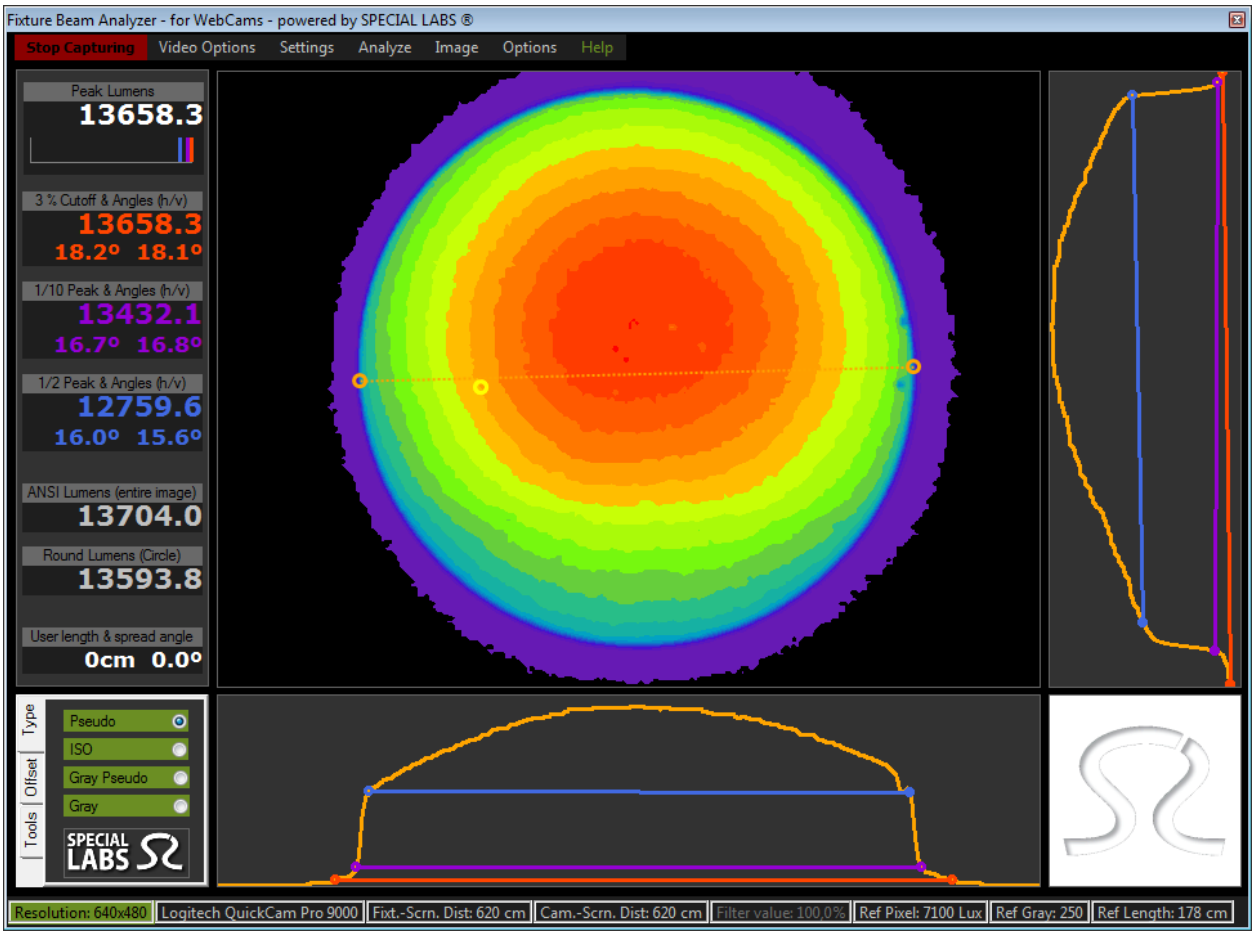
Fixture Beam Analyzer™

User Guide



SPECIAL LABS

User Guide Revision B, covering Fixture Beam Analyzer™ version 2.6.0

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Contents

Introduction

Thank you for purchasing Fixture Beam Analyzer™ (FBA™).

FBA™ is a Windows application that gives numerical data, light distribution curves, distribution diagrams and ISO curves that you can export as images to provide an accurate analysis of the intensity of a lighting fixture at all points within its beam. It is especially useful for technicians, optics specialists and lighting developers who need to analyze fixtures and make lamp or other setup adjustments.

FBA™ uses a standard webcam (Logitech Webcam/QuickCam Pro 9000 recommended, not included) to analyze a lighting fixture's output projected onto almost any surface. FBA™ takes the guesswork out of correctly setting up lighting fixtures. It provides accurate data that is close to what you can normally only obtain using a very expensive goniophotometer. FBA™ allows virtually anyone to quickly optimize output and obtain an even beam. Fixtures that are correctly set up are brighter and more efficient, with optimal color rendition. Groups of fixtures that are set up with FBA™ – at the same time or at different times – are more closely matched.

FBA™ is supplied as a set that contains:

- A filter holder designed to clip onto the Logitech Webcam/QuickCam Pro 9000
- A set of four color-coded attenuation filters
- A license key

License information

Make a record of your license key (see the label under the lid of the FBA™ box) and keep it safe.

FBA™ can be run on one PC at a time. You will need to uninstall it by clicking the **Uninstall** menu item while your PC is connected to the Internet before you can install it on another PC.

What does FBA™ measure and why?

FBA™ measures the light intensity distribution in the projection from a light source. It gives you various types of distribution images as well as distribution curves along horizontal and vertical cross-sections of your choice. FBA™ gives figures for total lumens (also known as overall, cutoff or 3%), one-tenth peak (10%) and half-peak (50%) intensities.

In entertainment lighting (shows/stage/TV and movie studios/concerts, etc.), one-tenth peak and total lumens figures normally give the most useful data, because this

environment can be blacked out. When a space such as a theatre is blacked out, output from a fixture tends to be visible where intensity is above one-tenth of the peak level.

In architectural lighting, half-peak and total lumens figures normally give the most useful data, because ambient stray light in building environments generally cannot be controlled. When stray light (from other buildings and street lighting, for example) is present, output from a fixture tends to be visible only where intensity is above half the peak level.

Installing and setting up the webcam

Important! Connect and install your webcam BEFORE you install FBA™.

FBA™ was designed for use with the Logitech Webcam Pro 9000 or QuickCam Pro 9000 (Windows version). This webcam, with its Carl Zeiss optics and software features, offers good quality and ease of use at an affordable price. It is possible to use other good-quality manually controllable webcams with FBA™, but we cannot guarantee satisfactory results or offer any guidance on using these devices.

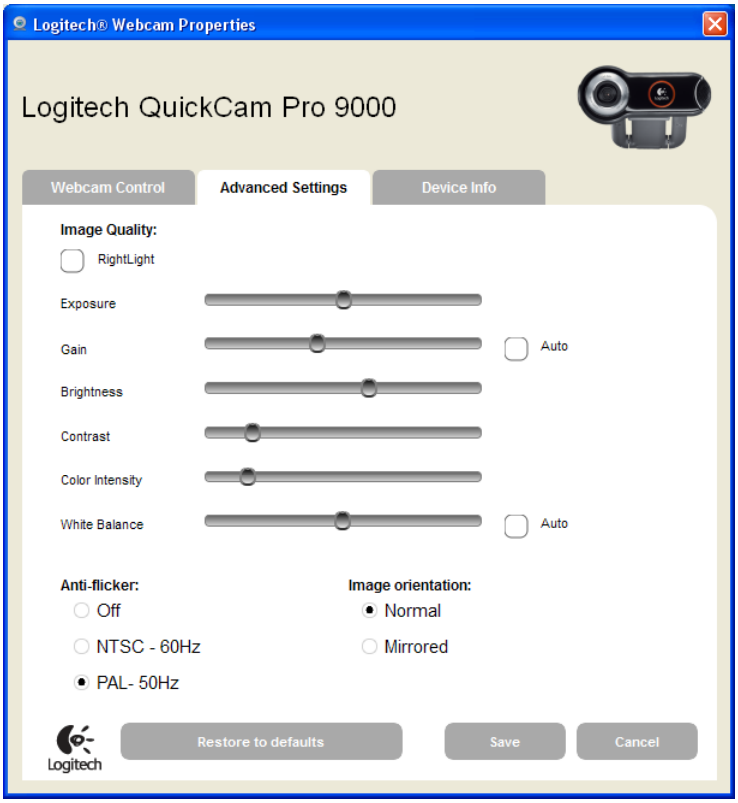
Installing the webcam

1. Obtain a Logitech Webcam Pro 9000 or QuickCam Pro 9000 (Logitech model number V-UBM46) for Windows
2. Obtain Logitech Webcam Software version 2.31 that includes drivers for this webcam (the generic Windows webcam driver is not suitable because it does not contain features that you will need). The latest Logitech Webcam Software package is available for download from www.logitech.com.
3. Connect the webcam to your PC via USB and install it using the Logitech Webcam Software package. You normally need to restart your PC after installing the webcam driver.

Setting up the webcam

To set up the webcam, open the Logitech Webcam Software **Controls**, open **Advanced Settings** and check that the following settings are selected as a starting point. You may need to come back and change some of them later, especially **Exposure** and **Gain**.

- Unmark the **RightLight** checkbox.
- Unmark the **Auto** checkbox for **Exposure** and **Gain**.
- Leave **Brightness**, **Contrast** and **Color Intensity** at their default settings.
- Unmark the Auto checkbox for White Balance and move the White Balance slider until it is approximately at the center of its range (this corresponds to approx. 5500 nm).
- Select the correct **Anti Flicker** radio button depending on the mains power frequency in your region: 50 or 60 Hz.
- Leave **Image orientation** at **Normal**.



These are the settings in Logitech Webcam Software version 2.31. They are liable to change if a later version becomes available.

Installing FBA™

Important! Connect and install the webcam BEFORE you install FBA™.

To install FBA™:

1. Go to www.speciallabs.com and navigate to 'Downloads' where you will find the FBA™ installer file.
2. Have your license key ready (see the label under the lid of the FBA™ box). Your PC must be connected to the Internet when you install FBA™ so that you can unlock the application with the license key.
3. Run the FBA™ installer program and enter your license key when asked. Installation takes a few seconds.

Setting up FBA™

You need to set up FBA™ and the webcam before you can use it. This will only take a few minutes the first time you do it, and once you are familiar with FBA™ it is a very quick operation.

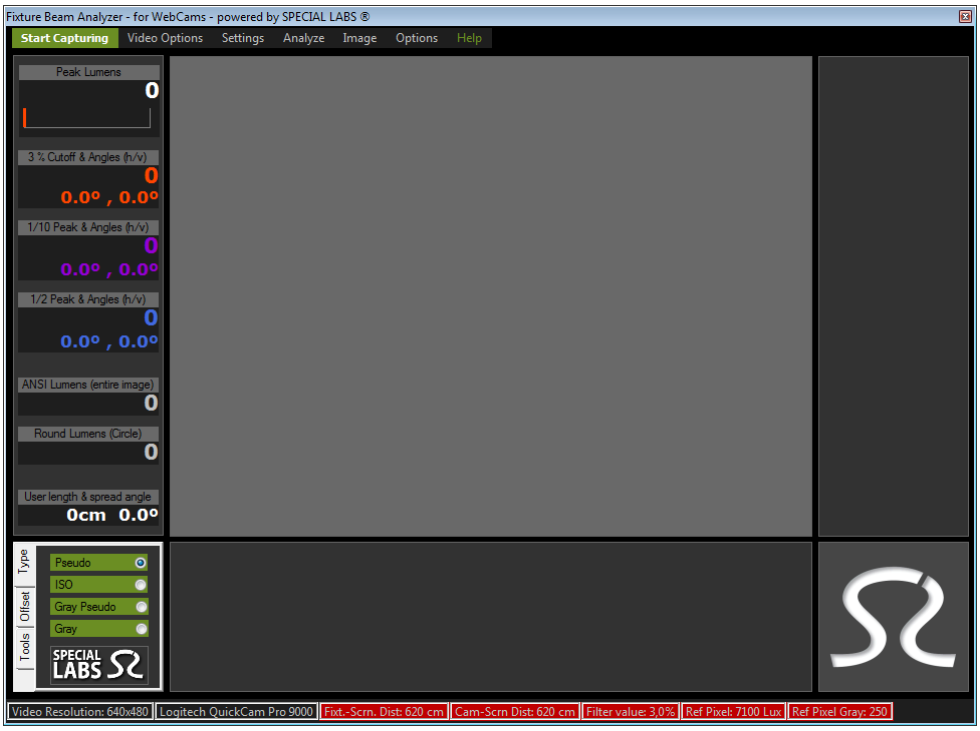
When you use FBA™ for the first time (or when you analyze a different fixture or change the distance to the projection surface, for example), you will probably need to adjust the sensitivity of the FBA™/webcam setup to match the intensity of the beam projection you want to analyze. The brighter the beam, and the nearer the fixture and webcam are to the projection surface, the more critical the setup becomes and the finer the sensitivity adjustments you will need to make.

Basic settings

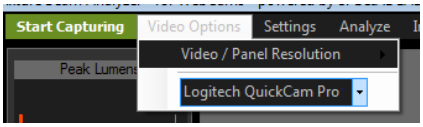
To set up FBA™:

1. Start up the lighting fixture you want to analyze with its beam projecting directly onto a flat, even surface. Use a white surface with a matt finish. Avoid projecting at an angle.
2. Start your PC with the webcam positioned as close to the front lens as possible, making sure that it has a full view of the output from the lighting fixture. Position the webcam as close as possible to the center of the beam projection.

3. Start FBA™. You will see this startup window:

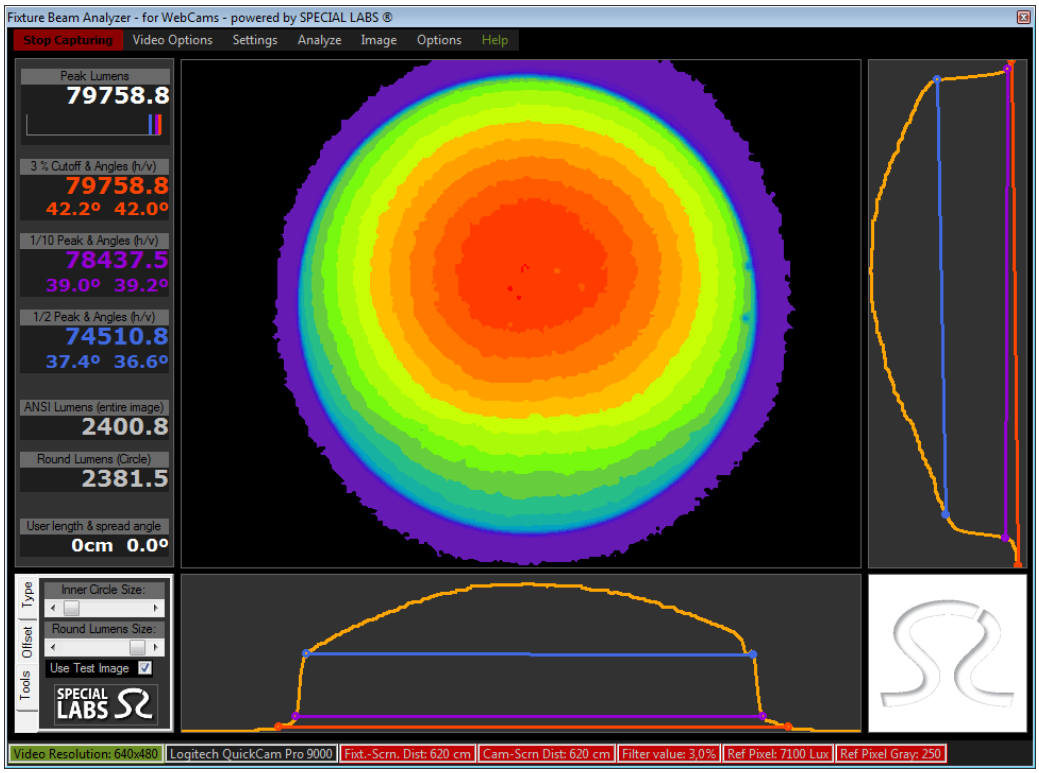


4. Click on **Video Options** in the top menu bar and select the webcam you will use together with FBA™:



Note that you cannot change the webcam's resolution while FBA™ is capturing video. If you want to change the resolution, click on **Stop capturing** in the top left of the window first.

5. With the webcam working, the FBA™ window should look something like this:



The lumen values in this image are too high. You will correct this when you adjust sensitivity and set a reference length as described later.

There are red boxes in the status bar at the bottom of the window. In the **Fixt.-Scrn. Dist.** box, enter the distance from the fixture to the projection surface in centimeters.

Adjusting sensitivity

The secret to good measurement is setting the system up so that the input signal is as strong as possible while at the same time avoiding saturation, and the easiest way to achieve this is to experiment with the supplied attenuation filters, webcam settings and FBA™ settings until you find the right combination. You should aim for the optimum amount of gain but avoid saturation:

- If gain is too low, the distribution curves in the side and bottom panes will be too low, with either a very small green intensity area or no green area at all. It will be difficult to see differences in intensity, or differences in intensity may not be displayed at all.
- If gain is too high, FBA™ intensity analysis will be saturated: the distribution curves in the side and bottom panes will be too high. They will look like wide, flat plateaus with steep sides and a very large red (highest) intensity area. It will be

difficult to see differences in intensity because these differences will be tightly packed into the edges of the curves.

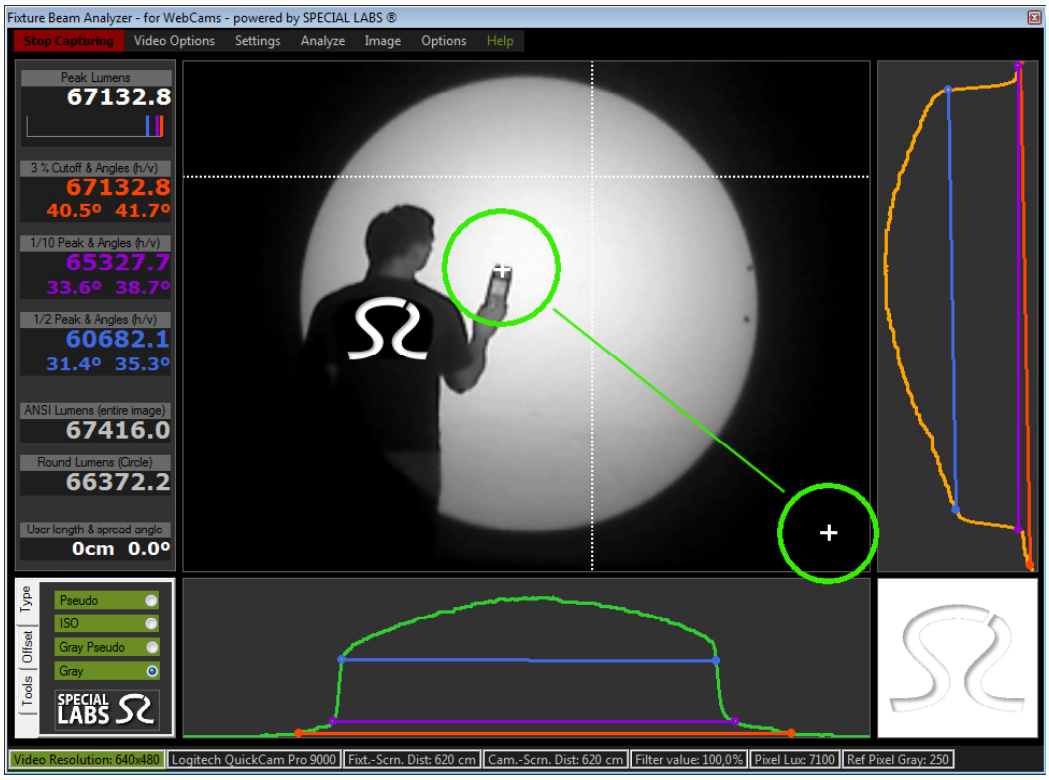
Webcam/FBA™ setup sensitivity

To configure the sensitivity of your webcam/FBA™ setup, you experiment with the supplied attenuation filters and the Logitech Webcam Software **Exposure** and **Gain** settings to obtain the best sensitivity level:

- Clip the supplied filterholder onto the Logitech webcam so that you can place attenuation filters in front of the lens, and experiment with the supplied filters until you obtain the best results. Filters are color-coded as follows:
  - Blue 7% transmission, darkest filter
  - Red 15% transmission
  - Green 25% transmission
  - Yellow 50% transmission, lightest filter
- If necessary, open the Logitech Webcam Software. See 'Installing and setting up the webcam' on page 5. Unmark the **RightLight** checkbox and unmark the **Auto** checkbox for **Exposure** and **Gain**. Adjust **Exposure** and **Gain** sliders to obtain the most useable results:
  - **Exposure** defines the time that each CCD pixel in the webcam is stimulated.
  - **Gain** defines the sensitivity of each CCD pixel.

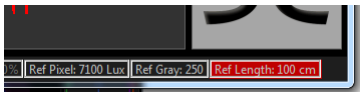
If you have difficulty getting access to the Logitech Webcam Software Advanced Settings window while FBA™ is running, see the solution in the **Troubleshooting** section at the end of this User Guide.

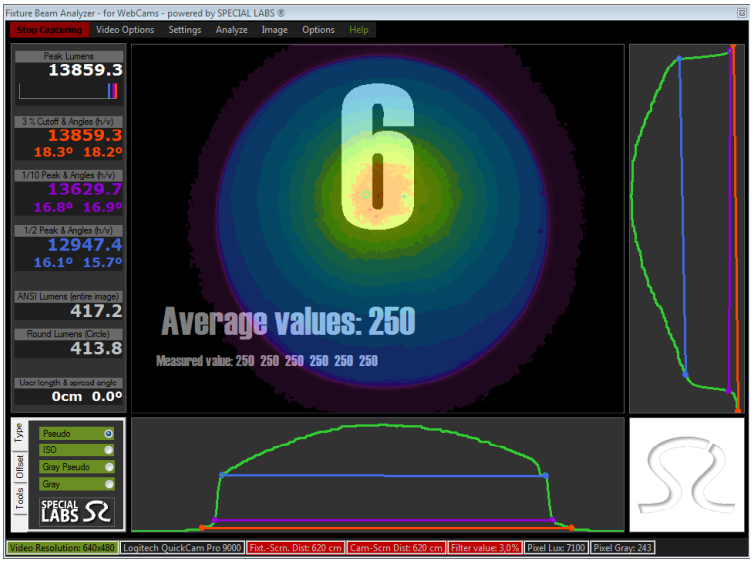
Setting up a reference for luminous intensity values



To give FBA™ a reference point so that it can give you accurate intensity data, you must place a light meter in a reference spot in the beam projection and take a reading in lux. You then enter this reading into FBA™:

1. Mark a reference spot on the projection surface (it may help if you temporarily stick a post-it note, for example, to the surface).
2. Hold a light meter facing the beam at this spot and measure the value in lux that you obtain.
3. Now go back to your PC, hold CTRL on your keyboard pressed down and **left**-click on this spot in the image of the beam projection in the FBA™ main panel.





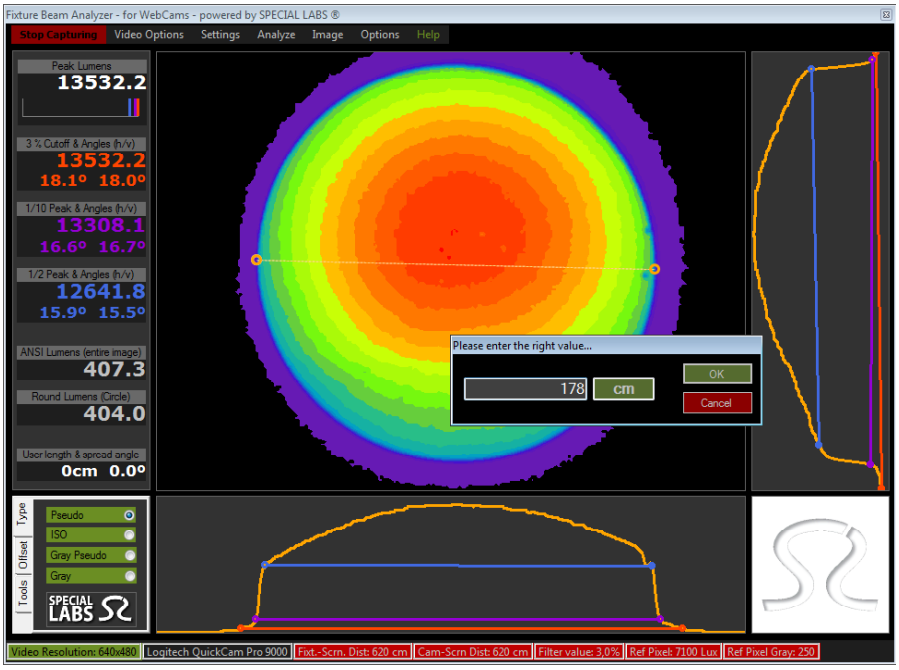
4. A countdown starts while FBA™ processes data. As the countdown number decreases, FBA™ displays the values and the overall average value it has measured for the pixel that you have selected.

5. When the countdown reaches zero, a pop-up box appears. Enter the value in lux that you measured using the meter at the reference point and click on **OK**. The **Pixel Lux** box at the bottom of the window will now show that value.

6. The **Ref. Pixel Val.** box will show the value from zero to 255 that FBA™ is now using for the maximum intensity. If this value reaches 255, FBA™ may be saturating, meaning that it cannot display high intensities correctly, so keep this figure at 253 or below. If **Ref. Pixel Val.** is over 253, put a filter with higher attenuation (lower transmission, a darker filter) into the filterholder in front of the webcam and repeat the process of setting up a reference point described above.

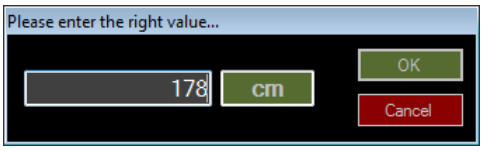
Setting up a length reference

Setting a 'length' reference allows FBA™ to calculate beam angles based on the size of the projection that the webcam captures. Before you set the length reference, check that you have correctly entered the distance from the webcam to the projection surface in the **Cam.-Scrn. Dist.** box.



To set the 'length' reference:

1. Position an object with a known length on the projection surface.
2. View the object on your PC screen. Hold SHIFT on your keyboard pressed down and **left**-click on one end of the object to define the start position. Then **right**-click-and-drag the cursor arrow to the other end of the object and release the right mouse button.
3. The pop-up box below appears. Enter the actual length of the object in centimeters and click on **OK**.



Tip: It does not matter where you make this length reference measurement on the image. Its purpose is simply to set up FBA™ with a reference to use when calculating beam angles. The longer the object you use, the more accurately you can indicate its length on your PC screen.

Using FBA™

Before you use FBA™ to analyze a beam, make sure that the boxes in the status bar at the bottom of the screen contain the correct values:

- If a box is gray, FBA™ will use the values in the box.
- If a box is red, FBA is waiting for input from you. If the correct value is already in the box, just click on the box and then click on **OK**. The box will change from red to gray. If you enter a wrong value, simply repeat your action, entering the correct value.

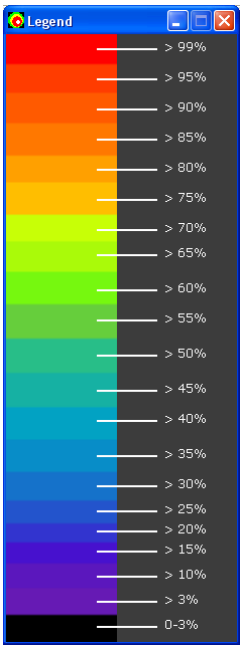
Distribution panel display modes

FBA™ can display the light distribution of a fixture's beam in four different display modes:

- Pseudo colors
- ISO
- Gray and Gray Pseudo

Pseudo Color mode

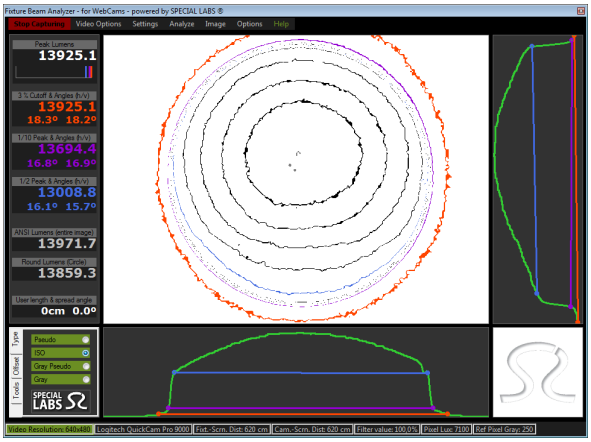
Pseudo Colors are colors from red to purple that FBA™ uses to give a visual representation of luminous intensity in the distribution panel. Each **Pseudo Color** band represents a 5% reduction in lumens value, starting with red (~100%) and ending with purple (3%). Black is used to represent values below the cutoff value of 3%. The 3% cutoff value is especially useful when analyzing the beam from a wash fixture that does not have a sharp border.

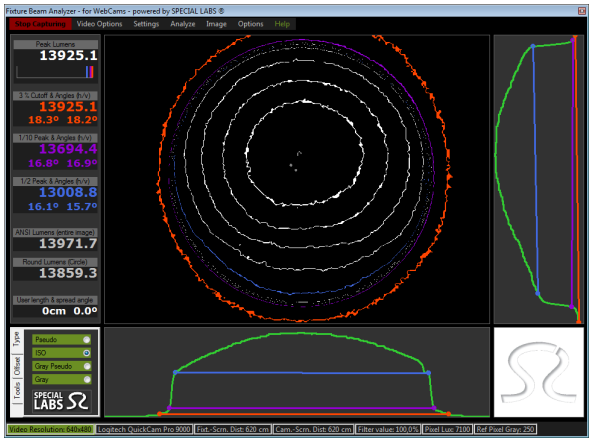


Clicking on **Legend** in the **Help** menu displays the pseudo colors used and the intensity levels they represent.

Note that the pseudo colors used in the distribution panel are not related to the colors used for the distribution curves in the lower and right-hand panels and the cutoff, 1/10 and half-peak figures in the boxes on the left of the window.

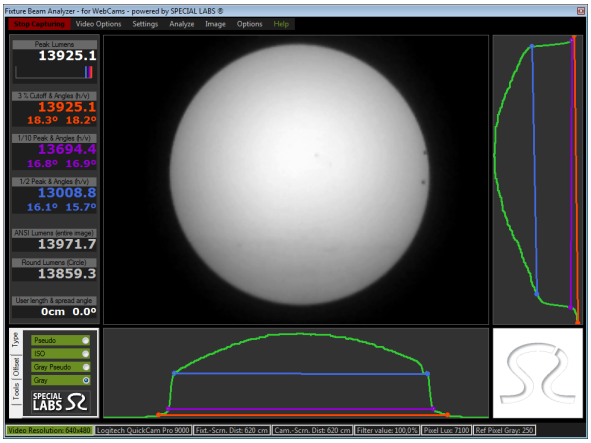
ISO mode

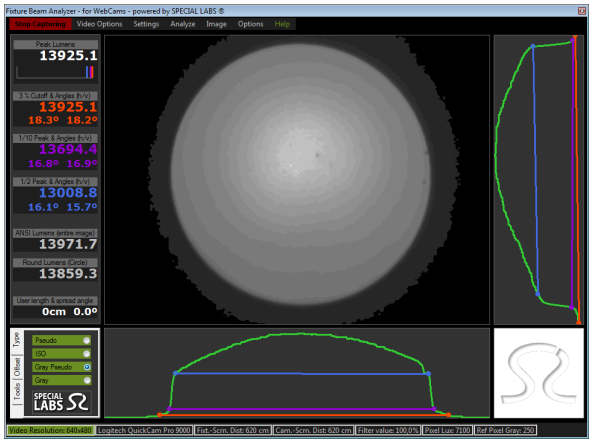




The background color for the ISO display mode can be changed in the menu item **Settings** -> **ISO Background**. Changing the background color can be useful for matching the paper color in printed reports or background color in presentation software, for example.

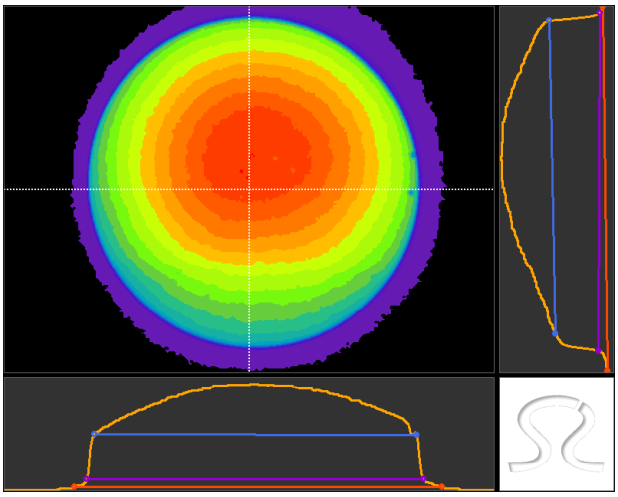
Gray and gray pseudo modes





FBA™ carries out all colorizing operations and calculations in the CPU (and not in the graphics card's MCU). **Gray** and **Gray pseudo** modes are the least CPU-intensive and are fastest, allowing the highest frame rate.

Distribution Curves



Curve shape

The distribution curves at the bottom and on the right of the FBA™ window are horizontal and vertical cross-sections of the beam. They give a graphic representation of distribution in the beam, and their shape shows distribution characteristics. For example:

- A distribution curve with a pointed peak indicates that the beam has a hot-spot.
- A distribution curve with a 'plateau' (i.e. a wide, flat area in the center of the beam) indicates an even intensity distribution in the center of the beam.
- A dip in the center of the distribution curve indicates that the beam has a cold-spot.

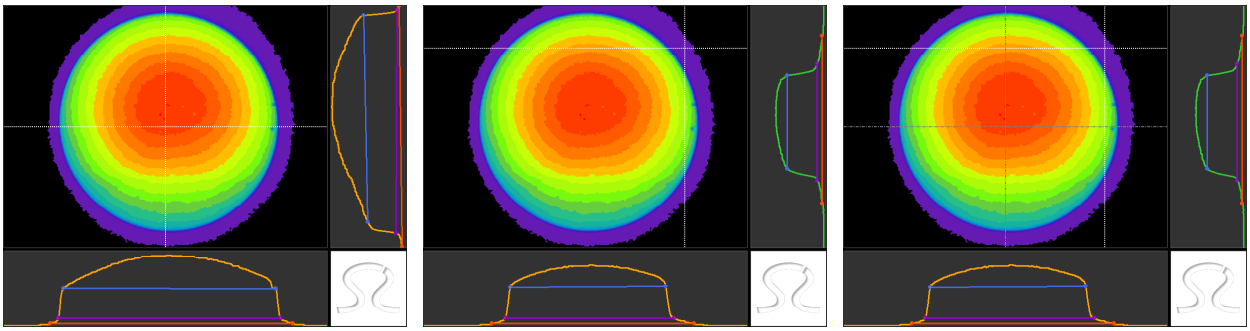
Curve color

The color of the distribution curves gives the following indications:

- If a distribution curve is *green*, FBA™ is receiving useable data, and the setup is working correctly. Check that the curve is high enough to provide a good range of data. If the curve is very low and flat, you may need to use a filter with lower attenuation (a lighter filter) or increase gain.
- If a distribution curve is *red*, the light input level is exceeding the maximum. Reduce the light input level by:
    - Placing a lower transmission (darker) filter in front of the webcam.
    - Adjusting the **Time** and **Exposure** settings in the Logitech Webcam Software
    - Adjusting the gain settings in FBA.

- If a distribution curve is *orange*, FBA™ is measuring too many pixels at the same level. This is probably due to incorrect adjustment. Try adjusting gain and/or exposure to obtain more useable data.

Cut Lines

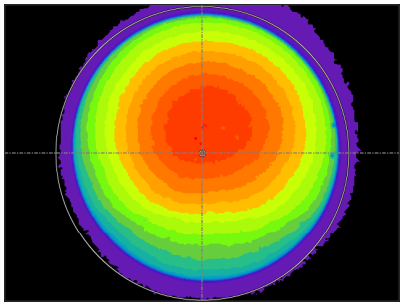


Cut Lines define the horizontal and vertical cross-sections of the beam that FBA™ uses to produce the **Distribution Curves** in the panels at the bottom and on the right of the FBA™ window (see above).

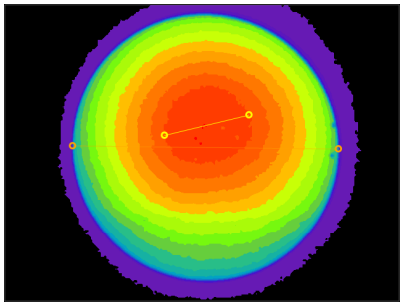
You can adjust the positions of the **Cut Lines** by clicking-and-dragging the ends of the lines. Move the cursor over the end of a line until the cursor icon changes to show that you have control over the line. Then left-click-and-drag to move the line with the mouse. Release the mouse button when you are happy with the position of the line.

Use **Settings → Show Cut Lines → Zero Cut Lines** to return the cut lines to their center positions.

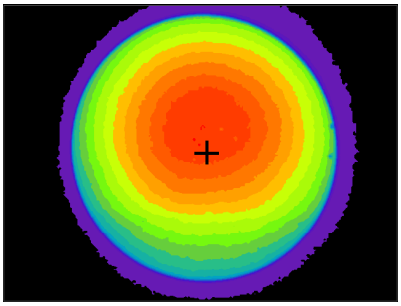
Additional tools



Cut Lines



User Measurement

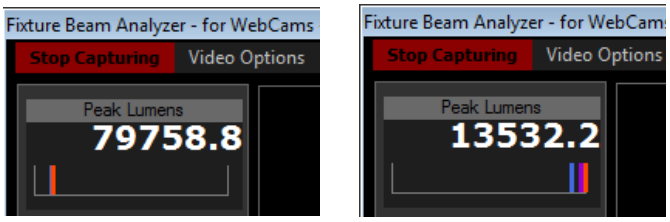


Geometric center

Besides the **Cut Lines** described above, other markup and display tools are available in the **Settings** menu:

- A **User Measurement** line can be drawn anywhere in the main panel by left-clicking and dragging. The values for this line are displayed in the left-hand panel.
- **Geometric Center** places a cross in the geometric center of the area inside the 3% cutoff angle. You can use this point to help you decide where to position the **Cut Lines**.
- **Show Help Circles** displays a circle in the distribution panel to help you assess how circular the beam projection is. If the fixture is not aimed at 90° to the projection surface, for example, **Show Help Circles** will help you see this.
- **Half Markers** displays horizontal and vertical lines that meet in the *geometric* center* of the beam projection in the distribution panel.
  **The geometric center is the center with reference to the points that are furthest to the left, right, top and bottom of the beam projection.*
- **Show Rulers** lets you draw a line on your screen in the distribution panel that FBA™ will then measure.
  - If you hold the Shift key pressed down while you left-click-and-drag, FBA™ lets you enter a new **Reference length** (or click on **Cancel** if you do not want to change the existing **Reference length**).
  - Left-click-and-drag to draw a User measurement line. The length of this line and the beam angle that it corresponds to is displayed on the left of the window.
- **Show grid** displays 10% incremental lines in the Distribution Curves. You must also restart capturing (click on **Stop Capturing**, then **Start Capturing)** to activate/de-activate this feature.

Peak Lumens meter



The **Peak Lumens meter** constantly monitors the peak values of the cutoff (3%), one-tenth and half-peak lumens values:

- The peak figure (79758.8 and 13532.2 in the examples above) shows the peak cutoff value in lumens. The highest value measured is held. Press ENTER on your keyboard to reset this value.
- The cutoff, one-tenth and half-peak bars are displayed in the colors chosen for these values everywhere in the program. They move constantly when you adjust the fixture. To get the highest lumens output from the fixture, adjust it until these bars are as far to the right as possible.

Exporting images

Snapshots

You can capture snapshot images from FBA™ and export them to other programs (word-processing, spreadsheet, graphics or presentation programs, for example) to record or present data.

Snapshots of the distribution panel include all the elements (such as the rulers, for example) that you can see on your screen. If you do not want these elements to be included, hide them before you take the snapshot.

To take a snapshot of the current view in the distribution panel, press the space bar on your keyboard. The snapshot is held in memory FBA™ and can be saved as a BMP, JPG or PNG file using the **Save as…** command.

Advanced FBA™ Settings

The **Analyze** menu gives control over some advanced settings in FBA™:

- **Nr. of averages** shows the number of averaged measurements taken to find the intensity value of a certain point and lets you adjust this number. Increasing the number of averages will give more precise data, but it increases the number of calculations the CPU must make so FBA™ will run slower.

- **Gamma correction** shows the degree of gamma correction encoding applied to the intensity data from the webcam and lets you adjust this value. The default value is 0.45, which will normally give satisfactory results.
- **Gray corrected**, when applied, takes color reception on the retina of the human eye into account to give more realistic measurement of intensity in terms of human vision and intensity perception. Turning gray correction on or off will give a small difference in some cases.

Other commands

In the **Help** menu:

- **Tips and Tricks** displays a list of the main keyboard shortcuts available in FBA™.
- **About** gives information about FBA™.
- **Legend** displays the colors used to represent intensities in the main distribution panel (see 'Pseudo Color mode' on page 14).
- **Uninstall FBA…** lets you carry out a clean uninstall. Uninstall FBA™ while your PC is connected to the Internet if you want to install FBA™ on another PC.

Troubleshooting

I can't get usable results

You may not have adjusted your setup to match the light intensity of the beam correctly. You may need to experiment a little to obtain the best setup. See 'Adjusting sensitivity' on page 9.

I am having problems adjusting the sensitivity of the webcam

Adjusting the sensitivity of the setup involves experimentation until you find the levels that give the best results. Adjustment should not take long once you are familiar with the setup, but you may need to spend a little extra time experimenting in the beginning when you are new to the system. Here are a couple of tips that may help you:

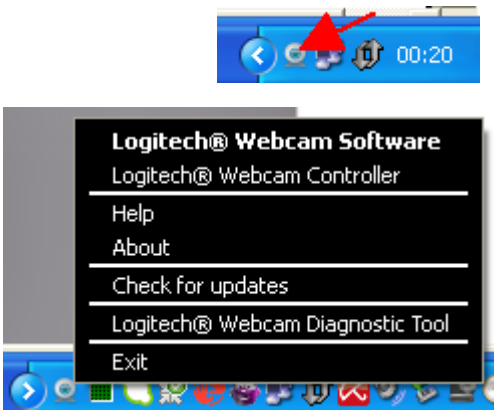
1. In the Logitech Webcam Software, open the **RightLight Settings** tab and turn on **Automatic Settings** in the Logitech Webcam Software by marking the **Automatic Settings** checkbox. The software will set the webcam's **Exposure** and **Gain** automatically.
2. Unmark the **Automatic Settings** checkbox to return to manual control. The **Gain** and **Exposure** sliders will stay in the positions they were set to automatically. You can now use these positions as starting points for manual adjustments.

3. In the Logitech Webcam Software **Advanced Settings** tab, make sure that the **Auto** checkbox by the **White Balance** slider is unmarked and that the slider is approximately in the middle of its range.

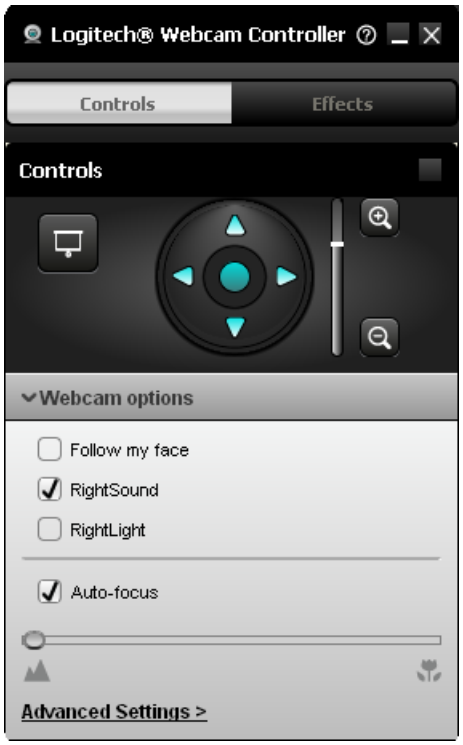
I am having problems accessing Logitech Webcam Software to adjust the webcam settings while I am running FBA.

Unlike previous versions, Logitech Webcam Software version 2.31 can sometimes become difficult to access while FBA is running. Here is the solution:

1. Press Ctrl+Alt+Del to open the Windows Task Manager. Open the **Processes** tab, select the process called **CameraHelperShell.exe** and then close it down by clicking on the **End process** button.
2. Find the Logitech icon in the Taskbar at the bottom right of your screen near the clock and right-click on it to open the **Logitech© Webcam Software** menu. Click on **Logitech© Webcam Controller**.



3. The **Logitech© Webcam Controller** window opens. Click on **Webcam options** to open the list of options at the bottom of the window.
4. Click on **Advanced Settings** at the bottom of the window to open the **Logitech Webcam Properties** mixer (see 'Setting up the webcam' on page 6). You can now make adjustments as described on page 6 while FBA is running.



Specifications

Requirements

OS:	Microsoft Windows XP, Windows 7
I/O:	SB 2.0 port
Webcam:	Logitech QuickCam Pro 9000 for Windows (minimum), Logitech Webcam Pro9000 for Windows (recommended)
	Note that the Logitech Webcam Pro 9000 for Business is supplied with a wide lens.

Attenuation filters

- Blue 7% transmission, darkest filter
- Red 15% transmission
- Green 25% transmission
- Yellow 50% transmission, lightest filter