

Beam Profiler with M2 platform software

LaseView 6.0

&

Beam profiler for large diameter and high-power

LaseView-LHB

User guide manual

Kokyo

株式会社光響

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1. Notes

■ Notes about the manual

1. Before using the device, please read carefully this book, and proceed correctly following the instructions.
2. Keep this book precious so that you can check it any time you need.
3. If you use the product beyond its intended uses or specs, please acknowledge that we can't warranty the safety.
4. Respect carefully the instructions of this book relative to safety.
5. The content of the book may change without prior notice.
6. The pictures displayed in this book are for illustration purpose and may be partial or schematized.

Please acknowledge beforehand that our company can't be held responsible for any loss of profits resulting from the use of the product.

■ About the warning and caution signs in this book



Risk of death or serious injury from improper use while not respecting these instructions.



Risk of injury or damage to property from improper use while not respecting these instructions.

■ For a safe use



- Operation during the following states may cause fire or electric shock. Cancel the operation and shutdown the power of the device. In case it need a repair, please contact us through the contact information at the end of the book for an exchange. For your safety, refrain from disassemble, modify or repair by yourself.

- Smoke is going out of the device, its surroundings are hot, the device produces a strange noise or smell
- In the case where water or matter has penetrated into the device
- In the case of damages following a fall or hit
- Do not place the product on a unstable place (on a loose stand or an inclined plan) as it may fall and provoke or get damages.
- If the light reflected from the entrance window penetrates someone's eyes, it may result in blindness. Moreover, it may get easily flammable materials to burn. As 4-8% of the input light is reflected, when you want to measure high-power lasers, make sure to block this reflected light in order to avoid damages on surrounding materials.



Warning

- Do not place near a source of oily smoke or steam where it could get clogged up and cause fire or electric shock.
- Do not let the device in a high-temperature place such as direct sunlight, inside a car or near a fire. As it can affect the internal components, it may cause a fire.
- Do not operate in conditions where the heat of the device can't evacuate, like wrapping the device in a cloth. Some parts may get deformed and start a fire.
- Prevent the device from falling or being hit, it may cause a dysfunction.
- Do not connect cables with wet hands. It may cause electric shocks.
- When power is on, do not touch during a long time the device. Its temperature rises so that doing so may cause superficial burns.

Other notes

- If you input a beam with a higher power than acceptable according to the specification of the device, it may deteriorate its sensor and other parts. Even when the device is turned off, do not input such a powerful laser.
- If you input a beam with an incident angle greater than the tolerance angle specified for the device, or if the beam divergence angle (respectively

convergence angle) is greater than this tolerance angle, it may damage the sensor or other parts. Even if it doesn't cause damage, it may introduce ghost images which will prevent the device from performing correct measurements.

- Do not shake or rub the entrance window. If you damage it, it may reduce the measurement accuracy.
- To remove dust from the window, rather use a soft air-duster or assimilate. If you apply a too strong pressure on the window, it may cause a deformation and result in a loss of accuracy.
- To remove dirt from other parts of the device, wipe with a soft cloth or a tissue paper. In this case, do not use alcohol, paint thinner, benzine and so on. It may alter or remove the surface film.
- If you operate the camera near a radio or TV receptor, it may cause reception interference.

■About export control

This product is regulated by the Foreign Exchange and Foreign Trade "Catch-all control" Law. Except for the territories listed in the Export Trade appended Table n°3 (27 countries applying Strict Export Trade Control※), if it appears that the device may be used in practice for the development, etc, of massive destruction weapons (like nuclear weapons), or conventional weapons in the countries of destination, you need to receive in advance the authorization from the Minister of Economy, Trade and Industry. In accordance with the relevant laws and regulations, please understand that it is your responsibility to obtain the mandatory authorizations.

Reference: Trade Control Department of the Ministry of Economy, Trade and Industry

<http://www.meti.go.jp/policy/anpo/index.html>

※Ireland, United States, Argentina, Italy, the United Kingdom, Australia, Austria, the Netherlands, Canada, Greece, Switzerland, Sweden, Spain Republic of Korea, the Czech Republic, Denmark, Germany, New Zealand,

Norway, Hungary, Finland, France, Bulgaria, Belgium, Poland, Portugal, Luxembourg

■ About warranty

Our company promotes paperless solutions, therefore we refrain from sending warranty form, and we manage the warranty period starting on the shipping date. For more information, please contact us through the contact information at the end of the document.

2. Operating systems

- Windows Vista SP1
- Windows 7
- Windows 8、Windows 8.1
- Windows 10
- CPU speed : at least Intel Core i3 2GHz or equivalent
- Free memory : at least 512MB

※ This is not a warranty of operation on all computers fitting the above description.

※ Installation of .NET Framework 4.5 or higher needed; you can check your current version on this Microsoft page:

[http://msdn.microsoft.com/ja-jp/library/hh925568\(v=vs.110\).aspx](http://msdn.microsoft.com/ja-jp/library/hh925568(v=vs.110).aspx)

※ Depending on the version, the Guide illustrations may slightly differ from the actual screens but it can be used without any problem.

3. Overview and components

LaseView-LHB is a beam profiler for large-diameter, high-power lasers by using the corresponding projection on a window. It can pre-process a large reduction of the speckles (pattern of bright and dark spots) produced by the scattered light on the window, and easily measure the distribution of accurate light intensity of bright light sources interference. By adopting this small light-absorbing screen, it allowed the direct incidence of high power density lasers.

The components of the device are as follow:

- ① Body
- ② USB cable (type A-B connector)
- ③ AC adapter (6V, 1A)
- ④ Software (LaseView 6, LaseView-LHB driver)
- ⑤ Product manual (this book)

4. Installation

To use the product, you need to install the following parts. Please, proceed in the indicated order.

For LaseView:

1st. CCD camera device driver

2nd. LaseView Beam profiler

In addition, for LaseView-LHB device:

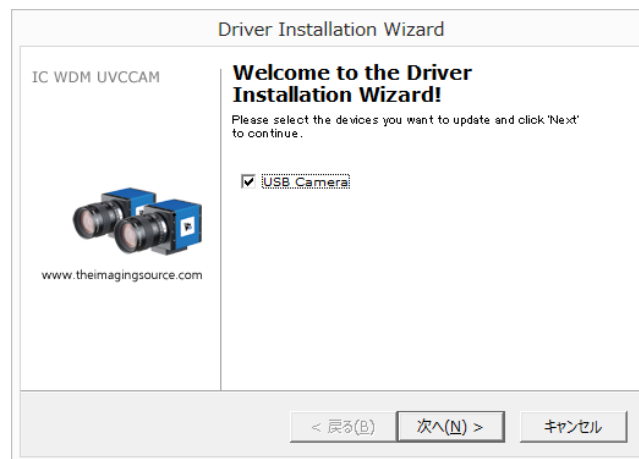
3rd. LaseView-LHB driver

4.1. CCD camera device driver installation

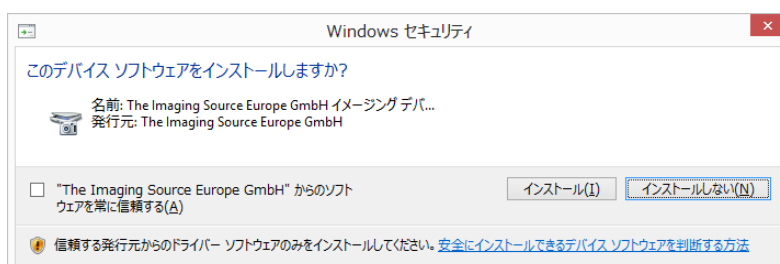
I. Connect your camera (or the LaseView-LHB device) to your PC with the USB cable.

*Skip if you already started an automatic install of the driver.

II. Double-click on the drvInstaller.exe file in the "1_CCD camera device driver" folder. Driver Installation Wizard will open. Click on "Next (N)>".

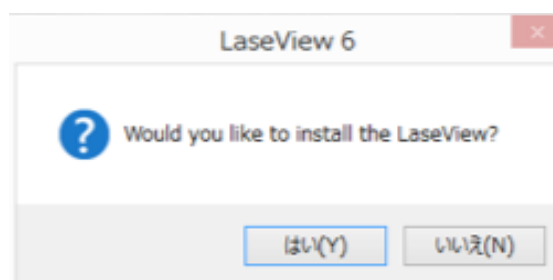


III. When the installation begins, Windows Security window opens and a box asking "Install this device software ?" will appear. Click "Install". A few seconds later, installation is completed. Click the "Complete" button to end the process.



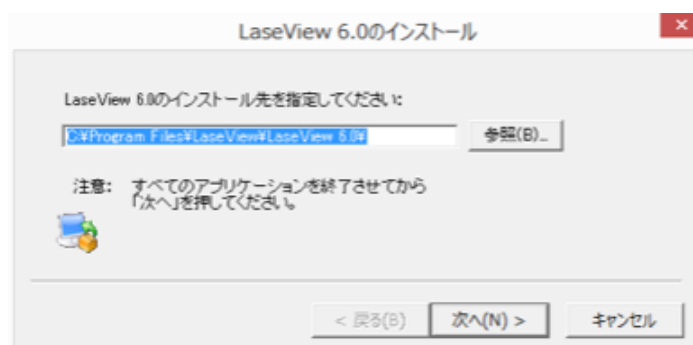
4.2. Installation of LaseView

- I. Double-click on the "LaseViewInstaller6010.exe" file in the "2_LaseView Beam profiler" folder. A window asking "Would you like to install the LaseView?" will open. Click "Yes (Y)".



A window indicating "Application installation - Security warning" will open. Click "Install (I)", and the Install Window of LaseView will open.

- II. "Install LaseView" Window will open. Click on "Next (N)>" without changing the destination path.



- III. Then, in the next selection screen, you can choose the options "Include in the Start menu" and "Add a shortcut to the desktop". Click on "Next (N)>", a

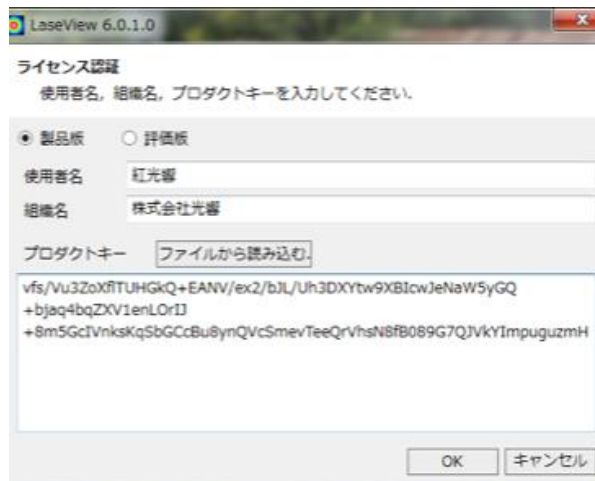
few seconds later, installation is completed. Click the "Completed" button, the "License agreement" window will open.



IV. Check the content of the "License agreement" window. If you agree with it, select the Check box "I accept the terms of the License agreement" and click on "OK".



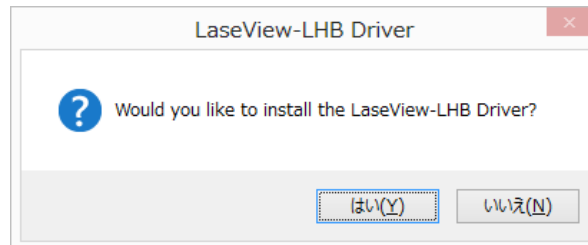
V. The "License activation" window opens. Enter the "Organization name" and the "User name" registered for purchase. Then click on the "Load File" button and select the text file where your Product key is. You may also copy and paste the product key in the corresponding input field. After that, click on "OK".



※Fake Product key for illustration purpose only.

4.3. Installation of LaseView-LHB driver

- I. Double-click on the LHBDriver6000.exe file in the "3_LaseView-LHB driver" folder. A window asking "Would you like to install the LaseView-LHB Driver?" appears, click "Yes (Y)".



- II. The window "LaseView-LHB Driver Install" window opens. Without changing the destination folder, click "Next (N)>". After a few seconds, installation is completed. Click on the "Complete" button.



5. Operating instructions

Before using LaseView-LHB, note the following limitations. Please use this checklist.



- Computer performances

If your PC does not meet the requirement, the software may be slow and you may not be able to use the maximal frame rate.

- Beam diameter

If the beam diameter is too small, resolution may be not sufficient. Consider 5mm diameter as a minimal requirement.

- Speckle reduction function

In case you apply the Speckle Reduction function, it requires the process of an average of 10-20 pictures, so that a measurement will take 1-2 seconds (typical value).

- Connection of multiple USB devices

In case you connect several USB devices, depending on the PC performances, there may be a lack of power, and malfunctions of the PC or the USB devices may occur.

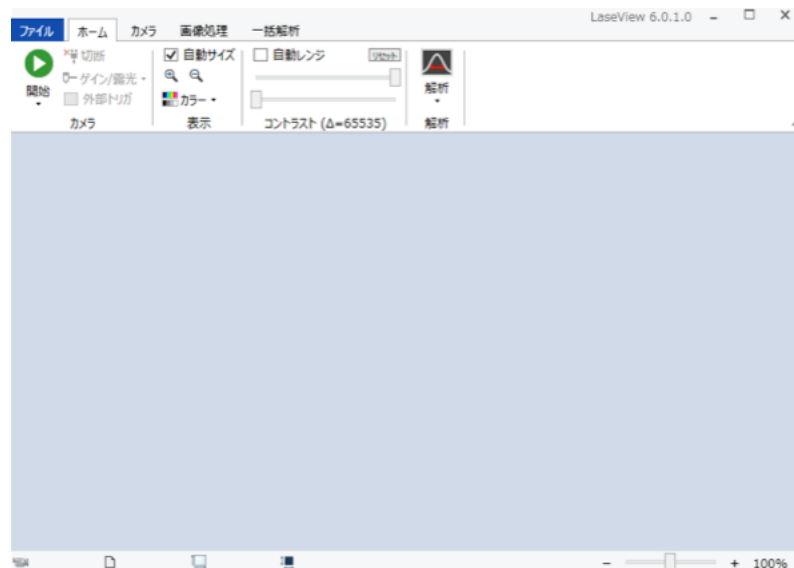
- USB 2.0 Extension cable

If you connect the camera with an USB 2.0 Extension cable, etc, the USB 2.0 bandwidth may decrease, speed of transmission too and the frame rate may be degraded, the camera may not be recognized.

※ Depending on the version, the Guide illustrations may slightly differ from the actual screens but it can be used without any problem.

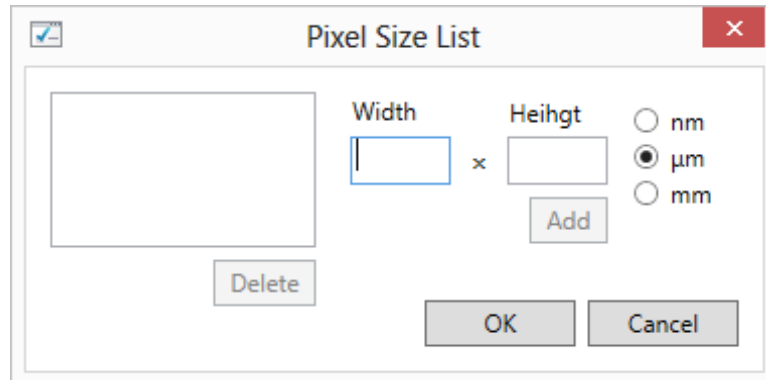
5.1. Using the general functions of LaseView

- I. Connect your camera (or the LaseView-LHB device) to your PC with the USB cable. Double click the LaseView icon on your PC.
 - (a) Evaluation version
Click the “evaluation” button and the time remaining in the evaluation period is displayed. Click the “OK” button and continue using LaseView.
 - (b) Product version
User name, affiliation, and product key are required.
 - Please use user name and affiliation registered for purchase.
 - Fill product key or select a product key file sent from Kokyo, inc.
- II. For LaseView-LHB, connect the AC adapter (if needed, there is a toggle switch on the DC connector's up face which allows to run the Speckle Reduction function).
- III. Click on the up-left located pull-down menu "Open ▼" of the Home tab window. Select the camera connected to the PC, for instance the "LaseView-LHB (*****) [Kokyo]" (where ***** is the serial number).



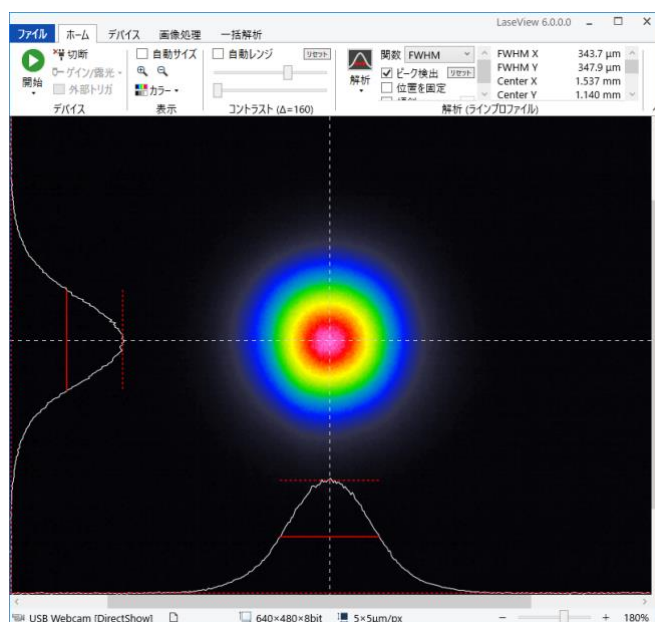
- IV. To measure the point-point distance and beam diameter, the sensor size of the CCD camera is needed. Click on the up-right located "Pixel Size

setting..." button of the "Camera" tab, then on "Add". The "Pixel size list" window opens; enter the pixel size of the current camera (for LaseView-LHB, it is $40\mu\text{m}\times 40\mu\text{m}$).



If you use LaseView with a micro-beam measurement optional system set, fill with the value obtained by dividing the sensor size of the CCD camera by the magnification of the micro-beam measurement optional system set.

- V. Click the "Start" button to start acquisition, and the "Stop" button to stop it. If needed, the "Gain" and "Acquisition time" values can be adjusted to prevent saturation.



- VI. To save the data, click on the Floppy disk icon in the "File" tab.

- To save the single displayed picture, choose "Save the picture"
- To save all the buffered pictures (max 20), choose "Save all the pictures in the buffer"
- To save the image as displayed, including added graphs, choose "Save the screenshot"
- To save the numerical data of the graphs, choose "Save the graphs numerical data"

Data saved through "Save the picture" can be viewed again in LaseView by Drag&Drop method.

Data saved through "Save the graphs numerical data" is a file which displays, starting from the left, the Horizontal graph's X coordinate (in pixels and meters) and Y coordinate, then the Vertical graph's X coordinate (in pixels and meters) and Y coordinate.

VII. For LaseView-LHB, in case of speckle, turn on the toggle switch of the body to enable the image averaging of LaseView 6. In that case, the suitable buffer size shall be at least 10-20 pictures. When the display is completely stabilized, you can save the pictures.

5.2. Using the Analysis functions of LaseView

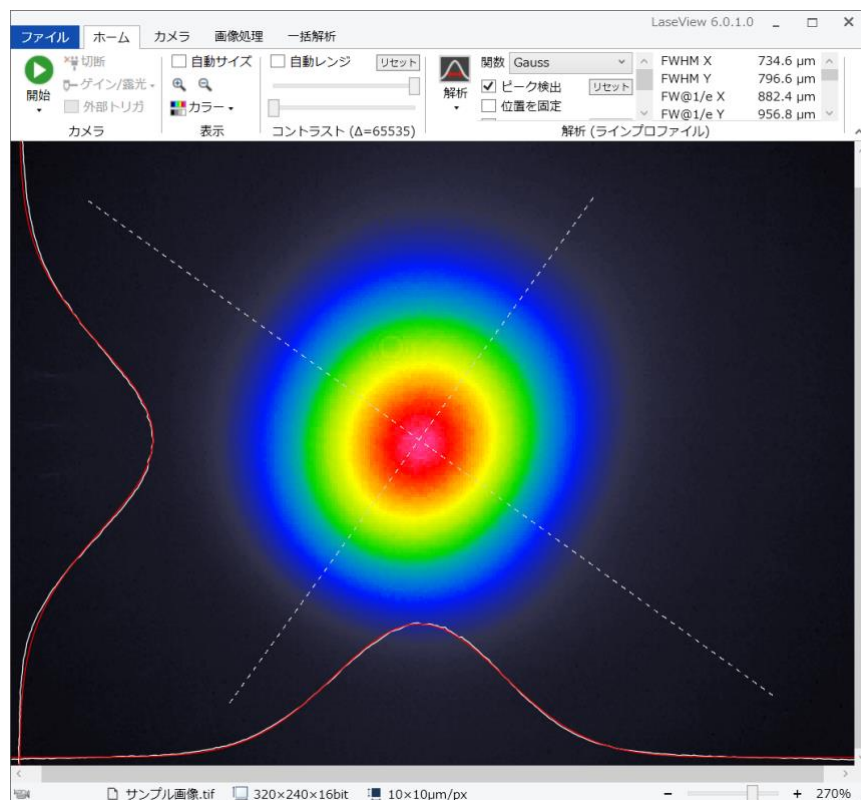
In the "Home" tab, by clicking the "Analysis" button, you can access to 5 analysis functions: Line profile, Integration profile, Maximum Intensity Projection, Point-to-Point distance, Peak Integration.

The following table displays the names of the variables used in these functions.

Function	Variable name	Description
Line profile Integration profile Maximum Value projection	FWHM X	Full width at half maximum on the horizontal axis
	FWHM Y	Full width at half maximum on the vertical axis
	FW@1/e X	Full width at max/e on the horizontal axis
	FW@1/e Y	Full width at max/e on the vertical axis
	FW@1/e ² X	Full width at max/(e*e) on the horizontal axis
	FW@1/e ² Y	Full width at max/(e*e) on the vertical axis
	Center X	Centroid position on the horizontal axis
	Center Y	Centroid position on the vertical axis
	Height X	Peak height on the horizontal axis
	Height Y	Peak height on the vertical axis
	Position X	Cursor position on the horizontal axis
	Position Y	Cursor position on the vertical axis
Integration profile	Max X	Signal intensity Maximum value on the horizontal axis
	Min X	Signal intensity Minimum value on the horizontal axis
	Max Y	Signal intensity Maximum value on the vertical axis
	Min Y	Signal intensity Minimum value on the vertical axis
Point-to-Point distance	Distance	Distance between 2 selected points (metric unit)
	Distance	Distance between 2 selected points (pixel unit)
	Pos. X1	X coordinate of the 1st point
	Pos. Y1	Y coordinate of the 1st point
	Pos. X2	X coordinate of the 2nd point
	Pos. Y2	Y coordinate of the 2nd point
Peak Integration	Intensity /cm ²	Intensity at the cursor position (cm ⁻² unit)
	Raw value	Digital count value of intensity
	Background	Signal intensity of the background
	Integral	Integral with background subtraction
	Raw Integral	Integral without background subtraction
	Position X	Cursor position on the horizontal axis
	Position Y	Cursor position on the vertical axis

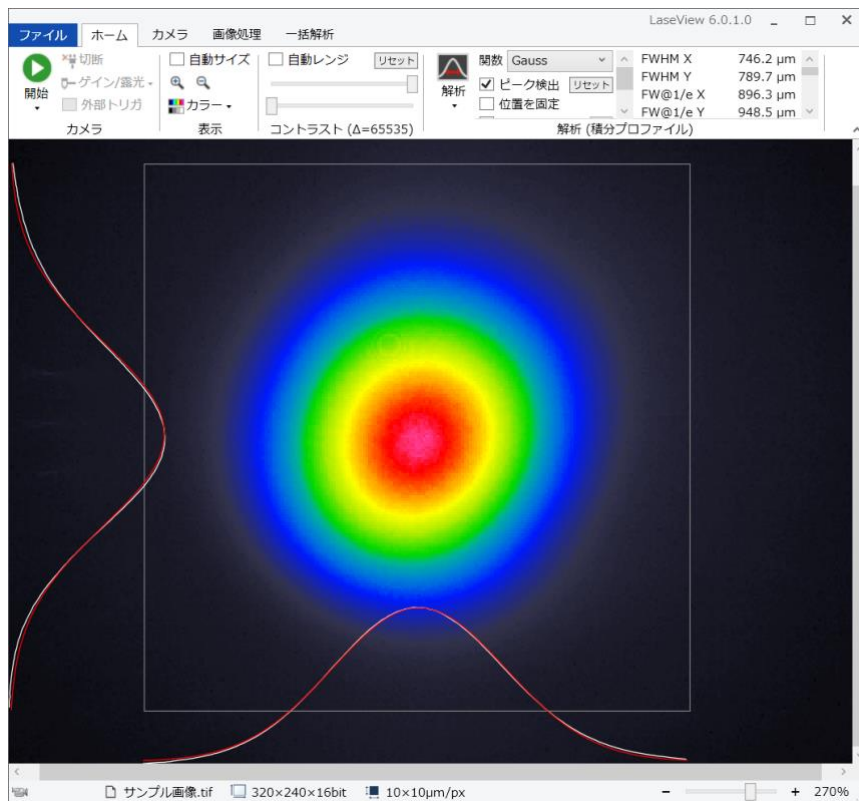
5.2.1. Line Profile

Displays line profile (white lines) along the white dashed cross-line. You can calculate FWHM of the beam profile, and also fit the profile with Gauss, Lorentz, and Sech² functions (The red line is the fitting result by Sech² function). The white dashed cross-line can be rotated.



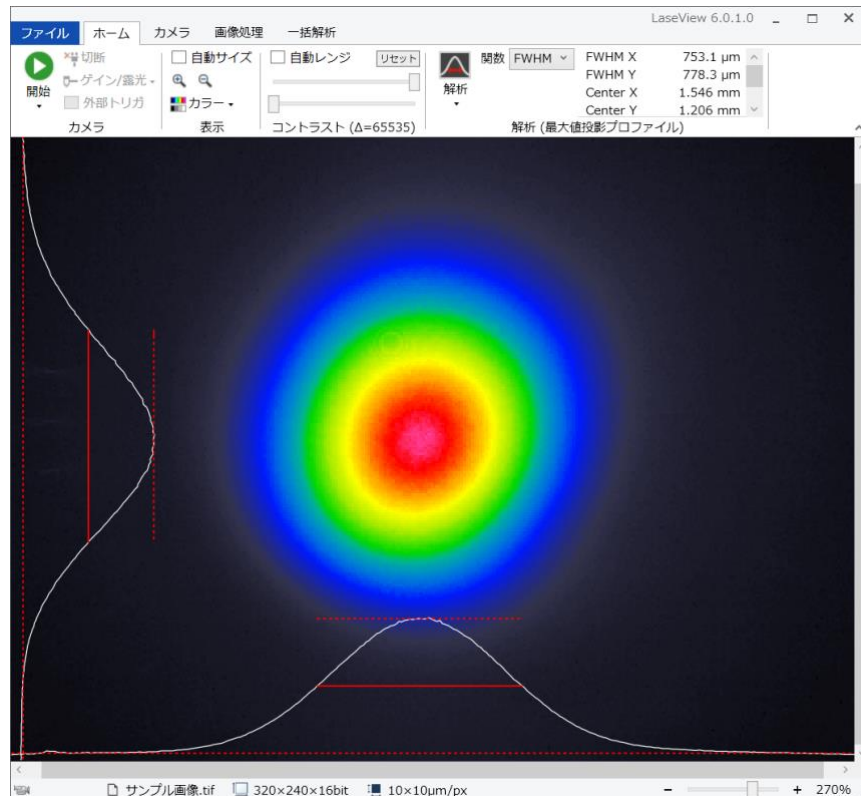
5.2.2. Integration Profile

Displays averaged profile in the horizontal and vertical direction (with analysis function similar to Line Profile).



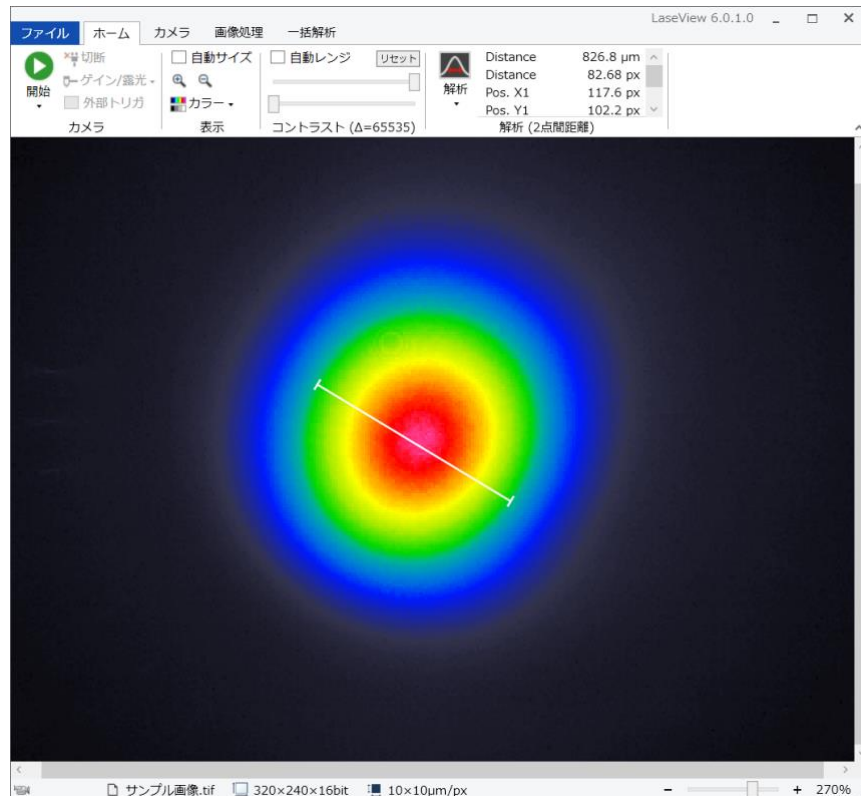
5.2.3. Maximum Intensity Projection

Displays the orthogonal projection (maximum value) profile of the horizontal and vertical direction (with analysis function similar line profile). FWHM is measured in the picture below.



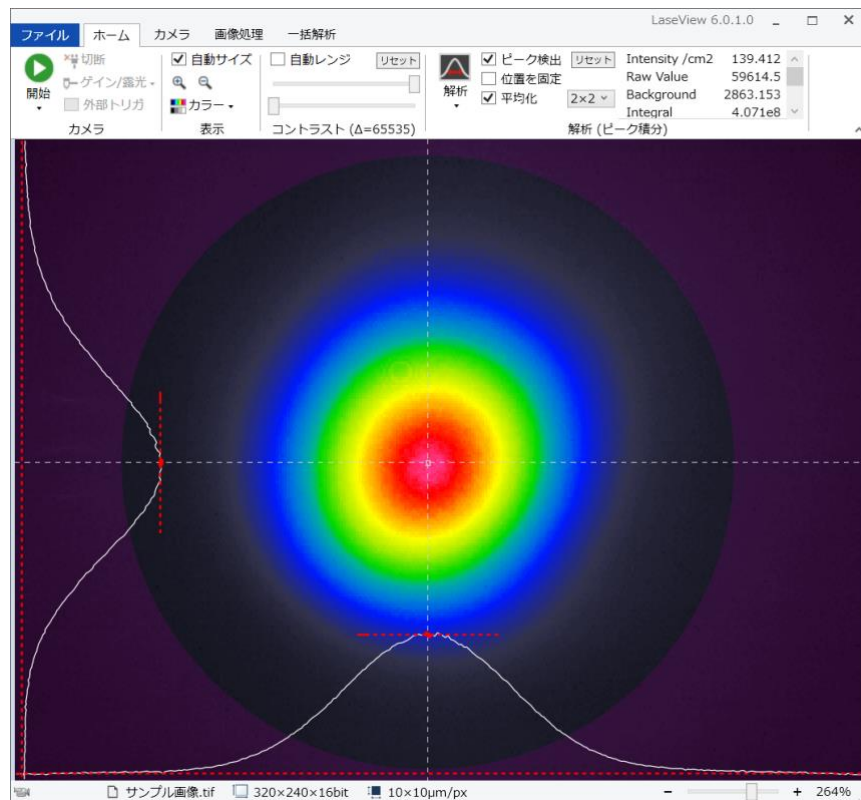
5.2.4. Point-to-Point Distance

Measurement of the distance between any pair of points on the screen. As shown in the following picture, you can measure for instance the diameter at any intensity level ; here the green circle diameter is 826.8 μm .



5.2.4. Peak Integration

This function calculate the integrated value inside a circle, while setting the outside of this circle as the background. You may adjust the circle's size and position in order to fit your beam. If you select Peak Detection as shown below, the position of the peak inside the circle will be indicated by a white dashed cross-line.

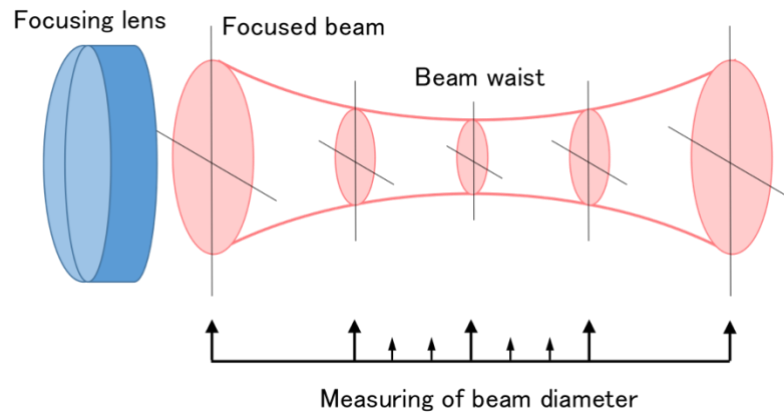


5.3. How to operate various LaseView global analysis function

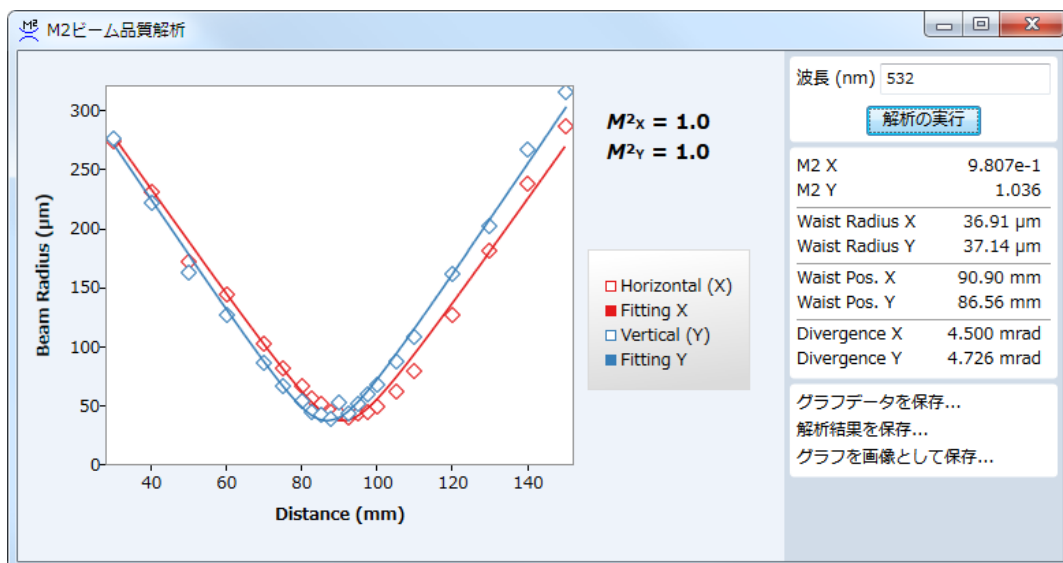
In the "Global analysis" tab, you can access this 4 analysis functions: M^2 beam quality, Divergence angle, Image logging, Beam pointing.

5.3.1. Using M^2 beam quality measurement

1. Setting up an optical system
 - (a) Focus the laser beam by a lens with a F-number of about 50 to 100.
 - (b) Set the optical rail or ruler to enable the CCD camera to slide $\pm 50\text{mm} \sim \pm 150\text{mm}$ around the beam waist.
 - (c) If needed, attenuate the incident beam, adjust the Gain and Exposure time.
2. Start LaseView and create (or select) a folder to save pictures by clicking "Open Folder..." in the option in the "File" tab.
3. Slide the CCD camera on the optical axis and save 10 to 30 beam profiles around the $\pm 50\text{mm} \sim \pm 150\text{mm}$ area of the beam waist as described below.
 - (a) Check the diameter of the beam waist.
 - (b) Move the CCD camera to a position where the beam diameter is about 5 times larger than the diameter of the beam waist.
 - (c) When the camera is fixed, adjust the beam amplitude and exposure time to obtain low noise pictures.
 - (d) Click the "save the image" of the "File" tab, fill the position value of the CCD camera in the file name box. You can set the unit to nm, μm (um), mm, cm, or m. If the unit is not set, mm is automatically used for calculation.
ex) 30mm.tif, 100mm.tif, 150mm.tif
 - (e) Repeat the (c) and (d) while moving the CCD camera at 2 ~ 10 mm intervals. The interval does not need to be regular, however measuring with short intervals is recommended, especially around the beam waist for higher accuracy.



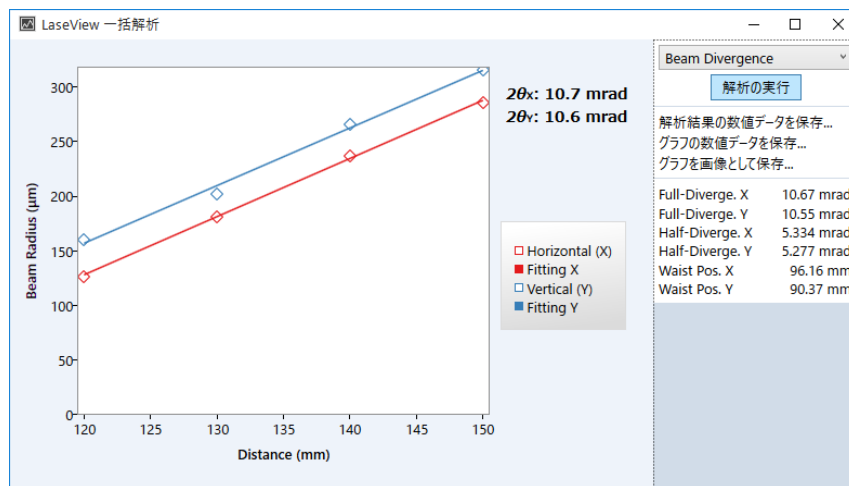
4. Click “M² Beam Quality Analysis” in the "collective analysis" tab to display M² Beam Quality Analysis window. Fill the wavelength (nm) of the laser in the upper right text box.
5. Click the “Execute Analysis” button and the result is shown in the graph.
*The result shows the beam radius.



5.3.2. The beam divergence angle analysis function

The beam divergence angle analysis procedure is described below:

1. Click on “Open Folder” of the “File” tab, and create an empty folder (or indicate an existing one) in order to save the images.
2. Measurements taken at 2 or more positions shall be saved in the same folder. Indicate the position in the file name (example: 1.5m, 25cm...).
3. Click the “Divergence angle” button of “Collective analysis” tab . The Divergence angle window opens.
4. When you click the “Execute analysis”, the result will be displayed in a graph.



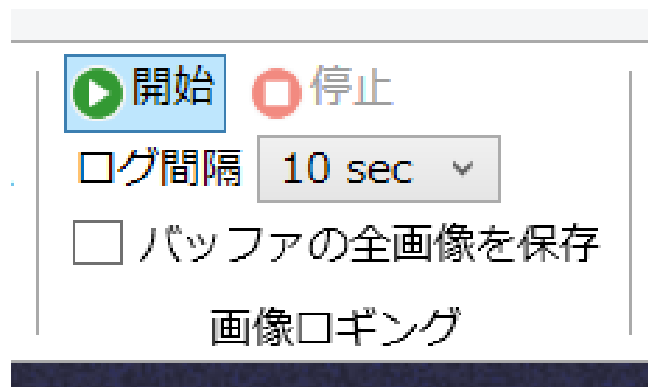
Example of analysis result

5.3.3. Image logging function

The Image logging procedure is described below:

1. Click on "Open folder" in the "File" tab, and create an empty folder (or indicate an existing one) in order to save the images.
2. Indicate the "Log Interval" in the "Image logging" frame of the "Global Analysis" tab. The saving time interval can be set between 1s and 1h.
3. Click on "Start" in the "Home" tab.
4. When you click on "Start" inside the "Image logging" frame of the "Global Analysis" tab, the images are recorded according to the specified time interval. Note that if the specified time interval is short, a lot of pictures will be saved.

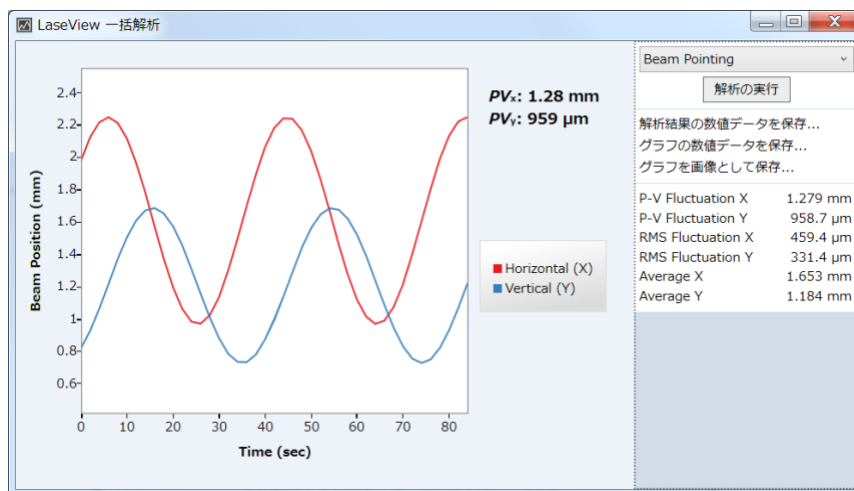
When you select the "Save all the pictures of the buffer" checkbox , the unsaved pictures in the buffer are saved at once (several pictures are saved inside a single file). For instance, if the size of the buffer is 20, a maximum of 20 pictures are saved inside one file.



5.3.4. Beam pointing variation Analysis function

Beam pointing measurement procedure is described below.

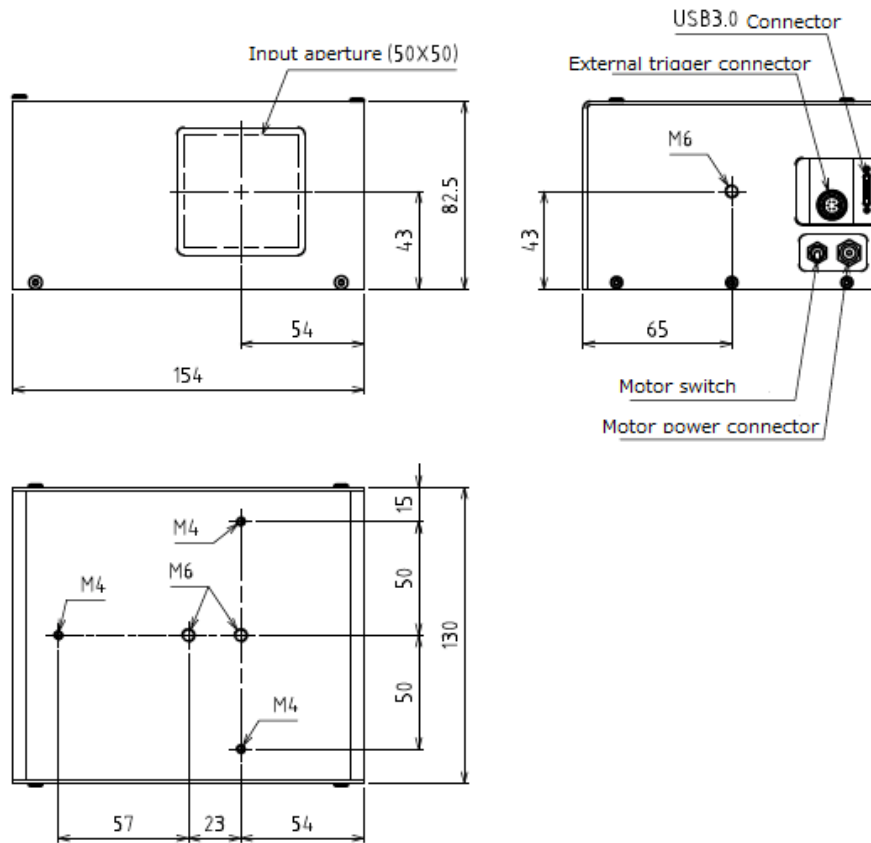
1. Click on “Open Folder” of the “File” tab, and create an empty folder (or indicate an existing one) in order to save the images.
2. Use the image logging function, and save images taken at an appropriate time interval.
3. Click the “Pointing” button.
4. When you click the “Execute analysis”, the changes over time of X and Y coordinates of the beam barycenter will be displayed in a graph. The elapsed time is calculated based on the shooting date and time embedded in the file.



6. LaseView-LHB Specifications

Item	Specifications
Acceptance aperture size	50 mm×50 mm
Optical resolution	About 100μm
Indication of measurable Power Density	0.1~100 W/cm ² (Sensitivity may be adjusted through Exposure time)
	(If ND filter is changed, it may start from 1mW/cm ²)
Total incident power	Maximum 10W
Incident angle tolerance	±15°
Measurable wavelength range	400~1100 nm (focused for 532 nm or 1060 nm)
Effective imaging size in pixels	1280×960 (horizontal x vertical)
Picture size in pixels	1250×1250 (horizontal x vertical)
A/D converter	8 bit / 12 bit
Frame rate	30 fps (Maximum)
Exposure time	0.1 ms~250 ms
Interface	USB3.0 (miniB connector)
External trigger function	Yes (3.3~24 V/3.5 mA)
Electrical Power	Camera power 5V, about 250mA (with USB supply)
	Motor power 6V, less than 100mA (with the furnished AC adapter supply)
External dimensions	W154mm×H82.5mm×D130mm (without stand, cable)
Weight	Less than 2 kg (without stand, cable and AC adapter)
Software functions	Compliant with LaseView
Remarks	<ul style="list-style-type: none"> ● If the beam is small, full resolution may not be achieved. Please take a 5 mm diameter as a minimum requirement. ● The frame rate may be further limited on the PC performances and the USB connection. ● If you use the Speckle Reduction function, a mean of 10-20 pictures must be processed so that the measurement time may grow up to 1-2s (typical values).

7. External drawing



Kokyo, Inc. (株式会社光響)

No.5 Hase Bldg. 2F, 637, Suiginyacho, Shimogyo-ku Kyoto-shi, Kyoto
600-8411, Japan

TEL : 070-6925-5558

FAX : 075-320-1604

<http://www.symphotony.com/> <<http://en.symphotony.com/>>