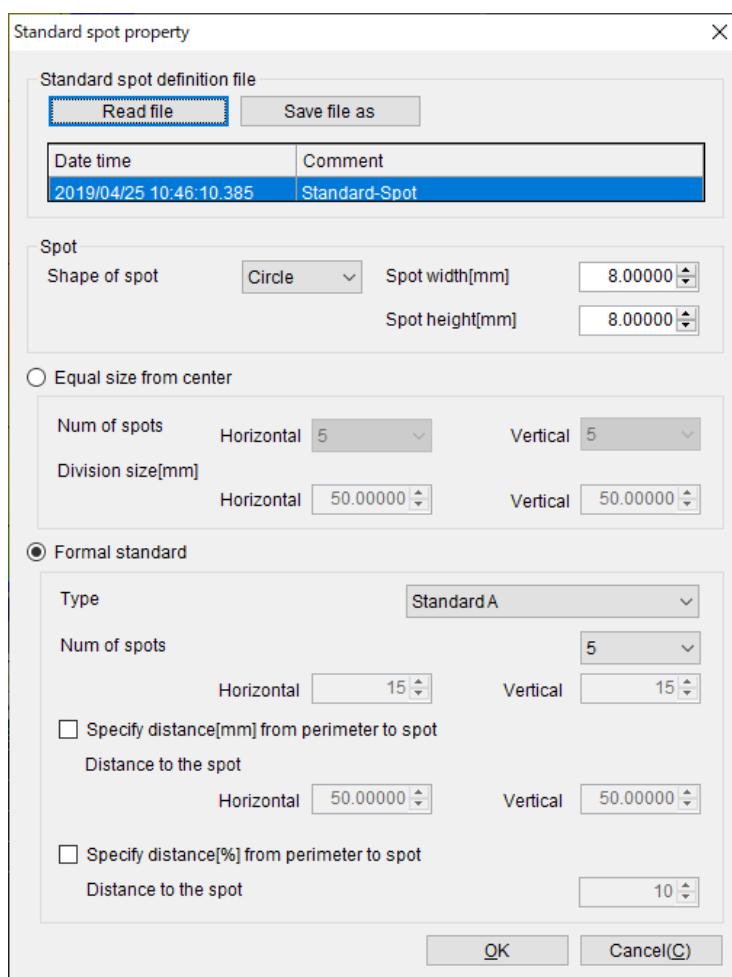
Sets standard measurement spot, formal standard, even split based on center and even split based on outer frame. The setting is applied to the measurement image which is being displayed.

To open the standard spot property, go through the following steps.

1. Right-click on [Standard spot view] to open the pop-up menu. Select [Property...].



2. [Standard spot property] is displayed.



The contents of the items are described below.

[Read file]/[Save file as]

Saves the standard spot definition as a file and reads the definition from a file.

☞ “5.5.9 Save/Read Standard Spot File”

[Comment]

Sets an optional comment.

[Initial spot]

Sets initial information when creating a spot.

☞ “5.5.5 Set Spot Pattern and Size”

[Equal size from center]

Sets measurement spots according to the specified measurement spot number and the specified size between the measurement spots on condition that the center of the measurement area is regarded as standard.

☞ “5.5.8 Set Center Standard Even Split”

[Formal standard]

Selects the split method of standard spot.

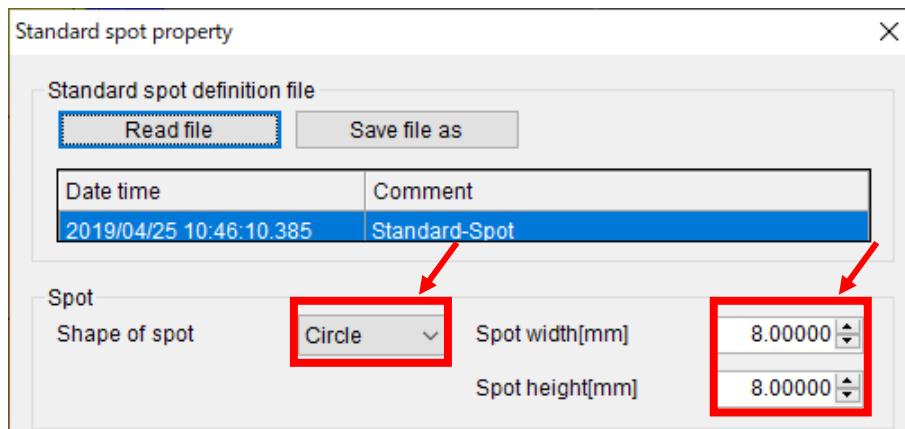
☞ “5.5.6 Change Formal Standard”

5.5.5 Set Spot Pattern and Size

Sets the pattern and size of measurement spots for standard spot. The spot pattern and size set here are applied to a measurement spot which will be newly created.

To set the spot pattern and size, go through the following steps.

1. Display [Standard spot property] according to "5.5.4 Display Standard Spot Property".
2. Select a pattern from the pull-down menu of [Shape of spot] under [spot]. You can select [Circle] and [Square].
3. Input a value for [Spot width] and [Spot height], then click the [OK] button to go back to the previous screen.



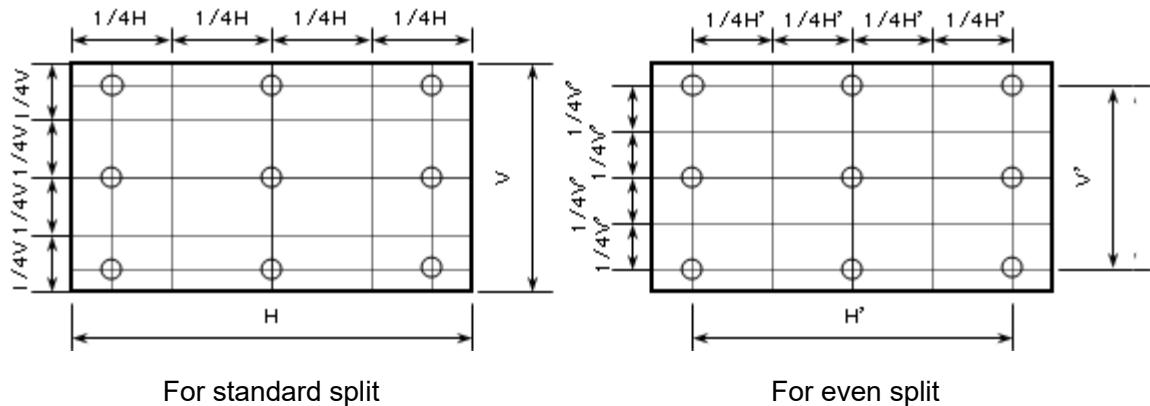
Memo

- The spot pattern and size set here are applied to a measurement spot which will be newly created.
- You can change the pattern and size of each measurement spot via the standard spot list.

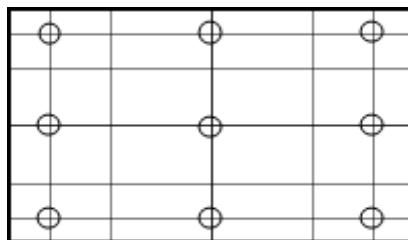
☞ “5.5.3 Display Standard Spot List”

5.5.6 Change Formal Standard

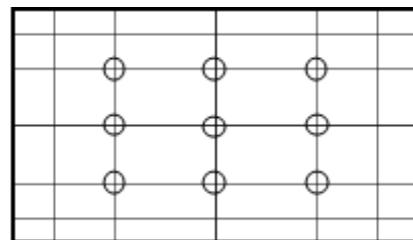
Selects the split method of the standard spot. In this method, there are two types: the standard split and the even split. The difference between standard split and even split is as shown below. For JEITA standard, select [Standard Split A].



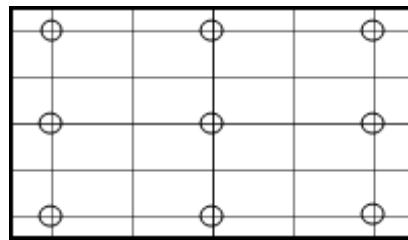
The measurement spot difference between split A and split B is as follows.



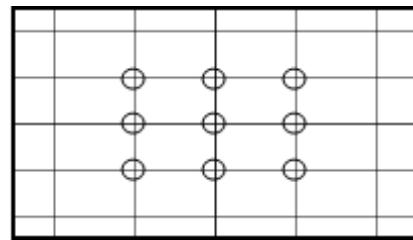
For standard split A



For standard split B

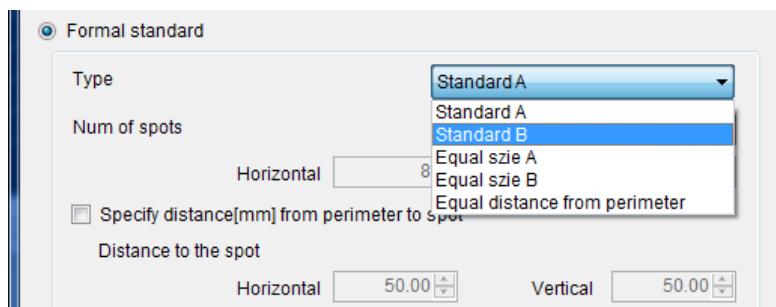


For even split A



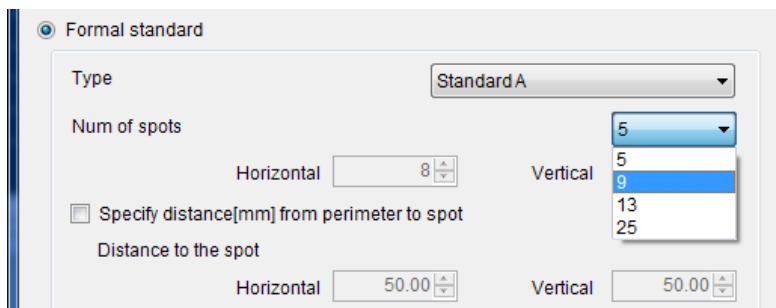
For even split B

1. Display [Standard spot property] according to “5.5.4 Display Standard Spot Property”.
2. Select the split method for the [Formal Standard] from the Pull-down menu.



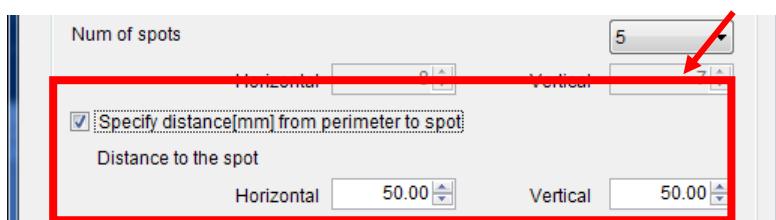
3. Select [Measurement Spot Count] from the Pull-down menu.

For the spot count, select one of four types: 5, 9, 13, or 25 points.



4. To specify the dimension [mm] from the outer frame to the measurement spot, set the [Specify distance [mm] from perimeter to spot] check box to ON. The edit boxes of [Horizontal] and [Vertical] for [Distance to the spot] are valid and you can input values. Input the dimension directly or use the [\blacktriangleleft] and [\triangleright] buttons.

The setting ranges for vertical and horizontal dimensions are from 0.00010 [mm] to 999.99000 [mm].



5. After setting, click the [OK] button to go back to the previous screen.



Note In [Specify Dimensions from Outer Frame to Measurement Spot [mm]], when the adjacent lines intersect with each other, the error message will appear. Confirm the vertical and horizontal dimensions of the measurement object, vertical and horizontal dimensions from the outer frame to the measurement spot, and split method, and then perform the resetting.

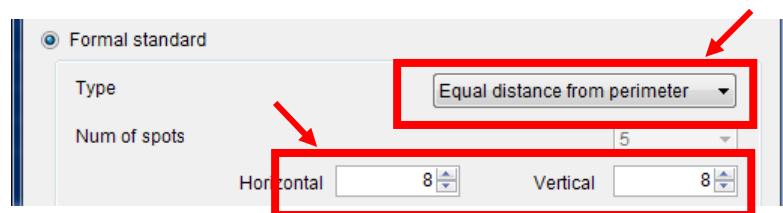
5.5.7 Set Even Split Spot Basing Outer Frame

Sets the even split basing outer frame. Set the number of measuring spots and the distance of space between spots and the distance to spot from outer frame as base point.

To set the Even split basing outer frame, go through the following steps.

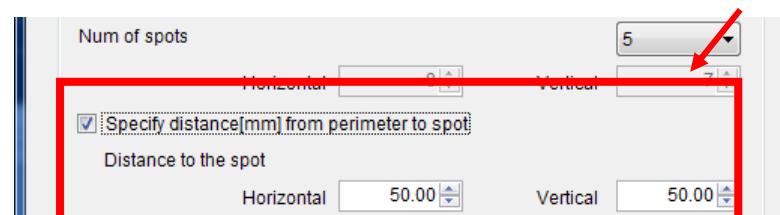
1. Display [Standard spot property] according to "5.5.4 Display Standard Spot Property".
2. Select [Equal distance from perimeter] from the pull-down menu of [Type]. The edit boxes of [Horizontal] and [Vertical] for [Num of Spots] are valid and you can input values. Input the values directly.

Input the values so that the result of "Vertical spot count × Horizontal spot count" may be 999 or less.



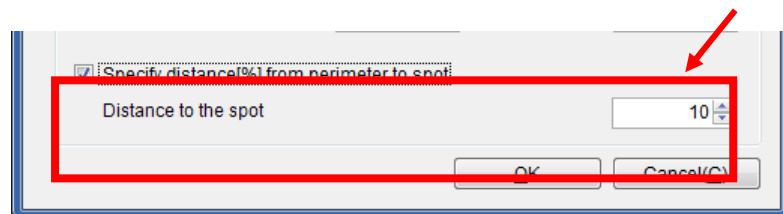
3. To specify the dimension [mm] from the outer frame to the measurement spot, set the [Specify distance [mm] from perimeter to spot] check box to ON. The edit boxes of [Horizontal] and [Vertical] for [Distance to the spot] are valid and you can input values. Input the dimension directly or use the [Δ] and [∇] buttons.

The setting ranges for vertical and horizontal dimensions are from 0.00010 [mm] to 999.99000 [mm].

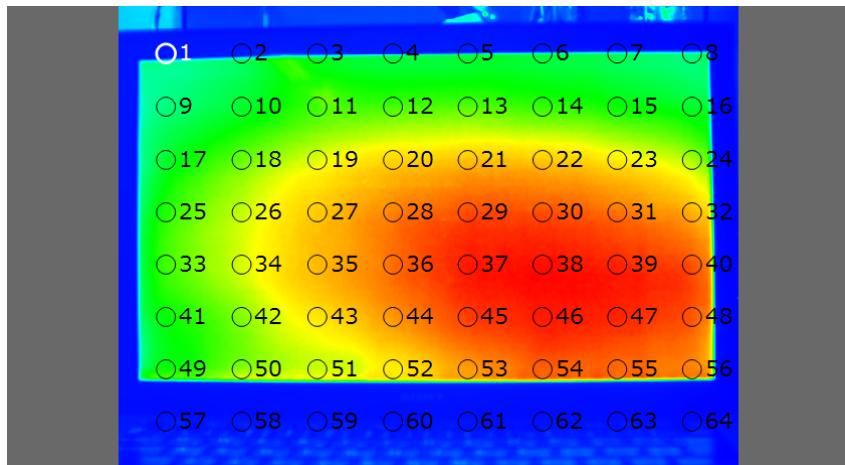


4. When you specify the dimension [%] from the outer frame to the measurement spot, set the [Specify distance [%] from perimeter to spot] check box to ON. The edit box of [Distance to the spot] is valid. Input the dimension directly or use the [Δ] and [∇] buttons.

The setting range is 1 [%] to 99 [%].



5. After setting, click the [OK] button to go back to the previous screen.



 Memo

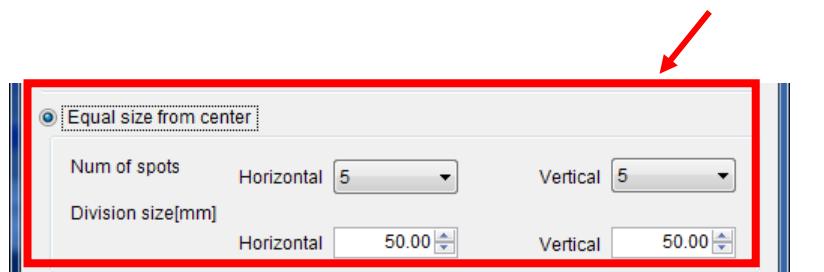
- The distance setting is applied to spot no. 1.
- When both [mm] and [%] are not selected, the distance from the outer frame to measurement spot is 10 % as default.

5.5.8 Set Center Standard Even Split

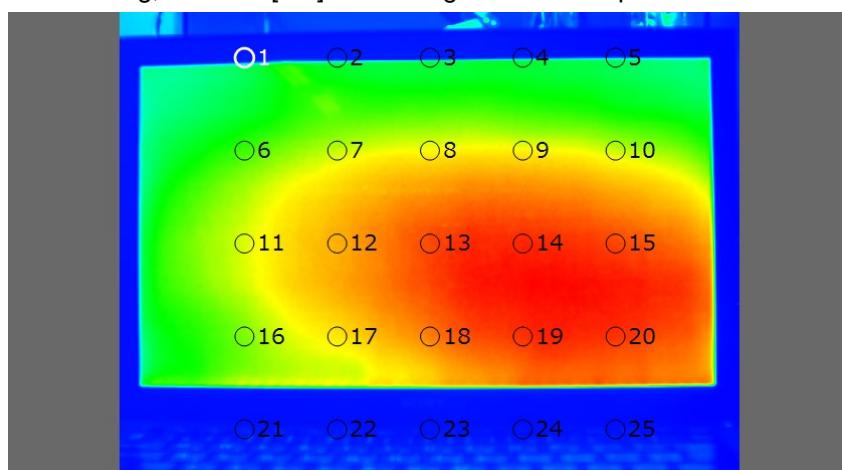
Sets the center standard even split. Set measurement spots by setting the number of measurement spots and the dimension between the spots on condition that the measurement area center is regarded as standard.

To set the center standard even split, go through the following steps.

1. Display [Standard spot property] according to "5.5.4 Display Standard Spot Property".
2. Set the [Equal size from center] radio button to ON. [Horizontal] and [Vertical] of [Num of Spots] and [Horizontal] and [Vertical] of [Division size] are valid and you can input values.
Select values from the pull-down menu of [Horizontal] and [Vertical] for [Num of Spots].
You can select values for [Horizontal] and [Vertical] of [Num of Spots] from
3/5/7/9/11/13/15/17/19/21.
Input values directly to the edit boxes for [Horizontal] and [Vertical] of [Division size].
The setting range for vertical and horizontal distances is 0.00010 [mm] to 500 [mm].



3. After setting, click the [OK] button to go back to the previous screen.

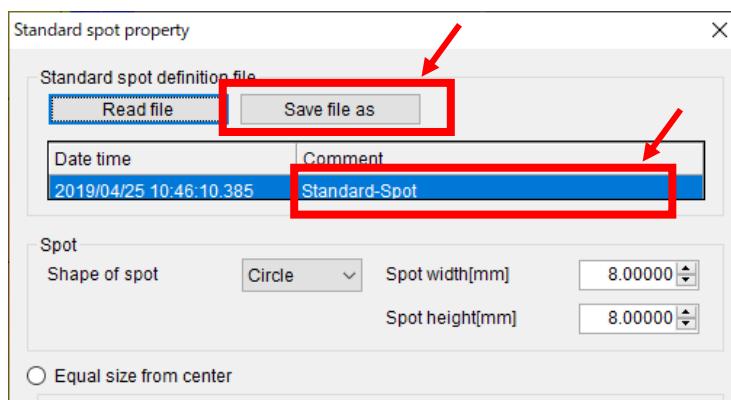


5.5.9 Save/Read Standard Spot File

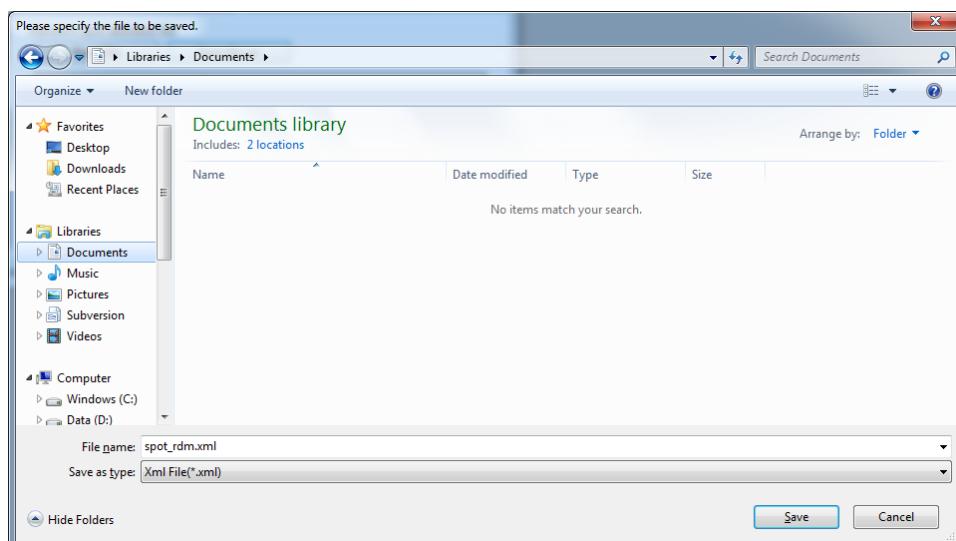
Saves the standard spot file. It is possible to read the standard spot file later. Moreover, the standard spot file can be used for the standard accessory SDK.

To save the standard spot file, go through the following steps.

1. Display the [Standard spot property] according to “5.5.4 Display Standard Spot Property”.
2. Edit the comment if necessary. Then, click [Save file as].



3. Specify the save destination file.



Memo

It is possible to read the standard spot file saved here via [Read file].

5.6 Matrix Spot View Operation

The Matrix Spot View function displays the measurement image by splitting it in a reticular pattern. The area split in a reticular pattern is handled as the measurement spot. For the Matrix Spot View measurement data, calculate the measurement value on the average within the split area.

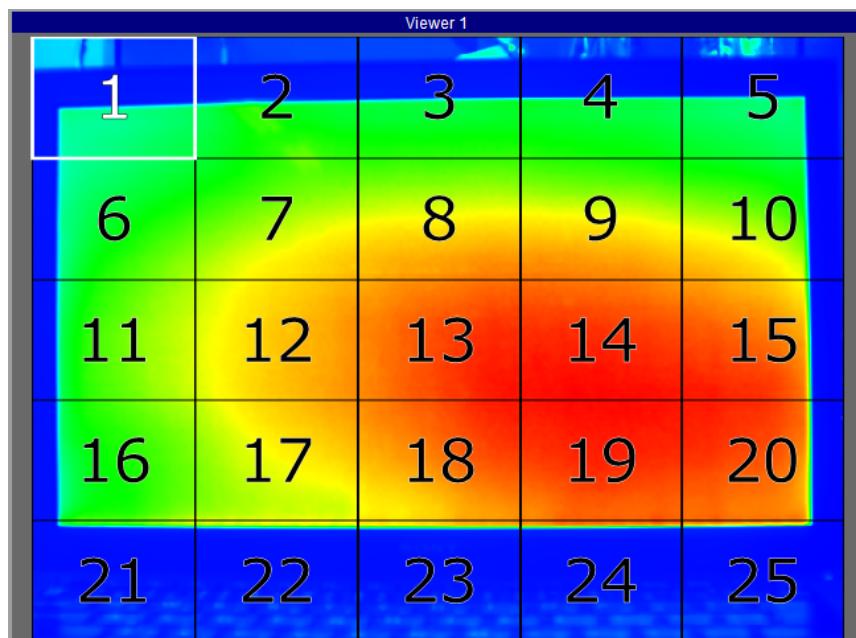
5.6.1 Open Matrix Spot View

To display [Matrix spot view], go through the following steps.

1. Select [Matrix spot] on [Spot type]. Select [Pseudo color] on one of [Viewer 1] and [Viewer 2].



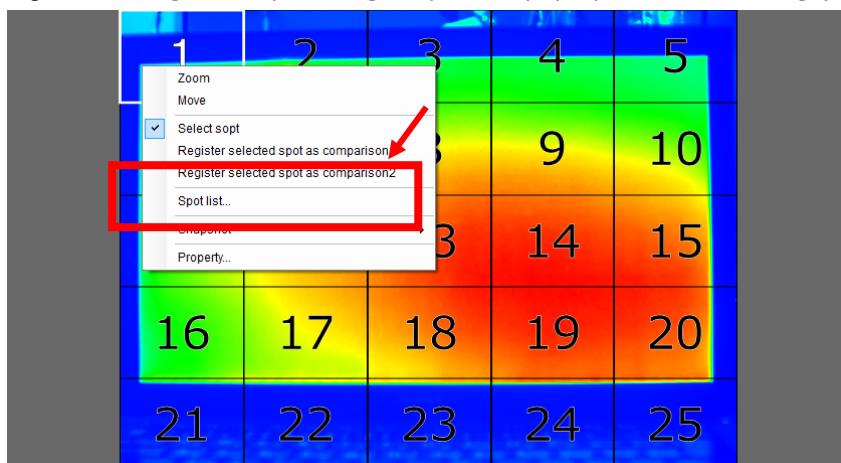
2. [Matrix spot view] is displayed. A measurement image is displayed on the view and the split spot diagram is drawn on the image.



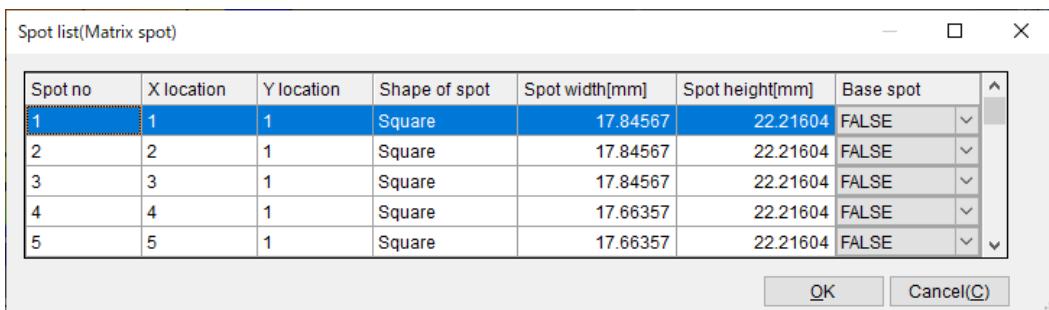
5.6.2 Display Split Spot List

Displays the split spot list. It is possible to set pattern, size, etc. of measurement spots individually. To display the split spot list, go through the following steps.

1. Right-click on [Matrix spot view] to open the pop-up menu. Select [Spot list...].



2. The [Spot list] screen appears.



You can set directly [Base spot]. The contents of setting for the items are described below.

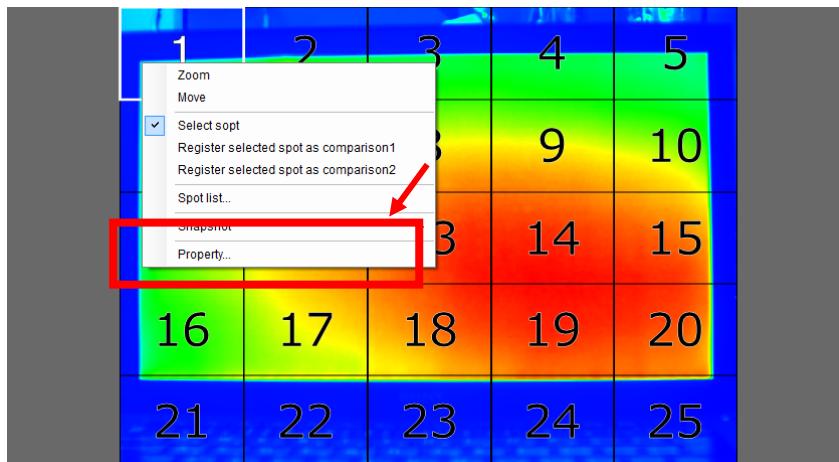
Item	Contents of setting
[Base spot]	Sets a standard spot to calculate the center difference of measurement spots. You can select only one spot as the standard spot in the list.

5.6.3 Display Split Spot Property

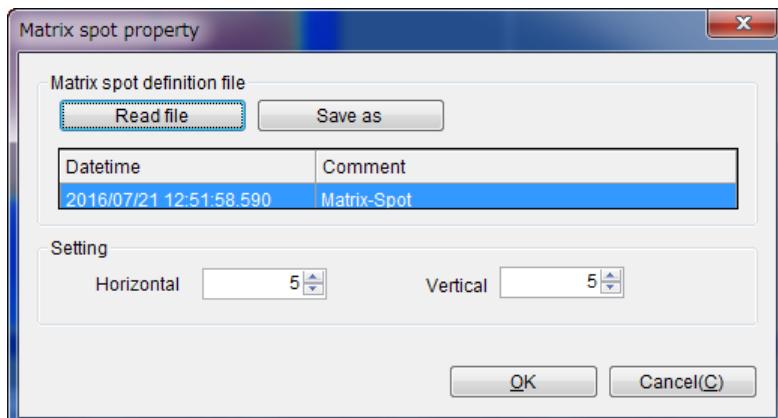
Displays the split spot property.

To open the split spot property, go through the following steps.

1. Right-click on [Matrix spot view] to open the pop-up menu. Select [Property...].



2. [Matrix spot property] is displayed.



The contents of items are described below.

[Read file]/[Save file as]

Saves the split spot definition as a file and reads the definition from a file.

☞ “5.6.5 Save/Read Split Spot File”

[Comment]

Sets an optional comment.

[Setting]

Sets the split count of the measurement spots.

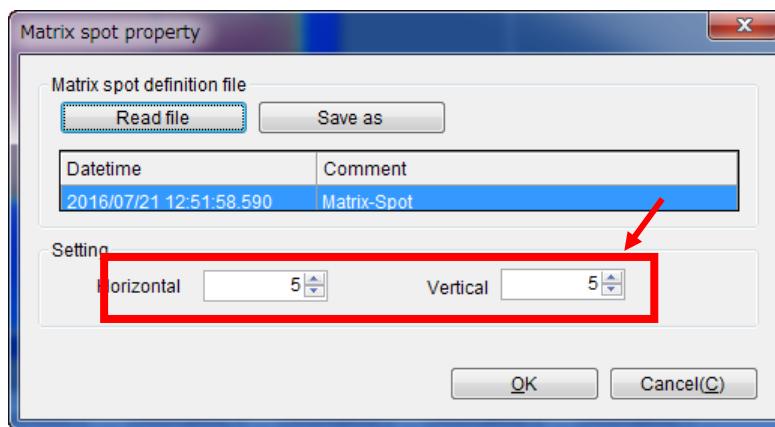
☞ “5.6.4 Set Split Count”

5.6.4 Set Split Count

Specifies the split count of the measurement spots of the Matrix Spot View.

To set the split count of the split spots, go through the following steps.

1. Display [Matrix spot property] according to “5.6.3 Display Split Spot Property”.
2. Set the split count by using [\blacktriangle] and [\blacktriangledown] within the edit boxes of [Vertical] and [Horizontal] in [Setting] of [Matrix spot property]. The value range varies depending on trimming.



Memo

- Divisible number for horizontal and vertical pixel of trimmed image is displayed as the initial value in edit box.
- Split count number can be entered directly in edit box.
Max split count Horizontal: 160 Vertical: 120
When there is remainder, one pixel is added (enlarged) to spots from the upper left.



Note

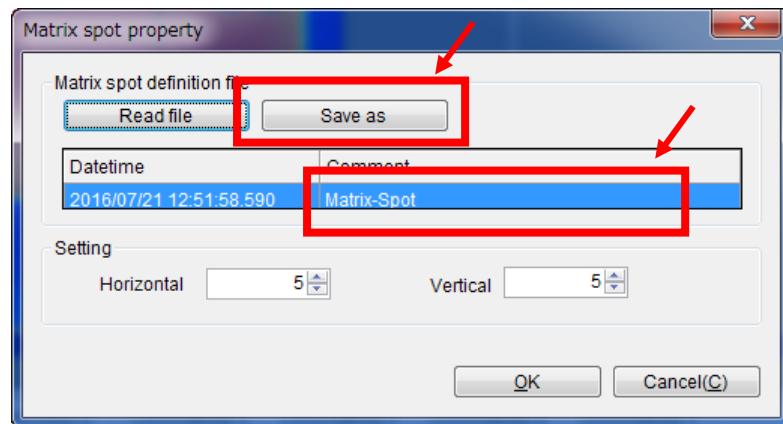
If there is no divisible number in the trimming area, may be 1 the divisible number in the edit box. In that case, set an arbitrary number of divisions directly, or perform trimming again to change the specified area.

5.6.5 Save/Read Split Spot File

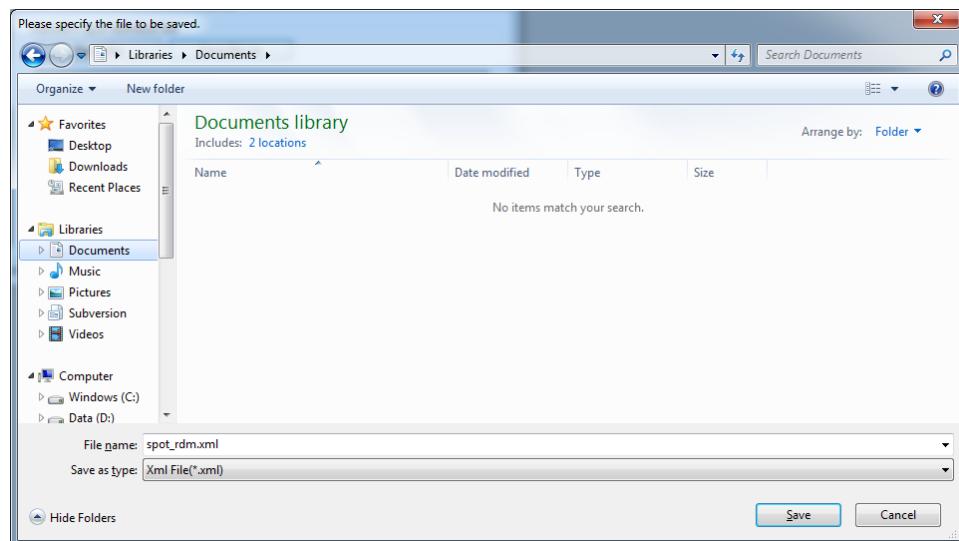
Saves the split spot file. It is possible to read the split spot file later. Moreover, the split spot file can be used for the standard accessory SDK.

To save the split spot file, go through the following steps.

1. Display the [Matrix spot property] according to “5.6.3 Display Split Spot Property”.
2. Edit the comment if necessary. Then, click [Save file as].



3. Specify the save destination file.



Memo

It is possible to read the split spot file saved here via [Read file].

5.7 Data Sheet Operation

After changing to the spot view, data sheet is displayed under two views.

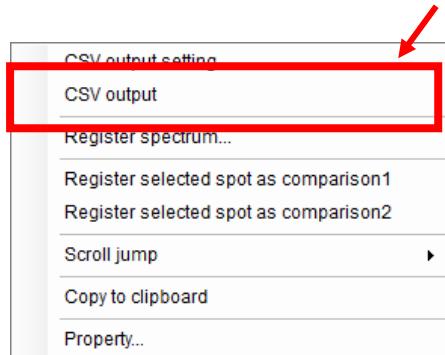
The data sheet function is common to three spot types.

5.7.1 Save in CSV File Format

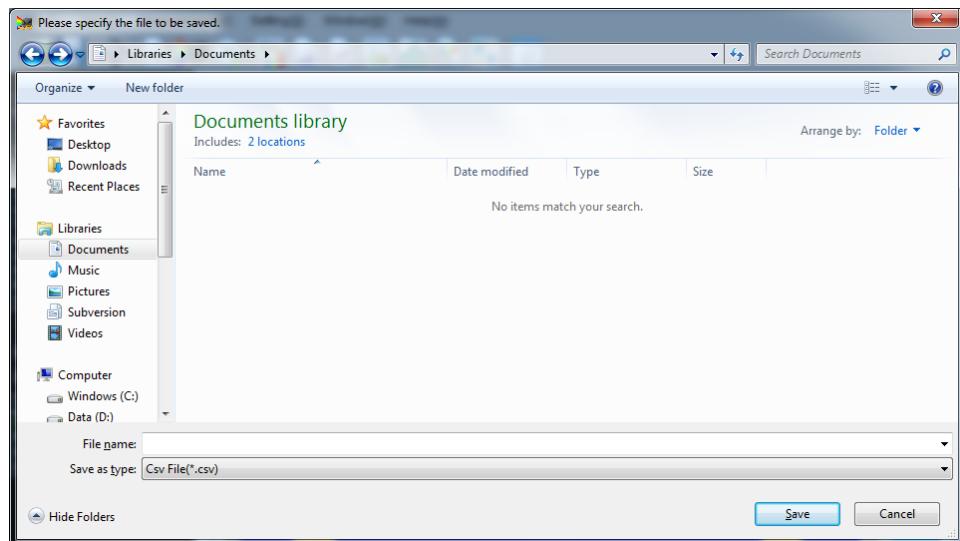
Saves the contents displayed on [Data sheet] in the CSV file format.

To save in the CSV file format, go through the following steps.

1. Right-click on [Data sheet] to open the pop-up menu. Select [CSV output].



2. Specify the save destination file.



3. The contents set by “3.15.4 Output Setting” or “5.7.2 Set Output Items for CSV Format” are output.

Memo

- The contents output into CSV file are different from the displayed items. It is necessary to perform setting separately for outputting.
- The setting for CSV output is available from pop-up menu, or [Application setting]-[Output]

“3.15.4 Output Setting”

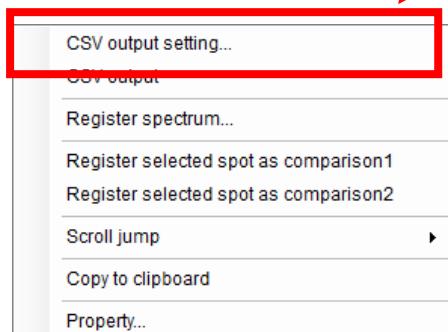
“5.7.2 Set Output Items for CSV Format”

5.7.2 Set Output Items for CSV Format

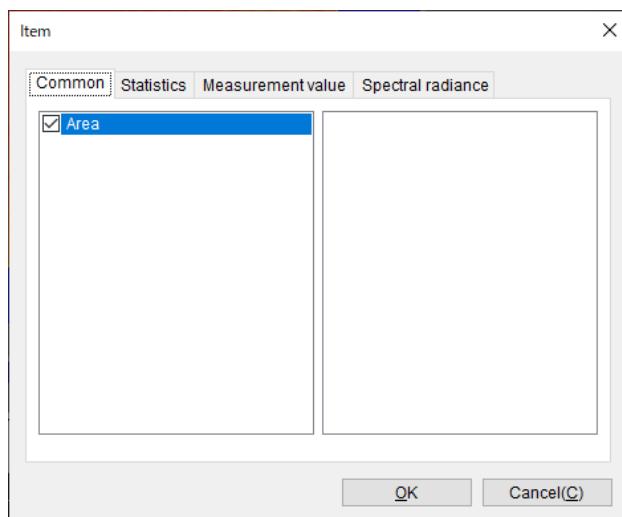
Sets output items for CSV file format.

To set output items for CSV file format, go through the following steps.

1. Right-click on [Data sheet] to open the pop-up menu. Select [CSV output setting] from the pop-up menu.



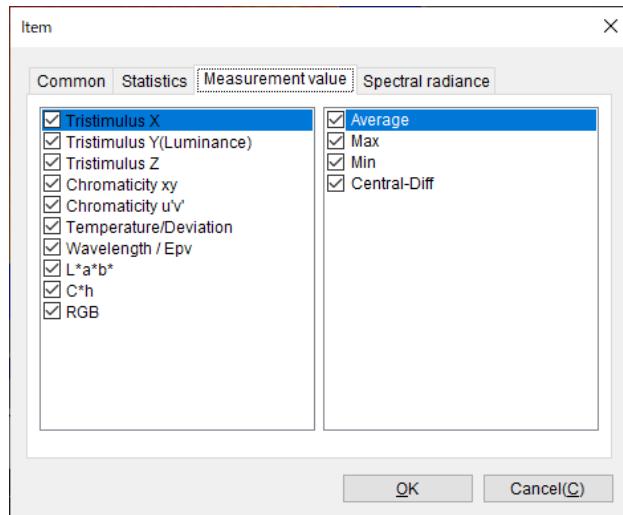
2. The [Item] screen appears. Set the check boxes of the items that should be output to ON in [Common].



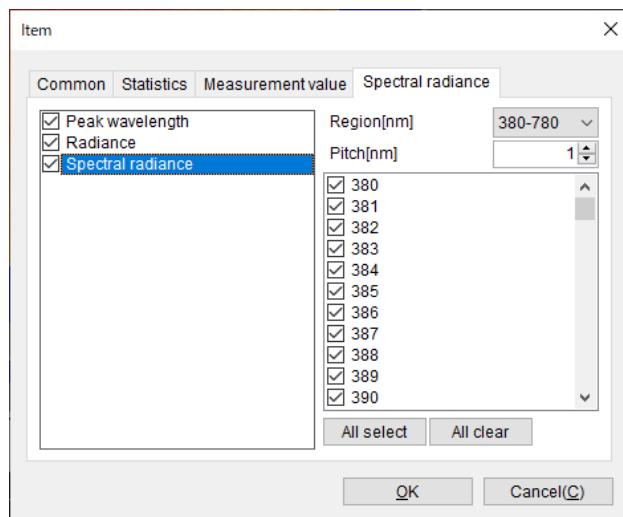
3. Set the check boxes of the items that should be output to ON in [Statistics].

Two screenshots of the 'Item' dialog box showing the 'Statistics' tab selected. Both dialogs have tabs for 'Common', 'Statistics', 'Measurement value', and 'Spectral radiance'.
Left Dialog (Row items selected):
- Tristimulus X
- Tristimulus Y(Luminance)
- Tristimulus Z
- Chromaticity xy
- Chromaticity uv'
- Temperature/Deviation
- Wavelength / Epv
- L*a*b*
- C*h
- RGB
- Peak wavelength
- Radiance
- Spectral radiance
Right Dialog (Column items selected):
- Average
- Stdev
- Stdev / Avg
- Stdev / Avg [%]
- Max Spot no
- Min Spot no
- Max
- Min
- Max - Min
- Min / Max
- Min / Max [%]

4. Set the check boxes of the items that should be output to ON in [Measurement value].



5. Set the check boxes of the items that should be output to ON in [Spectral radience].



Memo

- The setting for CSV output is available from [Application setting]-[Output].
- CSV output data items depend on measurement condition.

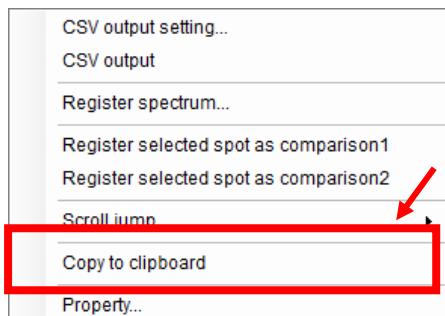
“3.15.4 Output Setting”

5.7.3 Copy Items to Clipboard

Copies the contents of data sheet into clipboard. After copying, you can paste the copied data to a text editor or an office software and use it.

To copy the items to clipboard, go through the following steps.

1. Right-click on [Data sheet] to open the pop-up menu. Select [Copy to clipboard].



2. Perform [Paste] on the software which will use the copied items data. For example, the data is pasted into "Microsoft®Excel®2007".

A screenshot of Microsoft Excel 2007 showing a data table. The columns are labeled: G20, A, B, C, D, E, F, G. The data rows are:

	Spot no	X location	Y location	Tristimulu	Tristimulu	Tristimulu	Tristimulu	Tri
2	1	344	256	102.8536	105.6959	100.2342	0	10
3	2	51	51	7.112484	34.64947	2.864857	-95.7411	6.
4	3	636	51	19.90491	38.3738	1.501726	-82.9487	19
5	4	636	460	2.022904	4.04484	1.267733	-100.831	1.
6	5	51	460	2.695956	4.291624	1.850129	-100.158	2
7								



The contents which are copied into clipboard are the same as the displayed items.

5.7.4 Register Spectrum

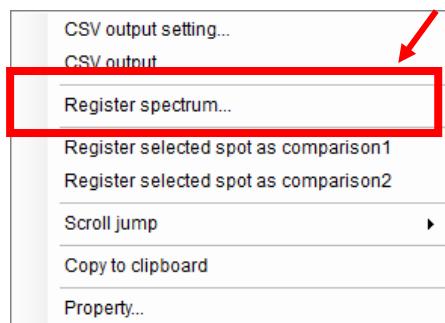
You can register the spectrum included in the currently selected measurement spot and use it in other functions. It is possible to use the spectrum in “5.18 Spectrum Search Operation” or “5.19 Object Color Simulation Operation”.

To register spectrum, go through the following steps.

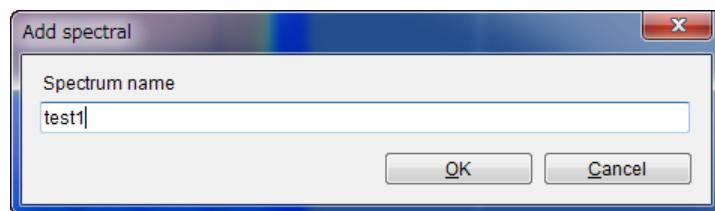
1. Select measurement spots to be registered on [Data sheet].

Spot no	X location	Y location	Tristimulus X	Tristimulus Y	Tristimulus Z	C
			Average	Average	Average	C
1	344	256	102.853649	100.816503	88.147249	
2	51	51	7.112484	6.459159	3.610093	
3	636	51	19.904909	19.173919	9.757857	
4	636	460	2.022904	1.762175	2.649216	
5	51	460	2.695956	2.449190	2.545516	

2. Right-click on [Data sheet] to open the pop-up menu. Select [Register spectrum...].

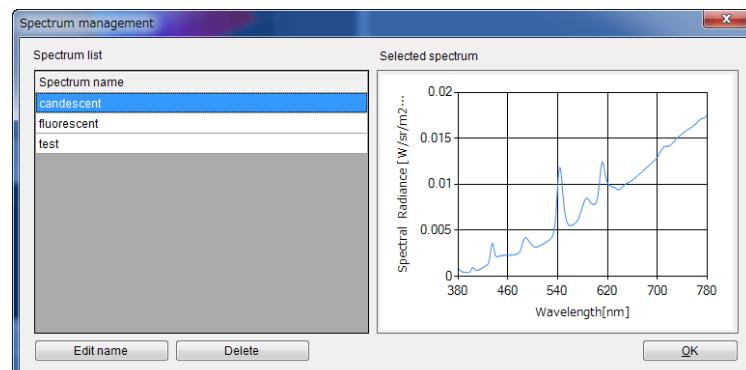


3. The [Register spectrum] screen appears. Enter an optional name and click the [OK] button.



4. You can check the registered spectrum on the [Spectrum management] screen.

☞ “3.16 Spectrum Management”



5.7.5 Register As Comparison Spot

When performing the spot comparison, register the spots which will be the targets of comparison.

For details of the spot comparison function, refer to the following section of this manual.

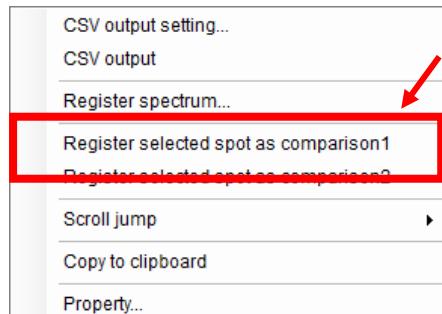
☞ “5.17 Spot Comparison Operation”

To register the compared spots, go through the following steps.

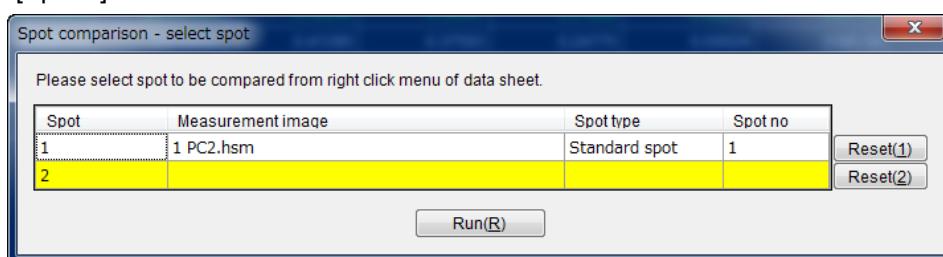
1. Select measurement spots to be registered on [Data sheet].

Spot no	X location	Y location	Tristimulus X	Tristimulus Y	Tristimulus Z	C
			Average	Average	Average	
1	344	256	102.853649	100.816503	88.147249	
2	51	51	7.112484	6.459159	3.610093	
3	636	51	19.904909	19.173919	9.757857	
4	636	460	2.022904	1.762175	2.649216	
5	51	460	2.695956	2.449190	2.545516	

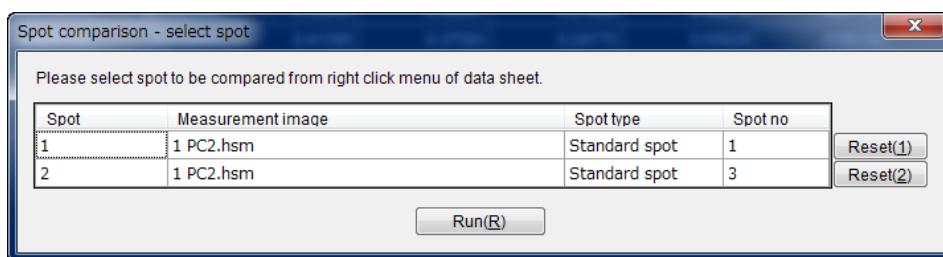
2. Right-click on [Data sheet] to open the pop-up menu. Select [Register selected spot as comparison1]. When one spot has already been registered as [Spot 1], select as [Spot 2].



3. The [Spot comparison] screen appears. Make sure that the selected spot is registered as [Spot 1].



4. Even while the [Spot comparison] screen is displayed, you can register another comparison spot. Perform the operation of Step 1 and Step 2 for another measurement spot. The second spot is registered. Click the [Run] button to shift to the [Spot comparison] screen.



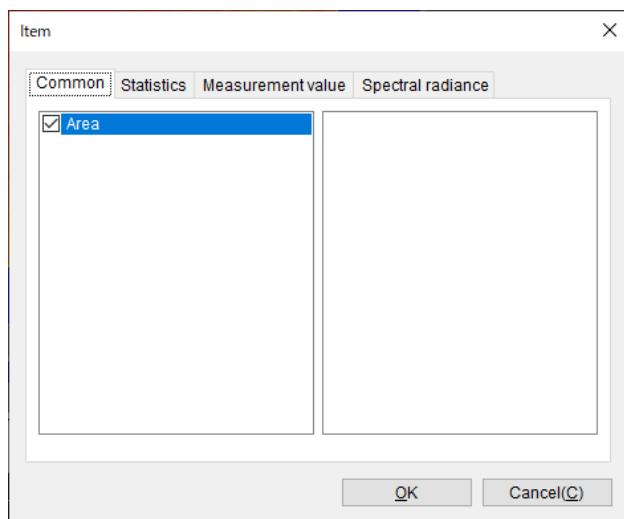
5.7.6 Display Data Sheet Property

Set the items which should be displayed on [Data sheet] through [Property] of data sheet.
To set the data sheet property, go through the following steps.

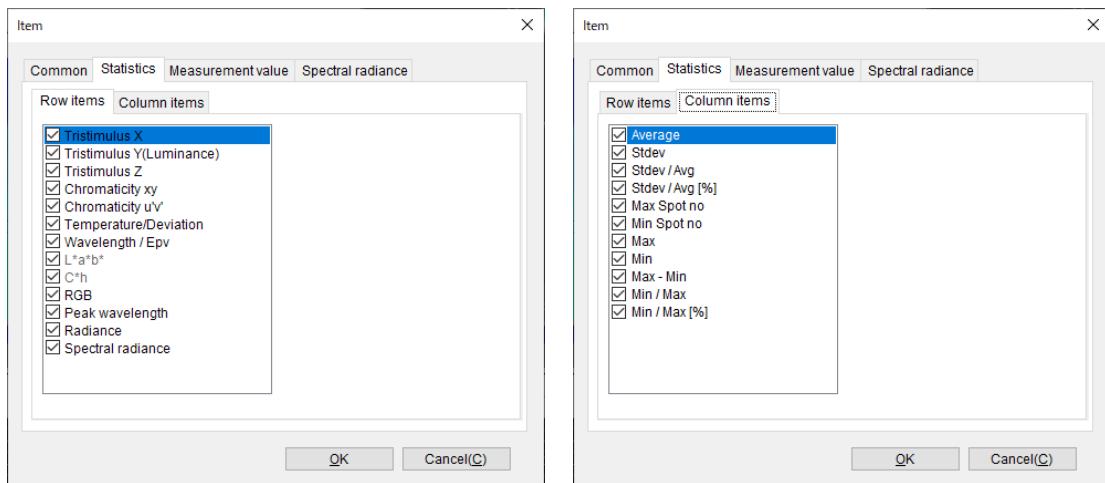
1. Right-click on [Data sheet] to open the pop-up menu. Select [Property...].



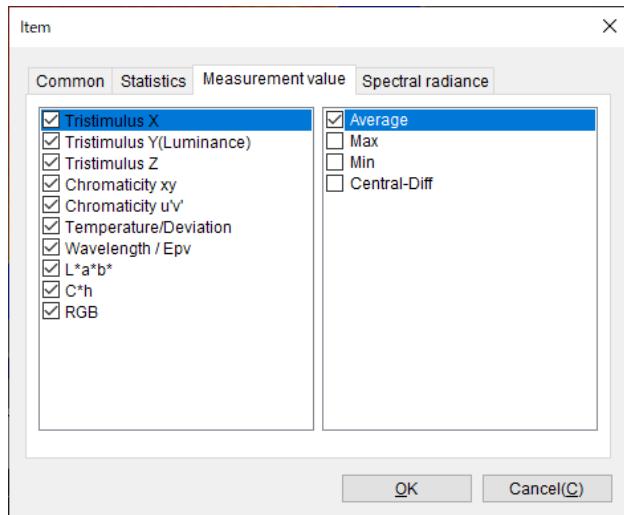
2. The [Item] screen appears. Set the check boxes of the items that should be output to ON in [Common].



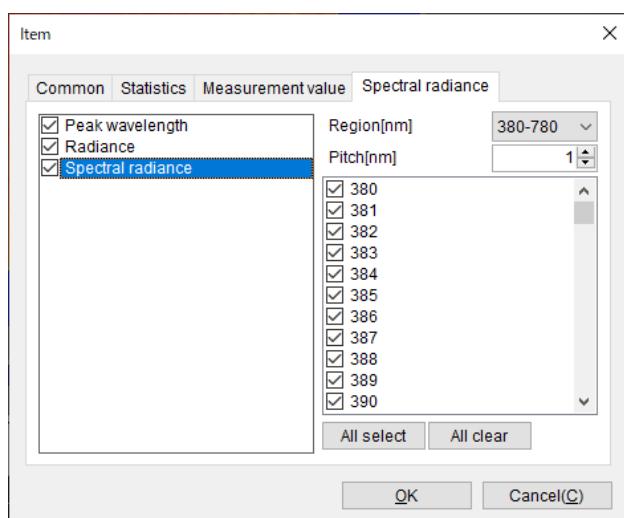
3. Set the check boxes of the items that should be output to ON in [Statistics].



4. Set the check boxes of the items that should be output to ON in [Measurement value].



5. Set the check boxes of the items that should be output to ON in [Spectral radiance].



5.8 Chromaticity Diagram View Operation

The Chromaticity Diagram View function plots the measurement spot data specified in the [Standard Spot View], the [Matrix Spot View], and the [Random Spot View] on the CIE Chromaticity Diagram (hereafter Chromaticity Diagram).

Chromaticity xy or u'v' coordinate value of the measurement spot data is plotted on the chromaticity diagram, enabling you to visually confirm the color distribution. It also enables you to zoom in the concentrated plotted zone, which helps you to know the distribution more accurately. The enlargement/movement operation is the same as the measurement image view.

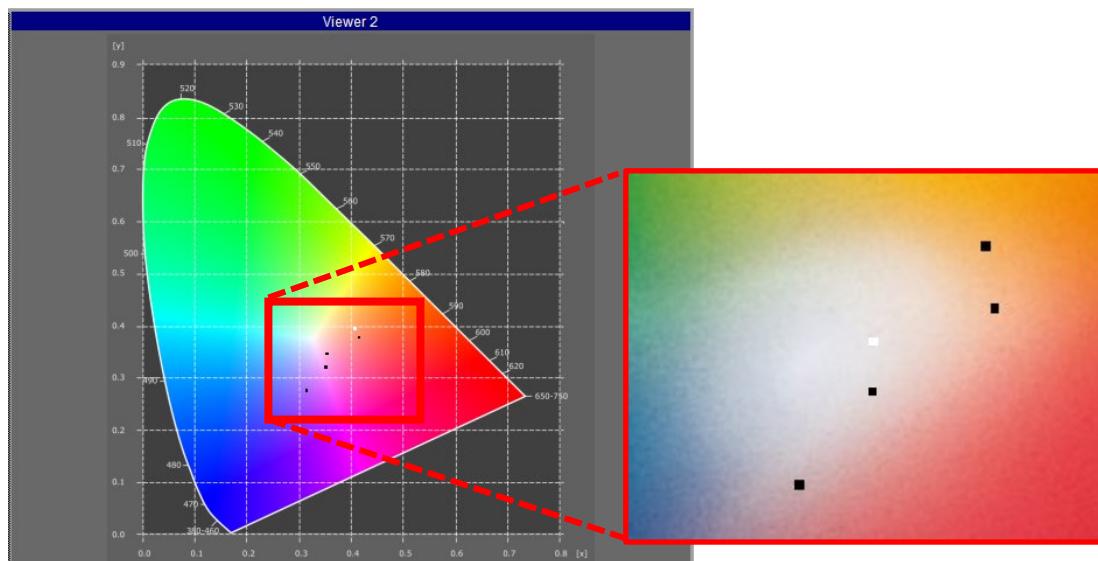
5.8.1 Open Chromaticity Diagram View

To open the chromaticity diagram view, go through the following steps.

1. Display the spot view and select [Chromaticity xy] or [Chromaticity u'v'] on one of [Viewer 1] and [Viewer 2].



2. [Chromaticity diagram view] is displayed. The chromaticity diagram is displayed on the view. The spot coordinates of the selected spot type are plotted on the chromaticity diagram.



The measurement spot selected on data sheet is plotted as a white square.

5.9 L*a*b* View

The L*a*b* view function plots the measurement spot data specified in the [Standard Spot View], [Matrix Spot View] and [Random Spot View] on the CIE 1976 L*a*b* diagram.

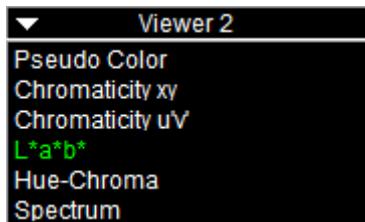
The L*a*b* coordinate value of the measurement spot data is plotted on the diagram, enabling you to visually confirm the color distribution. It also enables you to zoom in the concentrated plotted zone, which helps you to know the distribution more accurately. The enlargement/movement operation is the same as the measurement image view. To display L*a*b view, it is necessary to use the [White plate correction] function.

☞ “3.11 White Plate Correction”

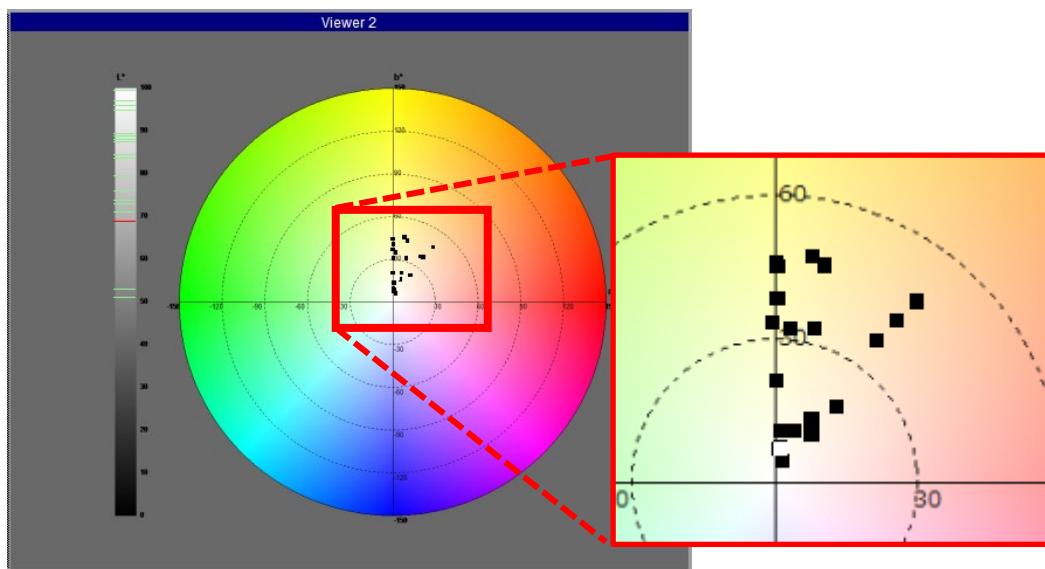
5.9.1 Open L*a*b* View

To open the L*a*b* view, go through the following steps.

1. Display the spot view and select [L*a*b*] on one of [Viewer 1] and [Viewer 2].



2. [L*a*b* view] is displayed. The L*a*b* diagram is displayed on the view. The spot coordinates of the selected spot type are plotted on the L*a*b* diagram.



5.10 Hue-Chroma View

The Hue-Chroma view function plots the measurement spot data specified in the [Standard Spot View], [Matrix Spot View] and [Random Spot View] on the Hue-Chroma diagram.

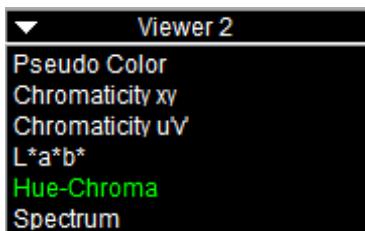
The Hue-Chroma coordinate value of the measurement spot data is plotted on the diagram, enabling you to visually confirm the color distribution. It also enables you to zoom in the concentrated plotted zone, which helps you to know the distribution more accurately. The enlargement/movement operation is the same as the measurement image view. To display Hue-Chroma view, it is necessary to use the [White plate correction] function.

 “3.11 White Plate Correction”

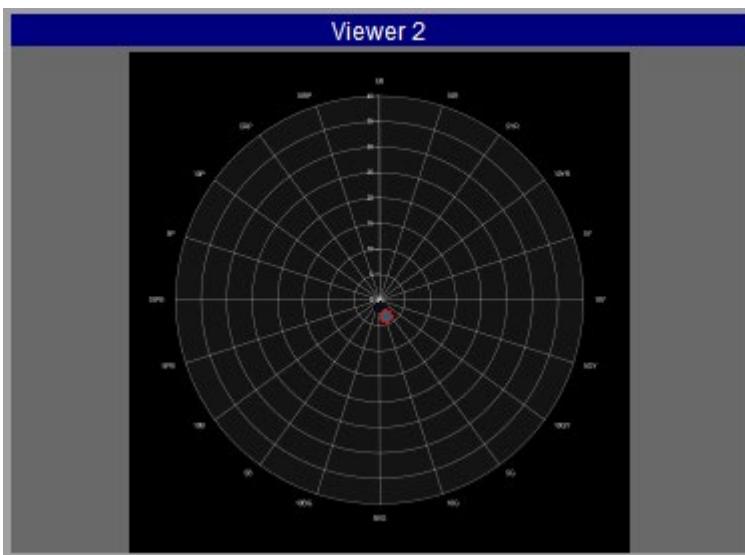
5.10.1 Open Hue-Chroma View

To open the Hue-Chroma view, go through the following steps.

1. Display the spot view and select [Hue-Chroma] on one of [Viewer 1] and [Viewer 2].



2. [Hue-Chroma view] is displayed. The Hue-Chroma diagram is displayed on the view. The spot coordinates of the selected spot type are plotted on the Hue-Chroma diagram.



5.11 Spectrum View

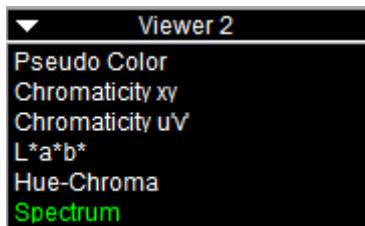
The spectrum view function displays the spectrum data that is included in the measurement spot specified in the [Standard Spot View], [Matrix Spot View] and [Random Spot View] as a graph.

The measured value at each wavelength in the measurement spot is displayed as a graph, enabling you to confirm the spectral distribution. The lateral and longitudinal axes indicate wavelength and spectral radiance respectively.

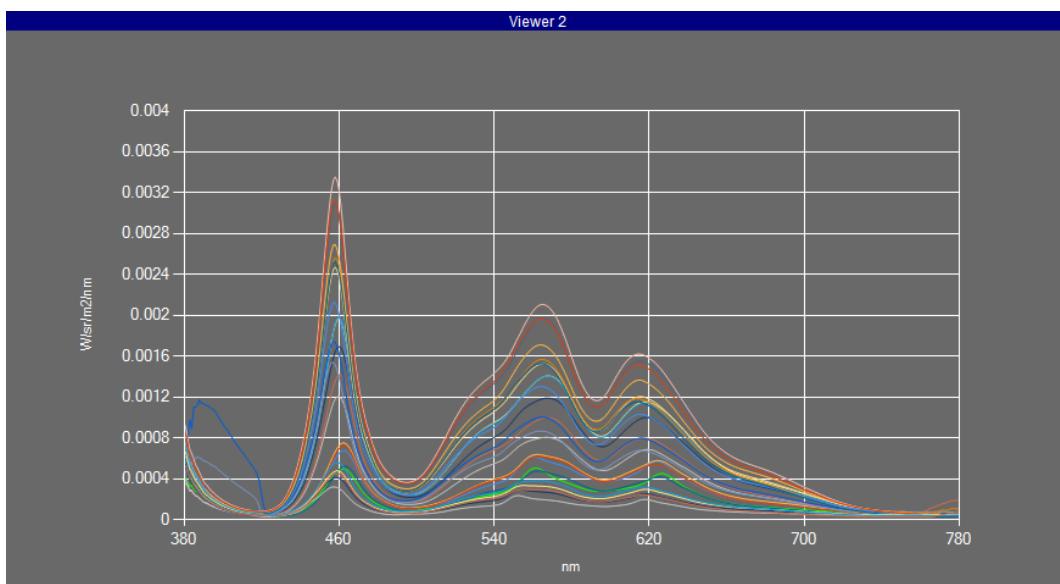
5.11.1 Open Spectrum View

To open the spectrum view, go through the following steps.

1. Display the spot view and select [Spectrum] on one of [Viewer 1] and [Viewer 2].



2. [Spectrum view] is displayed.



Memo

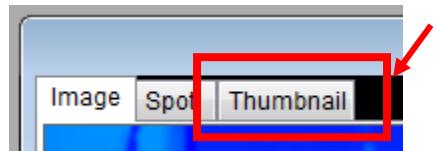
To change the number of shown spectra and the colors of line and y-axis and x-axis settings, select [Property...] from the pop-up menu, [Spectrum setting] is displayed.

5.12 Thumbnail View Operation

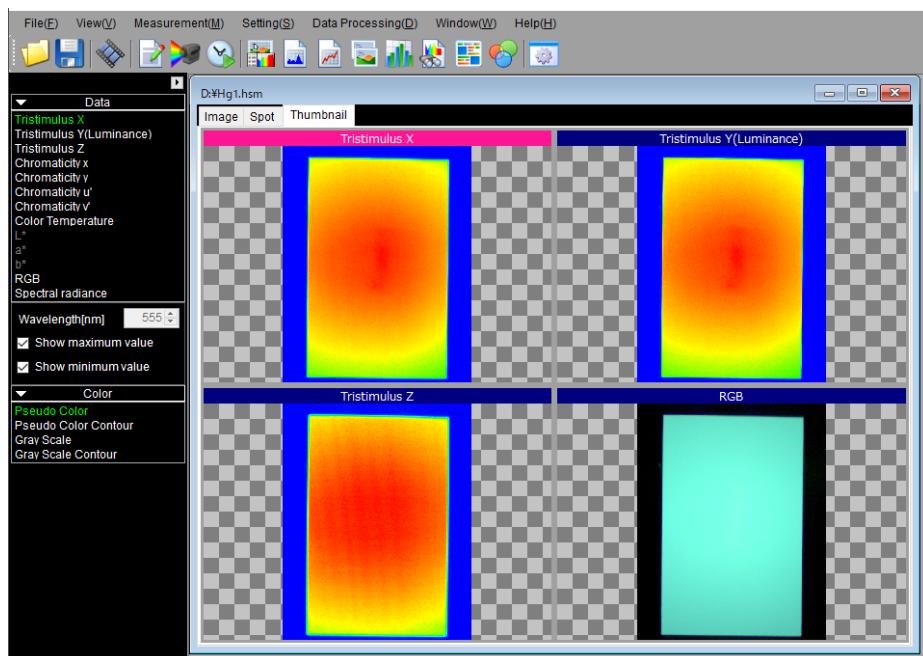
The thumbnail view function displays of each measured value or spectral radiance included in one measurement image.

To display the thumbnail view, go through the following steps.

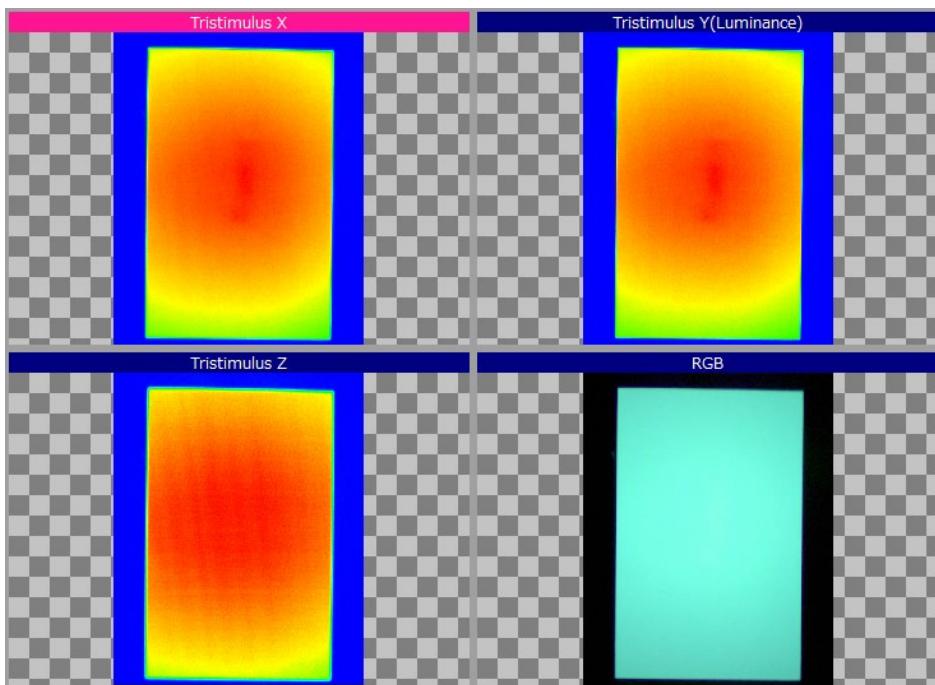
1. Select the [Thumbnail] tab from the tabs at the upper left on the measurement image view.



2. The thumbnail view appears.



The thumbnail to be operated is displayed with a pink title bar. By clicking each thumbnail, you can change the thumbnail to be operated.



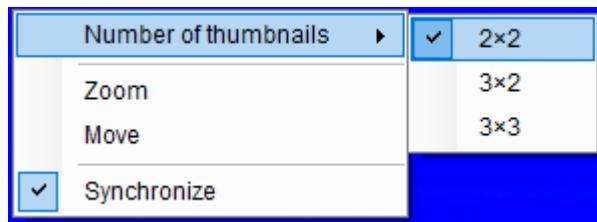
You can change [Data] and [Color] of the thumbnail to be operated. This change operation is the same as that of [Measurement image view].

☞ “5.2.1 Change Display Data”

☞ “5.2.2 Change Display Color”

Memo

- You can change the number of thumbnail images displayed.
Right-click and select the number of images to display from the pop-up menu.
- You can also choose to enlarge or move the thumbnail image from the pop-up menu.
If you want to enlarge and move all thumbnail images at the same time, select “Synchronize”.
- [Zoom] and [Move] operation is the same as the measurement image view.



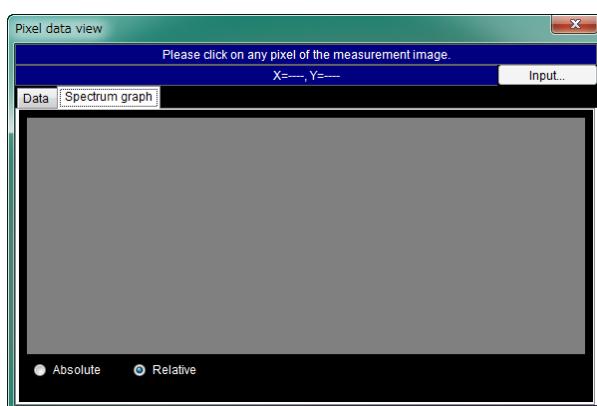
5.13 Pixel Data View Operation

The pixel data view function displays the spectrum and measured values of an optional pixel in a measurement image.

5.13.1 Open Pixel Data View

To open [Pixel data view], go through the following steps.

1. Select [View] - [Pixel data view] or click the  icon on the tool bar.
2. [Pixel data view] is displayed.

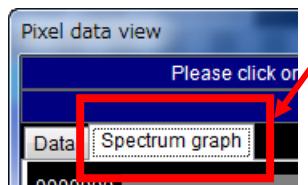


5.13.2 Display Spectrum

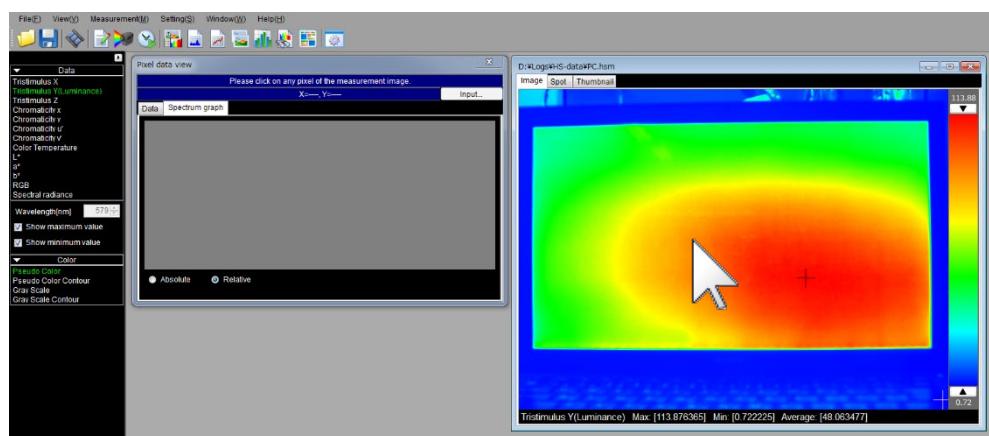
Displays the spectrum of a pixel in a measurement image. The lateral and longitudinal axes indicate wavelength and spectral radiance respectively.

To display the spectrum of each pixel, go through the following steps.

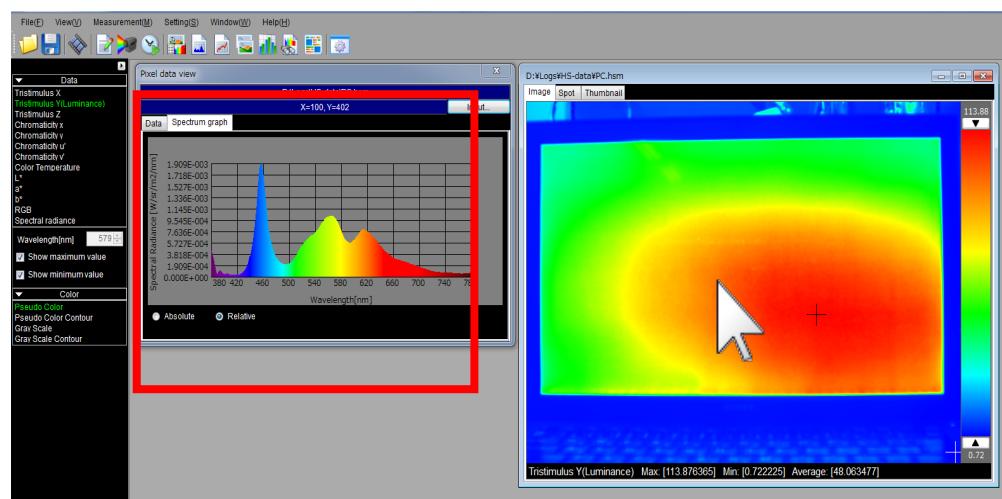
1. Under the condition that the measurement image is read in the main screen, display [Pixel data view] according to "5.13.1 Open Pixel Data View".
2. Select the [Spectrum graph] tab.



3. Click an optional place on the measurement image view.

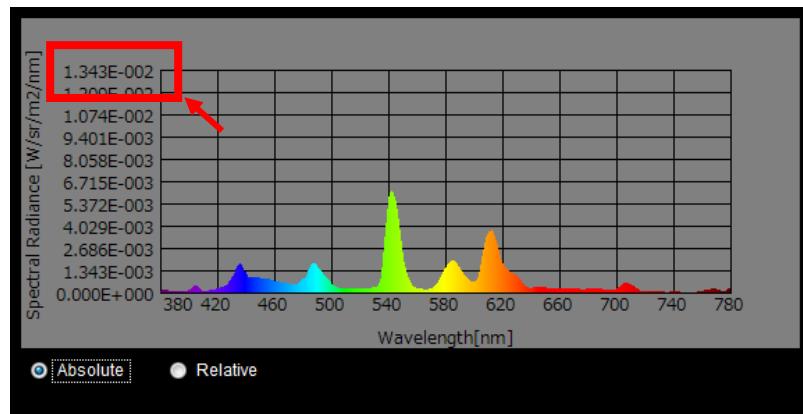


4. The spectrum of the clicked place is displayed on [Pixel data view].



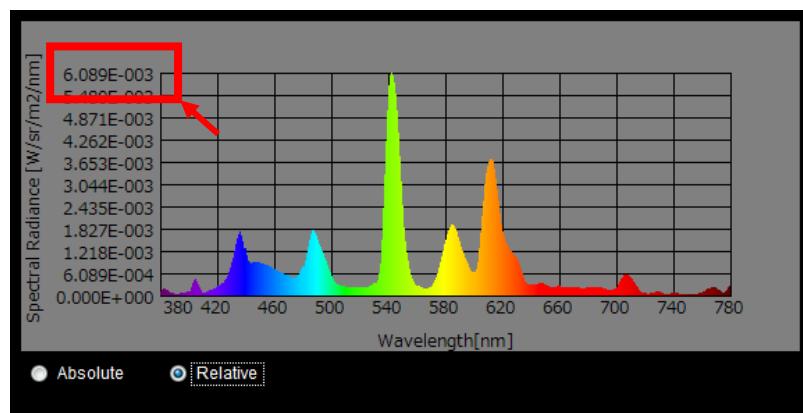
In the case of [Spectrum] of [Pixel data view], you can change [Absolute] and [Relative] to each other.

- [Absolute] The maximum value of spectrum graph is the maximum value of the whole screen.



[Absolute] is effective to check the spectral distribution and strength of the specified pixel in the whole measurement image.

- [Relative] The maximum value of spectrum graph is the maximum value of the selected pixel.



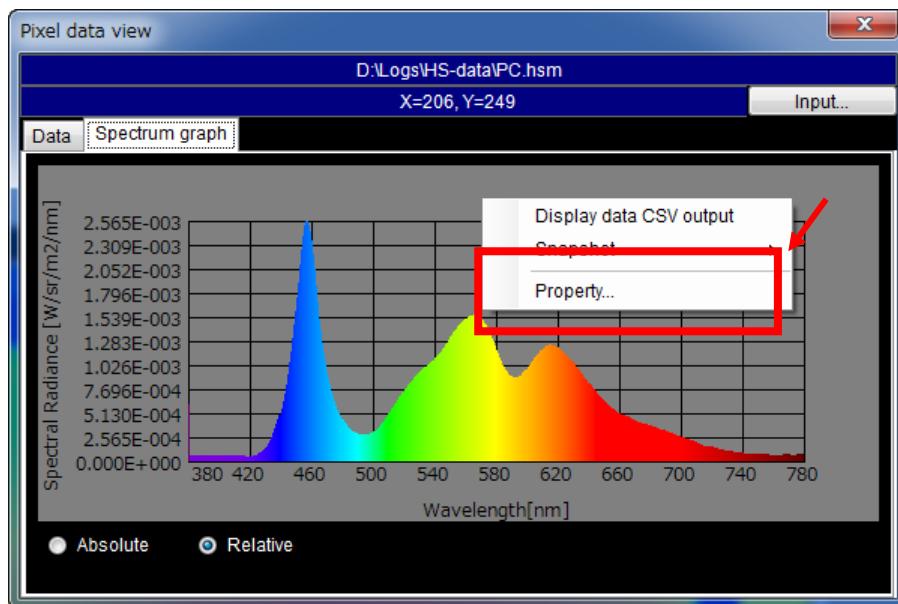
[Relative] is effective to emphasize and check the spectral distribution of the specified pixel.

5.13.3 Display Peak of Spectrum

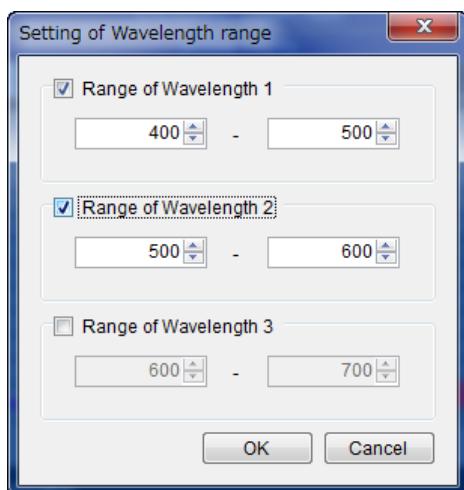
Displays the peak of spectrum in a pixel.

To display the peak of spectrum of each pixel, go through the following steps.

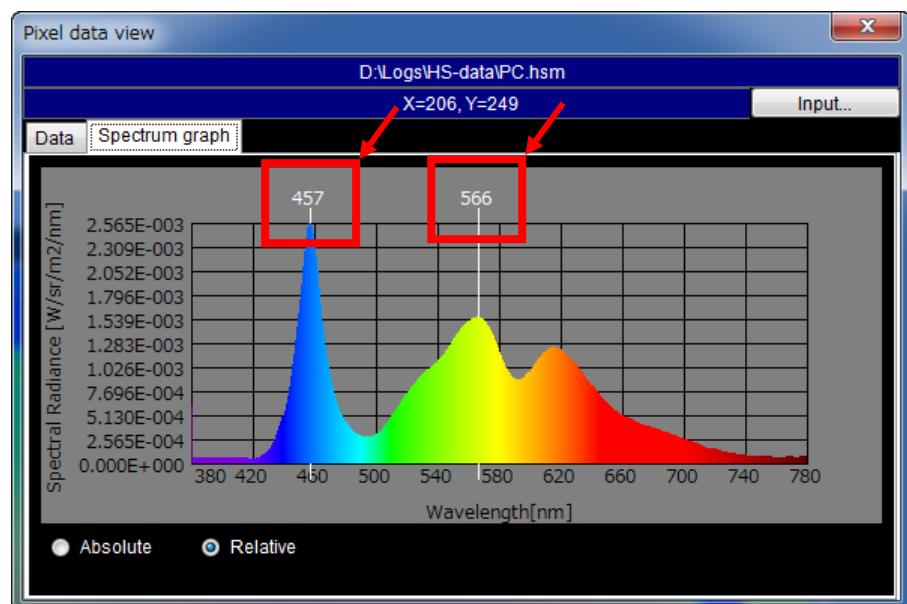
1. Display [Pixel data view] according to "5.13.2 Display Spectrum".
2. Right-click on [Pixel data view] to display the pop-up menu. Select [Property...] from the pop-up menu.



3. [Setting of Wavelength Range] is displayed. Set ON to [Range of Wavelength] check box and enter range of wavelength in edit boxes below.



4. After going back to [Pixel data view] by clicking [OK], the wavelength which has maximum spectral radiance in the specified range is displayed in upper part of the view.

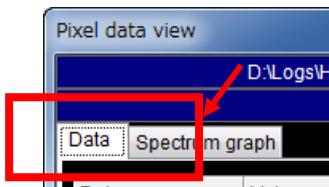


5.13.4 Display Measurement Data

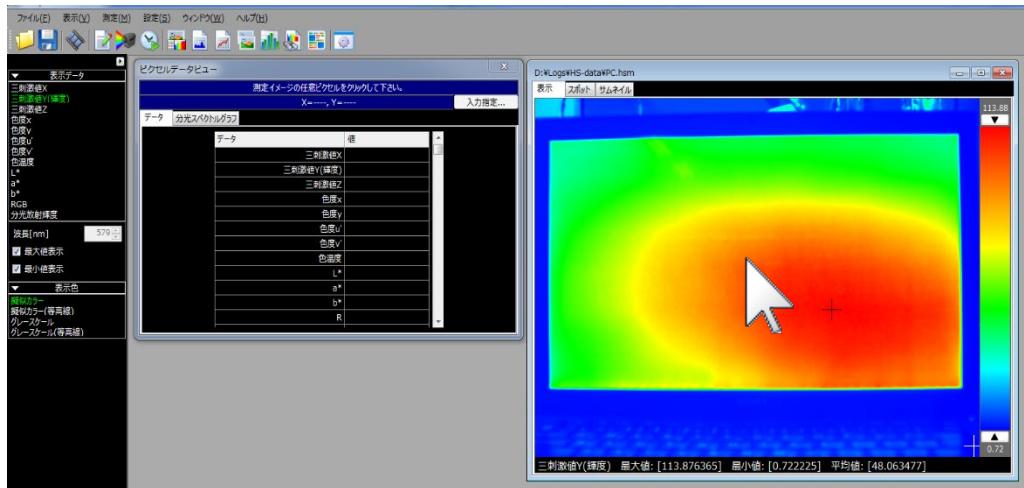
Displays the measurement data of an optional pixel in a measurement image as a table.

To display the measurement data of each pixel, go through the following steps.

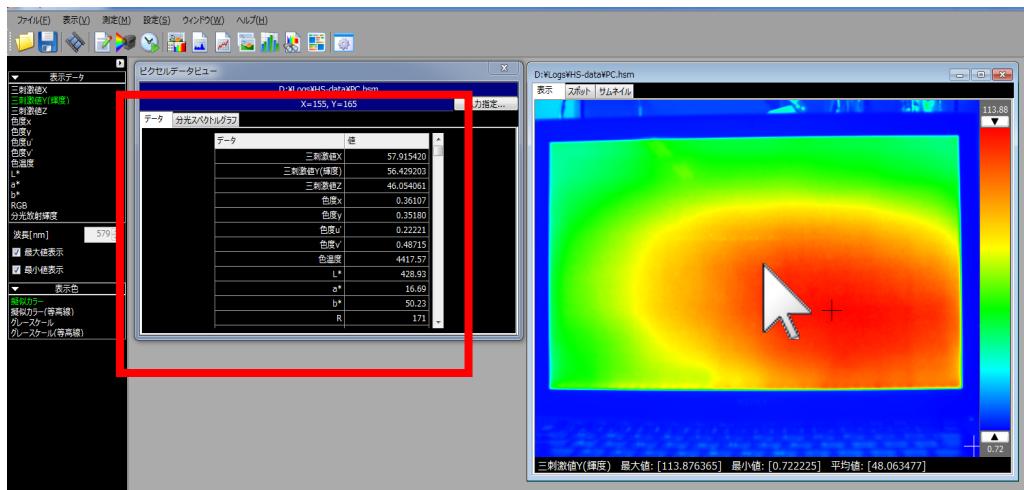
- Under the condition that the measurement image is read in the main screen, display [Pixel data view] according to "5.13.1 Open Pixel Data View".
- Select the [Data] tab.



- Click an optional place on the measurement image view.



- The data of the clicked place is displayed on [Pixel data view].



 Memo

- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the popup menu appeared by right-click.

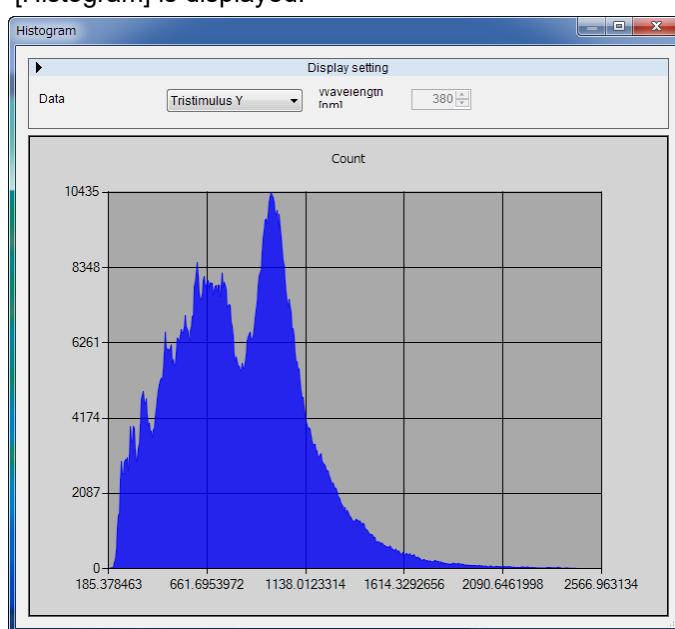
5.14 Histogram Operation

The histogram function displays the statistical graph which indicates the frequency in the longitudinal axis and the measured value in the lateral axis. The histogram enables you to visually understand the measured value distribution.

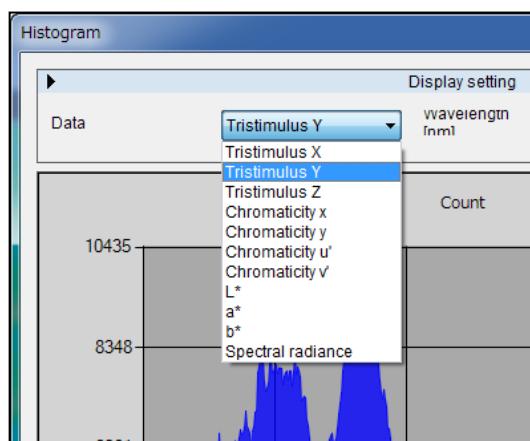
5.14.1 Open Histogram View

To open [Histogram view], go through the following steps.

1. Select [View] - [Histogram...] or click the  icon on the tool bar.
2. [Histogram] is displayed.



3. Select a data type from the pull-down menu of [Data] at the top on the screen to change the histogram of each measured value. When [Spectral radiance] is selected, you can specify [Wavelength].



 Memo

- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the popup menu appeared by right-click.

5.15 Cross Section Operation

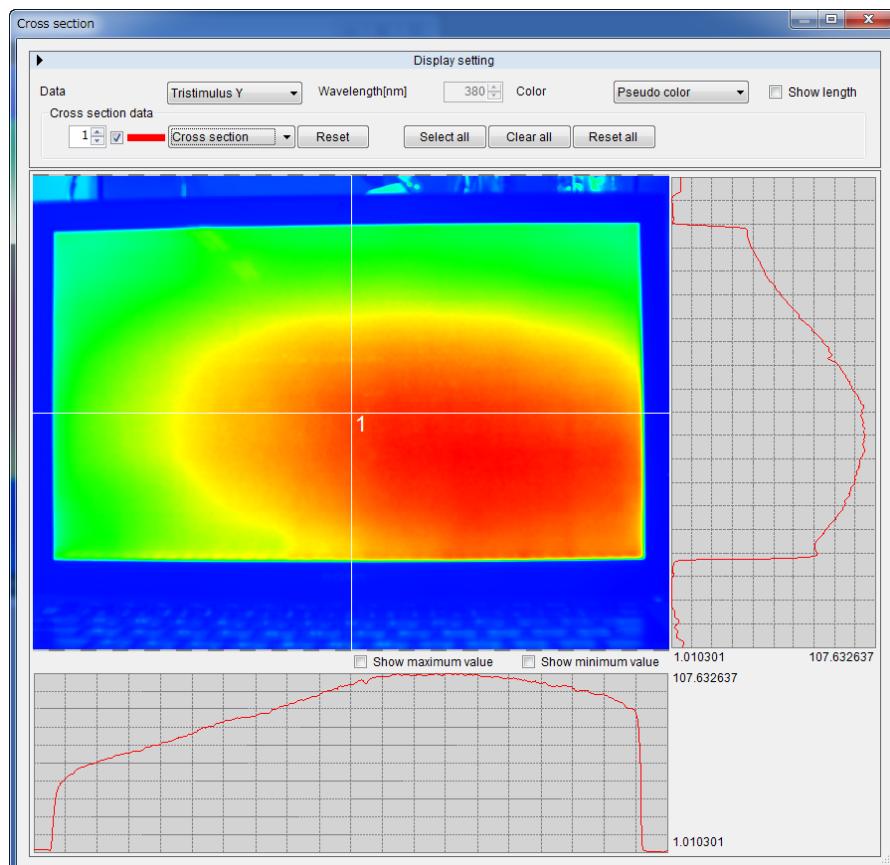
The cross section function displays the measured values of the cross section on a measurement image in longitudinal/lateral graph form. The cruciform or shaded type as the cross-section line can be selected.

When you move the mouse as dragging on the view, the cross-section line follows the mouse movement and you can confirm the cross section data of the arbitrary position in real time.

5.15.1 Open Cross Section View

To open [Cross section view], go through the following steps.

1. Select [View] - [Cross section...] or click the  icon on the tool bar.
2. [Cross section] is displayed.

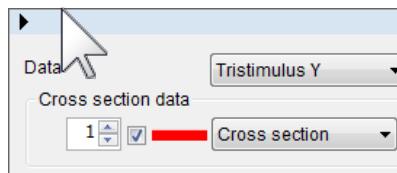


5.15.2 Display in Cruciform Cross Section Form

It is possible to set up to 10 cross-section lines on the cross section image.

To set the cross-section line, go through the following steps.

1. Display [Cross section view] according to “5.15.1 Open Cross Section View”.
2. Click the title of [Appearance] at the top on the screen to display the setting.

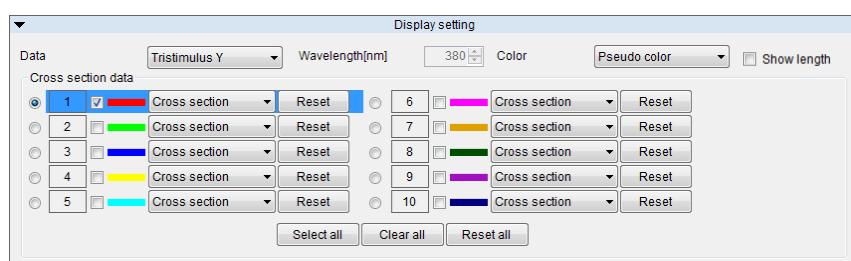


3. The setting data for up to 10 cross-section lines are displayed.

Specify the number of data to be edited, the type of cross-section line, the “displayed/hidden” status of cross-section line, etc.

Up to 10 cross-section lines using both of “cruciform” and “shaded” types can be displayed.

You can change the data to be edited by clicking the number.



The contents of the items are described below.

[Data]

By selecting the data type, you can change the type of measured values. When [Spectral radiance] is selected, you can specify [Wavelength].

[Color]

Changes the color of the data displayed on the cross section view.

[Show length]

Show lengths of Diagnal section on the cross section view.

[Reset]

Cross-section lines are reset to the default status. The cross section view where the lines cross at the central intersection is displayed again.

[Select all]

Select this to display all the cross-section lines. When selecting this item, check marks are placed on all the cross-section number check boxes.

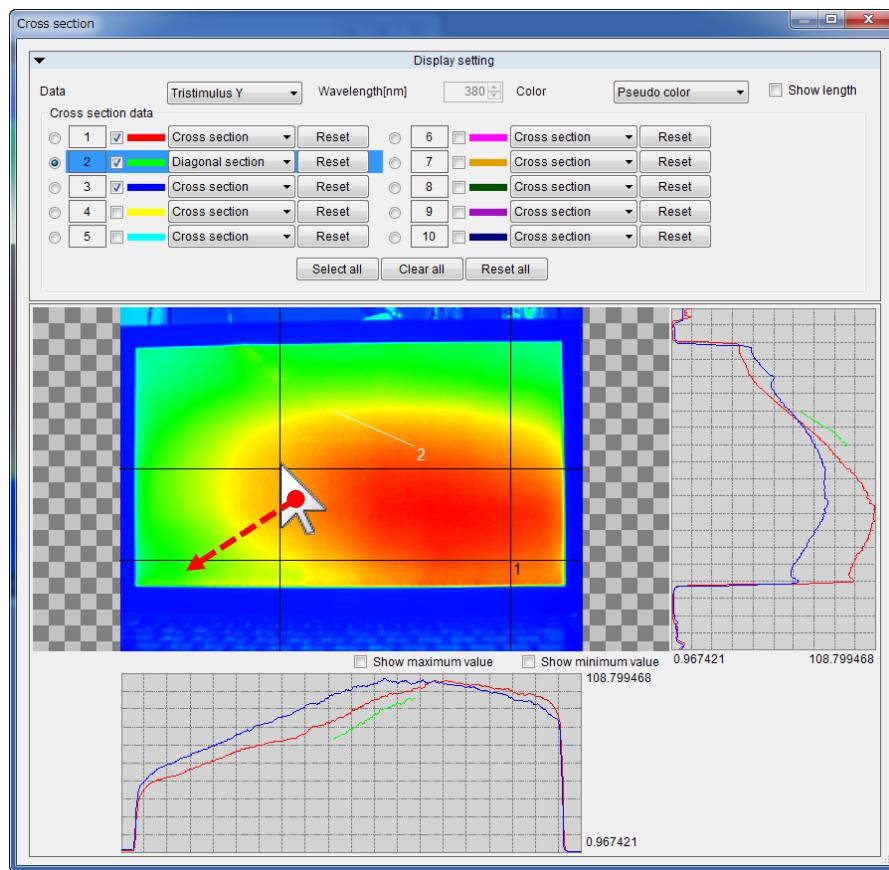
[Clear all]

Select this to hide all the cross-section lines.

[Reset all]

All the cross-section lines are reset to the default status. The cross section view where the lines cross at the central intersection is displayed again.

4. Move the mouse as dragging the cross-section line of the edit data number on the view. The cross-section line follows the mouse movement and you can confirm the cross section data of the arbitrary position on the longitudinal/lateral graph in real time. The last cross-section lines are displayed at the next startup unless the last setting is reset.



Memo

- The setting of CSV output also available from [Application settings]- [Output]- [Section].
- CSV output data is outputted only outputable data depend on measurement condition.

“3.14.4 Output Setting”

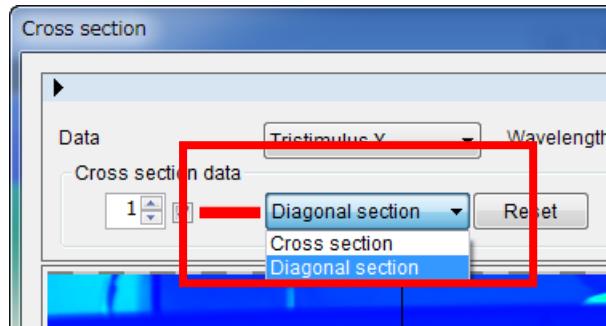
- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the popup menu appeared by right-click.

5.15.3 Display in Shaded Cross Section Form

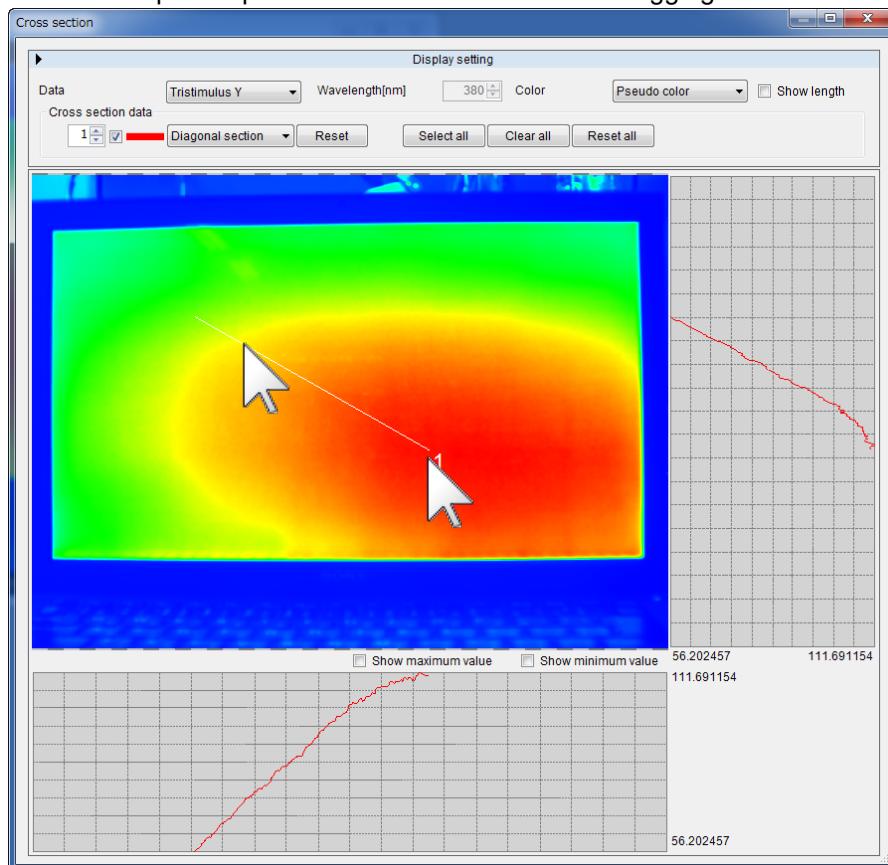
It is also possible to display cross-section lines in shaded status.

To display the shaded cross-section line, go through the following steps.

1. Display [Cross section view] according to “5.15.1 Open Cross Section View”.
2. Select [Diagonal section] from the pull-down menu of [Appearance].



3. Select an optional place with the mouse and start dragging.



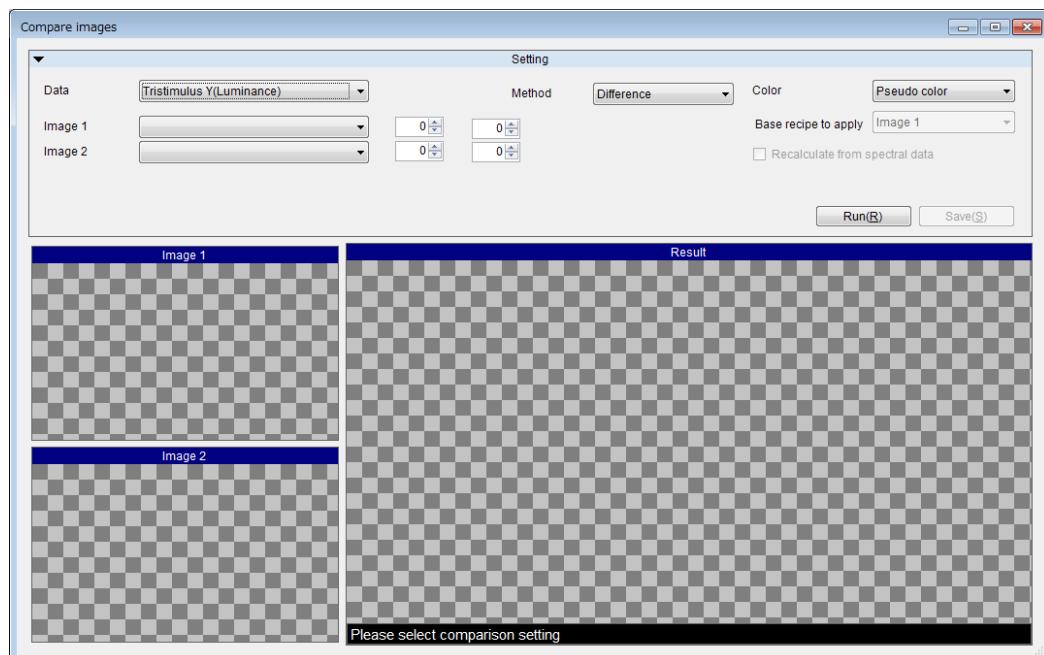
5.16 Measurement Image Comparison Operation

When using the measurement image comparison function, the difference and ratio between two measurement images are calculated and so the differences between the two images are displayed as an image.

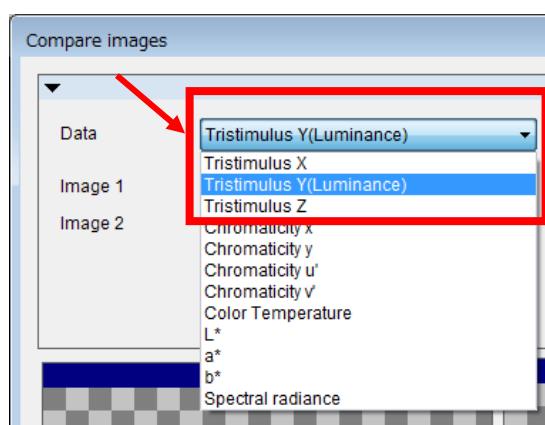
5.16.1 Compare Measurement Images

To compare the measurement images, go through the following steps.

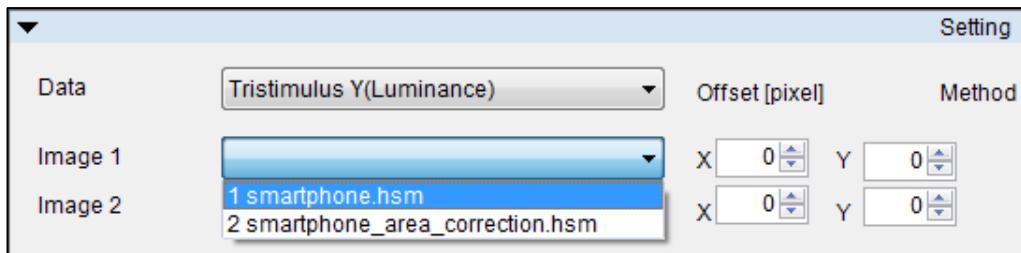
1. Open two or more measurement images in advance. (It is possible to perform comparison within one image.)
2. Select [View] - [Measurement image comparison...] or click the  icon on the tool bar.
3. The [Compare images] screen appears.



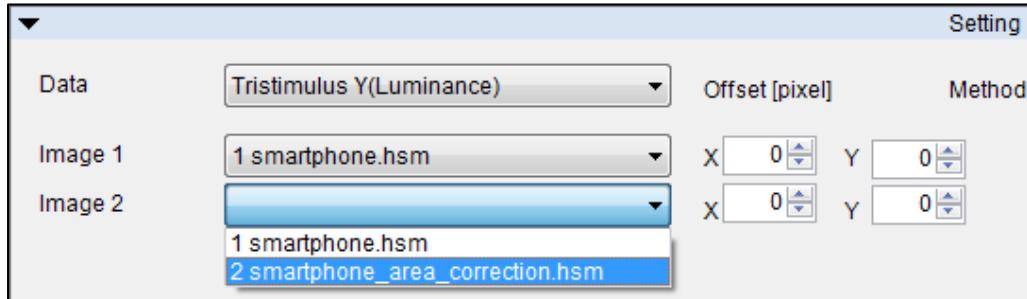
4. Select a data type from the pull-down menu of [Data].



5. Select a measurement image as a comparison target from the pull-down menu of [Image 1].



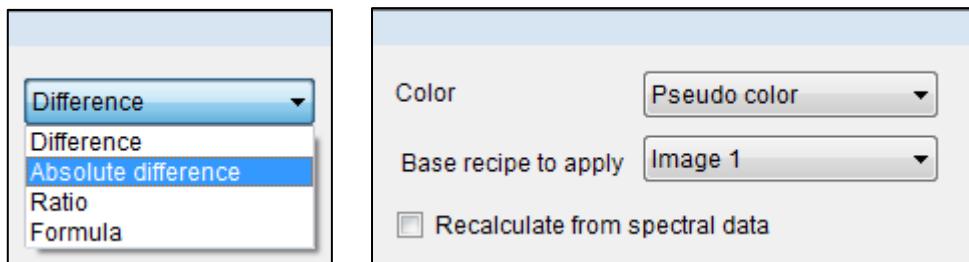
6. Select a measurement image as a comparison target from the pull-down menu of [Image 2].



Memo

It is possible to select the same image for [Image 2] as that for [Image 1].

7. It is possible to offset each measurement image when comparison. Input offset pixel if necessary.
 8. Select items from the pull-down menu of [Method] or [Color] or [Base recipe to apply] if necessary.



Memo

- Base recipe is used to create comparison measurement image.
- When selecting [Formula] on [Method], the [Recalculate from spectral data] checkbox is displayed.
- When you don't check [Recalculate from spectral data], comparison is only operated for each image.
- When you check [Recalculate from spectral data], tristimulus value XYZ is recalculated from spectral data after calculation.

Memo

- When selecting $[L^*] \cdot [a^*] \cdot [b^*]$ on [Data], you can select $[\Delta E^{ab}]$ on [Method].
- When selecting [Spectral radiance] on [Data], the [Wavelength] edit box is displayed. Specify wavelength optionally.

The contents of the [Method] are described below.

[Difference]

Subtracts image2 from image1

$$result = I_1 - I_2$$

[Absolute Difference]

Absolute value of subtraction

$$result = abs(I_1 - I_2)$$

[Ratio]

Divides image1 by image2

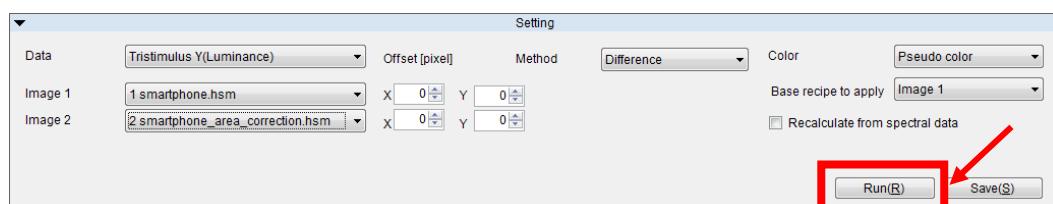
$$result = I_1 / I_2$$

[Formula]

Define formula for calculation

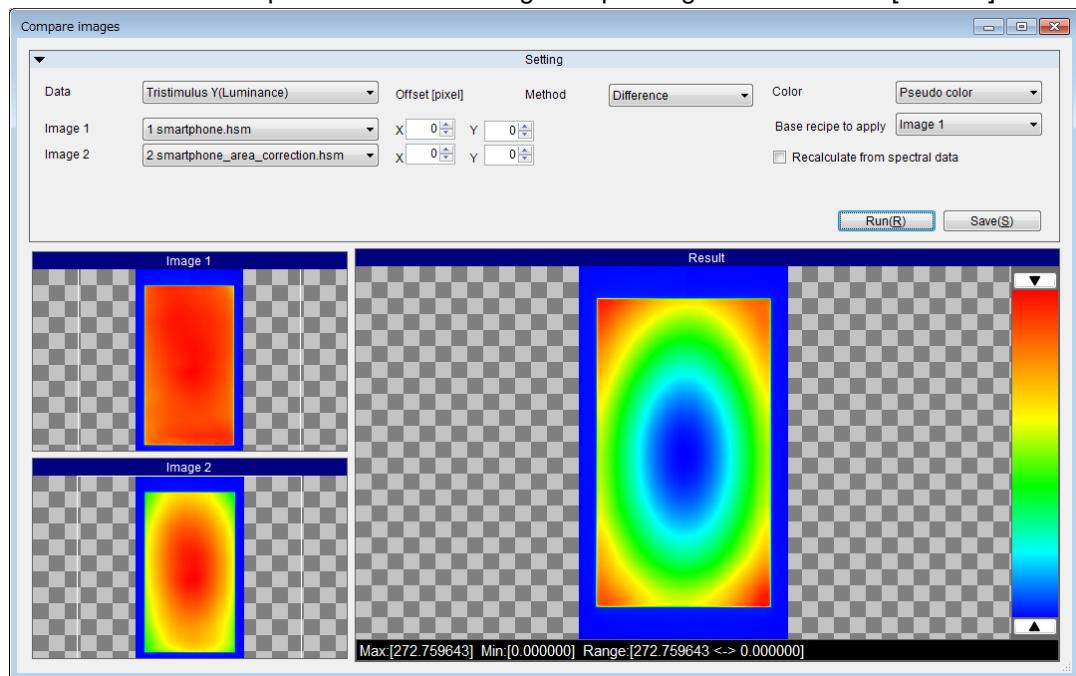
$$result = Formula(I_1, I_2, I_3)$$

9. Click the [Run] button at the right of the screen to start comparison.



10. The comparison result is displayed.

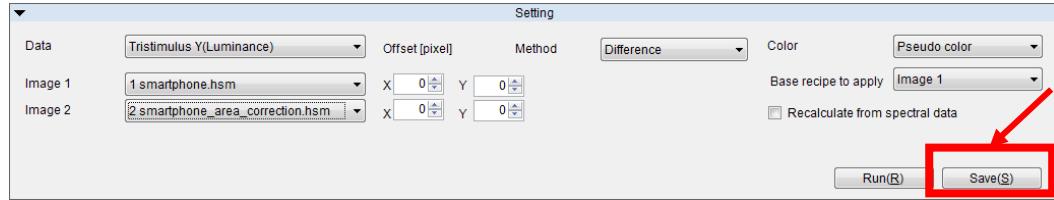
The red part of [Result] at the right side on the screen indicates the part having the large difference between the two images. The blue part indicates the part having the small difference. The comparison result is changed depending on the selected [Method].



Memo

- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the popup menu appeared by right-click.

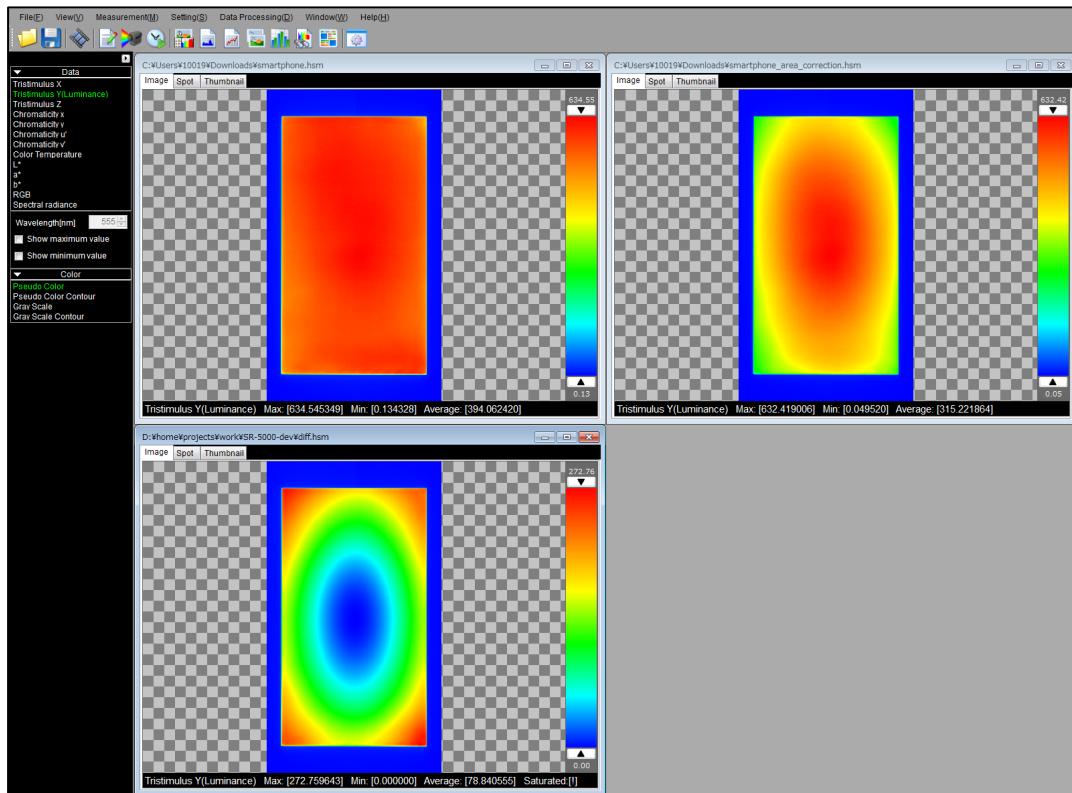
11. Click the [Save] button at the right of the screen to start saving comparison result.



Memo

- It isn't possible to save if the following conditions are satisfied at the time of comparison.
 - Select [ΔE^*ab] for comparison method
 - Comparison wavelength is different
 - Lens types are different
 - Binning settings are different
 - Wavelength data pitch is different
 - Spectral data and XYZ data are mixed in comparison data
 - Measurement filter of measurement data is different

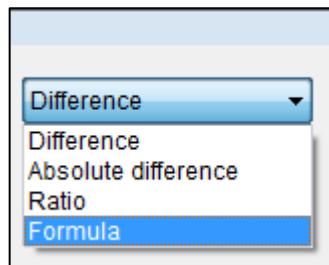
12. The file save dialog box is displayed. Enter a proper name to [File name] and click the [Save] button. After finished calculation, new hsm file is created with the name entered in the file save dialog box.



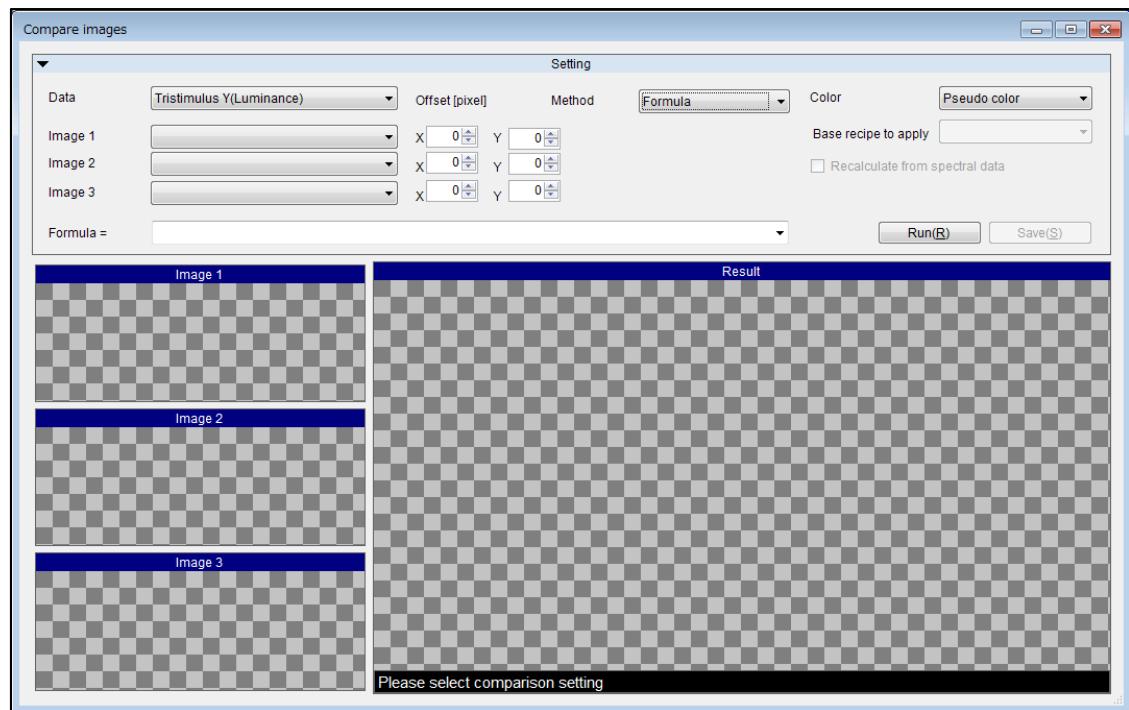
5.16.2 Define the comparison method by a formula

By selecting formula for the comparison method, you can freely define the comparison method of the measurement image. Go through the following steps.

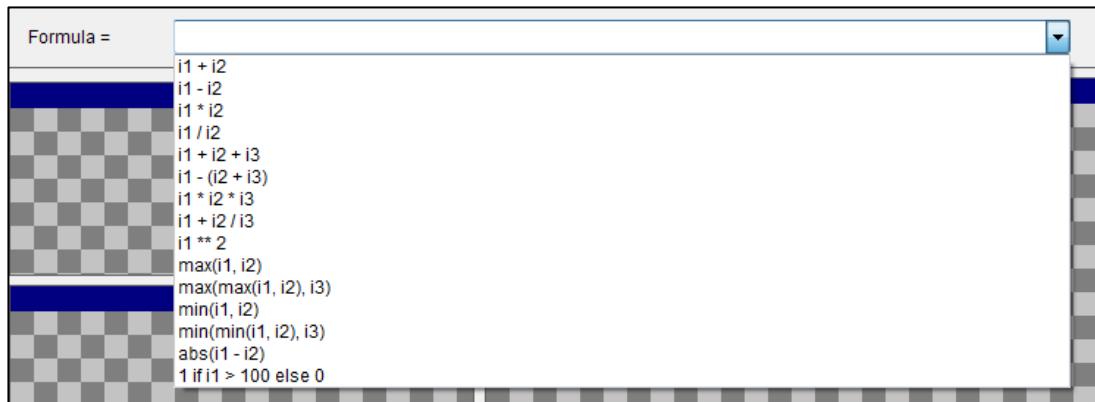
1. Select [Formula] from the pull-down menu of [Method].



2. The number of comparison measurement images is expanded to 3 data and the formula edit box is displayed.



3. When you input predefined formula, click [\downarrow] button in the right of formula edit box.



4. When you compare using other than predefined formula, enter the formula to apply between pixels in the formula edit box. Calculate the result for each pixel with the formula and create the comparison image.

The description rule of [formula] is as follows.

The pixel values of measurement images 1, 2 and 3 can be referred to with the following variable names.

Variable	Meaning
i1	Refer to pixel value of measurement image 1
i2	Refer to pixel value of measurement image 2
i3	Refer to pixel value of measurement image 3

Within the formula edit box you can freely define the comparison method using the following operators.

Operator	Example	Meaning
+	i1 + i2	Add measurement image 1 and 2.
-	i1 - i2	Subtract measurement image 1 to 2
*	i1 * i2	Multiply measurement image 1 and 2
/	i1 / i2	Divide measurement image 1 by 2
**	i1 ** 2	Square measurement image 1

It is possible to apply built-in functions to formula

Function	Example	Meaning
max	max(i1, i2)	Compare the pixels of measurement image 1 and 2, create comparison image from larger pixel.
min	min(i1, i2)	Compare the pixels of measurement image 1 and 2, create comparison image from smaller pixel.
abs	abs(i1 - i2)	Subtract measurement image 1 to 2 and take an absolute value.

It is possible to define complex formula using if statement.

Example	Meaning
1 if i1 > 100 else 0	It is 1 if the pixel value of measurement image 1 is larger than 100, and 0 if it is smaller.
1 if abs(i1 - i2) > 10 else 0	It is 1 if the absolute value of the pixel difference between measurement images 1 and 2 is larger than 10, and 0 if it is smaller.
abs(i1 - i2) if abs(i1 - i2) > 0.1 else 0	It is the absolute value of the pixel difference between measurement images 1 and 2 if the absolute value is larger than 0.1, and 0 if it is smaller.

 Memo

- Python 2.7 interpreter is embedded in formula editor.
- Math module is preimported within formula editor.
- Please refer to official python document for details.

 <https://docs.python.org/2.7/>

5.17 Spot Comparison Operation

When using the spot comparison function, two measurement spots, which are created in the measurement image, are selected and the comparison result is displayed as a graph.

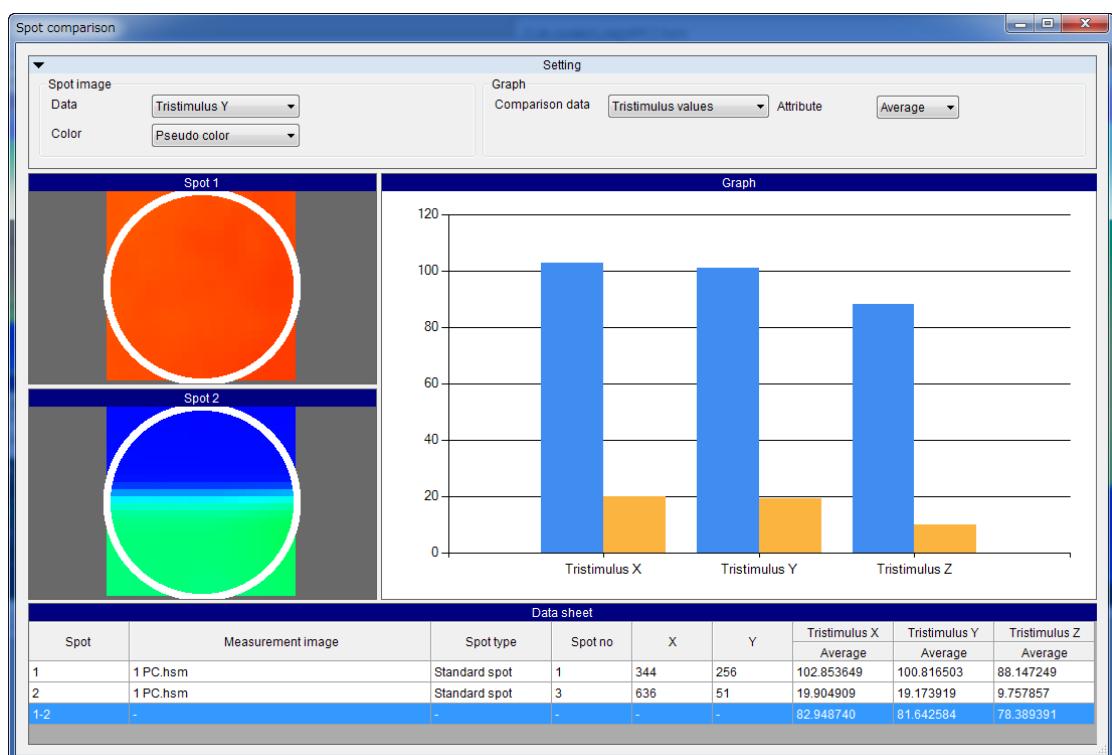
To register the comparison spots, refer to the following section in this manual.

☞ “5.7.5 Register As Comparison Spot”

5.17.1 Compare Spots

To compare the spots, go through the following steps.

1. Select [View] - [Spot comparison...] or click the  icon on the tool bar.
2. Register the comparison spots according to “5.7.5 Register As Comparison Spot” and display the spot comparison screen.



Memo

- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to output data to CSV file and copy it to clipboard. Select [CSV output] or [Copy to clipboard] from the popup menu appeared by right-click.

5.17.2 Change Comparison Setting

By changing the comparison setting, you can perform the comparison fitted to your purpose. This chapter will explain the relation between the setting items and displays.



[Setting area]

- [Data] Selects the data type of the spot image displayed on [Image view].
- [Color] Selects the color of the spot image displayed on [Image view].
- [Comparison data] Selects the type of data to be compared. When [Spectral radiance] is selected, the contents to be set on [Setting area] are changed.
- [Attribute] Selects the property of data to be compared.

[Image view]

Displays the spot image of the data type selected on [Data].

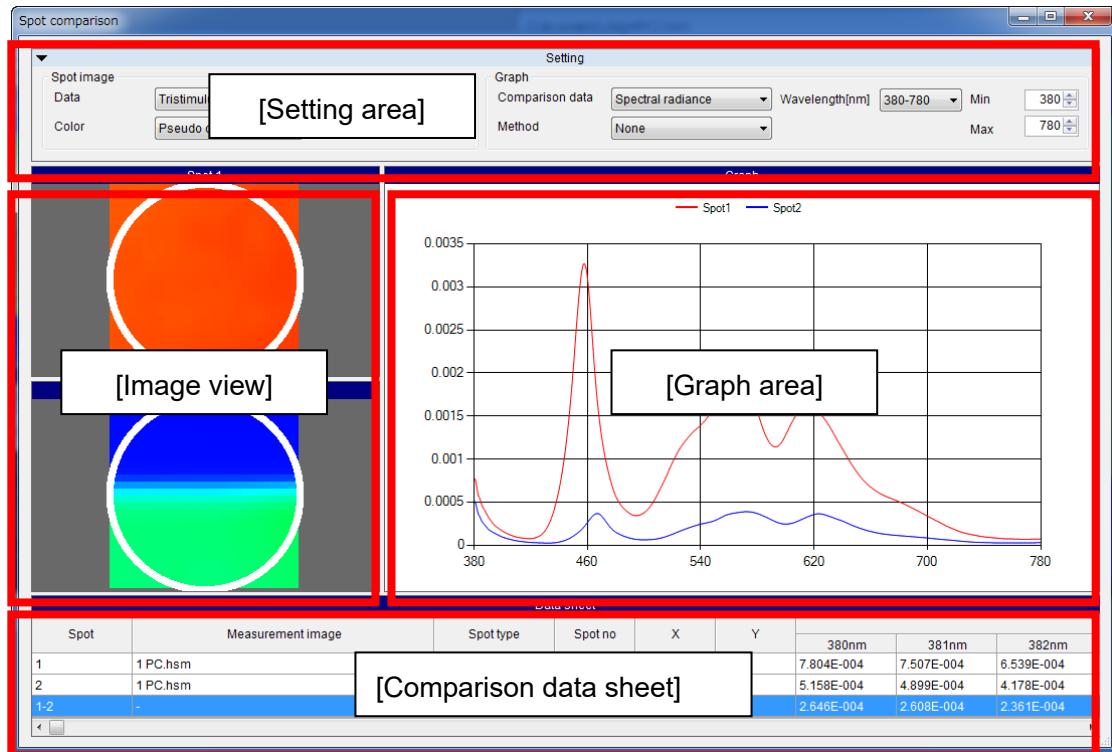
[Graph area]

Displays the data of the type selected on [Comparison data] as a graph. The data of comparison spot 1/2 are displayed as a bar graph.

[Comparison data sheet]

The values of the data type selected on [Data] are displayed. The measured values of the spot are displayed on the first and second lines and, the calculation result, on the third line.

When [Spectral radiance] is selected on [Comparison data], the contents to be set on [Setting area] are changed. The setting peculiar to [Spectral radiance] will be explained below.



[Setting area]

[Method] Select one of the following items for [Method].

[None]

Two spectrums are displayed without calculation.

[Difference]

Performs the operation of “[Spot 1] — [Spot 2]” and displays the result as a line graph.

[Absolute difference]

Performs the operation of “[Spot 1] — [Spot 2]” and displays the absolute value of the result as a line graph.

[比率]

Performs the operation of “[Spot 1] ÷ [Spot 2]” and displays the result as a line graph.

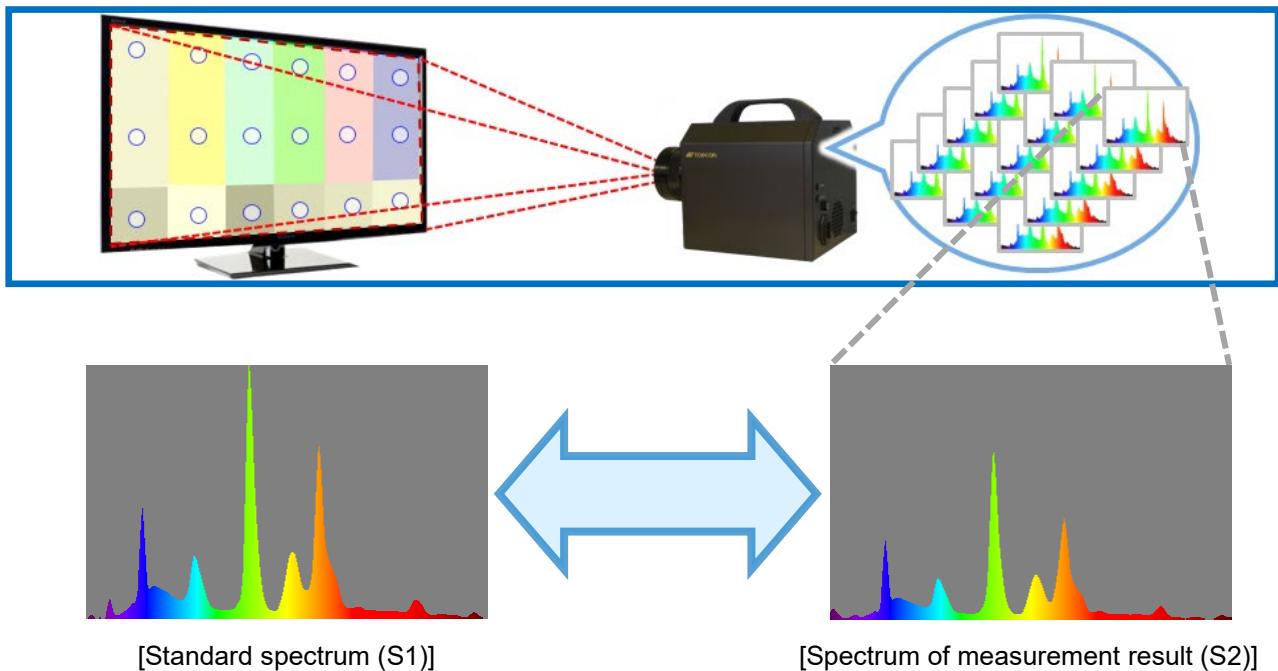
[Wavelength] Select [380-780].

[Min] • [Max] Sets the range of the comparison target and wavelength.

5.18 Spectrum Search Operation

Specifies a spectrum which should be standard and searches for the spectrum in the whole measurement image. It is not likely that the same spectrum as the standard one exists. So, the matching ratio between spectrums is calculated and the matching ratio is displayed in pseudo color.

By separating the surface spectral components, it is certain that each pixel has spectrum in the measurement image. The degree of correlation between the pixel's spectrum and the standard spectrum is calculated to search for the place having the same spectral distribution as the standard spectrum in the measurement image.



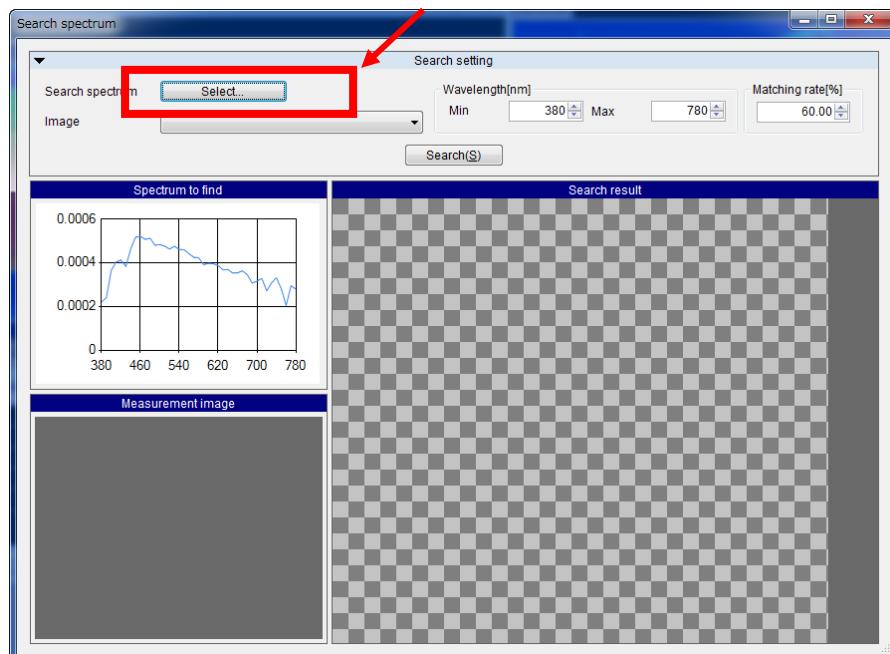
The degree of correlation is calculated by the following formula.

$$score = \frac{\sum_i (S_1(i) - \bar{S}_1)(S_2(i) - \bar{S}_2)}{\sqrt{\sum_i (S_1(i) - \bar{S}_1)^2 \sum_i (S_2(i) - \bar{S}_2)^2}}$$

5.18.1 Search for Spectrum

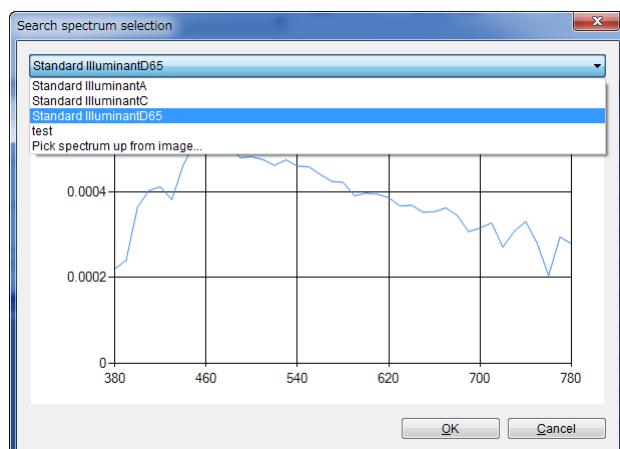
To search for spectrum, go through the following steps.

1. Select [View] - [Search spectrum] or click the  icon on the tool bar.
2. The [Search spectrum] screen appears. Click the [Search...] button beside [Search spectrum] to set the reference spectrum.

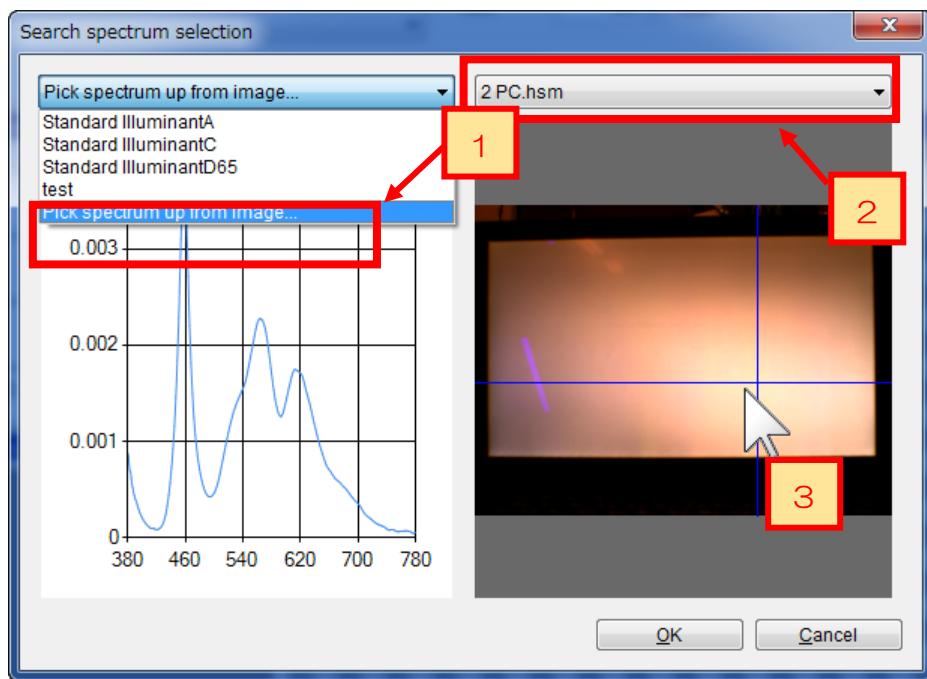


3. The [Search spectrum selection] screen appears. Select the spectrum that has already been registered from the pull-down menu and return to the previous screen with the [OK] button. The spectrums displayed on this pull-down menu are the standard light spectrum that does not need to be registered or the optional spectrum that has been registered by "5.7.4 Register Spectrum".

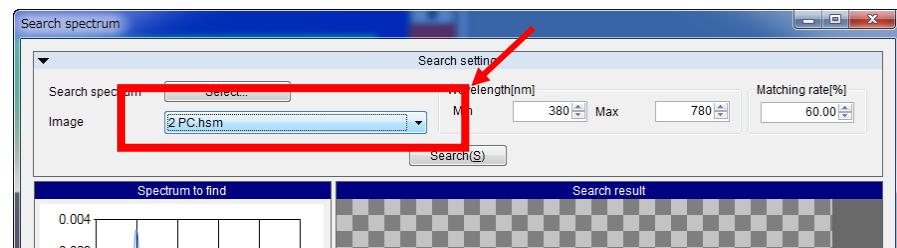
 "5.7.4 Register Spectrum"



4. Another method is as follows. Select [Pick spectrum up from image] and then select the measurement image that has already been read. Specify one point in the measurement image with the mouse. Check the spectrum and then return to the previous screen with the [OK] button.



5. Select the measurement image name from the pull-down menu of [Image]. Search for the spectrum in the selected measurement image.



Set the following items if necessary.

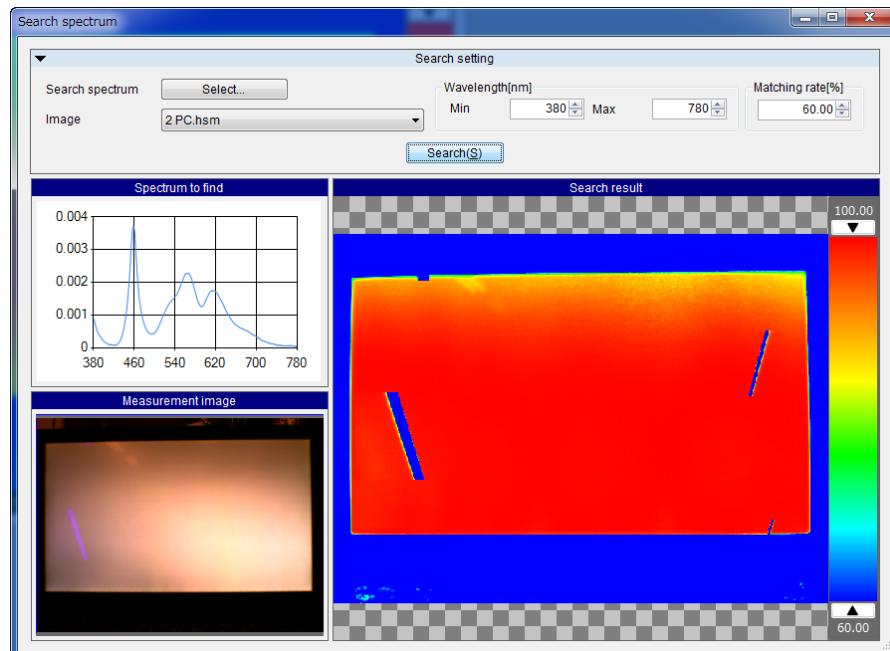
[Wavelength]

Sets the start and end of the wavelength to be the search target.

[Matching rate]

Sets the lower limit for degree of correlation. The degree of correlation between pixels that is below this lower limit is omitted to zero.

6. After setting, click the [Search] button at the center on the screen to start searching.
7. When searching is completed, the search result is displayed as an image. On the red part of the image, the degree of correlation against the standard spectrum is high.
By adjusting the upper and lower ends of the bar at the right side on the screen, you can concentrate on some portion of the displayed image.



Memo

- It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.
- It's possible to save the search result data to CSV file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.

5.19 Object Color Simulation Operation

It is possible to simulate how a measurement target is seen under another illumination environment. First, the spectral reflectance is calculated by the spectral radiance of the measurement target and the spectral radiance of the illumination light source at that time. This reflectance is integrated by the spectral radiance of another illumination light source and how the measurement target is seen under another illumination light source is simulated.

To carry out this simulation operation, the following three measurement images are necessary.

- Measurement image (Image A) obtained by measuring a target under some illumination light source (Light 1)
- Measurement image (Image B) obtained by measuring a white plate under the illumination light source (Light 1) that was used for Image A
- Measurement image (Image C) obtained by measuring the white plate under another illumination light source (Light 2)

By using the above-mentioned three measurement images in simulation, you can check what kind of measurement image will be obtained when measuring the measurement target under another illumination light source (Light 2).

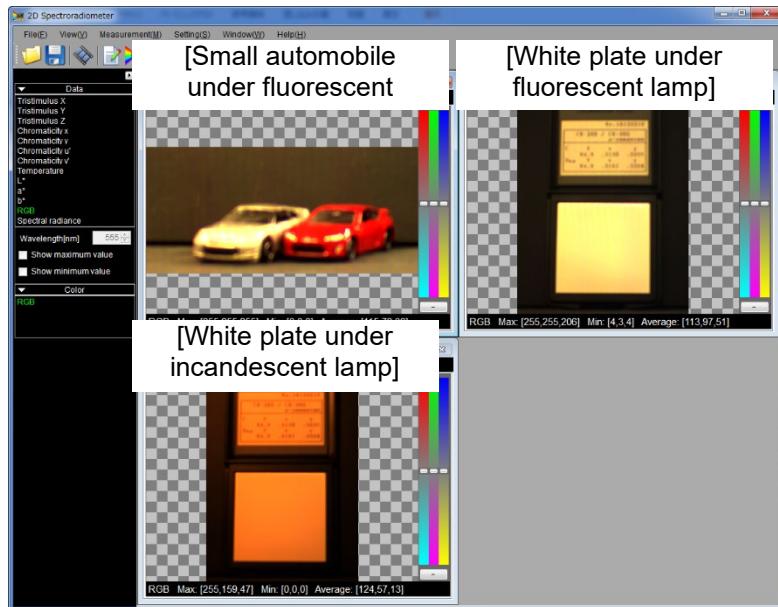
For example, how a small automobile is seen under incandescent lamp will be simulated with the images mentioned below.

- Image A: Image obtained by measuring a small automobile under fluorescent lamp.
- Image B: Image obtained by measuring a white plate under fluorescent lamp.
- Image C: Image obtained by measuring a white plate under incandescent lamp.

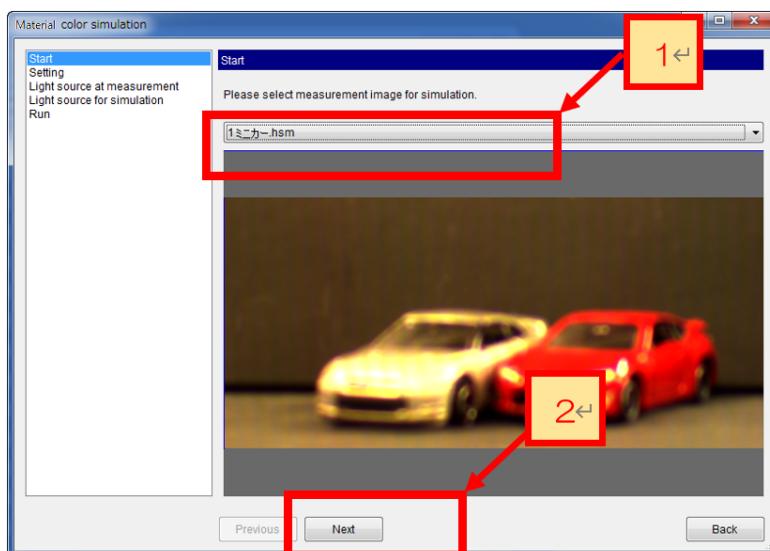
5.19.1 Perform Object Color Simulation

To perform the object color simulation, go through the following steps.

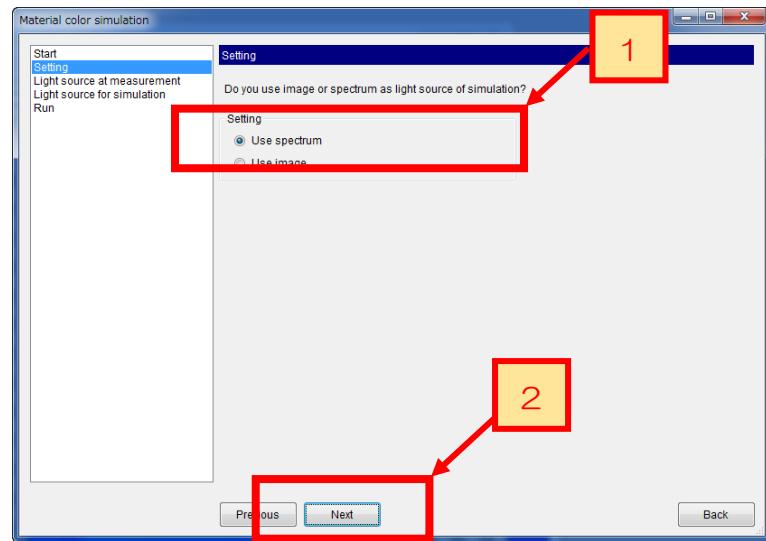
1. Read the aforementioned three measurement images in advance.



2. Select [View] - [Color simulation] or click the  icon on the tool bar.
3. The [Object color simulation] screen appears. Select the measurement target image from the pull-down menu at the center on the screen. Here, select the image of “Small automobile under fluorescent lamp” as Image A. After selecting, click [Next] to proceed to [Setting].



4. This is the setting to select spectrum or image as the light source of simulation. Select [Use spectrum] for here. After selecting, click [Next] to proceed to [Light source at measurement].



Set the following items if necessary.

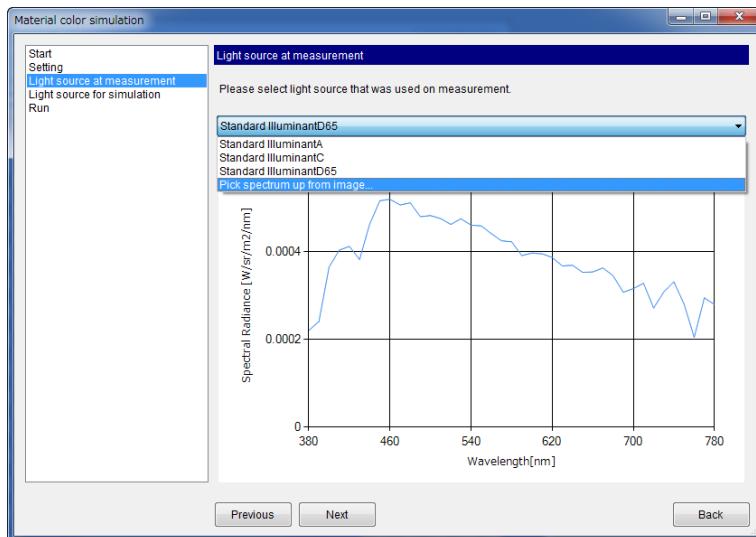
[Use spectrum]

It uses spectrum of single point as light source for the simulation. The spectrum that will be selected from next procedures is used for whole image.

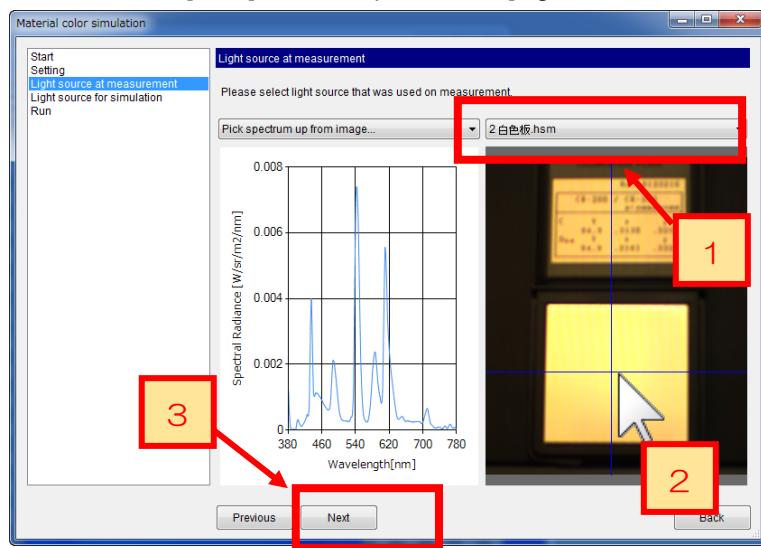
[Use image]

It uses image of measurement result as light source for the simulation. Spectra of every pixel in the image is used as light source.

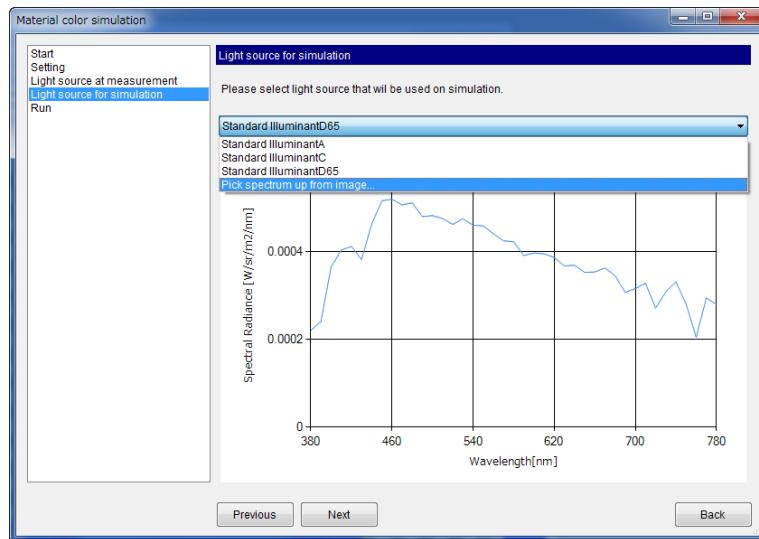
5. Select [Pick spectrum up from image] from the pull-down menu at the center on the screen.



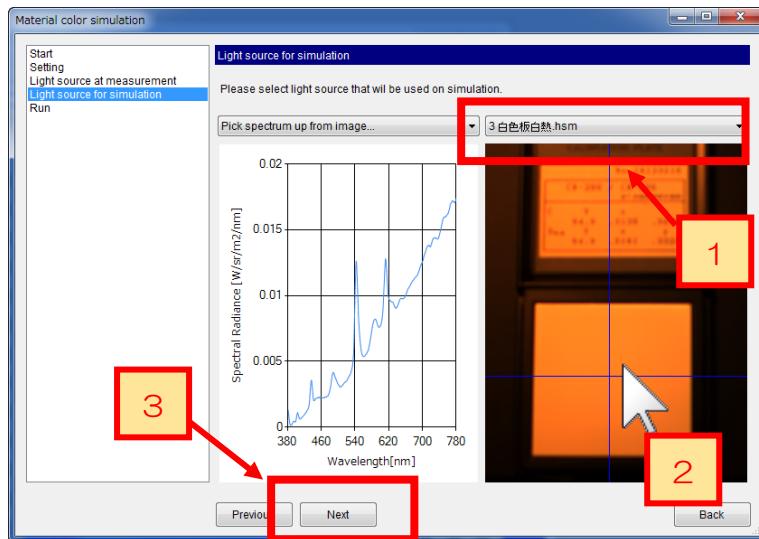
6. Select the image of “White plate under fluorescent lamp” as Image B from the pull-down menu. Then, click one point on the image with the mouse to make sure that the spectrum is updated. Next, click the [Next] button to proceed to [Light source for simulation].



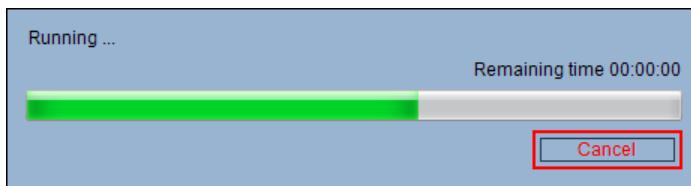
7. Select [Pick spectrum up from image] from the pull-down menu at the center on the screen.



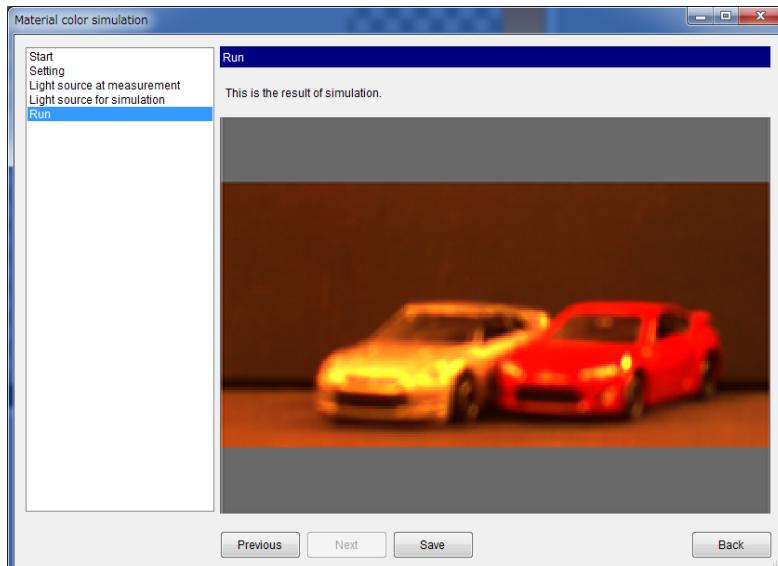
8. Select the image of “White plate under incandescent lamp” as Image C from the pull-down menu. Then, click one point on the image with the mouse to make sure that the spectrum is updated. Next, click the [Next] button to proceed to [Run].



9. The status check dialog box is displayed.



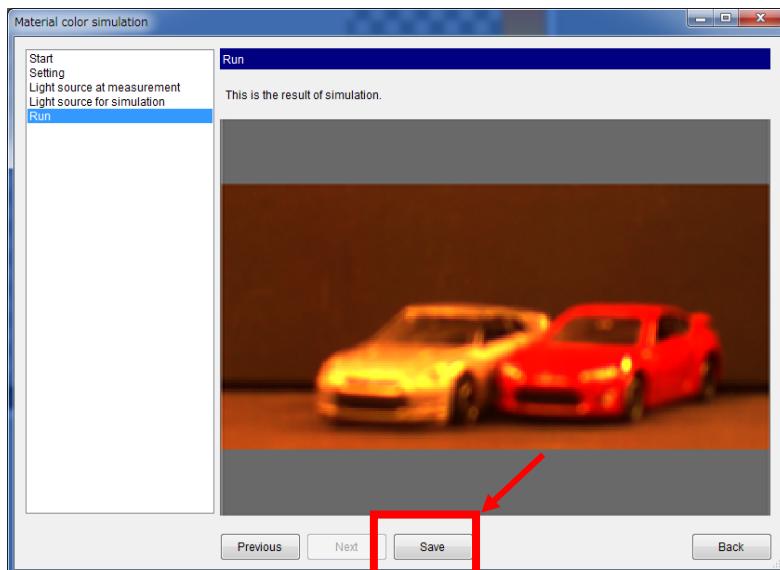
10. When the simulation is completed, the result is displayed.



Memo

It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.

11. If you need to save the result of simulation as a measurement data, click [Save] button.



12. The file save dialog box is displayed. Enter a proper name to [File name] and click the [Save] button. After finished calculation, new hsm file is created with the name entered in the file save dialog box.

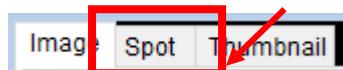
5.20 Color Rendering Operation

Represents the property of the light source (how the color looks compared to the standard illuminant) as a color rendering index. The color rendering index can be obtained for each spot in the measured image.

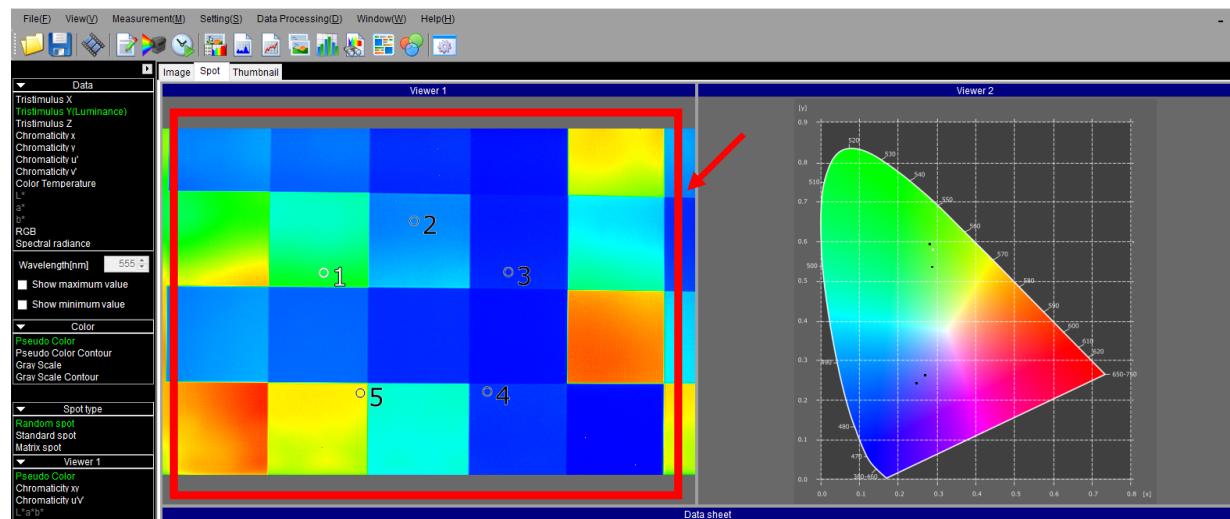
5.20.1 Calculate Color Rendering

To calculate the color rendering index, go through the following steps.

1. Select the [Spot] tab from the tabs at the upper left of the measurement image view.

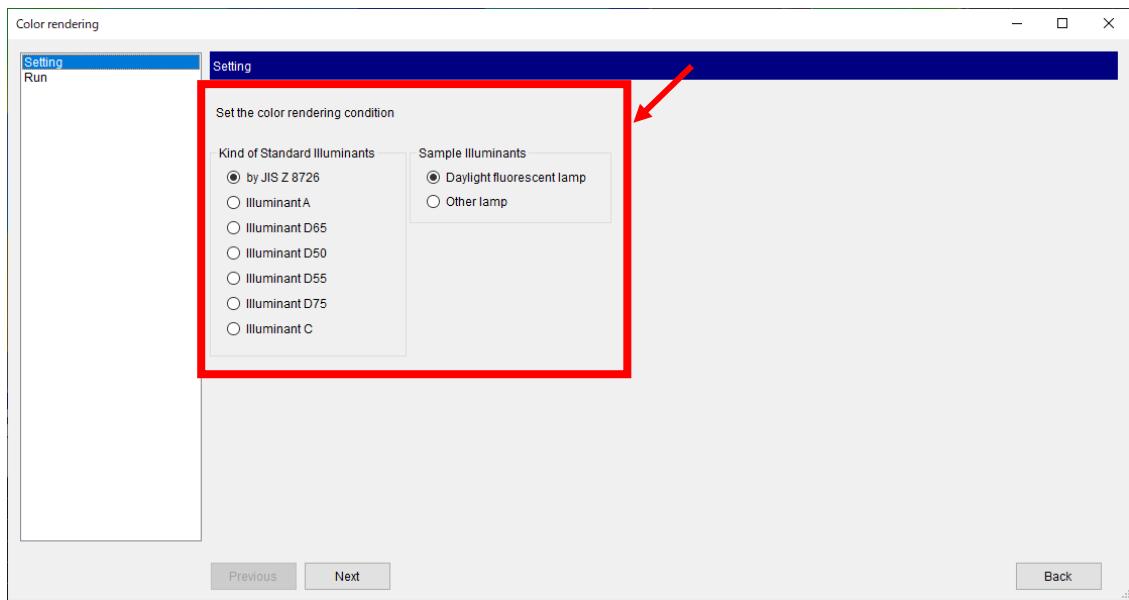


2. Create some spots to calculate the color rendering index.



3. Select [View] - [Color rendering] or click the icon on the tool bar.

4. The color rendering screen is displayed. Select “Standard Illuminants” and “Sample Illuminants”.



The contents of the items are as follows.

[Kind of Standard Illuminants]

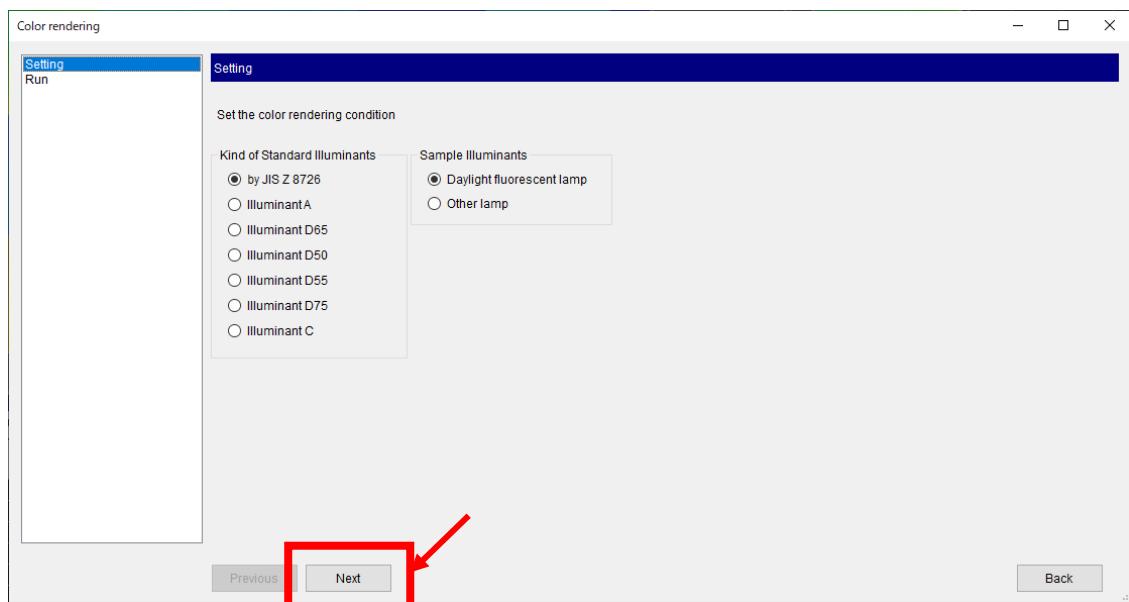
by JIS Z 8726/Illuminant A/D65/D50/D55/D75/C

[Sample Illuminants]

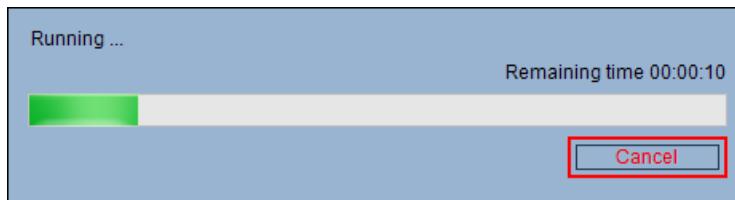
Daylight fluorescent lamp/Other lamp

When [Kind of Standard Illuminants] is set to [by JIS Z 8726], the selection of [Sample Illuminants] is applied to the color rendering calculation.

5. Click the [Next] button to proceed to [Run].



6. The status check dialog box is displayed.



7. When the calculation is complete, the results are displayed.

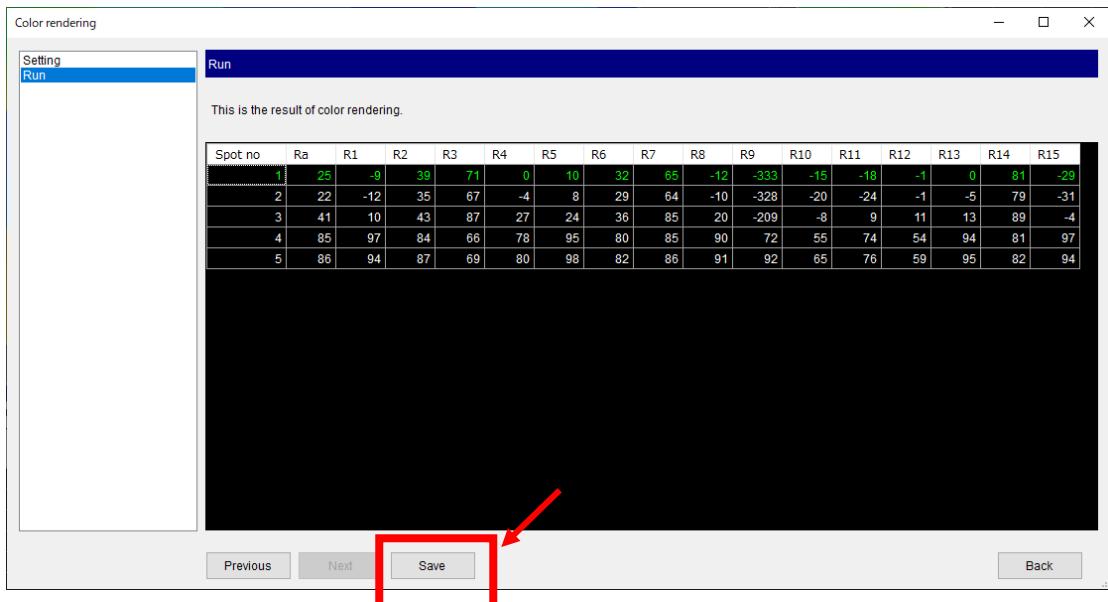
A screenshot of a software window titled "Color rendering". The left sidebar has tabs for "Setting" and "Run", with "Run" selected. The main area is titled "Run" and contains the text "This is the result of color rendering." Below this is a table with 5 rows and 16 columns. The columns are labeled Ra, R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, and R15. The first row (Spot no. 1) contains values: Ra=25, R1=-9, R2=39, R3=71, R4=0, R5=10, R6=32, R7=65, R8=-12, R9=-333, R10=-15, R11=-18, R12=-1, R13=0, R14=81, R15=-29. The other four rows show similar data for spots 2 through 5.

Spot no	Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
1	25	-9	39	71	0	10	32	65	-12	-333	-15	-18	-1	0	81	-29
2	22	-12	35	67	-4	8	29	64	-10	-328	-20	-24	-1	-5	79	-31
3	41	10	43	87	27	24	36	85	20	-209	-8	9	11	13	89	-4
4	85	97	84	66	78	95	80	85	90	72	55	74	54	94	81	97
5	86	94	87	69	80	98	82	86	91	92	65	76	59	95	82	94

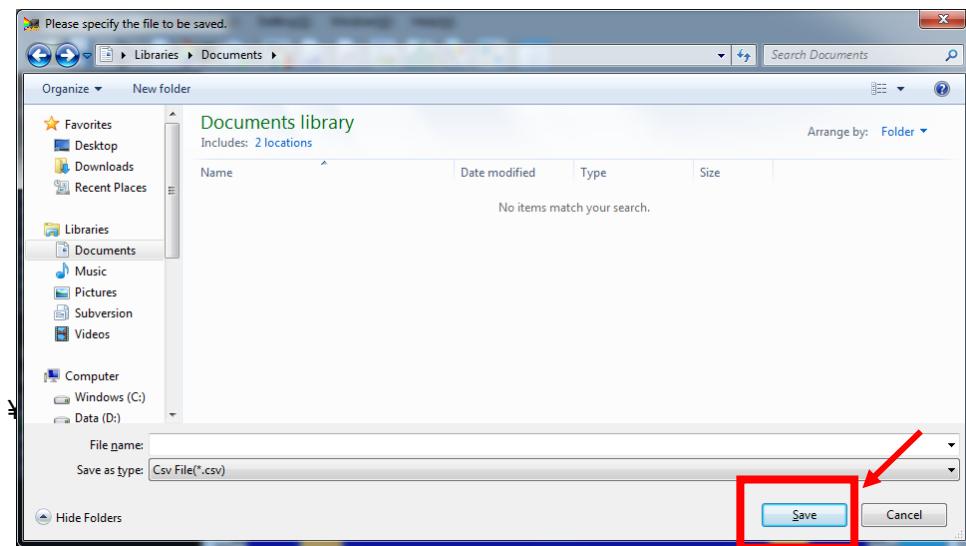
Memo

- The average color rendering index (Ra) is the average of R1-R8.
- The test color of R15 is standardized in JIS Z 8726, the others are equivalent to the test colors of CIE standard.

8. To save the color rendering result data, click [Save] button.



9. Specify the save destination file.



5.21 Measurement Information List Operation

The measurement information list function displays the file names and the measurement information of all the read measurement images in a list. By displaying the measurement information list, you can compare the measurement conditions of two or more measurement images easily.

5.21.1 Display Measurement Information List

To display the measurement information list, go through the following steps.

1. Select [View] - [List of measurement information...].
2. The [List of measurement information...] screen appears.

List of measurement image			
Item	1 200929_121648.hsm	2 200929_121722.hsm	3 200929_121802.hsm
Define standard white point	User(0.3300, 0.3300)	A(0.4476, 0.4074)	D85(0.3127, 0.3280)
Binning type	Binning2 (688 x 512)	Binning2 (688 x 512)	Binning2 (688 x 512)
Resolution(ROI)[pixel]	688 x 512	688 x 512	688 x 512
Optical Resolution[mm]	0.505 x 0.505	0.505 x 0.505	0.505 x 0.505
Measurement area[mm]	347.35 x 258.49	347.35 x 258.49	347.35 x 258.49
Image Rotation	None	None	None
Image Processing ROI	None	None	None
Lens	Standard	Standard	Standard
Measurement distance[mm]	600	600	600
Measurement type	Continuity:1 times	Continuity:1 times	Continuity:1 times
Layer	Unused	Unused	Unused
Averaging	1 times	1 times	1 times
Saturation detection	Interrupt	Interrupt	Interrupt
Smoothing	On	On	On
Measurement kind	Spectrum	Spectrum	Spectrum
Gain	1	1	1
Integration time	20.000	20.000	20.000
ND filter	None	None	None
Scan mode	Standard(5nm)	Standard(5nm)	Standard(5nm)
Trigger mode	Software	Software	Software
Wavelength[nm]	380 <-> 780 (1)	380 <-> 780 (1)	380 <-> 780 (1)
Luminous factor correction	Disable	Disable	Disable
Diagonal correction	Disable	Disable	Disable
Color correction	Enable	Enable	Enable
Area correction	Disable	Disable	Disable
White plate correction	Disable	Disable	Disable
Microscope Correction	Disable	Disable	Disable
Ruler Correction	Disable	Disable	Disable
Spectrum correction	Disable	Disable	Disable



- Memo
- The measurement image that is active on the main screen is displayed in green.
 - Double-click a data column. The measurement image whose data are displayed on the column is activated and the previous screen appears again.

6. Data Processing Operation

6.1 Time-series Analysis Operation

The time-series analysis function displays the variations in measurement data as time advances. This function needs the images measured continuously under the same measurement conditions. When time-series measurement is done, time-series analysis is performed after continuous measurement and the results are displayed.

↳ “4.3 Time-series Measurement”

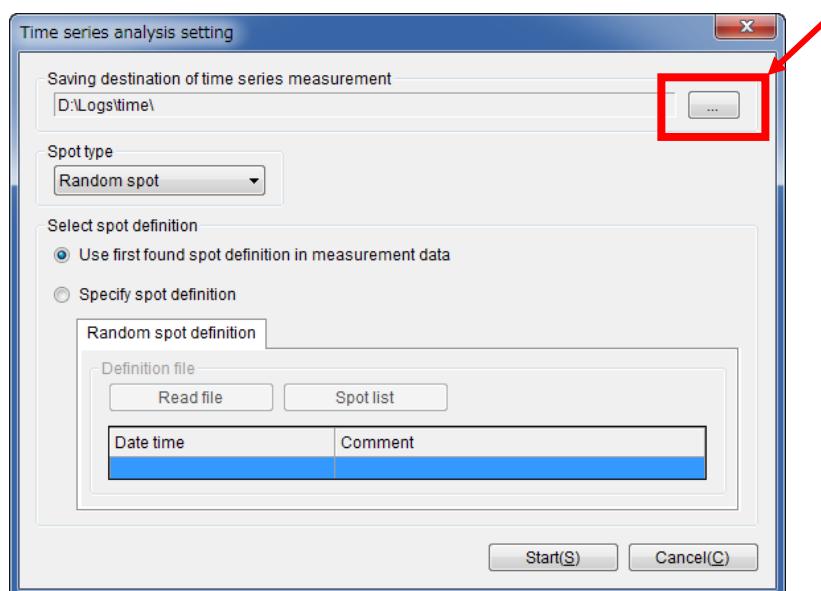
In [Time-series graph] and [Time-series data sheet], the measurement data for the set measurement spot are displayed.

For the measurement spot type, you can select one of [Standard spot], [Matrix spot] and [Random spot] or [All].

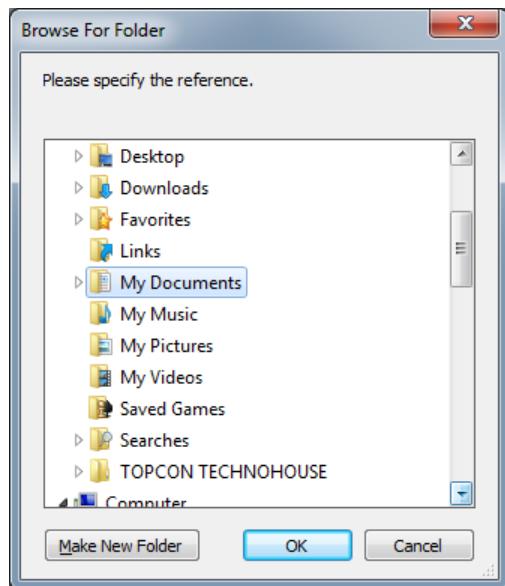
6.1.1 Perform Time-series Analysis

To perform the time-series analysis, go through the following steps.

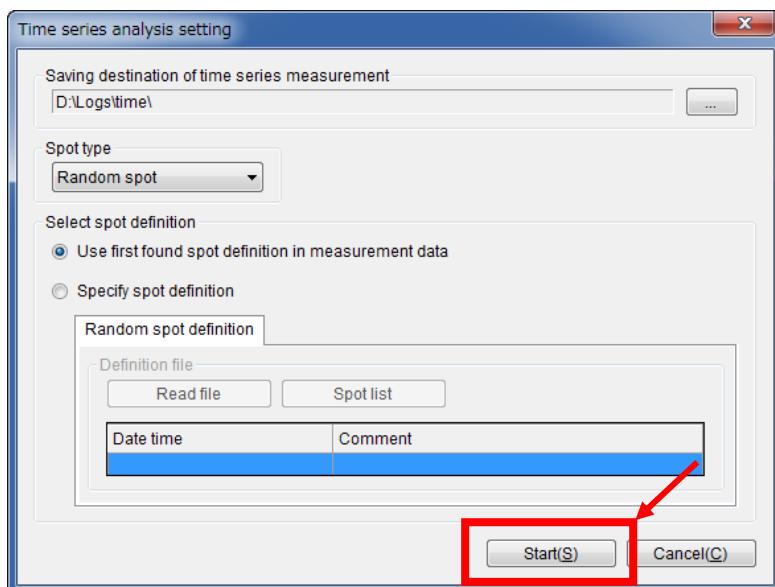
1. Select [Data Processing] - [Time series analysis...].
2. The [Time series analysis setting] screen appears. Click the [...] button of [Saving destination of time series measurement] to specify the folder where the measurement images are saved



3. Select the folder where the images of continuous measurement are saved and go back to the previous screen with [OK].



4. Set other items if necessary and click [Start] to proceed to the next step.



Set the following items if necessary.

[Spot type]

Selects one of [Standard spot], [Matrix spot] and [Random spot] or [All].

[Select spot definition]

When [Use first found spot definition in measurement data] is selected, the spot definition related to the measurement image that has been found first in the [Saving destination of time series measurement] folder is used.

When [Specify spot definition] is selected, the spot definition that is saved as a file is used. For saving the spot definition, refer to the following sections in this manual.

↳ “5.4.17 Save/Read Random Spot File”

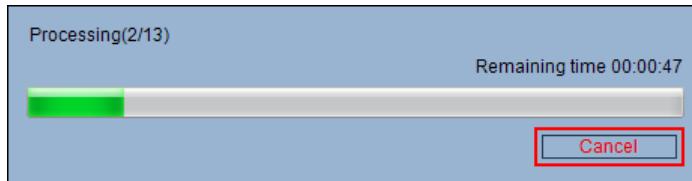
↳ “5.5.9 Save/Read Standard Spot File”

↳ “5.6.5 Save/Read Split Spot File”

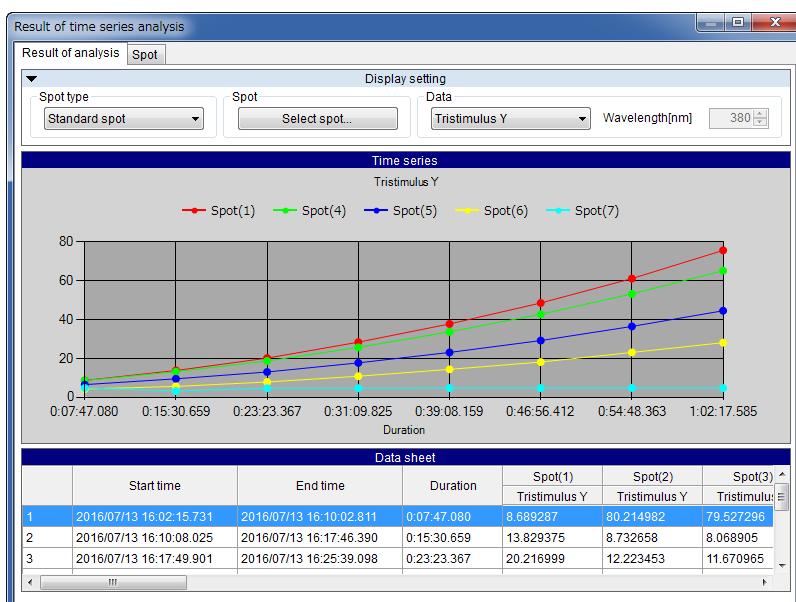
Click [Read file], and the file specification dialog box is displayed. Select a proper spot definition file.

When [All] is selected on [Spot type], perform setting for all of [Standard spot definition], [Matrix spot definition] and [Random spot definition].

5. The status check dialog box is displayed.



6. When the analysis is completed, the [Result of time series analysis] screen appears.

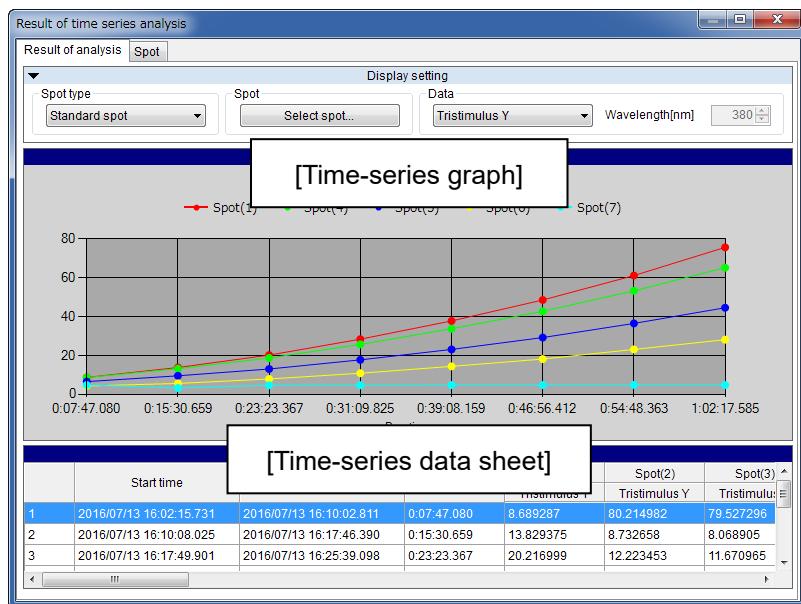


	Start time	End time	Duration	Spot(1) Tristimulus Y	Spot(2) Tristimulus Y	Spot(3) Tristimulus Y
1	2016/07/13 16:02:15.731	2016/07/13 16:10:02.811	0:07:47.080	8.689287	80.214982	79.527296
2	2016/07/13 16:10:08.025	2016/07/13 16:17:46.390	0:15:30.659	13.829375	8.732658	8.068905
3	2016/07/13 16:17:49.901	2016/07/13 16:25:39.098	0:23:23.367	20.216999	12.223453	11.670965

6.1.2 Time-series Analysis Result Operation

It is possible to set the time-series measurement results, change the displayed contents and output the data.

The settable and operable items are described below.



[Time-series graph]

Displays the time-series analysis results as a graph. The lateral and longitudinal axes indicate the time passage and the measured values of the data type selected on [Data] respectively.

It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.

[Time-series data sheet]

Displays the measured value of each spot in the chronological order on the spread sheet. The pop-up menu is displayed by right-clicking. It is possible to select [CSV output setting], [CSV output] and [Copy to clipboard] from this pop-up menu.

The setting for CSV output is available from [Application setting]-[Output].

CSV output data items depend on measurement condition.

[Spot type]

When [All] has been selected on [Spot type] at startup of time-series measurement or time-series analysis, you can change the spot type here.

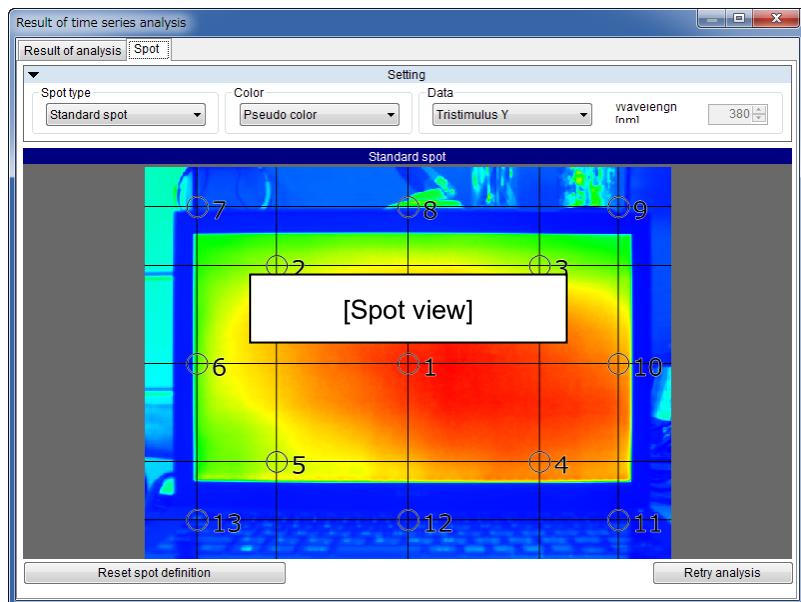
[Spot]

Data of up to 10 spots can be displayed at [Time-series graph] at the center on the screen. When more than 10 spots are created, it is necessary to select 10 spots. Click [Select spot...], and the [Spot list] screen appears. Select spots to be the display targets.

[Data]

Select the data type that will be displayed in [Time-series graph] at the center on the screen from the pull-down menu. When [Spectral radiance] is selected as the data type, input a value to [Wavelength].

At the upper left on the screen, change to the [Spot] tab. The editing screen for the measurement spot appears.



[Spot view]

Displays the measurement image and the measurement spot diagram.

The pop-up menu is displayed by right-clicking. For the usable operation, refer to the following sections in this manual.

☞ “5.4 Random Spot View Operation”

☞ “5.5 Standard Spot View Operation”

☞ “5.6 Matrix Spot View Operation”

[Spot type]

When [All] has been selected on [Spot type] at startup of time-series measurement or time-series analysis, you can change the spot type here.

[Color]

Selects the display color of the spot image that will be displayed on [Spot view] at the center on the screen. Select [Pseudo color] or [Grayscale].

[Data]

Selects the data type of the spot image that will be displayed on [Spot view] at the center on the screen. When [Spectral radiance] is selected as the data type, input a value to [Wavelength].

[Reset spot definition]

It is possible to create/edit a spot on [Spot view]. By using this, you can return the changed data to the original status.

[Retry analysis]

When you have created or edited the spot on [Spot view], it is necessary to perform analysis again. In such a case, click this button to perform analysis again.

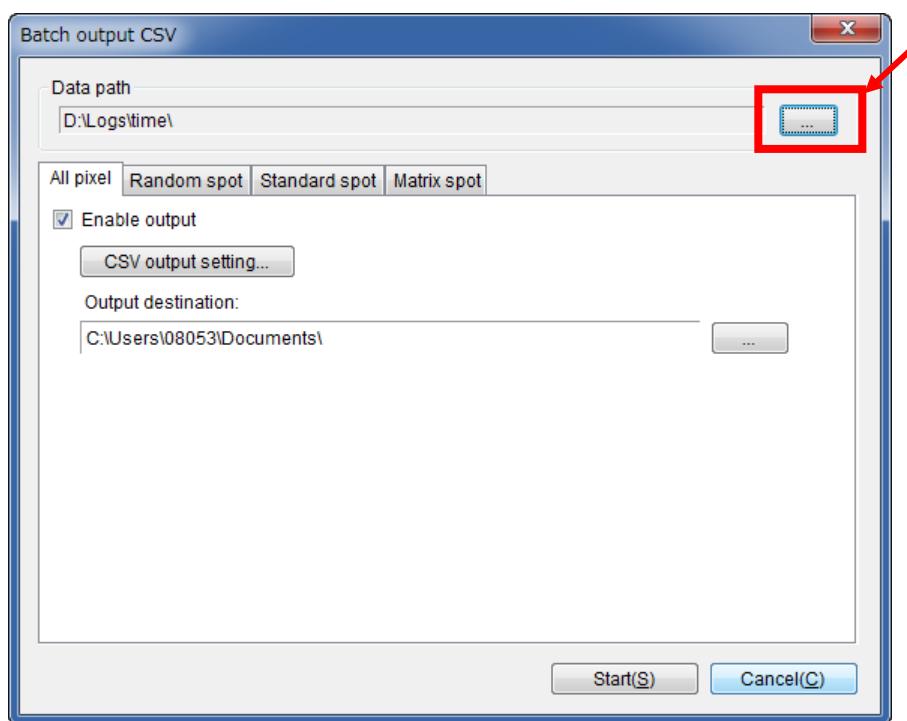
6.2 Batch CSV Output Operation

Batch CSV output function generates CSV files from multiple measurement data after the measurement. By specifying measurement data path, it is possible to output CSV files at once.

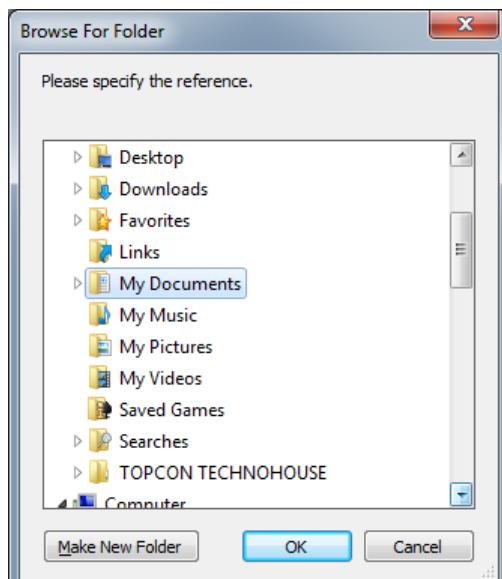
6.2.1 Perform Batch CSV Output

To perform the batch CSV output, go through the following steps.

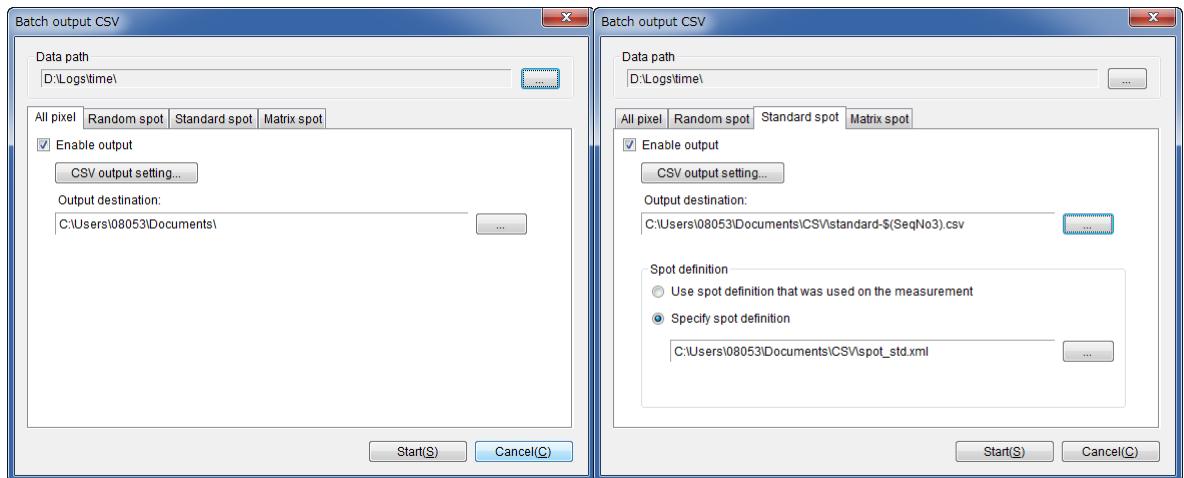
1. Select [Data Processing] - [Batch CSV Output...].
2. [Batch output CSV] screen appears. Click the [...] button of [Saving destination of time series measurement] to specify the folder where the measurement images are saved



3. Select the folder where the measurement images are saved and go back to the previous screen with [OK].



4. Set output settings for each CSV type. Setting items are described below.



Set the following items if necessary.

[Enable output]

Sets whether output is enabled or not.

[CSV output setting...]

By clicking [...], CSV output setting screen appears. Items that will be output in the file are set at here. How to set these items are same as the way of CSV output setting in other views.

CSV output data items depend on measurement condition.

“5.7.2 Set Output Items for CSV Format”

[Output destination...]

Sets output destination of CSV files. By clicking [...], file name convention screen appears. Please set the file name that will be output or folder location.

“3.15.6 Output Setting (File Name Convention)”

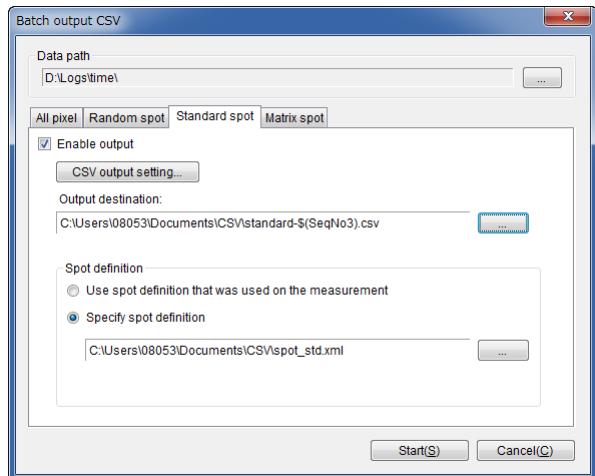
[Spot definition]

Sets usage of spot definition to generate CSV files for spots.

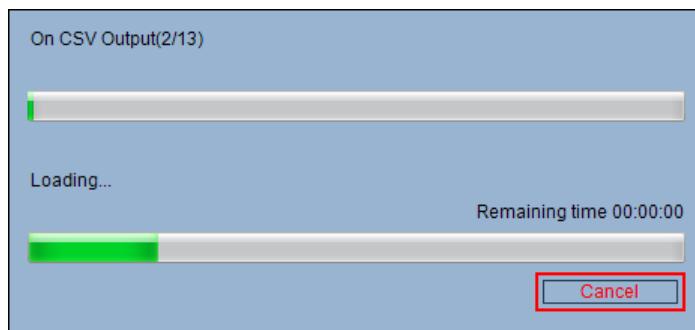
When [Use spot definition that was used on the measurement] is selected, the spot definition associated with the measurement image is used to generate CSV files.

When [Specify spot definition] is selected, the spot definition that is saved as a file is used. Click [...], and the file specification dialog box is displayed. Select a proper spot definition file.

- 5.** After settings are done, Click [Start].



- 6.** Output processing starts and status check dialog is displayed.



- 7.** After all CSV output is finished, goes back to main screen. Please check CSV files are created in the specified output destination.

6.3 Back Light Simulation

In the evaluation of LCD, sometimes we need to evaluate cell of LCD only. The cell of LCD is not light emitting object and need external light source. In this case we can use the back light of LCD. But the back light cannot have perfectly flat light. As a result, when a problem like MURA is found in LCD, we cannot distinguish it came from the back light or cell itself.

This software can simulate ideal flat back light from three measurement data below. It can eliminate bad influence of the back light like MURA and enable evaluation of the cell of LCD only.

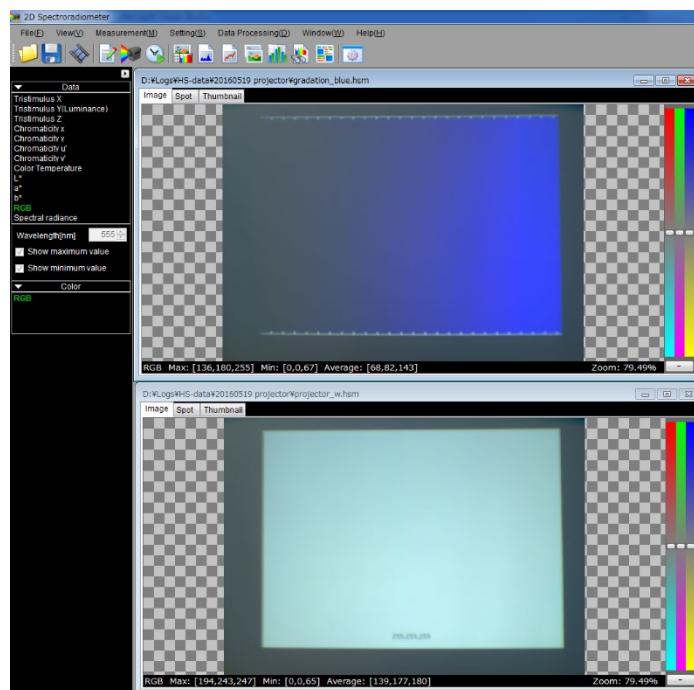
- A measurement result of the assembled cell and back light module. (Measurement 1)
- A measurement result of the back light only. (Measurement 2)
- A spectrum of ideal back light.

Measurement 1 and 2 should be done before this simulation process.

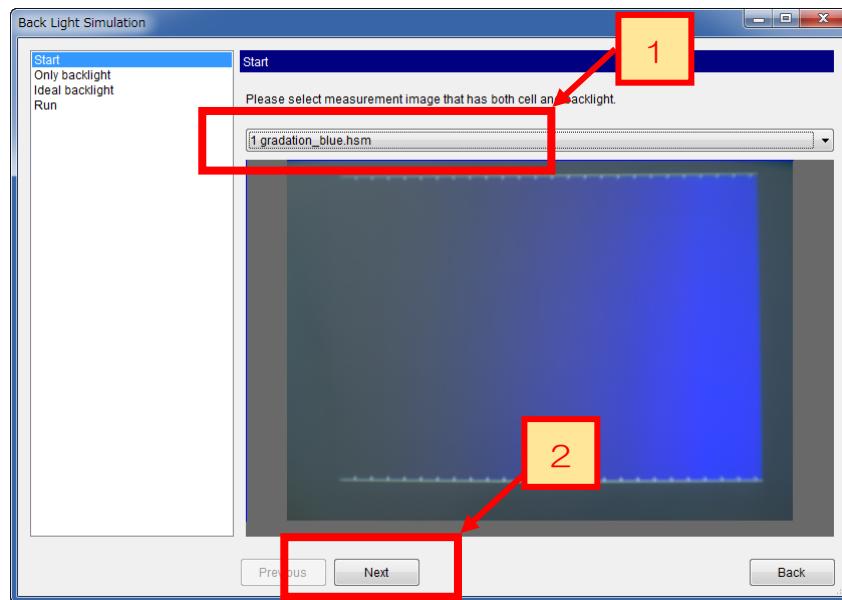
6.3.1 Perform Back Light Simulation

To perform the Back Light Simulation, go through the following steps.

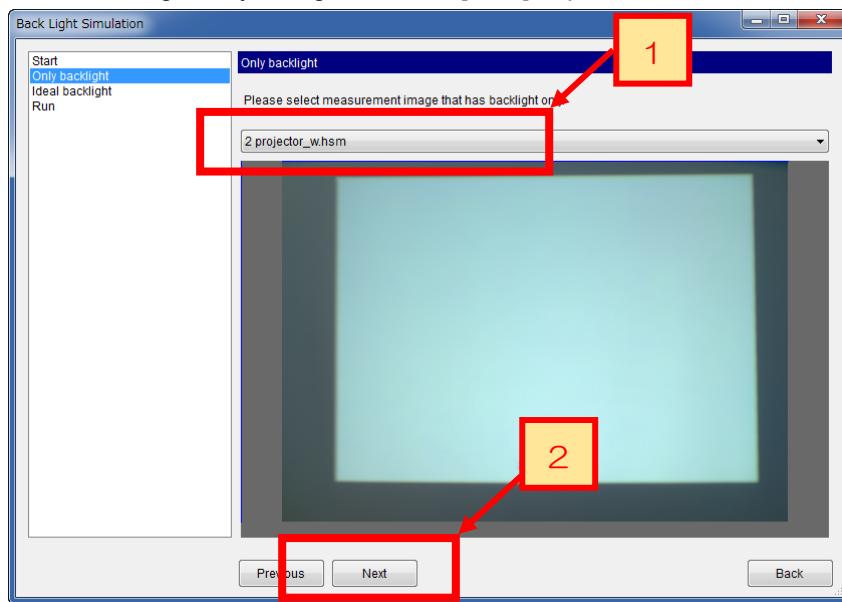
1. Load results of measurement 1 and 2 in advance. To illustrate description, blue image is used as “Cell and back light” image and white image is used as “Back light only” image at here for example.



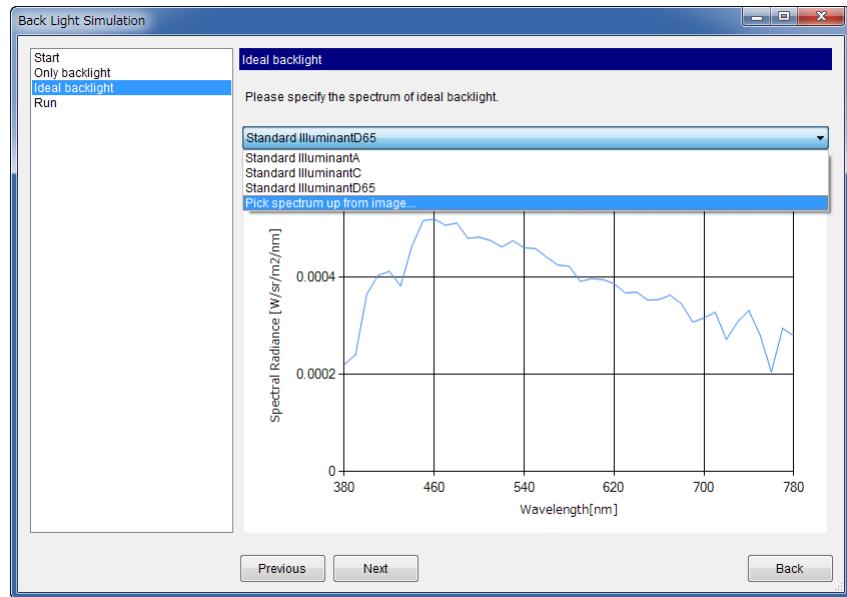
2. Select [Data Processing] - [Batch Light Simulation...].
3. [Back Light Simulation] screen appears. Select “Cell and back light” image and click [Next] to proceed.



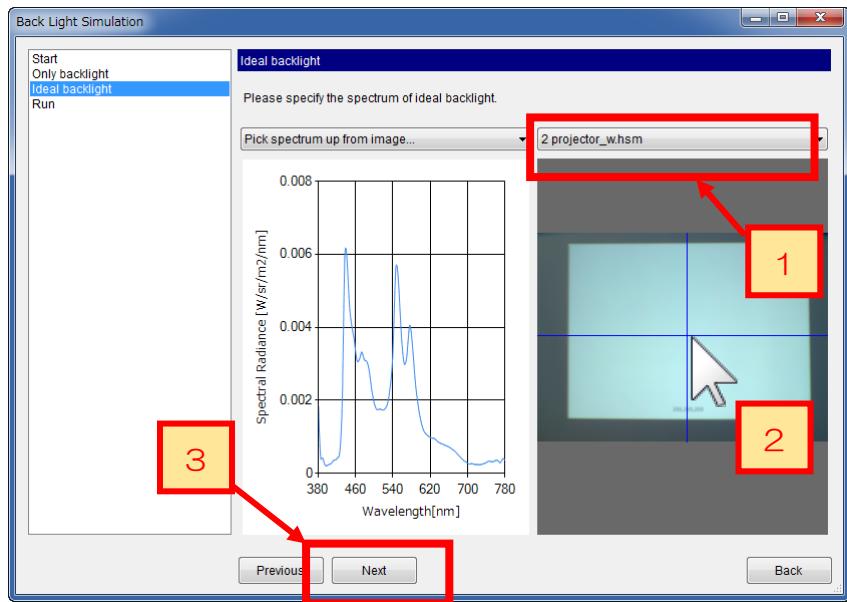
4. Select “Back light only” image and click [Next] to proceed.



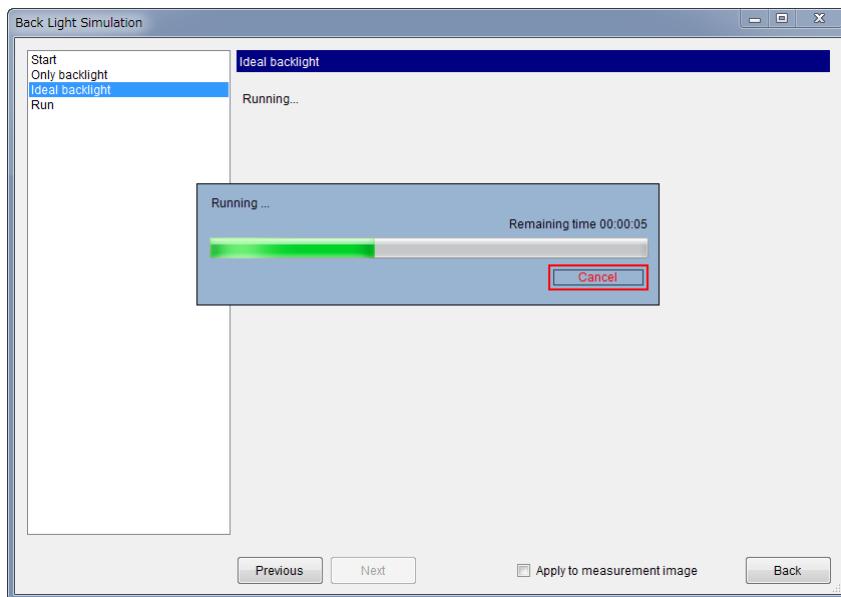
5. Select the spectrum of ideal back light. There are 2 ways to select spectrum. One is to use registered spectrum in advance. The other is to pick it up from loaded images. At here the latter one is used. From the pull down menu, select [Pick spectrum up from image...].



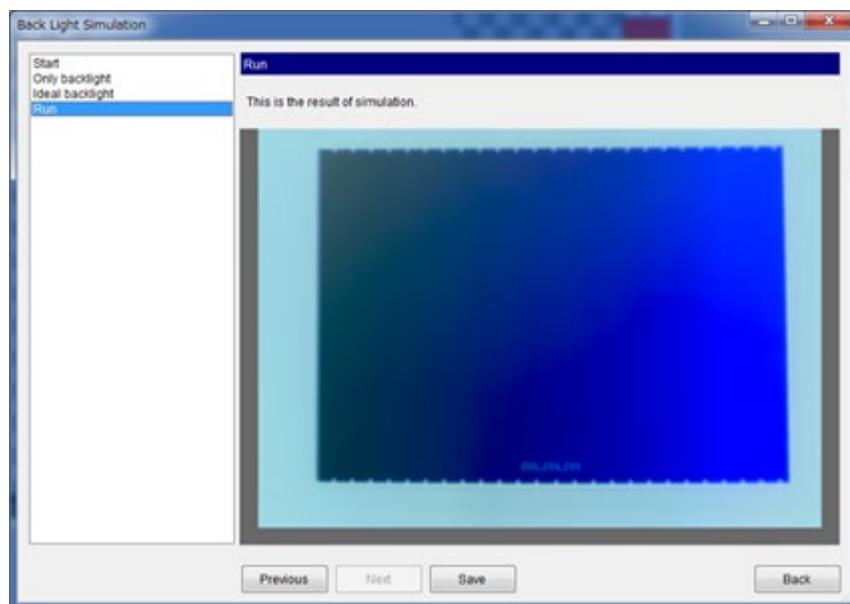
6. From the pull down menu on the right, select the image of “Back light only” and pick up the point that seems to be ideal. After validating data is updated, click [Next] to proceed.



7. Computation of the simulation starts.



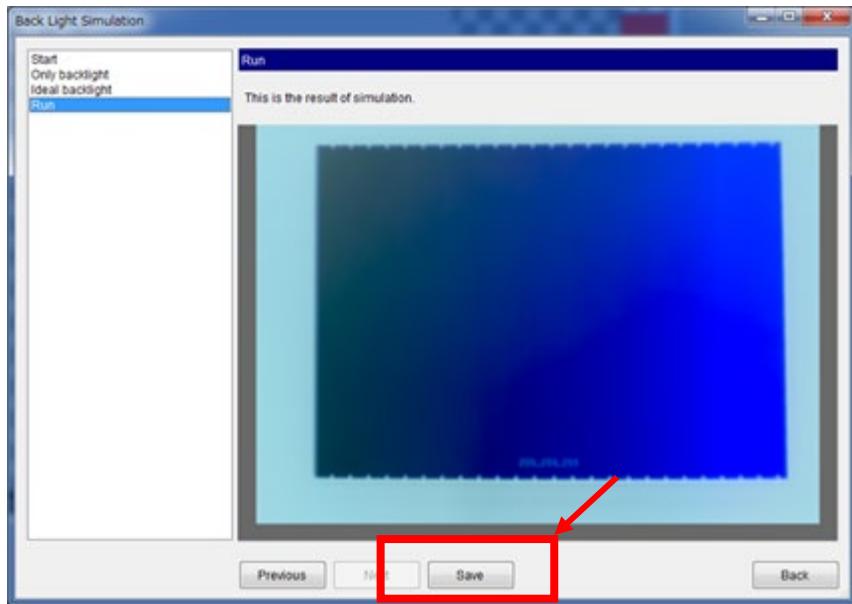
8. After computation finished, the result of simulation is shown.



Memo

It's possible to save the displayed image to file and copy it to clipboard. Select [Save to file] or [Copy to clipboard] from the popup menu appeared by right-click.

9. If you need to save the result of simulation as a measurement data, click [Save] button.



10. The file save dialog box is displayed. Enter a proper name to [File name] and click the [Save] button. After finished calculation, new hsm file is created with the name entered in the file save dialog box.

7. File Menu Operation

7.1 Open Measurement Image

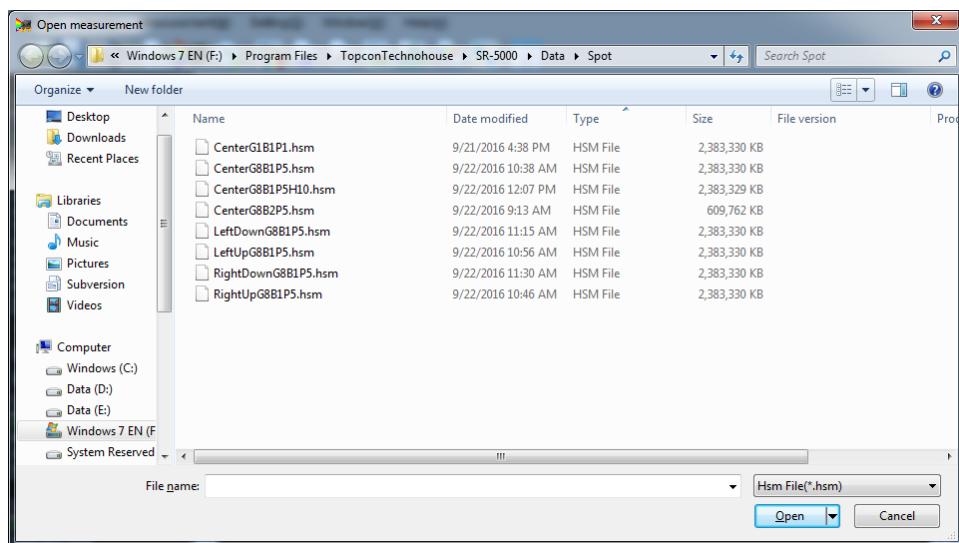
Loads the saved measurement image file to be displayed.

To open the measurement image file, go through the following steps.

7.1.1 Open from File Menu

Opens the measurement image file from the File menu. To open the measurement image from the File menu, go through the following steps.

1. Select [File] - [Open measurement...] or press the [Ctrl+O] keys or click the  icon on the tool bar.
2. The [Open measurement] dialog box is displayed.



Memo

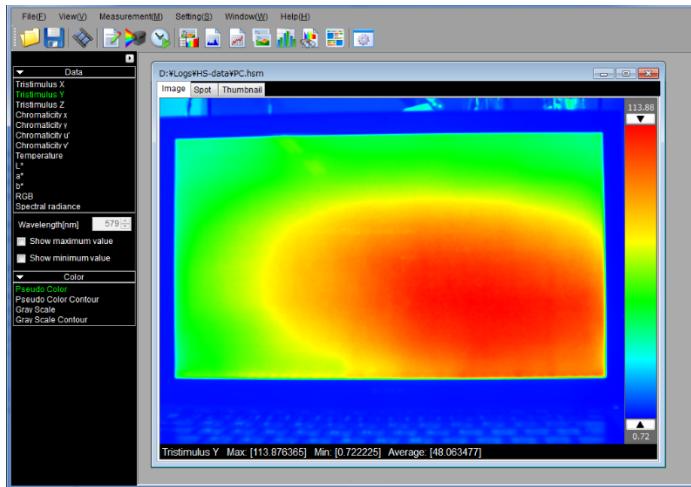
- Files on the network can be selected.
- You can select several image files at a time.

3. The status check screen appears.



As the measurement image size is larger, it will take longer to perform this work.

4. The loaded measurement image is displayed. When two or more images are loaded, all of them are displayed.

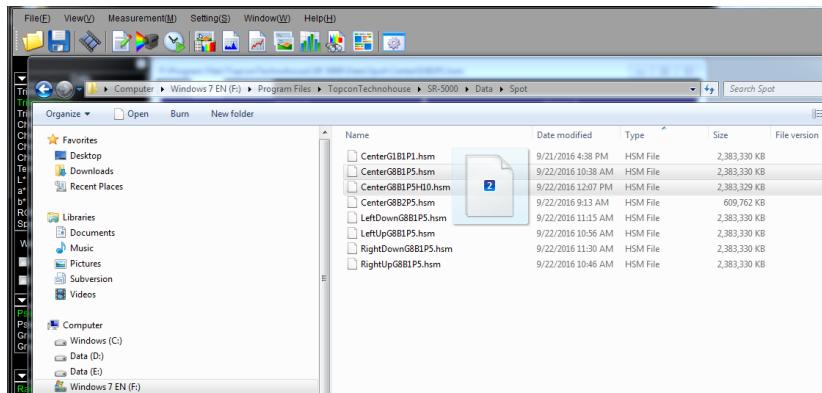


- If you try to open a measurement image that is already open, the warning dialog will appear, and the opening will stop.
- This software loads only the image file saved by the applicable products.

7.1.2 Open File by Drag & Drop Operation

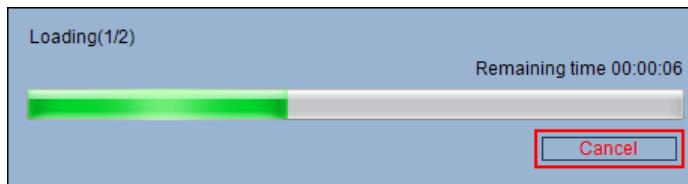
Opens the measurement image by drag & drop operation of file. To open the measurement image by drag & drop operation, go through the following steps.

1. Open the software.
2. Open the folder where the measurement image is saved through Explorer. Select the measurement image to be loaded. Then, drag and drop the image on the main screen.

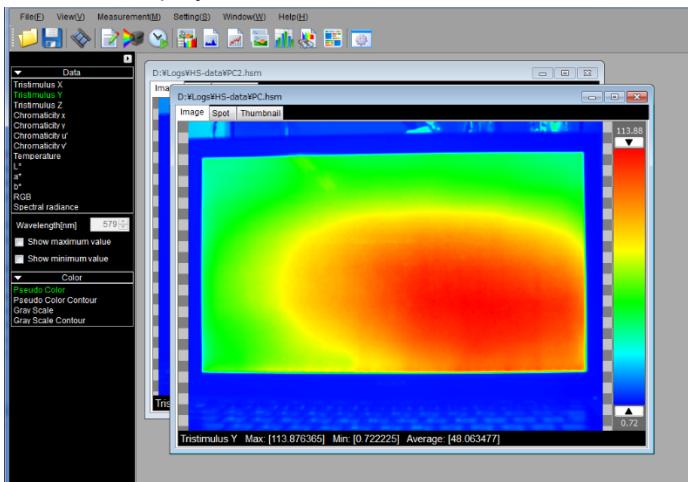


You can select several image files at a time.

3. The status check screen appears.



4. The loaded measurement image is displayed. When two or more images are loaded, all of them are displayed.



7.2 Close Measurement Image

Closes the currently displayed measurement image.

To close the measurement image, go through the following steps.

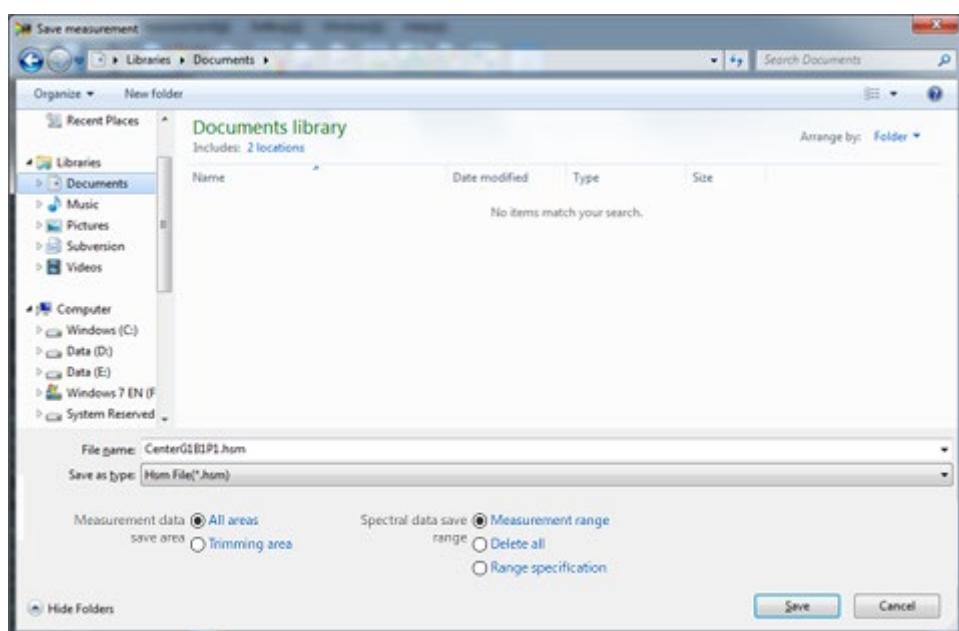
1. Select [File] - [Close measurement...] or press the [Ctrl+W] keys.

7.3 Save Measurement Image

Saves the measurement image.

To save the measurement image, go through the following steps.

1. Select [File] - [Save measurement...] or press the [Ctrl+S] keys or click the  icon on the tool bar.
2. The [Save measurement] dialog box is displayed. Select a proper folder, input [File name] and click [Save].



Memo

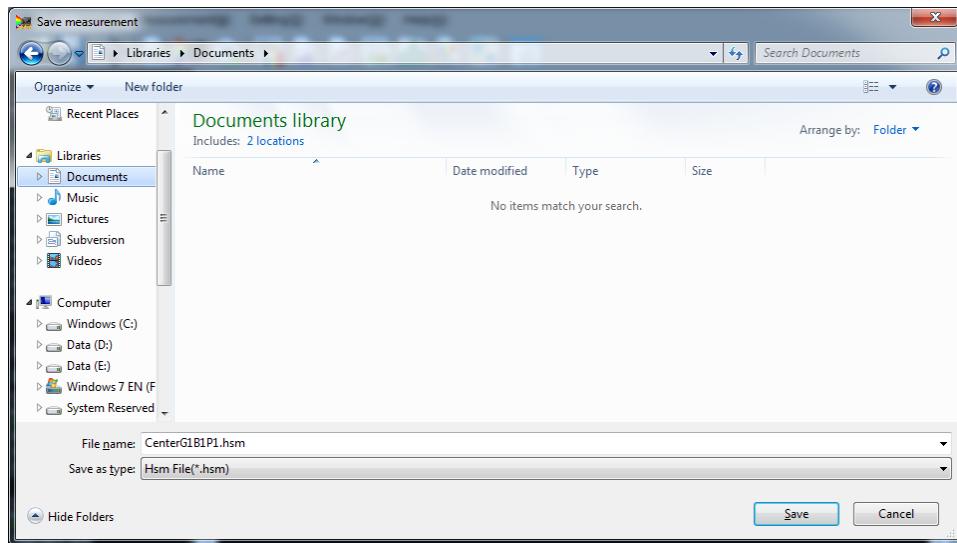
- After trimming the measurement image, you can select [Measurement data save area]. Also, when saving normal measurement data, you can select [Spectral data save range]. This makes it possible to reduce the storage size of measurement data.
- When the spectral data is deleted, the deleted spectral data is excluded from the calculation in the functions that calculate using the spectral data such as various correction processes and simulations.

7.4 Export Measurement Image

Exports the measurement image.

To export the measurement image, go through the following steps.

1. Select [File] - [Export...].
2. The [Export] dialog box is displayed. Select a proper folder and type, input [File name] and click [Save].



7.4.1 HDF5 File Format

Exported HDF5 file has below data and hierarchical structure.

Items	Contents	
FileVersion	File version	
HasSpectrallImage	Spectrum mode or not	
ImageInfo	Binning	Binning type
	Offset	Measurement range [X, Y]
	Size	Measurement range [Width, Height]
MeasurementImages	Tristimulus_X	Tristimulus value X
	Tristimulus_Y	Tristimulus value Y
	Tristimulus_Z	Tristimulus value Y
	Chromaticity_x	Chromaticity x
	Chromaticity_y	Chromaticity y
	Chromaticity_u	Chromaticity u
	Chromaticity_v	Chromaticity v
Wavelengths	Measurement wavelength list	
SpectrallImage	Spectral radiance	



“Wavelengths” and “SpectrallImage” are included in spectrum mode.

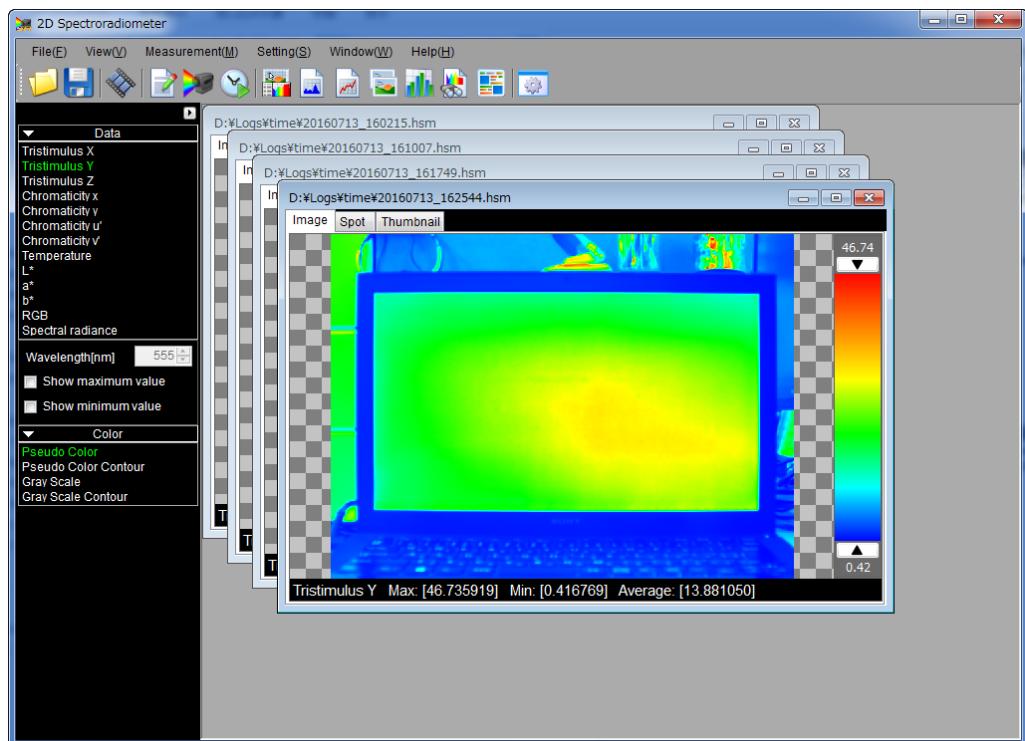
8. Display Window Operation

8.1 Overlap and Display

Overlaps and displays two or more measurement images.

To display the images in the overlapped status, go through the following steps.

1. Select [Window] - [Cascade].
2. Two or more measurement images are displayed in the overlapped status.

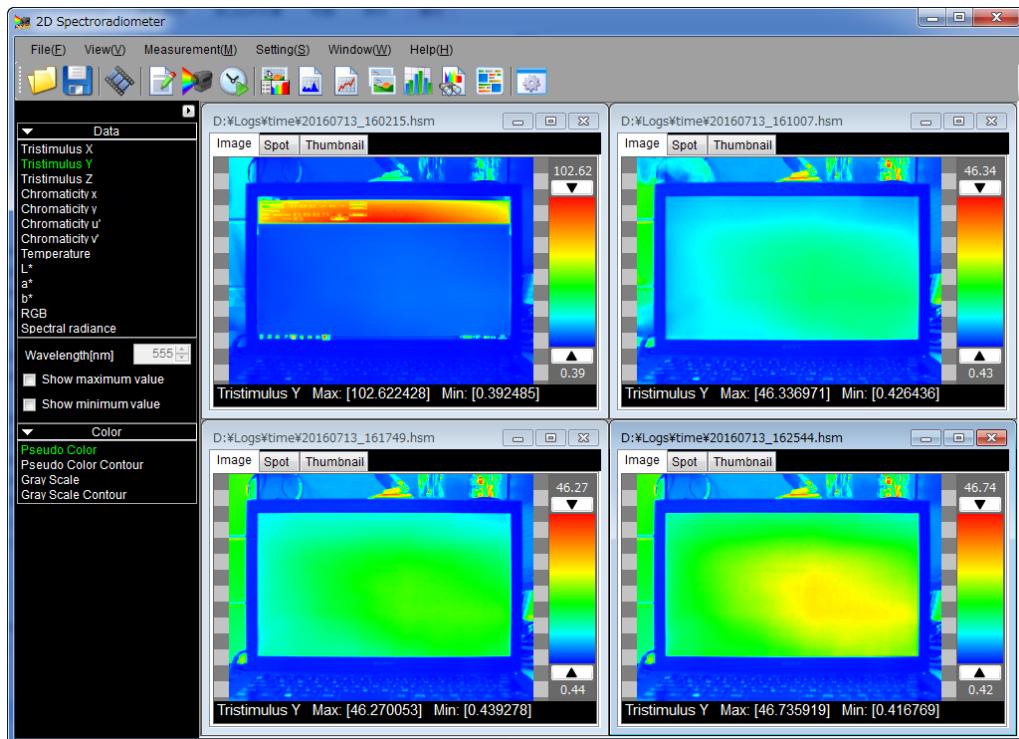


8.2 Arrange Side by Side

Arranges two or more measurement images side by side and displays them.

To arrange the images side by side and display them, go through the following steps.

1. Select [Window] - [Tile].
2. Two or more measurement images are arranged side by side and displayed.



9. Help Operation

9.1 Display Manual

To refer to the instruction manual, go through the following steps.

1. Select [Help] - [Manual...] or press the [F1] keys.
2. This instruction manual is opened.

9.2 Check Version Information

Opens the version information dialog. This information is required if you contact Topcon when you have any problem in the software.

To open the version information, go through the following steps.

1. Select [Help] - [Version info...].
2. The [Version info] dialog box is opened.



10. Error Message

10.1 Error Message List

Failed to load the setting file required to start application. ({File name})

Countermeasure

- It is probable that you don't have the access right for the file. The user having the access right must login to Windows.
- It is probable that the necessary file is lost. If there is the backup data, restore the file. If there is not the backup data, reinstall the file.

Failed to load the file. ({File name})

Countermeasure

It is probable that you don't have the access right for the file. The user having the access right must login to Windows.

Failed to load the file. The file with different image size cannot be loaded. ({File name})

Countermeasure

The setting file such as the spot definition file must have the same image size as the measurement image to which this setting file will be applied. Select a file with proper image size.

Failed to load the file. Check the format. ({File name})

Countermeasure

It is probable that the target file is broken. Delete the target file and then restart the software. Before deleting the target file, back it up just in case.

Failed to save the file. ({File name})

Countermeasure

- It is probable that you don't have the access right for the save destination. The user having the access right must login to Windows.
- It is probable that the free capacity of the hard disk is insufficient. Check the hard disk capacity.

Invalid input value:

Countermeasure

You tried to input the value out of the settable range. Input a value within the settable range.

Failed to initialize the system.

Countermeasure

- It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.
- It is probable that the free capacity of the hard disk is insufficient. Check the hard disk capacity.

No calibration data folder.

Countermeasure

It is probable that the installation of the software is not completed correctly. Uninstall the software and then reinstall it.

Failed to open the device (ID={O}).

Countermeasure

It is probable that the installation of the device driver is not completed correctly. Check whether the device driver is installed or not.

No connectable device:

Countermeasure

- It is probable that the hardware is not turned on. Check whether the hardware is turned on or not.
- It is probable that the communication cable is not connected correctly. Check the cable connection.
- This message is displayed when only the software has started without connecting to hardware.
You can use the functions which do not require the hardware connection.
- When the error is not related to the above-mentioned causes, it is probable that authentication of hardware has failed. Please contact Topcon or your dealer.

Optimization has failed because the light source of the measurement target was too bright.

Countermeasure

- Check whether you tried to measure the brightness out of the specifications or not. Then, execute optimization again.
- If the brightness of the measurement target is sharply changed during optimization, the optimization is not successful from time to time. Make sure that the brightness of the measurement target is not changed and then execute optimization again.

Optimization has failed because the light source of the measurement target was too dark.

Countermeasure

- Check whether you have removed the lens cap or not.
- If the brightness of the measurement target is sharply changed during optimization, the optimization is not successful from time to time. Make sure that the brightness of the measurement target is not changed and then execute optimization again.

Error has occurred during measurement. Code: {Detail code}

Countermeasure

- If the brightness of the measurement target is sharply changed during measurement, the measurement is not successful from time to time. Make sure that the brightness of the measurement target is not changed and then execute measurement again.
- It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Specified path does not exist. Check the input of path. ({Folder name})

Countermeasure

You try to use the nonexistent folder. Use the existing folder.

Specified file does not exist. Check the input of file path. ({File name})

Countermeasure

In some type of setting, the link to another file is placed in a measurement image or setting file. Check whether the file as the link destination is lost or not.

Failed to set parameters for device.

Countermeasure

It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Failed to get parameters from device.

Countermeasure

It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Failed to start capturing.

Countermeasure

It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Failed to stop capturing.

Countermeasure

It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Failed to capture live image.

Countermeasure

It is probable that the software is not connected to the hardware correctly. Turn off and turn on the power and then restart the software.

Failed to create spot data.

Countermeasure

An unexpected error has occurred while calculating the spot data. Check whether too many spots are created or not. If there are too many spots, delete them properly.

11. Appendix

Unit of display

Unit of display and details are as follows.

Item	Unit	Details		
Spectral Radiance	W/(sr·m ² ·nm)			
Tristimulus X	Non unit	Tristimulus values		
Tristimulus Y(Luminance)	cd/m ²			
Tristimulus Z	Non unit			
Chromaticity x	Non unit	Chromaticity		
Chromaticity y	Non unit			
Chromaticity u'	Non unit			
Chromaticity v'	Non unit			
L*	Non unit	Lightness index	Uniform color space	
a*	Non unit	Chromaticness index		
b*	Non unit			
C*	Non unit	Metrix Chroma		
h	Degree	Metrix Hue-angle		
R	Non unit	sRGB		
G	Non unit			
B	Non unit			
H	Non unit	Hue	Munsell color system	
C	Non unit	Chroma		
X Location	Pixel	Location		
Y Location	Pixel			
Area	mm ²			
Color Temperature	K	Correlated color temperature		
Deviation	Non unit	Distance from the blackbody locus		
Wavelength	nm	Dominant wavelength		
Excitation Purity	Non unit	Excitation purity		
Peek Wavelength	nm			
Radiance	W/(sr·m ²)			
ΔE' ab	Non unit	Color difference		
R _a	Non unit	General color rendering index		
R _{1~15}	Non unit	Special color rendering index		
Integration time	ms			
Measuring distance	mm	The distance from the tip of the objective lens		

When you contact us, please provide us the following information:

- Serial number: The serial number is written on the rating plate attached on the bottom of the product.
- Period of operation: Please inform us of the date of purchase of the product and the calibration date.
- Use conditions: Type of measuring light source, product settings, measurement value, measurement conditions, etc.
- Failure state: Please inform us of the failure state as accurately as possible.

Where to call: Please refer the rear cover of this Instruction Manual.

TOPCON TECHNOHOUSE CORPORATION

Hasunuma-cho 75-1, Itabashi-ku, Tokyo 174-8580, Japan

◆ **For inquiries about the product:**

Sales section: Phone: +81-3-3558-2666 Fax: +81-3-3558-4661

◆ **For inquiries about the after-care service including repairs:**

Maintenance service section: Phone: +81-3-3558-2710 Fax: +81-3-3558-3011

Colorimetric image software CI-100 Instruction Manual

Publication date: September, 2022 First Edition

Publication date: September, 2022 Rev. 3.0.4

Published by: TOPCON TECHNOHOUSE CORPORATION

Hasunuma-cho 75-1, Itabashi-ku, Tokyo 174-8580, Japan

©2022 TOPCON TECHNOHOUSE CORPORATION

ALL RIGHTS RESERVED

Copying and reproduction without permission are prohibited.