Image acquisition, managing and processing software

MC

Instruction Manual

- Content of the Instruction Manual
  - Square brackets are used to indicate items such as menu names, button names and window names that appear on the computer screen.
  - >> indicates the selection procedure of the menu. Example: [Capture] >> [Main Control] >> [FlatFielding]
  - : Marks tips for using the software.
  - : Marks information that should be read before use.
  - : Marks additional information you may find helpful.
- Help
  - Refer to [Help] >> [About MC] menu to get software information and technical support.
  - When need to contact the technical support, please try to list below information:

    ① Camera model and S/N (serial number);

    ② Software version number;

    ③ Description of the problem. If have some screenshots of the problem, it will be much appreciated.

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Main Features of MC

- Advance camera control
- Take still images and video. Available image types: JPEG, BMP, TIFF and RAW.
- Convenient fluorescence imaging settings
- Image management
- Extend depth of focus function
- Fluorescence combination function for still images
- High dynamic range (HDR) function.
- Still image measurements.

System requirement

OS	Windows XP/ Vista/ 7/ 8 (32 & 64bit)
CPU	Intel processor (Core2 Duo or higher is recommended)
Memory	2GB or More is recommended
USB ports	USB2.0 Hi-Speed port

Chapter1: Getting Started

This chapter explains preparatory steps and basic MC operations.

What You Need

To use the camera, you need to install the camera driver and application software MC:

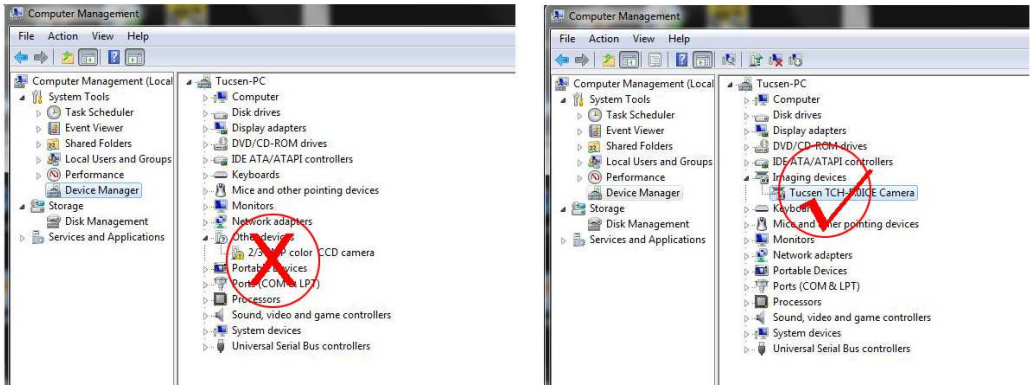
Application software installation:

1. Find the MC Setup.exe file from the CD, double-click on it to start the installation and hit “Next”.
2. The installer package selects the “C:\Program Files\” as the default file destination.
3. After finish the installation, the MC shortcut

will be created on the desktop.

Driver installation:

1. Double-click on the driver “Camera Driver Setup.exe” or “Camera Driver (H Series) Setup.exe” to start the installation.
2. Follow the steps to finish the installation.
3. Please go to the Device Manager to check if the driver was installed properly. When the driver is installed well, there is no yellow mark with the camera under the Imaging Device in Device Manager. Please see below picture:

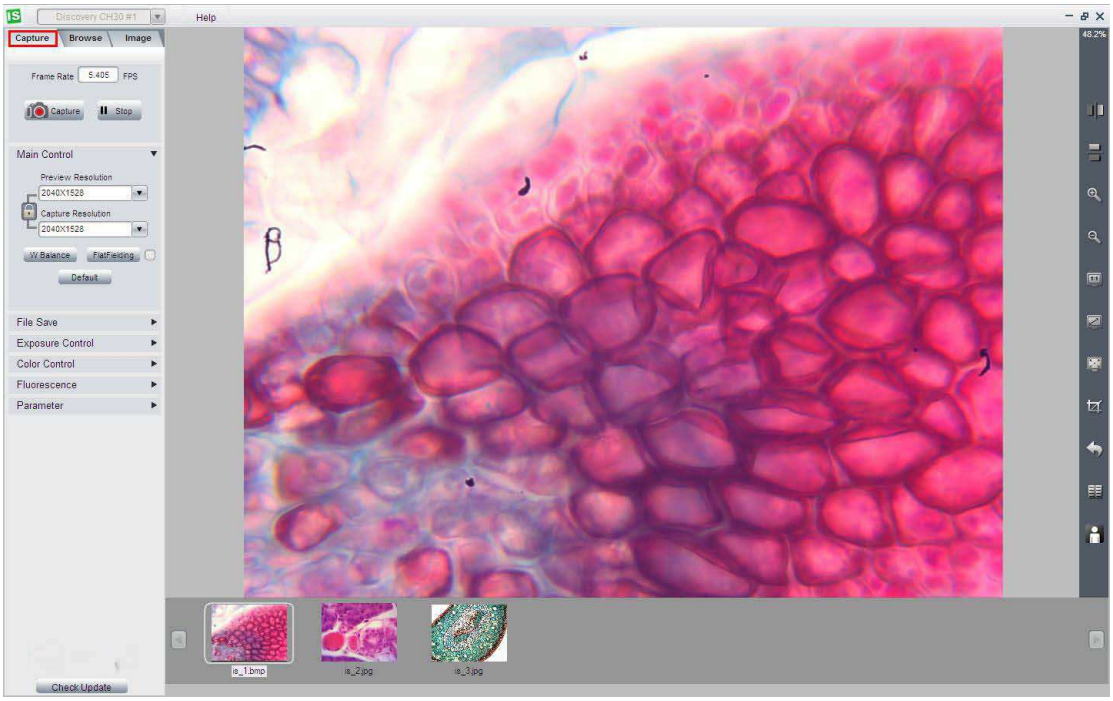


Starting up MC

After the installation, software shortcut will be created on the desktop. Double-click on it to start MC.

When MC starts up, live image window appears. You can set up the parameters to get proper images, save still pictures or videos. The [Capture] window provides image acquisition settings. [Browse] windows allows you to manage all your images. And the [Image] window offers advanced image processing functions.

[Capture] window



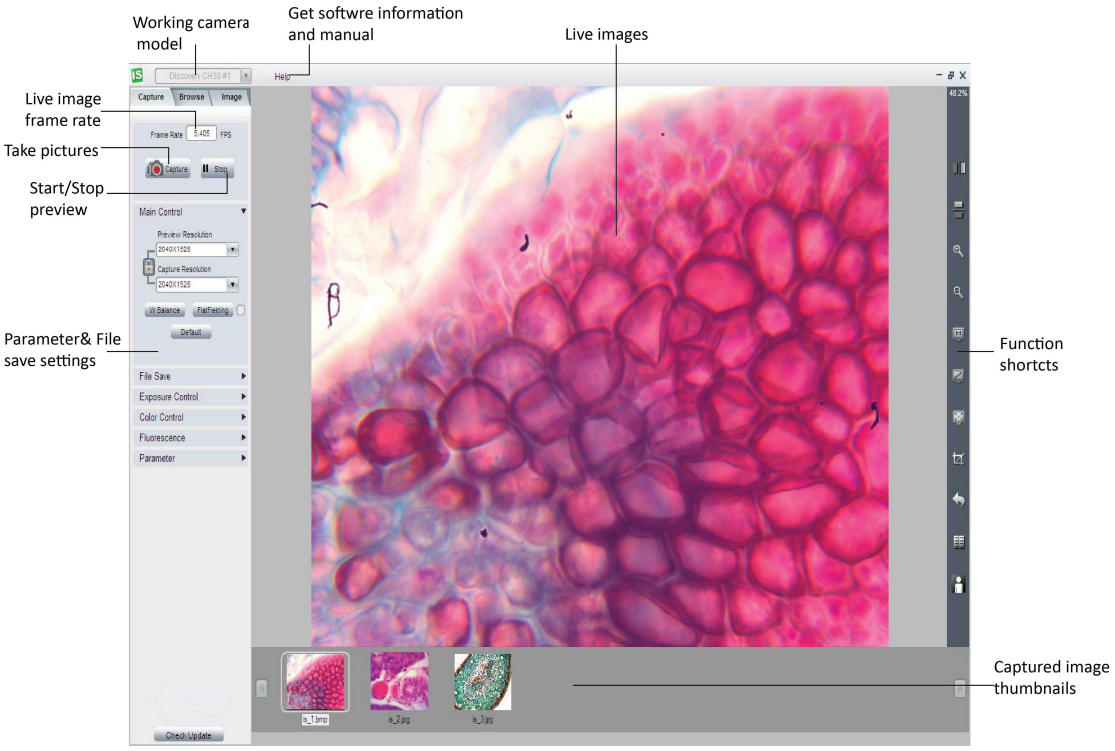
[Browse] window

[Image] window

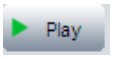
Chapter2: Image Acquisition

Adjust camera parameter settings to get proper live image; live image measurement and save still pictures and videos.

.



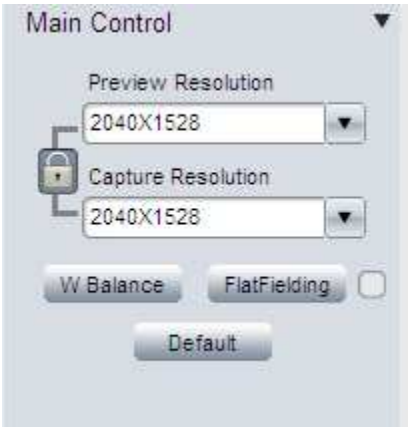
Start up MC with camera attached to PC, live image begins automatically.

If run MC first and then connect camera, click 

to start the preview.

MC supports multiple camera function (Only for H series or later). After stop the current preview, it allows you to select available connected cameras to preview in the drop-down menu.

Basic Control



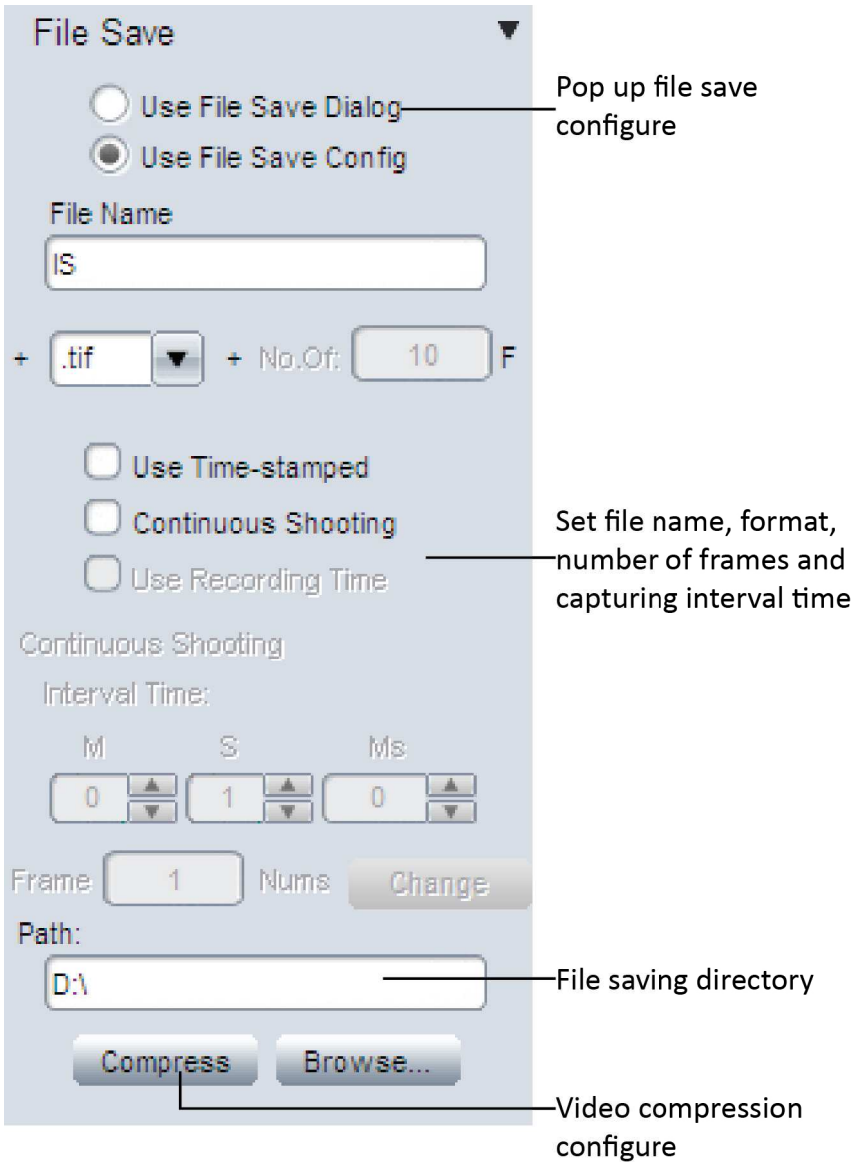
Provide basic camera settings:

Preview Resolution 2040X1528	Live image resolution	Select resolution for live image
Capture Resolution 2040X1528	Captured image resolution	Select resolution for capturing
/	Lock	Lock: Set same preview and capture resolution; Unlock: Allow to set different preview and capture resolutions.
W Balance	White Balance	Correct live image color
FlatFielding / FlatFielding	Flat Fielding	Correct image uneven brightness Uncheck the checkbox: Cancel background brightness correction.
Default	Default settings	Restore all the parameters to default value

After get proper brightness live images, it recommends to apply White Balance to correct live image color. To get better white balance effects, please follow below steps:

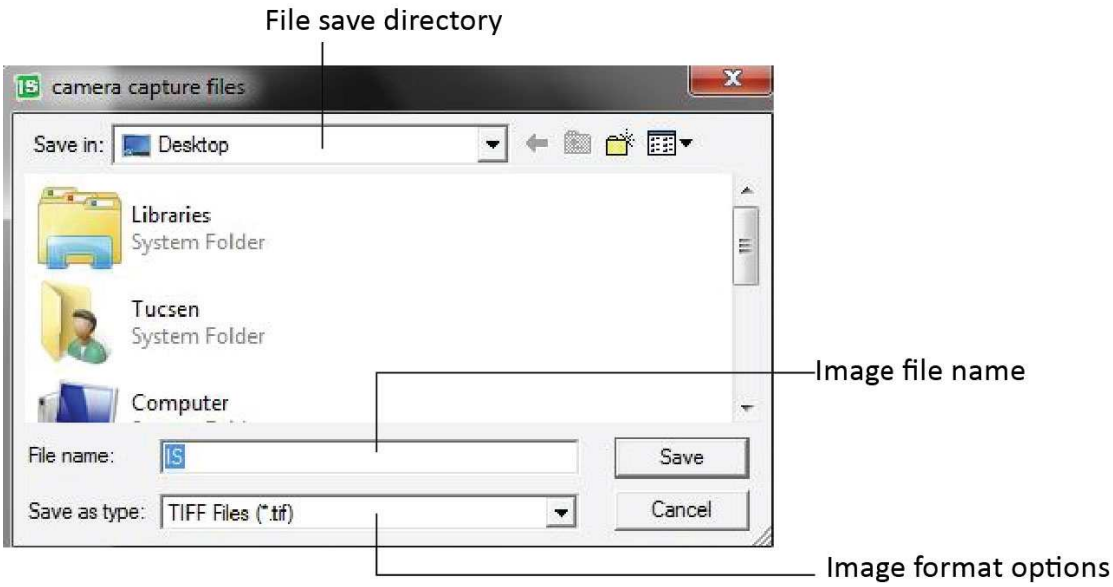
1. Move the sample to the blank area;
2. Unselect [Color Enhancement] (It is unselected by default in [Color Control] panel);
3. Push [White Balance];
4. Move back the sample.

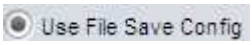
Take Still Images and Videos



- In [Use File Save Dialog] mode

, it will pop up file save configure window every time when you push [Capture] or [Video] button . This pop-up window asks you to select file saving directory, file format and key in the file name.

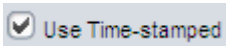


- In [Use File Save Config] 

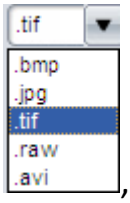
, it allows you to pre-set the file saving name, format, image quantity, capturing interval time and saving directory. After push the [Capture], MC will save files as you set.

Capturing and Saving Individual Images

- Enter preferred name in the [File Name] field

. If do not key in anything, "IS" is used by default.
- Select [Use Time-stamped] 

to name the image by the capturing time automatically. The time-stamp file name will be in the form of "MMDDHHmmSS". Here "MM" indicates the month; "DD" indicates the day; "HH" indicates the hour; "mm" indicates the minutes; and "SS" indicates the seconds.

- In the dropdown menu 

, 4 file formats are available: tif, bmp, jpg and raw; select .avi to take the video.

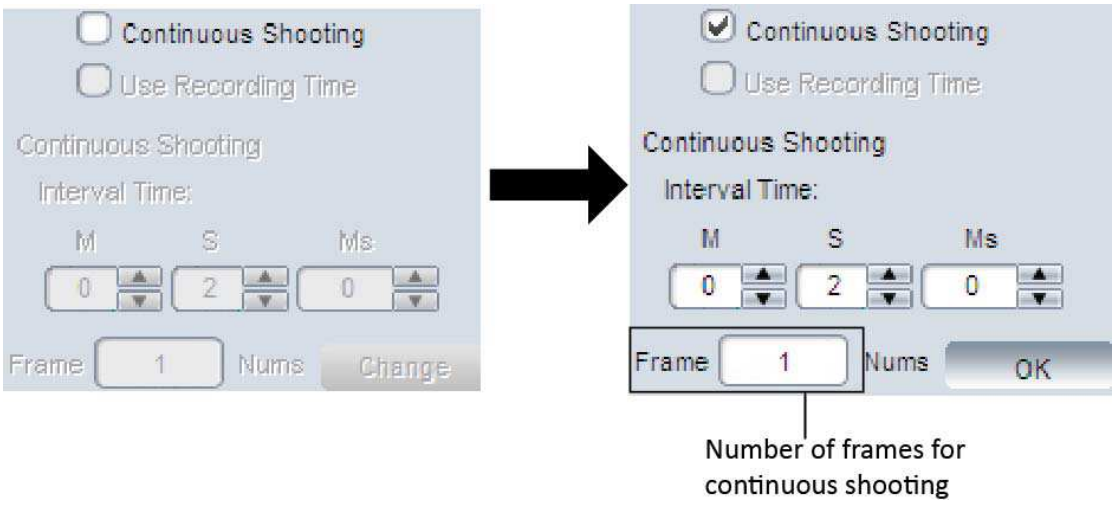
Raw image file contains minimally processed data from the camera. It needs to be read in some special softwares for example PhotoShop, ImagJ etc. If it is the color camera raw file, color information only can be seen after decording the Bayer matrix.

- Click [Capture] to take one image or video (if select .avi format) with the pre-set file name.

Capturing and Saving a set of Images

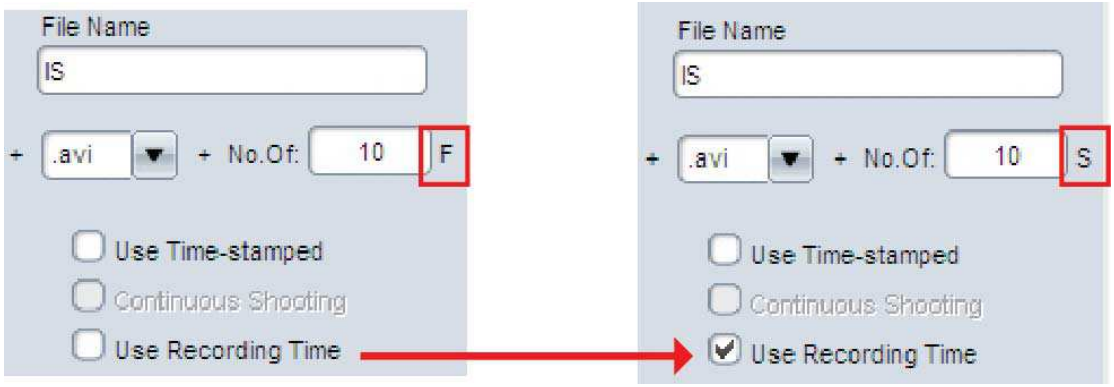
Click [Continuous Shooting] checkbox

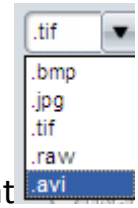
, the software will automatically save a set of images after push [Capture] one time. Set continuous capturing image numbers and the interval time in [Continuous Shooting] field.



- This set of image files' names are followed the same way you set for individual image capturing. If use [File Name], the image names will be in the form "X", "X-1", "X-2" (where X is the characters you entered or "IS" by default), and so on.

Video recording

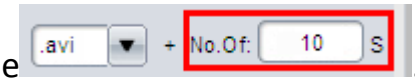


In file format  drop-down menu, select .avi format.

Two ways to stop the video recording:

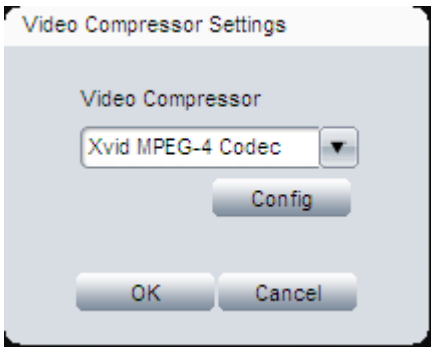
1. Set video frame numbers: Selected by default. When select .avi format, enter the number of frames for video recording .

2. Set video recording time: Select [Use Recording Time] to set

recording time 

.

The video taken without any compression will be very large size. MC Will automatically search the installed video compressors in the PC. Click [Compress], open “Video Compressor Settings” to select the available video compressor.

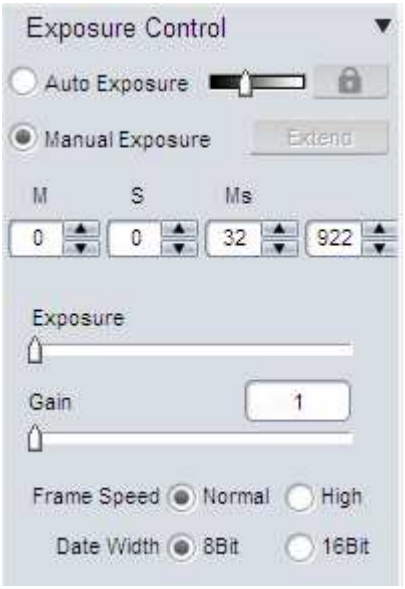


File Save Destination

Click [Browse...] to change file saving destination. The default path is the software installation folder. Usually it is “C:\Program Files\MC\”.

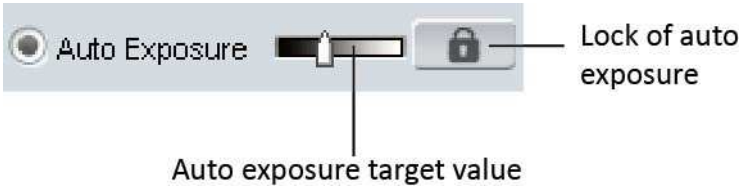
This default destination might NOT be allowed to write in any files if you did not log in the computer as Administrator in Windows Vista, 7 or later. You might fail to save images if use the default path. We recommend either to change the file saving path or release this folder “Write ” authority for this other user accounts.

Exposure Control



Change the Exposure time, Gain to adjust the image brightness. Select frame speed to get different live image frame rate. Set 8-bit or 16-bit data width for captured images.

Auto Exposure



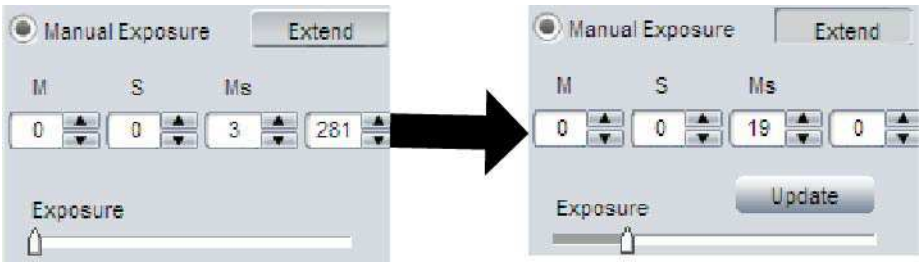
- Check [Auto Exposure] checkbox, software start adjust the exposure time automatically to get proper brightness live images.

- Auto exposure target value: Set the reference exposure time for auto exposure adjustment. It helps the auto exposure to find the proper exposure time faster. For example, if the imaging target is quite

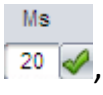
bright, we set lower target value to tell the software it is not necessary to set exposure too long.

- Lock: It will stop the auto exposure calculation. While auto exposure is working, it will keep on calculation the image brightness to get proper exposure time. During this, if you already see a good live image for you, you can push to lock it.

Manual Exposure



Adjust the exposure time manually. Two ways to change the exposure time:

- Key in the exposure time in the edit box directly 

, then click to confirm it.
- Pull the slide bar to change the exposure time.

[Extend]

is used to get longer exposure time. This function is ONLY available for CCD cameras. For other cameras especially

the CMOS camera, the maximum exposure time is shorter than 1 second, [Extend] will be gray out.

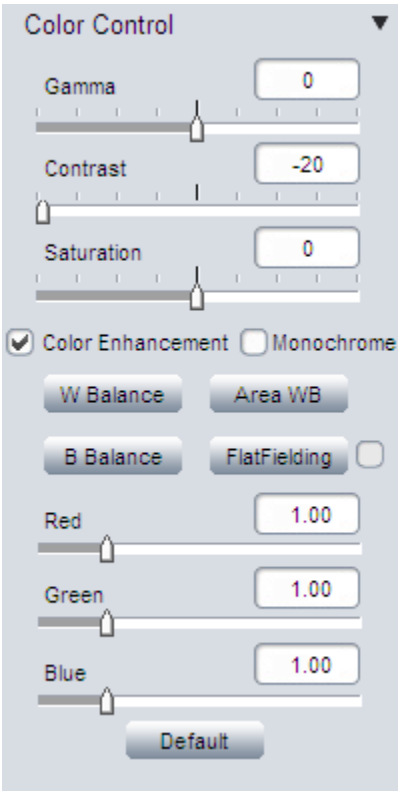
[Update]

appears after selected [Extend]. Click on it to stop the previous exposure time and restart the new one immediately. In long time exposure application, we strongly recommend to click [Update] to start the new setting. It will help to get the new exposed image earlier. If the exposure time is less than 2-3 seconds, it is not necessary to use it.

Gain, Frame Speed & Data Width

Gain		Increase the power of the image data. Higher gain gives brighter images, but also makes the noise signal more obvious.
Frame Speed	High Speed	Corresponding to high pixel clock. Gives faster frame rate.
	Normal Speed	Offer lower frame rate than High Speed, but gives longer maximum exposure time.
Data Width	8-bit	8-bit images use 2^8 = 256 gray levels to represent image details.
	16-bit	16-bit images use 2^16 gray levels to represent image details. ONLY available for CCD & Discovery series cameras in .Tiff and .Raw formats.

Color Control



Adjust image color, gamma, contrast and saturations.

Flat Fielding Function

Flat fielding function is used to correct the uneven background brightness.

- Click on [FlatFielding] to start the flat fielding parameter calculation and apply to the live images.
- Uncheck the check box , the calculated flat fielding parameter was NOT applied to the live images.

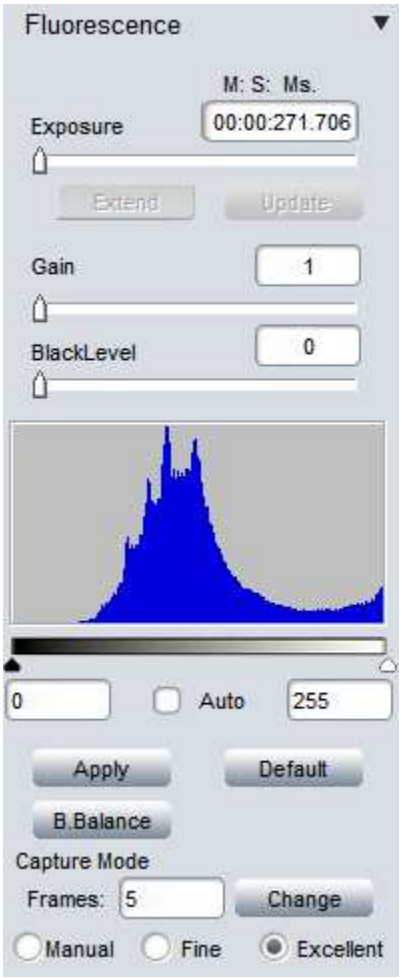
To get better flat fielding result, Move the sample to the blank

area first, apply the flat fielding, then move back the sample.

When the lighting is changed, please re-do the [FlatFielding] to correct the uneven brightness.

Gamma	Gamma is used to obtain correct reproduction of intensity. Default value (Gamma = 0) is recommended in most of cases.
Contrast	Contrast is the difference between the brightness brights and the darkest darks in an image. Higher contrast will make the shadows become darker and the highlights brighter. High contrast will lost more image details. Default value (Contrast = 0) is recommended.
Saturation	Adjust image saturation. Saturation is the intensity of color in the image.
Color Enhancement	Used to make the image color more vivid. Before doing White Balance, it recommends to uncheck this function, then apply WB
Monochrome	Check the checkbox to get a grayscale image
W Balance	White balance. Give reference to true white for the cameras. Correct image color
Area WB	Manually select the white color area in the image as the white balance reference
B Balance	Black Balance. Correct black color. Usually use in fluorescence application.
FlatFielding	Correct image uneven brightness. Uncheck the check box: cancle background brightness correction.
Red	Adjust the intensity of red in the image. [Red] = 1 means the original intensity of red in the image.
Green	Adjust the intensity of green in the image. [Green] = 1 means the original intensity of green in the image.
Blue	Adjust the intensity of Blue in the image. [Blue] = 1 means the original intensity of blue in the image.
Default	Restore the parameter settings to the initial value and apply white balance.

Fluorescence Settings

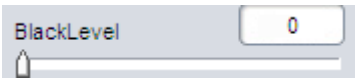


Integrate useful parameter settings for fluorescence or low light imaging.

It helps to get proper images easier and faster.

[Exposure] and [Gain] adjustment please refer to more details in [Exposure Control]

Black Level

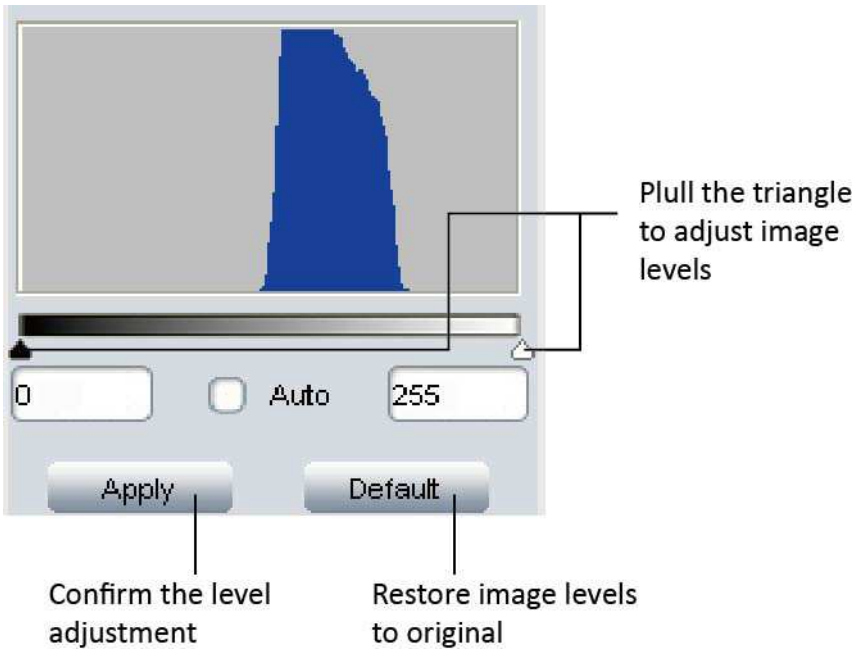


Black level function defines the brightness level at the darkest part of the

image. In low light imaging, it can help to see more details in the dark area.

In low light application, it usually needs quite long exposure time to get proper images. But if set the long exposure time at the beginning, you might need quite long time to find your target and get a proper image (wait for finishing a long exposure to get a new frame image, adjust, wait...). When searching for the imaging target at the beginning, we recommend to set shorter exposure time, but make larger Gain and Black level first. After you find the target, then reduce the Gain and Black level, increase the exposure time.

Levels



Live image histogram.

Adjust the live image levels automatically: select [Auto] check box.

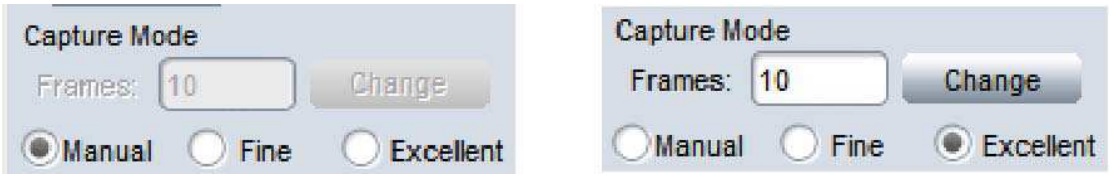
Adjust image levels manually:

- Pull the little trangle triangles to adjust the live image levels. Move the white triangle towards left, it is able to reveal some information in dark area. If move the black triangle towards right, it will reveal bright area information.
- It also allows to key in the image levels directly

After adjust the levels, click Apply to confirm the setting. If need to go back to the original image, click Default to restore the image

B.Balance: Black balance. Correct image black color.

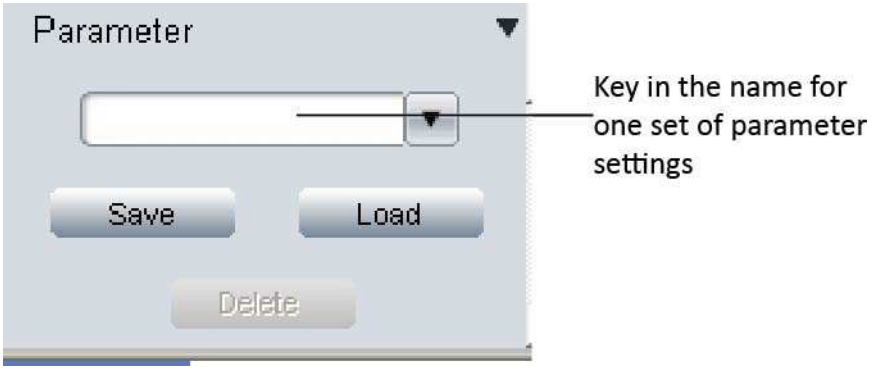
Capture Mode



Three capture modes are specially developed for fluorescence imaging.

Manual	Capture the image with current parameter settings
Fine	Automatically reduce the gain and extend the exposure to get the same brightness image. (Lower gain will give lower noise level images)
Excellent	Automatically save pre-set number of image frames with current settings and average them to get a smoother image. (It needs to take a while to capture an image in this mode.)
Frames: 10 Change	This area ONLY will be active when select [Excellent] mode. Allow to enter the number of frames for [Excellent] mode. After enter the numbers, click on [Change] to confirm the number.

Parameter Group

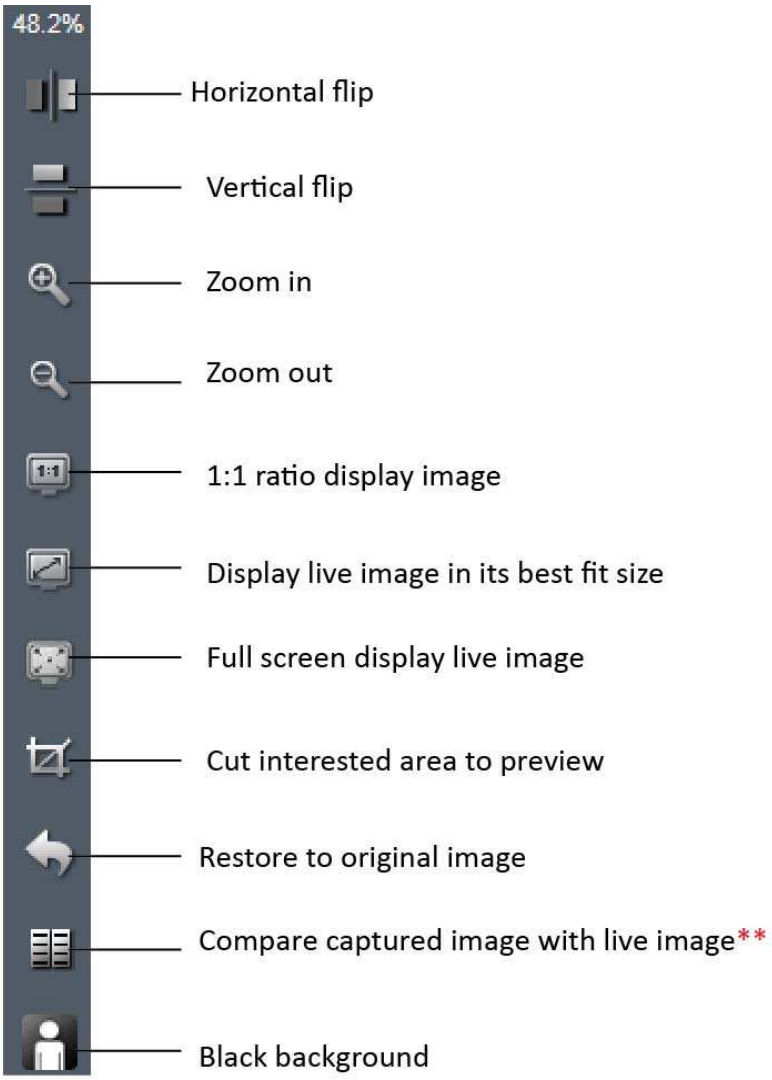


Save parameter sets for different applications. The saved parameters include exposure time, gain, frame speed, data width, gamma, contrast, saturation, color enhancement status, monochrome, RGB gain and black level. It allows to save 4 set parameters.

- Save parameter team: Enter a name for current parameter settings, click Save to save it.
- Load parameter team: Click to open drop-down menu, click on preferred parameter team and then push Load to make selected parameters take effect on the live image.

Live image shortcut

On the right hand side of the live image window, some shortcuts are provided to process the live image quickly.



** Compare function: Live image will be displayed on the left side. Click on the taken image thumbnail to select it to compare with live images (Chosen compared image will be enhanced in gray-white frame).

Chapter3: Image management

View image in [Browse] panel, it display the image File name, capturing time, color depth (bit), picture resolution and image size. It also allows to add comment to any individual image. When next time view this image in the MC, it will show the image comment.

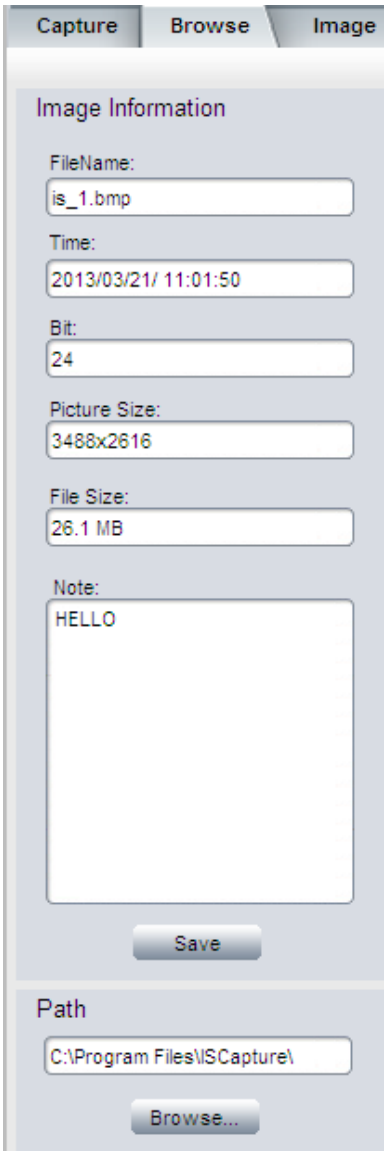
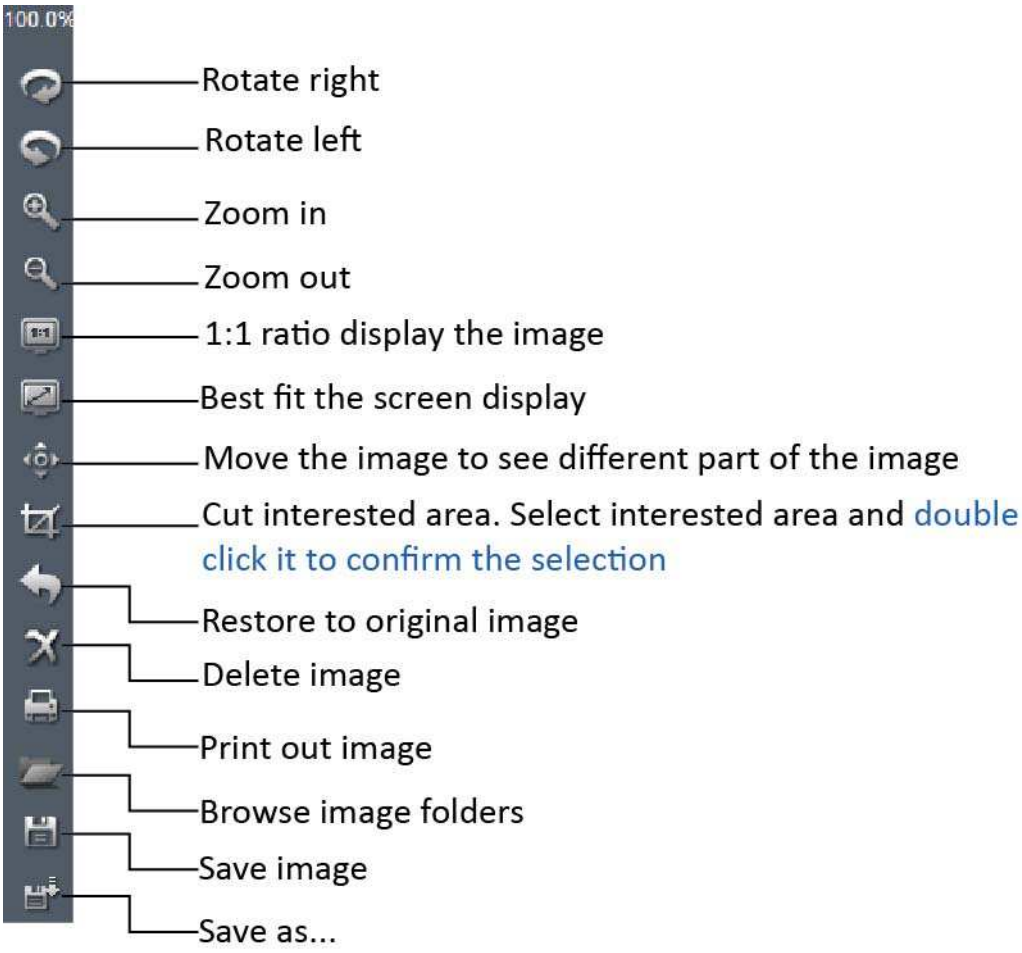
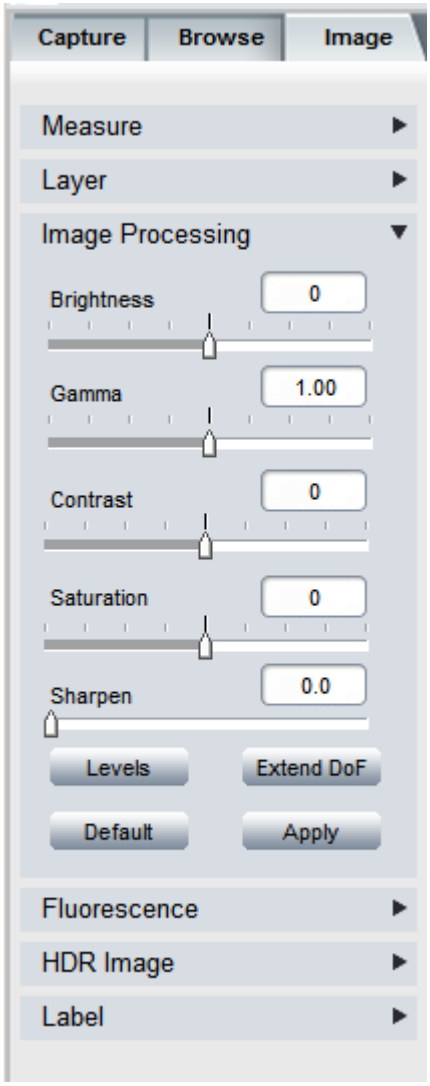


Image Management and Processing Shortcuts

MC provides some quick functions on the right hand side of the software.

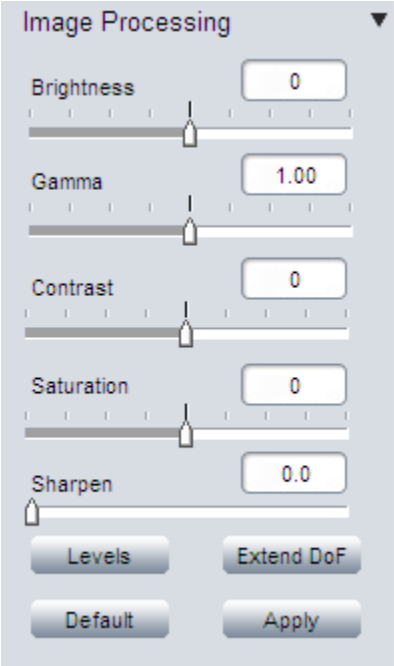


Chapter4: Image Processing



In this section, MC provides advanced image processing functions and also allows to do the measurement on the still images.

Image Processing



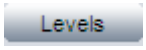
Provide basic stilled image processing functions and allows to extend the Depth of Focus.

Brightness	Adjust captured image brightness. Default brightness = 0
Gamma	Adjust captured image gamma. Default gamma = 1.00
Contrast	Adjust contrast. Increase the contrast, the shadows become darker and the highlights brighter. Decrease the contrast, the highlights grow dim and the dark areas lighten up
Saturation	Adjust the color saturation. Fully-saturated colors are very bright, while low saturation are grayish.
Sharpen	Adjust the image sharpness. Sharpness is the contrast on the edges. Sharpening increases the bright and dark lines on edges.
Levels	Adjust image levels. Get more details in [Fluorescence]>>[Levels]
Extend DoF	Extend the Depth of Focus (DoF)
Default	Restore Brightness, Gamma, Saturation, Sharpen and levels back to the default value
Apply	Confirm to apply all the settings to the image.

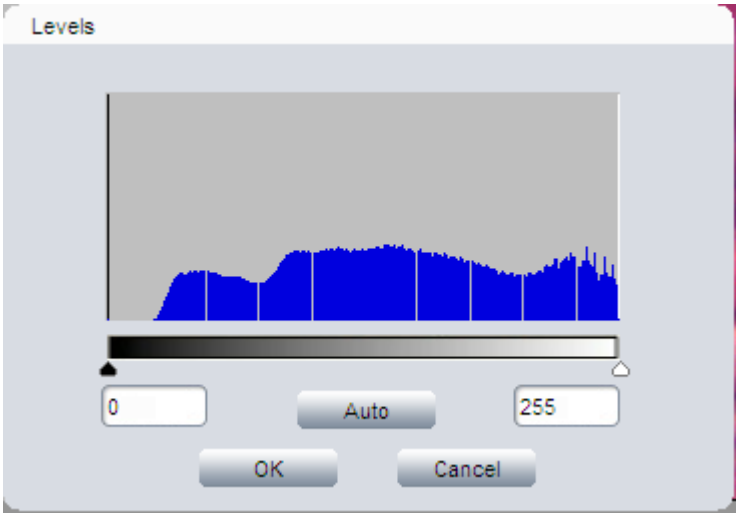
After click [Apply], all the settings are applied to the image. Then

you can NOT recovery to the original image.

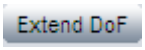
Level

Push [Levels] 

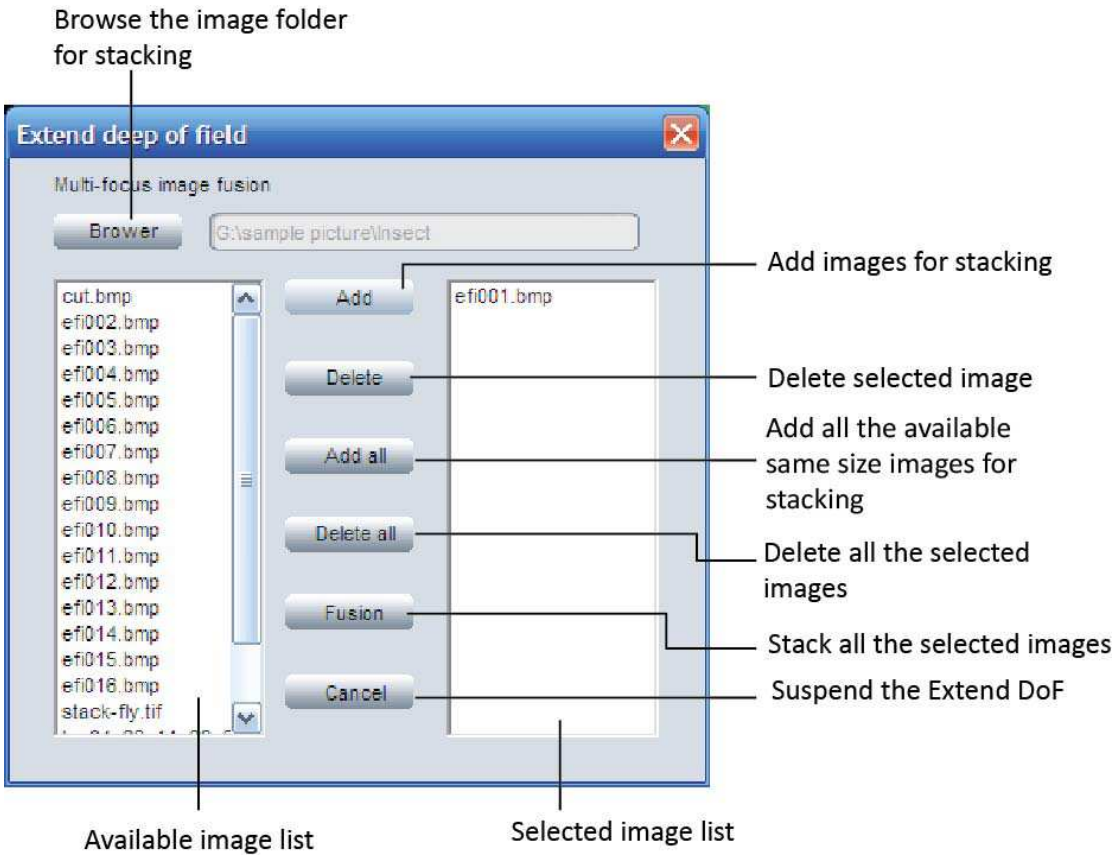
to get the image histogram. It allows to adjust the image levels. The level adjustment is the same as live image level adjustment. Get more detail in [Capture]-->> [Fluorescence].



Extend depth of focus

Push [Extend DoF] 

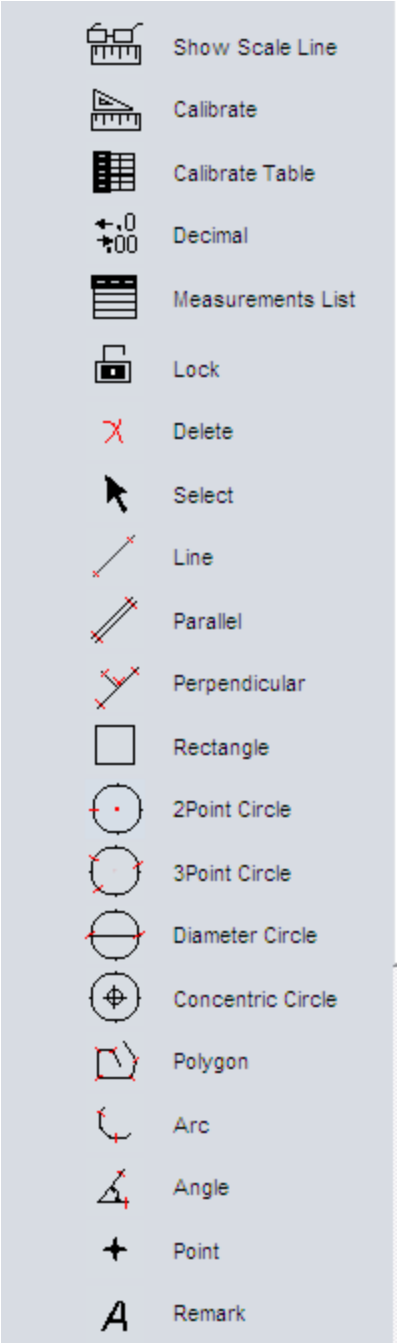
to get below dialog. Select the corresponding images and apply the function.



- Browse the image folder which are going to do the stacking.
- All the images in the folder will be listed on the left hand side. Click on one image, the image will be hightlight in BLUE.
- Click [Add] to add the highlighted image to the right hand side (the selected source images for stacking).
- [Add all] button allows to add all the same size images in the left hand side to the right as stacking source images by just one click.
- Click [Fusion] to stack all the selected source images and get an image with an extended depth of field.

When select a wrong image as stacking source, just click on it and then click [Delete] to remove it. [Delete all] will remove all the selected images.

Measure

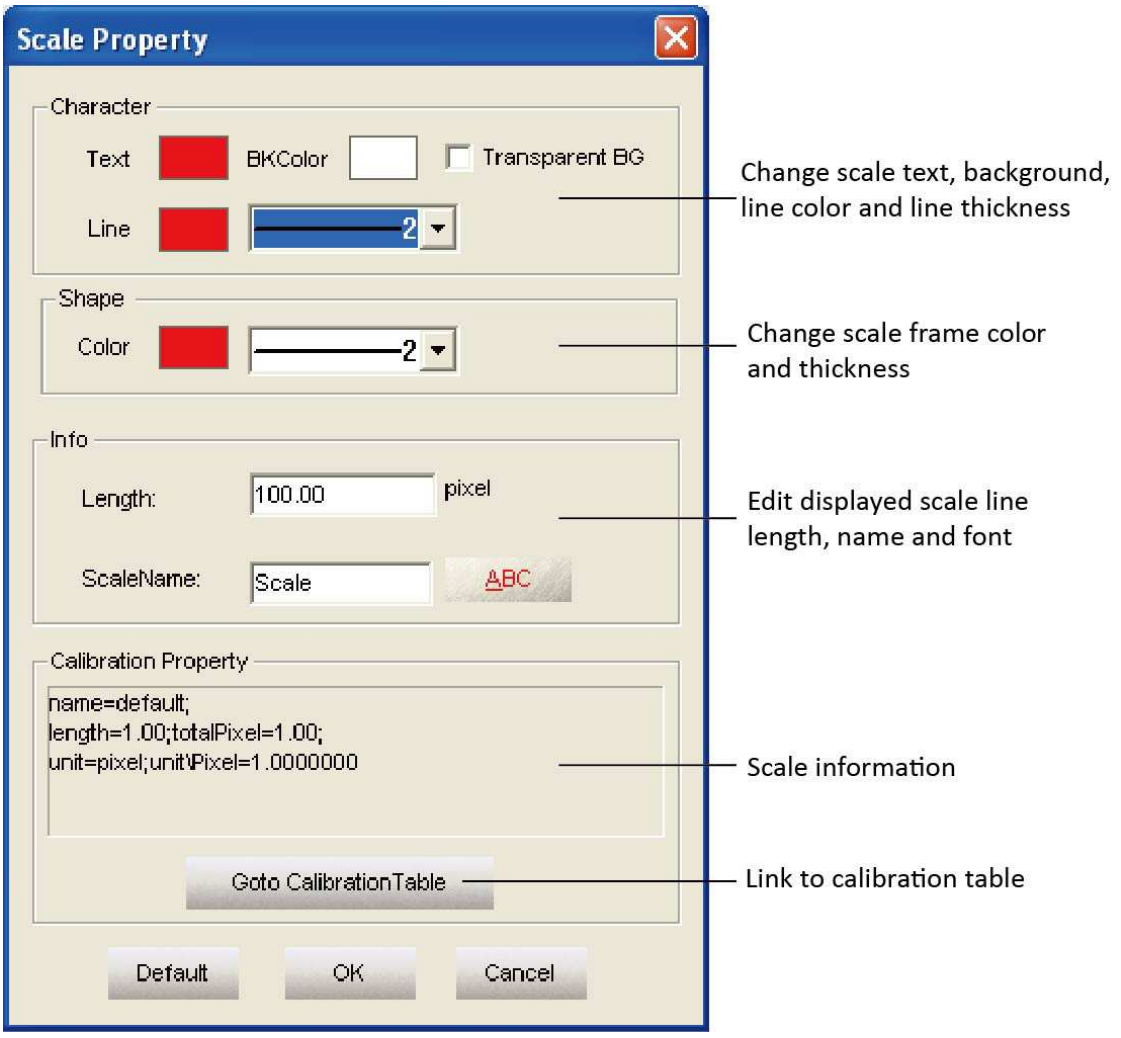


	Show Scale Line	On/off the scale line on the picture
	Calibrate	Create Calibration file
	Calibrate Table	Available calibration file list. Allow to add, edit and delete calibration file.
	Decimal	Set measurement precision. Allowed decimal range is from 0 to 7
	Measurement List	List all the measurement data
	UnLock/Lock	Unlock/lock the measurement operation. Allow to do same measurement continually when LOCKED
	Delete	Delete previous measurement. Select it then click on the measurement to delete the measurement.
	Select	Select to change measurement or the measurement data position
	Line	Measure the length
	Parallel	Measure the distance of parallel. Allow to do multiple parallels' distance measurement. Double clicking to end parallel measurement.
	Perpendicular	Measure the perpendicular length. Allow

		to do multiple perpendiculars' length measurement. Double clicking to end perpendicular measurement.
	Rectangle	Measure rectangle height, width, area and perimeter.
	2-points Circle	Use center point and point on the circle to draw a circle. Give the radius, area and perimeter of circle
	3-points Circle	Use 3 points on the circle to draw a circle. Give the radius, area and perimeter of circle
	Diameter Circle	Draw a circle according to the diameter. Give the radius, area and perimeter of circle
	Concentric Circle	Use center point and radius to draw concentric circles. Give concentric circles' radius, area and perimeter. Allow to do multiple concentric circles measurement. Double clicking to end concentric circles measurement
	Polygon	Measure polygon area and perimeter.
	Arc	Measure a curve angle, radius and length.

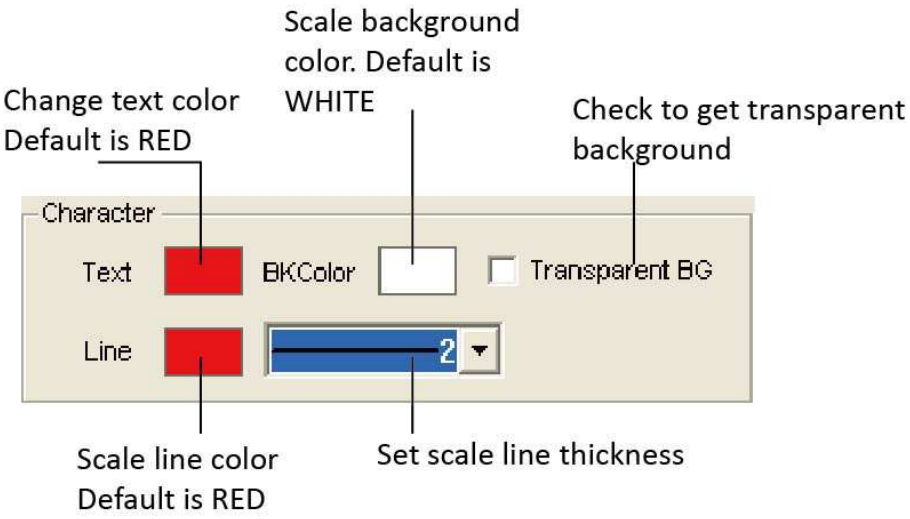
	Angle	Measure the angle
	Point	Counter. Count the quantity.
	Remark	Add remarks on the images.

Edit Scale Line

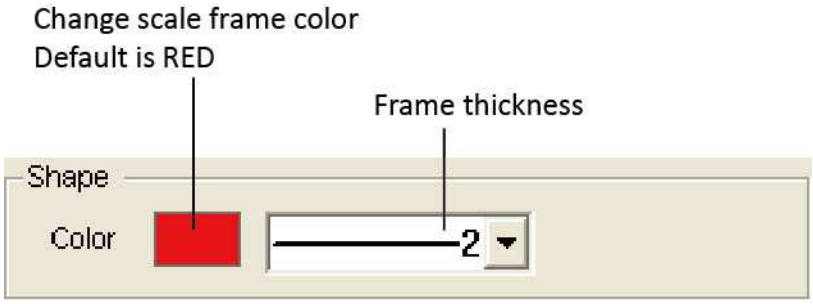


Double click on the scale to get this scale property.

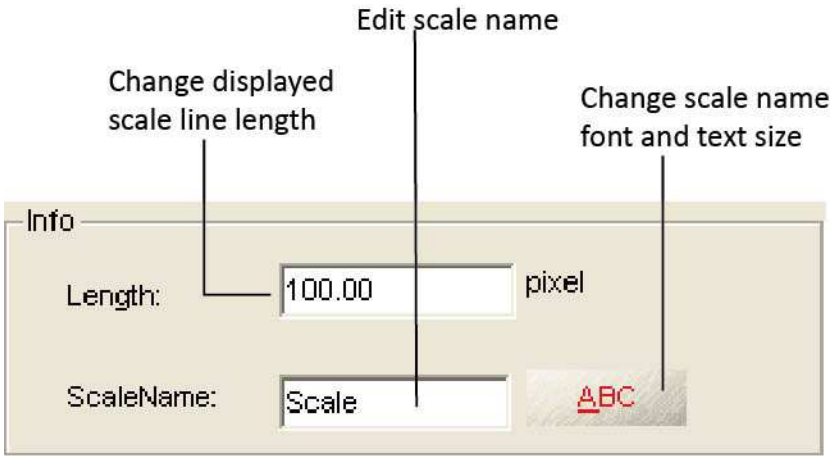
- Edit scale character



- Edit the frame of the scale



- Edit scale line length and name



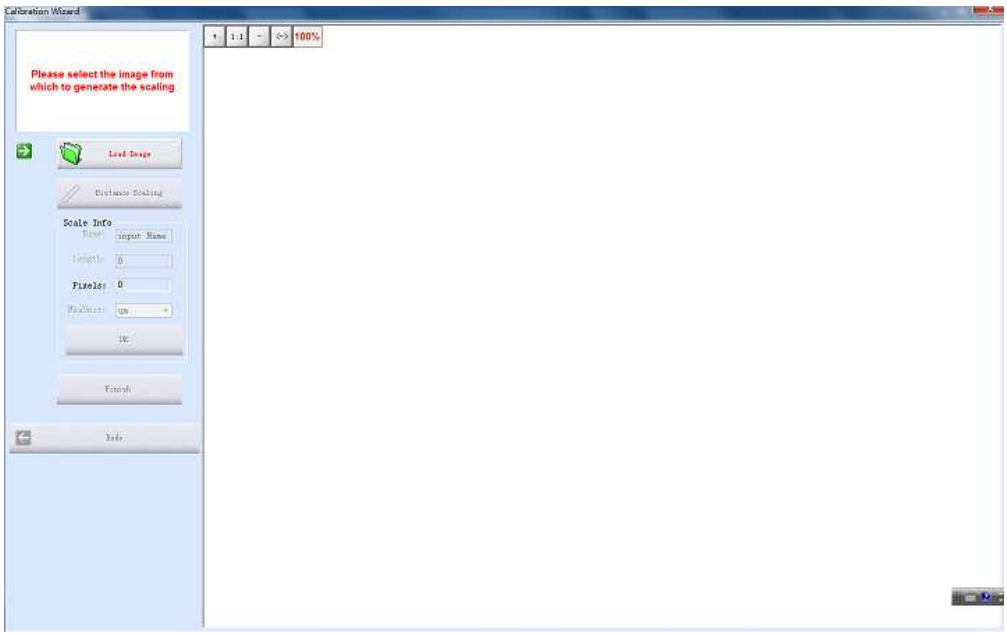
Create Calibration File

To measure the sample real size, the corresponding calibration file needs to be created first.

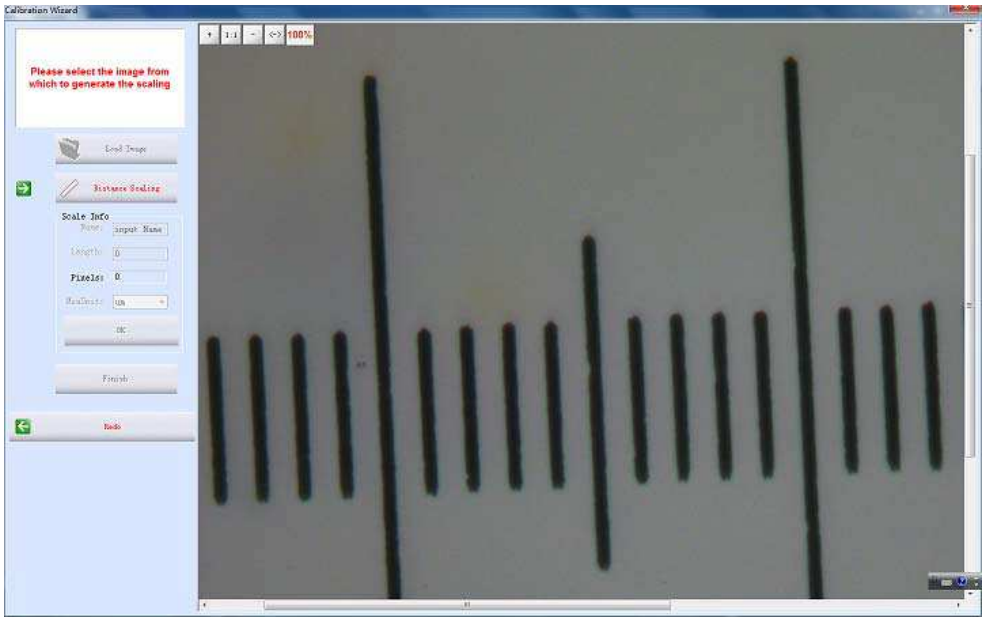
1. Take pictures of the calibration slide in the same working objectives and resolution (if the reduce lens is also used in your application, it also requires to take the calibration slide picture with the reduce lens attached).

If ONLY ONE objective and ONE resolution is used in the application, one calibration slide picture is enough. The calibration slide picture MUST be taken with exactly the same lens or microscope settings as the target image taken.

2. Click to start to create calibration file.

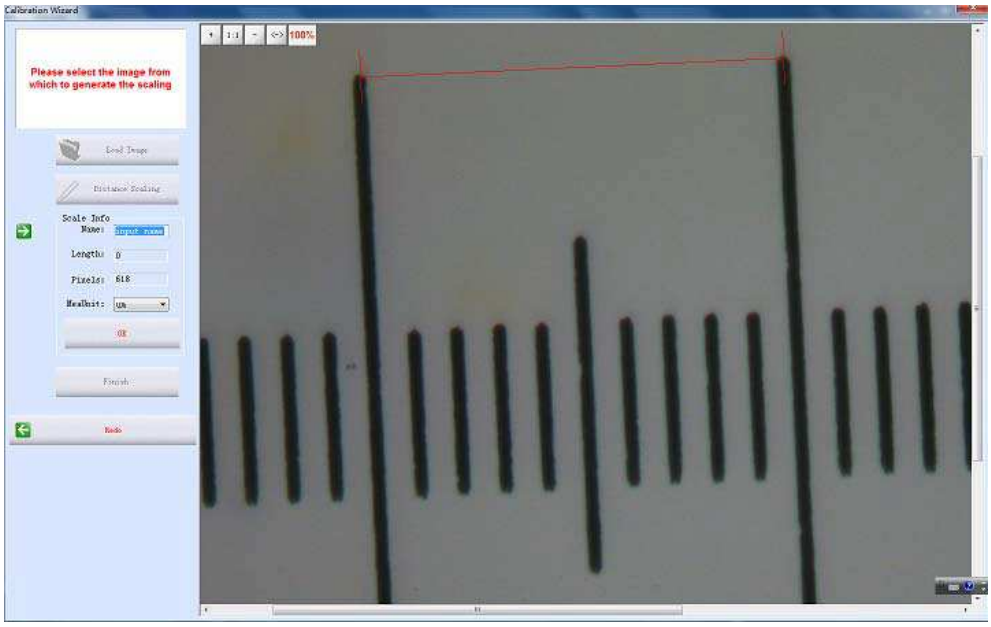


3. Click [Load Image] to load the calibration slide picture taken in Step1.



4. Click [Distance scaling] and move the cursor to the slide image, draw a line to get the reference length.

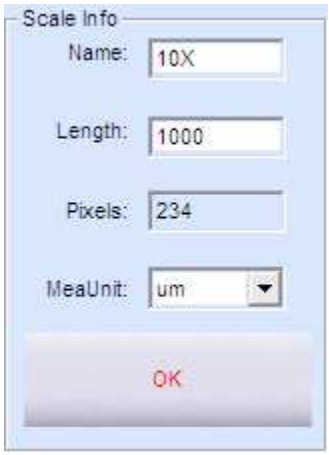
Using longer length as the reference length will give more accurate measurement result. For example, using 10 scale units as reference length will give more accurate result than using 1 scale unit.



5. Enter the name for the calibration file and the length of the line you draw.

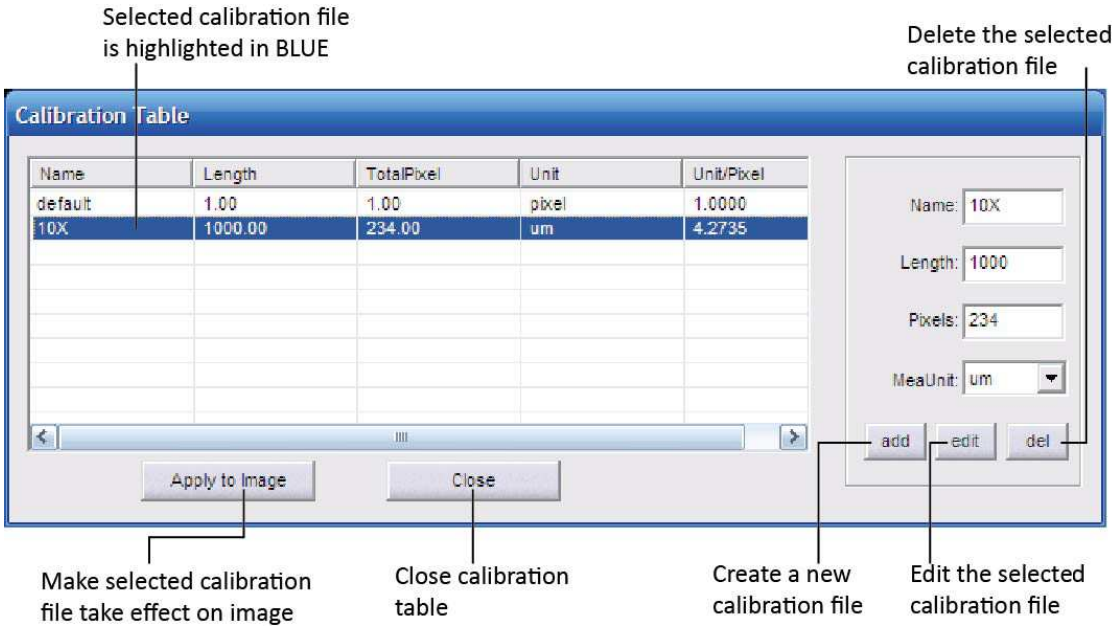
If you need more than one calibration file, using objective+reduce lens(if it is used)+resolution as the name of the calibration file is recommended. This can help to prevent using the wrong file to do the calibration.

When key in the length, please pay more attention to the calibration scale unit and the MeaUnit used here. For example, the calibration scale unit is 0.1mm; the MeaUnit is selected µm; and the reference length is 10 scale units, so the length should be 10 x 0.1mm x 1000 = 1000 µm.



6. Click [OK] to confirm the calibration. The new calibration file named "10X" is created in the [Calibrate Table].

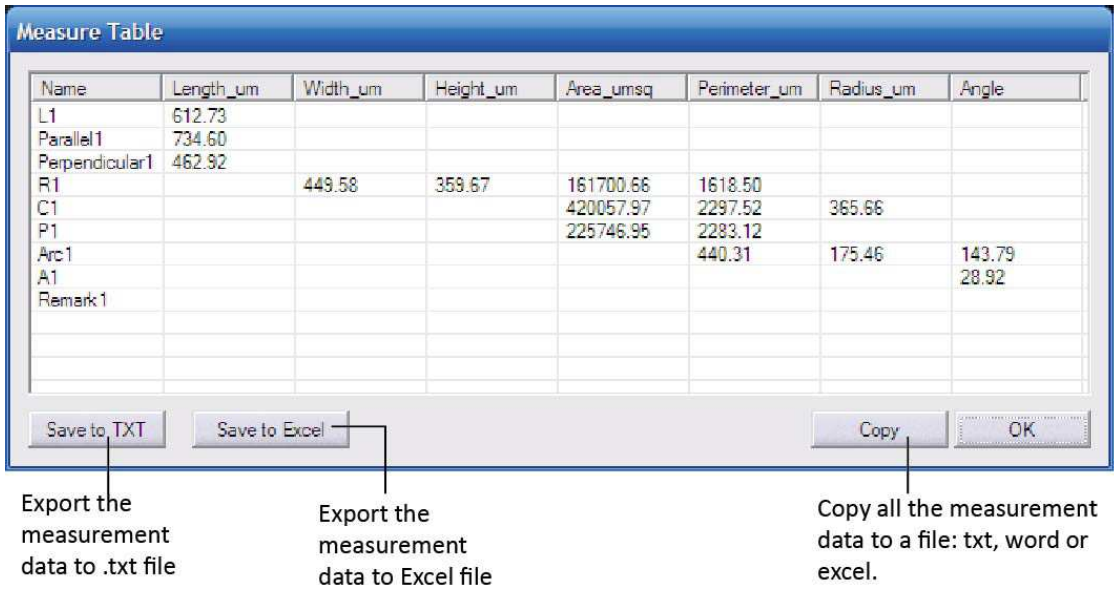
Calibration Table



- Click [Calibrate Table] to open the calibration table.
- Select the correct calibration file for current image measurement.

Using the WRONG calibration file will make the measurement result totally wrong. Please make sure the calibration file is correctly corresponding to the current image. Hence, it is useful to name the calibration file with the capturing settings.

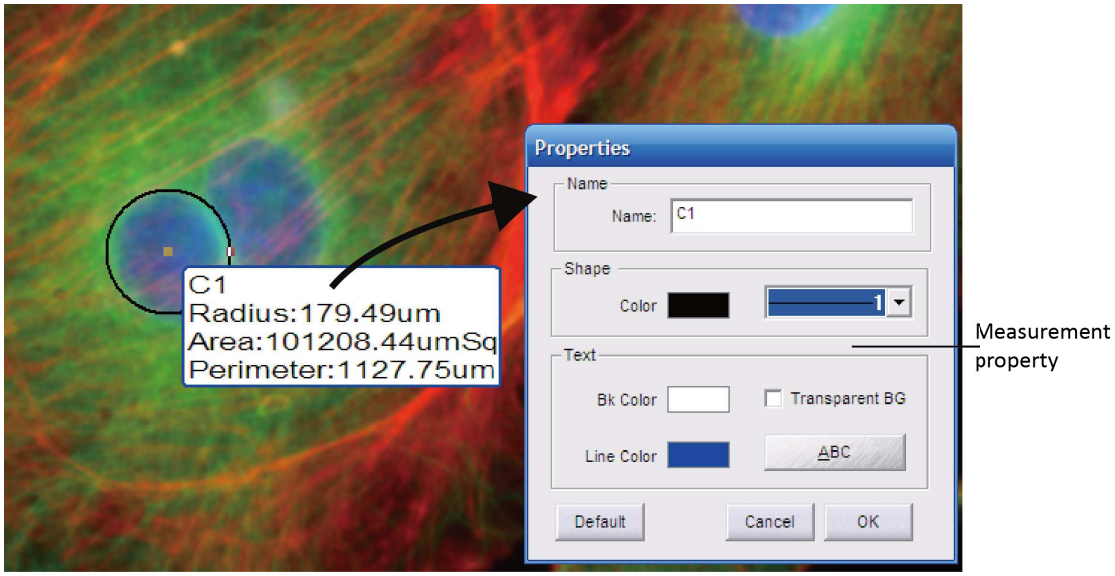
Measurement List



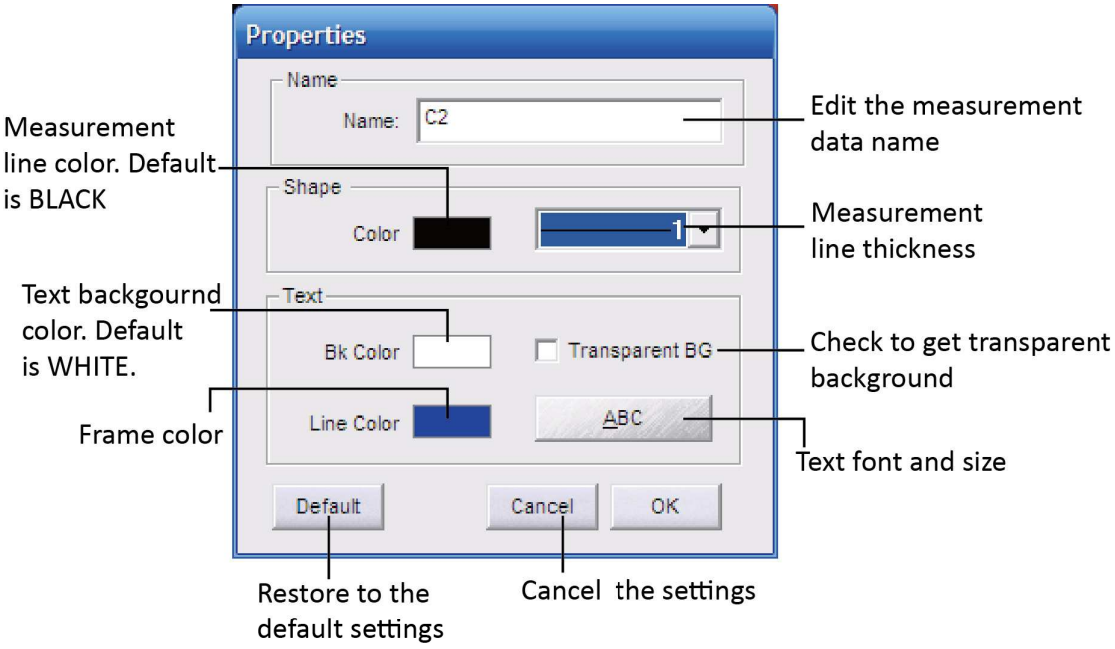
All the measurement data is listed in the [Measurement List]. It allows to export all the measurement data to the TXT or Excel file.

Measurement

MC allows to do the line, parallel, perpendicular, rectangle, circle, polygon, arc and angle measurement. The [Point] function allows to manually count the objects. And the [Remark] function offers to add comments on the images.



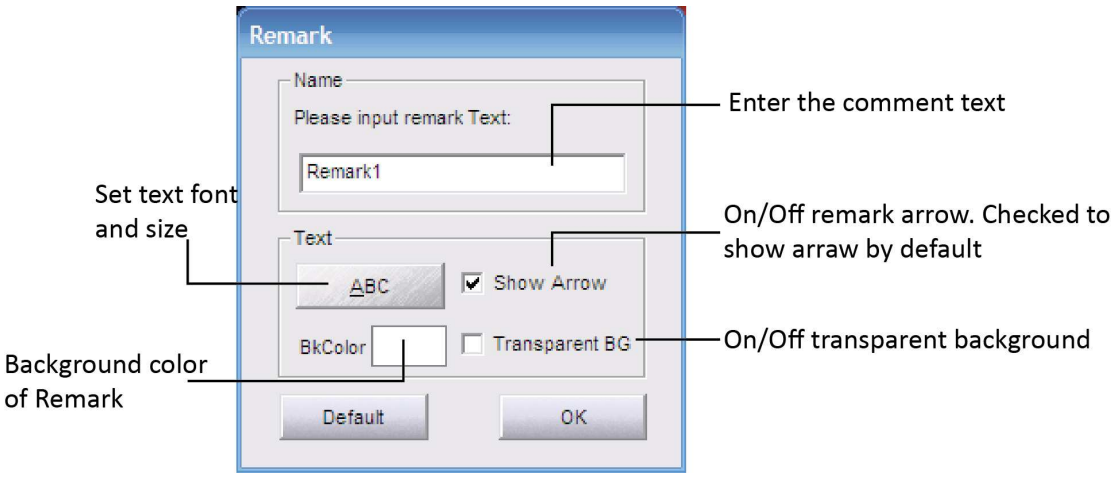
Double click on the measure data to get the measurement configure window. It allows to change the measure data name, color, thickness, background color and the character font.



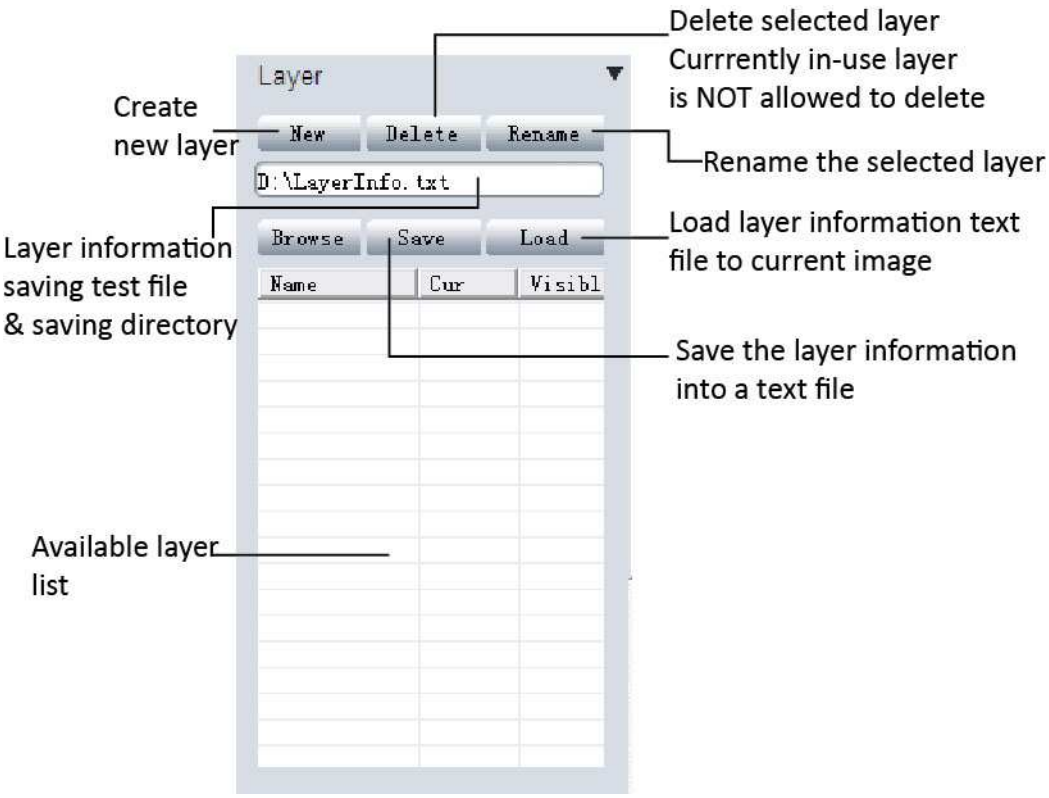
Remark

Select [Remark] and click on the image area which prefer to add remark. It allows to edit the comment, change the background color and on/off

the remark arrow.



Layer

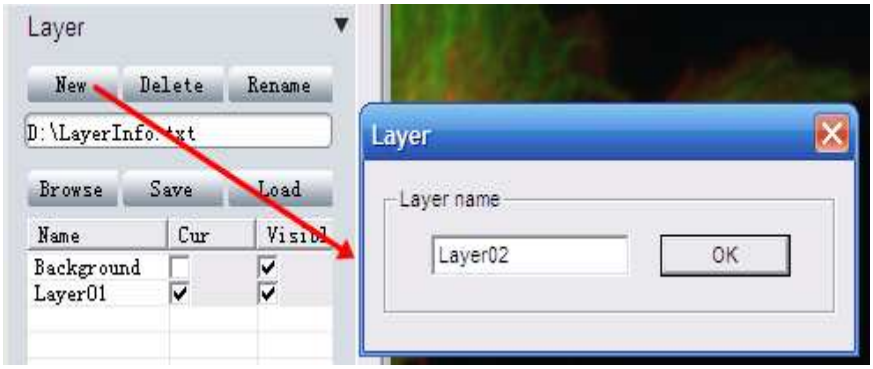


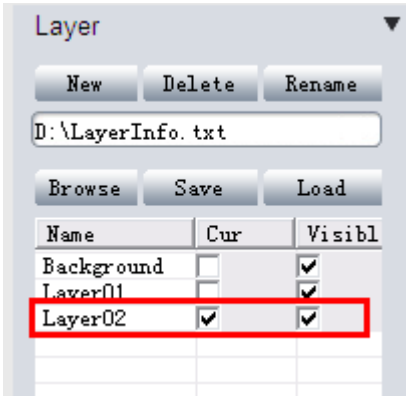
Create multiple layers for loads of measurement. The layer function makes the large number of measurements, processed image review

simple and easy.

If already apply some measurement on the image, the [Layer] function automatically create “Background” and “Layer01” for the current image.

Click [New] to create a new layer. Allow to key in the preferred name for the new layer. It uses “Layer02”, “Layer03”... etc as the layer name by default.

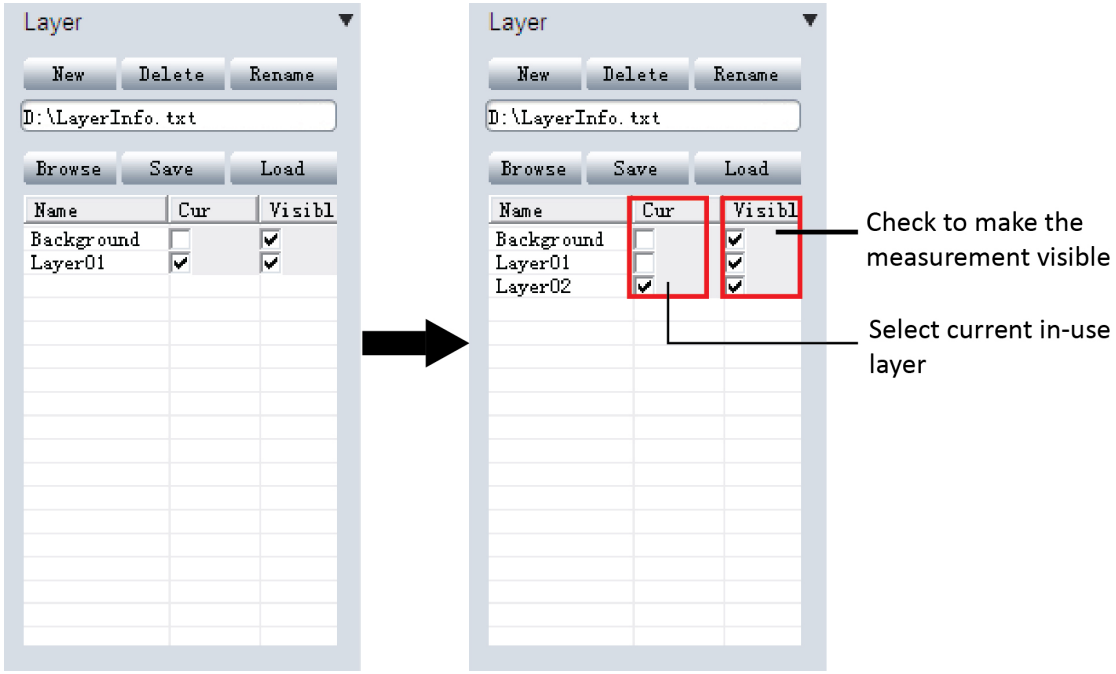


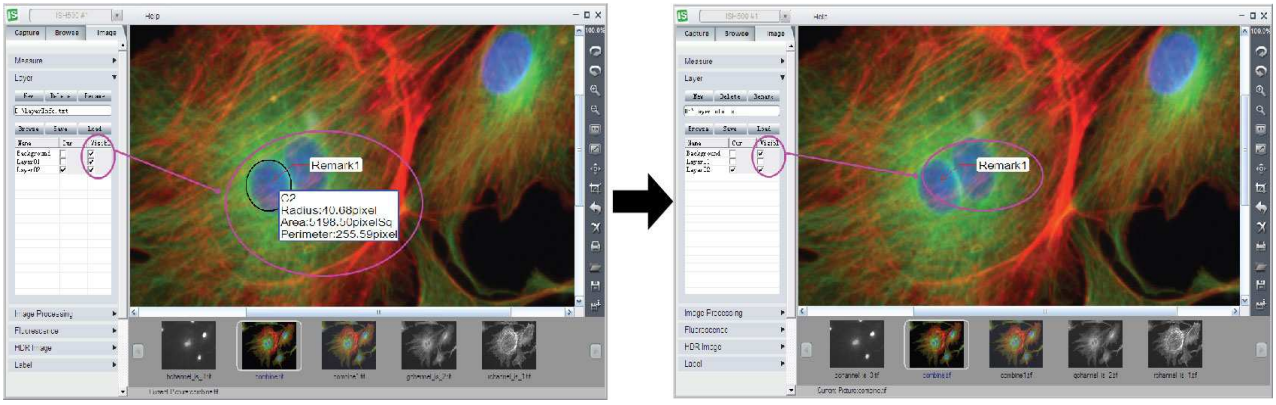


Now loads of measurements can be applied on different layers. It allows to choose any layers to view.

Checked [Cur] means the corresponding layer is displayed currently.

Select different [Cur] to switch between different layers. In the [Visible] column, the selected check box means all the measurements in the corresponding layers also display on the current layer. Uncheck the check box, the corresponding measurement will be invisible in current layer





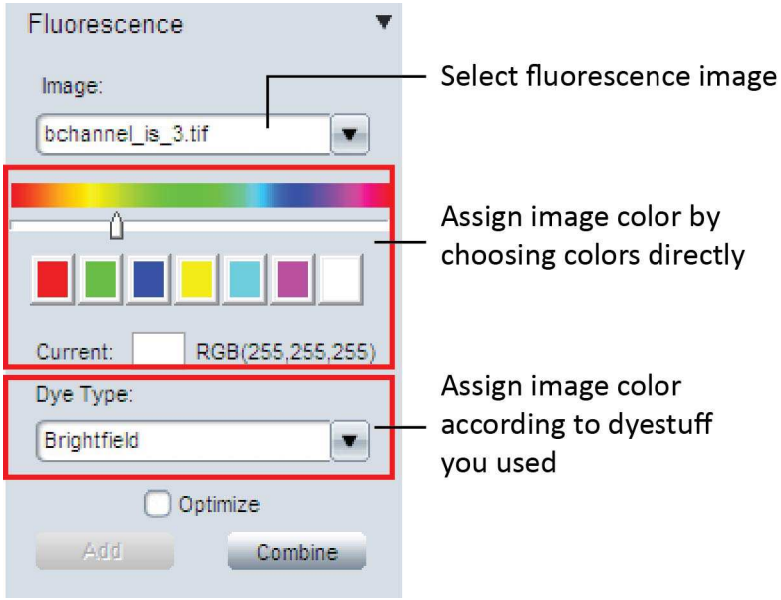
The layer information is saved in a text file.

- Click [Browse] to choose the text file saving directory and enter file name. Then click [Save] to save the current layer information in the

text file. The layer information will be saved as “LayerInfo.txt” in Disk D by default

- Click [Browse] to find the existed layer information text file. Click [Load] to load the layer information to the current image.

Fluorescence



This function is used to assign fluorescence images with different colors and combine them together into one images.

Step 1: Select fluorescence image and assign a color for it, then click [Combine] to start the combination.

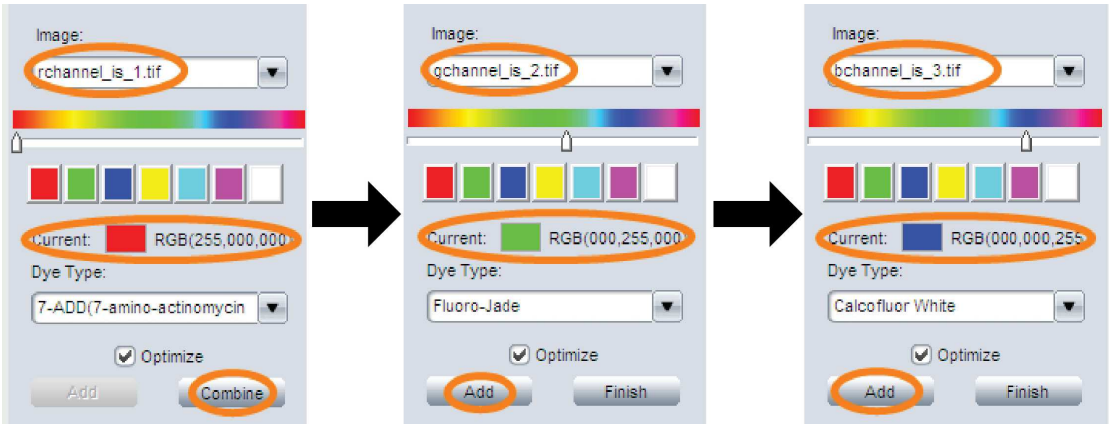
Two ways provided for color assignment:

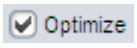
a. Click on the preferred color or slide to choose it.

b. Assign the color according to the dyestuff in the drop-down menu of [Dye Type].

Step 2: Select second image, assign a color, then click on [Add].

Step 3: Repeat **Step 2** to add more images for combination. When finish adding the images, click on [Finish] to get the combined images. The created new image is named as “combine”.





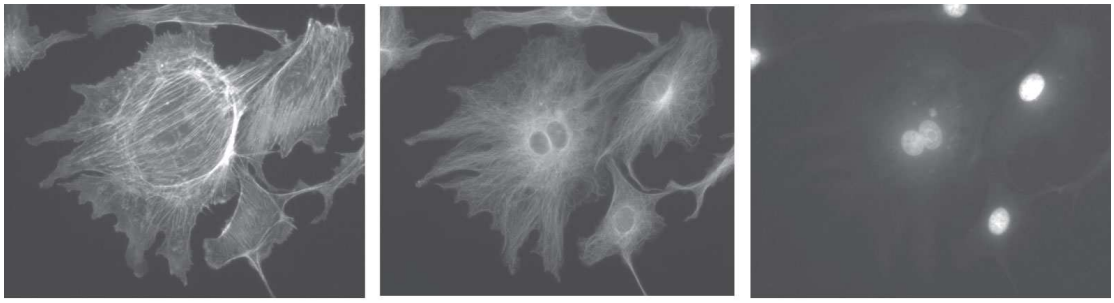
Optimize checkbox is recommended to select during the combination. It will optimize the combination to get a better image. But without optimization, the created image keep all the original information. No extra processing is applied to the image data.

After get the combined fluorescence image,

[Sharp] function in [Image Processing] can help to get sharper images and see more image details.

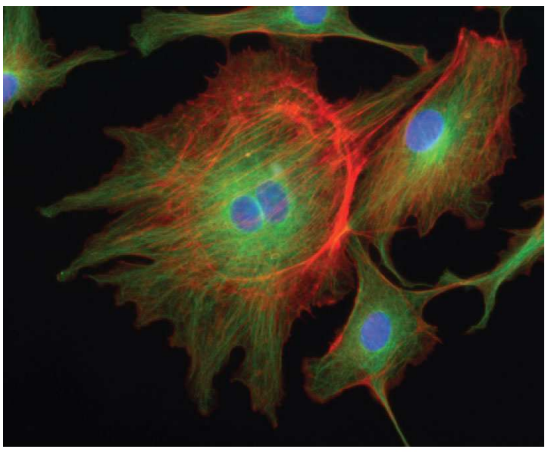
If make some mistake during combination operations, just click on [Finish] to close current operations and then restart the fluorescence combination.

Original images:

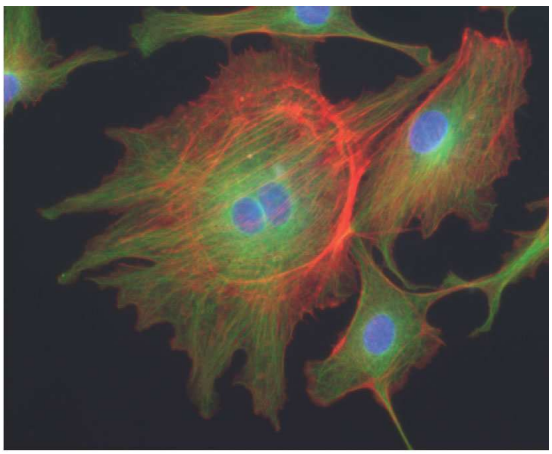


Original images

Combined image:

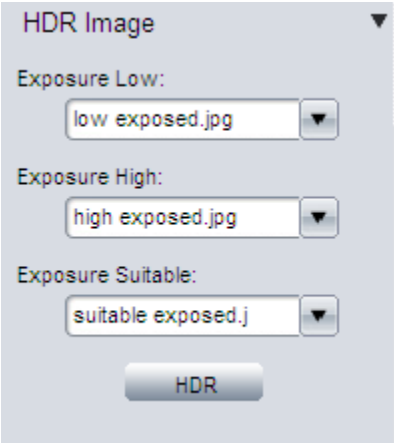


Combined image with optimization



Combined image without optimization

HDR Image

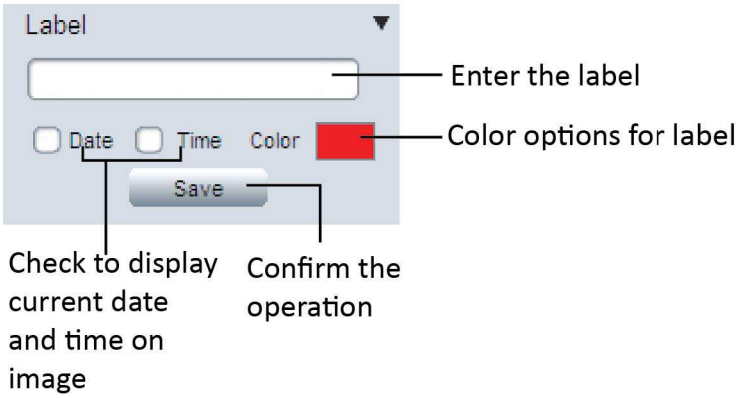


High Dynamic Range (HDR) image is used to get greater dynamic range image.

- Take pictures for one same scene with different exposure time and load them in the MC
- In the drop-down menu, select corresponding images for [Exposure Low], [Exposure High] and [Exposure Suitable].
- Push [HDR] button to combine different exposed images into one. The generated HDR image will be named as “hdr_image”.

If the different exposed images are not loaded in the MC yet, the shortcut on the right hand side of the MC allows you to browse any image simply.

Label



- The label text will be displayed on the lower right corner of the image.
- The date and time will be displayed on the top right corner of the image.
- After click [Save], the image with label will be saved as image file name+ _bak. For example, the original image file name is “IS.jpg”, then this image with label will be saved as “IS_bak.jpg”. So the original image is still kept.