
The X8FCAM4K Series Auto Focus HDMI/NETWORK/USB Multi-outputs C-mount CMOS Camera Help Manual



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1 X8FCAM4K Series Camera Application



Figure 1 The X8FCAM4K Series Camera

The **X8FCAM4K** series cameras come with an integrated high-precision autofocus system and support an extensive range of optical magnifications, enabling autofocus on designated areas of the field of view. Featuring high resolution, high output frame rates and superior image quality, they are perfectly suited for professional applications with stringent requirements for fine detail capture and accurate color reproduction.

The basic characteristic is listed as below:

- Sony large target surface / STARVIS 2 back-illuminated CMOS sensor
- High precision autofocus adjustment, supports an even wider range of optical magnifications, motor operating stroke: 17.46 mm
- With 10-bit ISP processing, it offers better color reproduction, remarkable sharpening and 3D noise reduction effects, and more accurate ROI white balance
- 4K HDMI/ NETWORK/ USB multiple video synchronous outputs
- 4K/1080P auto switching according to monitor resolution
- Support 4K 60fps low delay HDMI output mode, with an average delay of 80ms (X8FCAM4K8MPB)
- SD card/USB flash drive for captured image and video storage, customizable storage location and support local preview and playback
- Supports customized development based on neural network capabilities, including object recognition, counting, and detection functions
- Supports network storage function (images captured or videos recorded by the camera are saved in real time to network storage drives)
- Supports capture and display of JPEG, TIFF, PNG and RAW format images
- Supports external USB 3.0 interface solid-state drive, and supports automatic saving of recorded videos in case of sudden power failure
- Supports USB voice control module, enabling real-time control of the camera through voice commands for taking photos, recording videos, freezing, and other operations
- Provide real-time video EDF function and real-time Stitch function
- Provide two sets of default ISP parameters for biological microscope and stereo microscope
- Provide multiple focusing methods; The focus mode and the size of the focusing area can be modified; Provide AF+EDF, Provide Auto EDF, facilitating the synthesis of high depth of field images in multiple focus areas at high magnification
- New UI interface, the browsing interface provides rich file operation functions, image to image comparison, image to real-time video comparison, multi-image EDF function, multi-image Stitch function
- Embedded XCamView for the control of the camera and image processing, supporting automatic edge finding and measurement functions
- ToupView/ToupLite software for PC
- iOS/Android applications for smart phones or tablets

2 X8FCAM4K Series Camera Datasheet and Functions

Order Code	Sensor & Size(mm)	Pixel(μm)	G Sensitivity Dark Signal	Sensor Output (FPS/Resolution)	Binning	Exposure(us)
X8FCAM4K16MPA	IMX383(C) 1/1.1"(13.06x7.34)	2.4x2.4	470mv with 1/30s 0.21mv with 1/30s	60@5440*3060	1x1	41~10 ⁶
X8FCAM4K8MPB	IMX585(C) 1/1.2"(11.14x6.26)	2.9x2.9	5970mv with 1/30s 0.13mv with 1/30s	90@3840*2160	1x1	59~10 ⁶

Camera Model	Video Saving (FPS/Resolution)	Picture	HDMI2.0 (FPS/Resolution)	USB3.0 (FPS/Resolution)	NETWORK (Max FPS/Resolution)
X8FCAM4K16MPA	60@3840*2160	5440*3060	60@3840*2160 60@1920*1080	25@5440*3060 45@2688*1512 60@1920*1080	30@3840*2160 60@1920*1080 60@1280*720
X8FCAM4K8MPB	90@3840*2160	3840*2160	60@3840*2160 60@1920*1080	30@3840*2160 45@2688*1512 60@1920*1080	30@3840*2160 60@1920*1080 60@1280*720



Figure 2 Available Ports on the Back Panel of the Camera Body

Interface or Button	Function Description
USB Mouse	Connect USB mouse for easy operation with embedded XCamView software Connect USB voice control for enable real-time control of camera snap, recording, freezing, and other operations
USB3.0	Connect USB flash drive to save pictures and videos Connect 5G WiFi module to transfer video wirelessly in real time Connect USB microphone to record audio and video Connect USB voice control for enable real-time control of camera snap, recording, freezing, and other operations
USB Video	Connect PC or other host device to realize video image transmission
HDMI	Comply with HDMI2.0 standard. 4K/1080P format video output and supporting automatic switch between 4K and 1080P format according to the connected monitors
LAN	LAN port to connect router and switch to transfer video
SD	SD card slot, comply with SDIO3.0 standard and SD card could be inserted for video and images saving
ON/OFF	Power switch
LED	LED status indicator
DC12V	Power adapter connection (12V/2A)
Video Output Interface	Function Description
HDMI Interface	Comply with HDMI2.0 standard; 60fps@4K or 60fps@1080P
LAN Interface	Support real time resolution switching(4K/1080P/720P) H264 encoded video DHCP configuration or manual configuration Unicast/multicast configuration
WiFi Interface	Connecting 5G WiFi adapter (USB3.0 slot) in AP/STA mode
USB Video Interface	Connecting USB Video port of PC for video transfer MJPEG/NV12 format video Note: When the preview resolution of X8FCAM4K16MPA is set to 5440*3060, the NV12 format cannot be used
Other Function	Function Description
Video Saving	Video format: 8M (3840*2160) H264 encoded MP4 file Maximum Video saving frame rate: 60fps(X8FCAM4K16MPA);90fps(X8FCAM4K8MPB)

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Image Capture	16M (5440*3060, X8FCAM4K16MPA) JPEG/TIFF/RAW/PNG image in SD card or USB flash drive 8M (3840*2160, X8FCAM4K8MPB) JPEG/TIFF/RAW/PNG image in SD card or USB flash drive (Default SD card priority, priority can be modified in settings)
Measurement Saving	Measurement information saved in different layer with image content Measurement information is saved together with image content in burn in mode
ISP	Exposure(Automatic / Manual Exposure) / Gain, White Balance(Manual / Automatic / ROI Mode), Sharpening, 3D Denoise, Saturation Adjustment, Gamma Adjustment, Contrast Adjustment, Brightness Adjustment, Hue Adjustment, Color to Gray, 50HZ/60HZ Anti-flicker, Dark Enhance, Clarity Enhance, Purple Reduction, Brightness Enhance Function
Image Operation	Zoom In/Zoom Out (Up to 10X), Horizontal/Vertical Flip, Freeze, EDF, Stitch, Grids, Overlay, PIP, Auto Focus Browser (including Picture Browsing, Video Playback, Video Compare, Picture Compare, EDF, Stitch, Image Processing), Measurement Function
Embedded RTC(Optional)	To support accurate time on board
Restore Factory Settings	Restore camera parameters to its factory status
Multiple Language Support	English / Simplified Chinese / Traditional Chinese / Korean / Thailand / French / German / Spanish / Japanese / Italian / Russian / Dutch / Portuguese
Software Environment under Network/USB Video Output	
White Balance	Auto White Balance
Color Technique	Ultra-Fine Color Engine
Capture/Control SDK	Windows/Linux/macOS/Android Multiple Platform SDK(Native C/C++, C#/VB.NET, Python, Java, DirectShow, Twain, etc)
Recording System	Still Picture or Movie
Operating System	Microsoft® Windows 8 / 8.1 / 10 / 11(32 & 64 bit) OSx(Mac OS X) Linux
PC Requirements	CPU: Equal to Intel i3 12100F or Higher
	Memory: 16GB or More
	USB interface: USB 2.0 interface or higher
	Ethernet Port: RJ45 Ethernet Port
	Display:19" or Larger
	CD-ROM
Operating Environment	
Operating Temperature (in Centidegree)	-10°~ 50°
Storage Temperature (in Centidegree)	-20°~ 60°
Operating Humidity	30~80%RH
Storage Humidity	10~60%RH
Power Supply	DC 12V/2A or above Adapter

3 Dimension of X8FCAM4K Series Camera

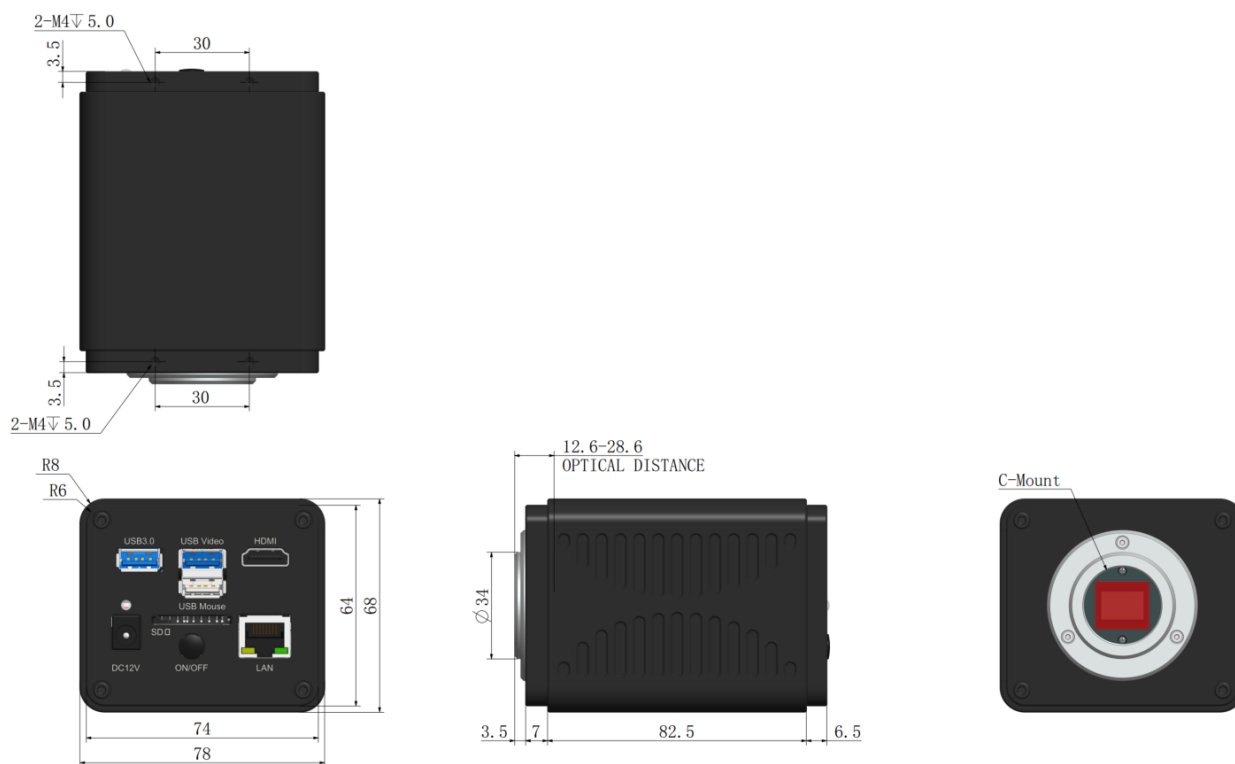


Figure 3 Dimension of X8FCAM4K Series

4 X8FCAM4K Series Camera Packing Information



Figure 4 X8FCAM4K Series Camera Packing Information

Standard Packing List	
A	Gift box : L:25.5cm W:17.0cm H:9.0cm (1pcs, 1.7Kg/ box)
B	X8FCAM4K Series Camera
C	Power Adapter: Input: AC 100~240V 50Hz/60Hz, Output: DC 12V 2A American standard: Model: POWER-U-12V2A(MX24Z1-1202000): UL/CE/FCC European standard: Model: POWER-E-12V2A(MX24Z1-1202000): UL/CE/FCC
D	USB Mouse
E	HDMI2.0 Cable
F	USB3.0 A male to A male gold-plated connectors cable /1.5m
Optional Accessory	
G	Voice Control Module
H	SD Card (32G or above; Speed: class 10)
I	USB flash drive (USB3.0)
J	Ethernet cable
K	USB WiFi adapter (Shape will vary with different models)

5 Software and App

The software or the APP can be downloaded from the following link :

Windows: <https://www.touptekphotonics.com/download/>

macOS: <https://www.touptekphotonics.com/download/?category=macOS>

Linux: <https://www.touptekphotonics.com/download/?category=Linux>

Android: <https://www.touptekphotonics.com/download/?category=Android>

iOS: <https://www.touptekphotonics.com/download/?category=iOS>

6 X8FCAM4K Series Camera Configurations

You can use the X8FCAM4K series camera in 5 different ways. Each application requires different hardware environment.

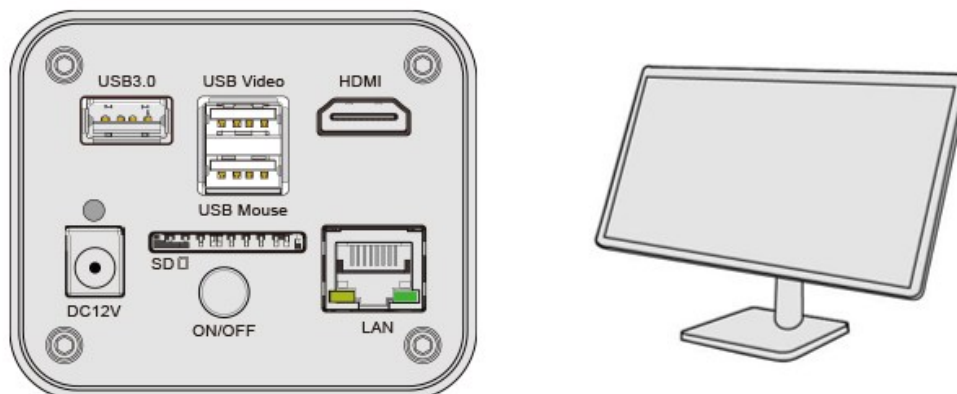
6.1 Camera working standalone with built-in XCamView software

For this application, apart from the microscope, you only need an HDMI monitor, the supplied USB mouse, and the camera embedded [XCamView](#) software. A computer or a network connection is not required to operate the camera in this application. The steps to start the camera are listed as below:

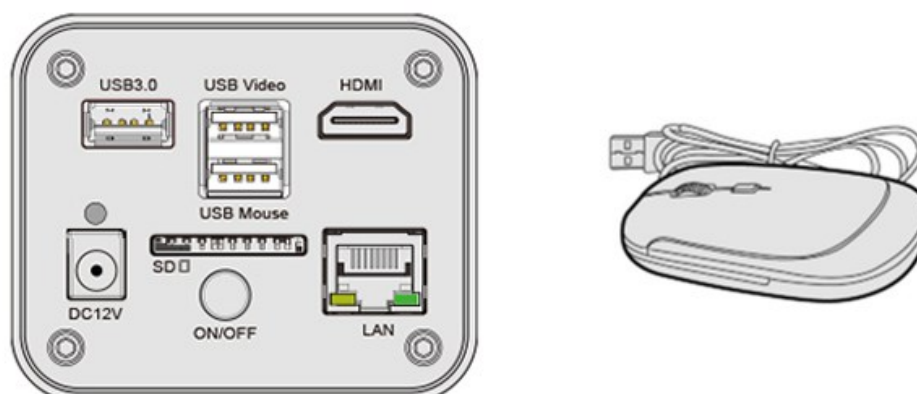


Figure 5 X8FCAM4K Series Camera with the HDMI Monitor

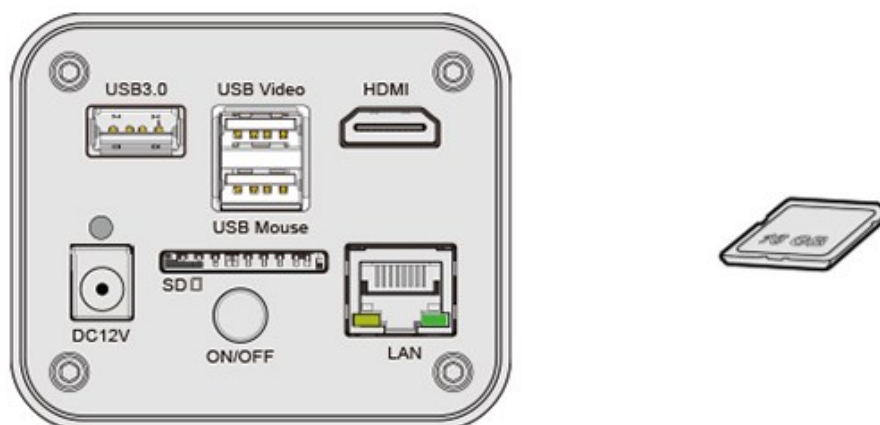
Connect the camera to a HDMI monitor using the HDMI cable;



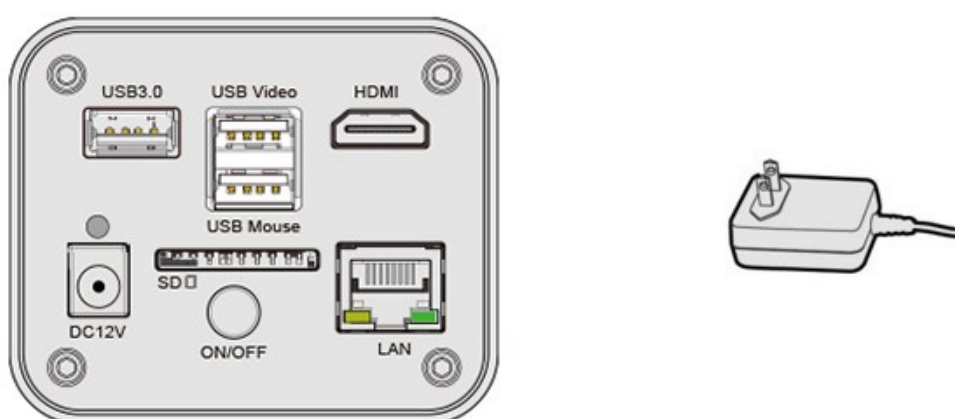
Insert the supplied USB mouse to the camera's USB Mouse port;



Insert the supplied SD card/USB flash drive into the X8FCAM4K series camera SD card slot/USB3.0 slot;



Connect the camera to the power adapter and turn it on;



Turn on the monitor and view the video in the [XCamView](#) software. Move the mouse to the left, top or bottom of the [XCamView](#) UI, different control panel or toolbar will pop up and users could operate with the mouse at ease.



Figure 6 XCamView and X8FCAM4K Series Camera in HDMI Mode

6.2 Connecting camera to computers with USB3.0 port

For Windows user (Windows 8/10/11 (32/64 bit)), please use [ToupView](#).

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For [macOS](#) and [Linux](#) user (macOS 10.10 or above or [Linux](#) distributions with kernel 2.6.27 or higher), please use [ToupLite](#). The steps to start the camera are listed below:

Start the camera according to Sec. 6.1. After the camera is running, connect camera to computer with USB cable. Please use “[USB Video](#)” slot, The upper left corner of the HDMI graphics interface displays “[USB3.0 Mode](#)” or “[USB2.0 Mode](#)”, indicating that a connection has been established with the PC.



Install [ToupView/ToupLite](#) on your PC or install [ToupView App](#) on the mobile device; Run the software [ToupView/ToupLite](#), clicking the camera name in the [Camera List group](#) to start the live video as shown in Figure 7.

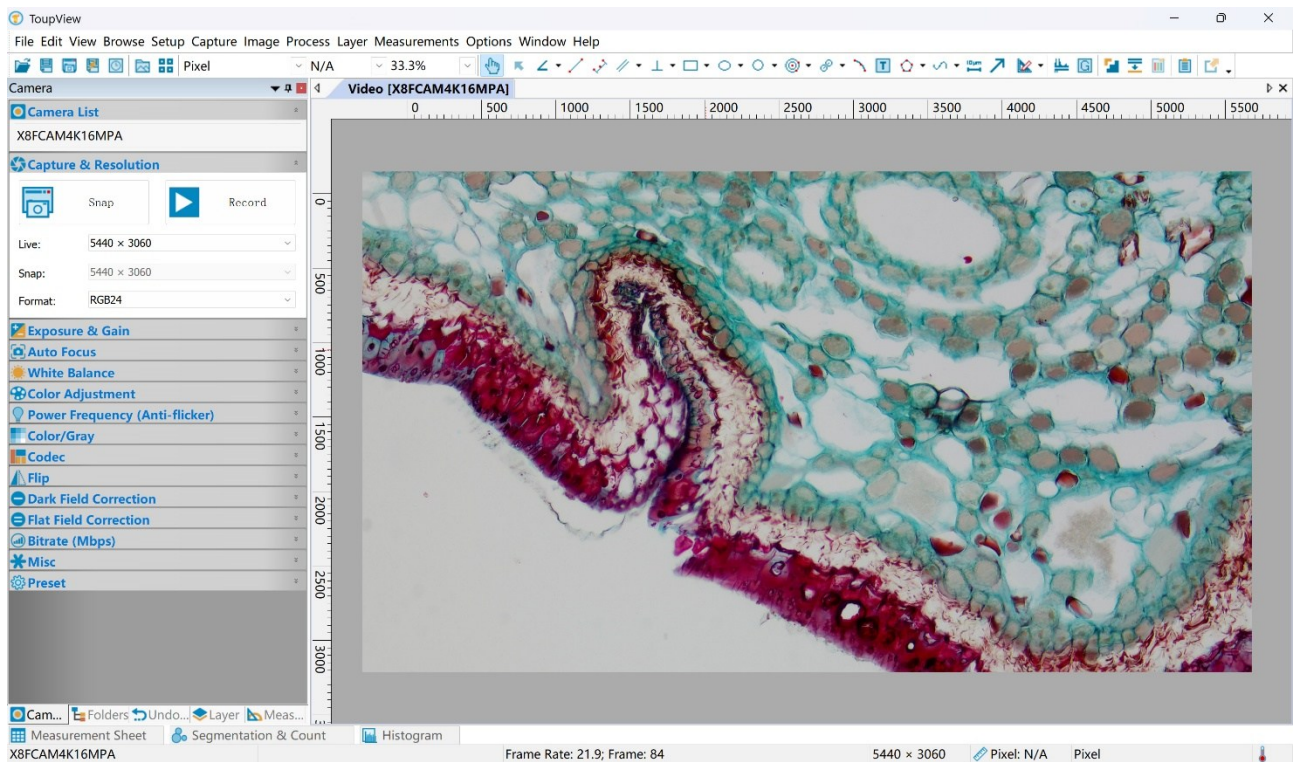


Figure 7 ToupView and X8FCAM4K Series Camera in USB Mode

6.3 Camera working in WiFi mode (AP mode)

Please make sure your PC is [WiFi](#) enabled.



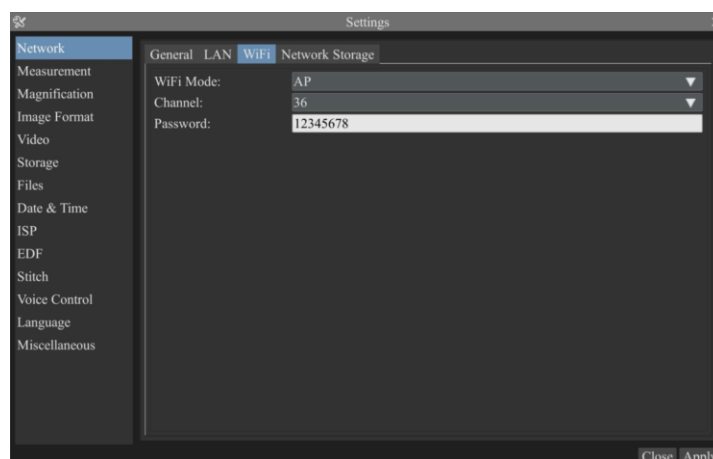
Figure 8 The PC or Mobile Device Connect to the Camera through WiFi

For Windows user (Windows 8/10/10/11 (32/64 bit)), please use [ToupView](#).

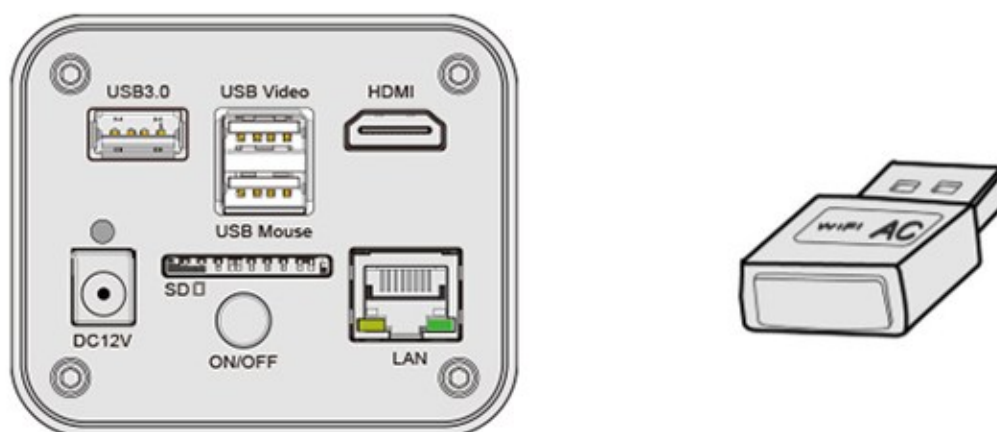
For [macOS](#) and [Linux](#) user ([macOS](#) 10.10 or above or [Linux](#) distributions with kernel 2.6.27 or higher), please use [ToupLite](#). When connecting the camera with a mobile device, the free [ToupView App](#) is required. Just make sure that the mobile device uses iOS 11 or higher/Android 5.1 or higher operating systems.

The steps to start the camera are listed below:

Start the camera according to Sec. 6.1. After the camera is running, move the mouse to the bottom of the GUI and clicking the  button on the [Synthesis Camera Control Toolbar](#) at the bottom of the video window, a small window called [Settings](#) will pop up as shown below. Click [Network](#)> [WiFi](#) property page and choose the [AP](#) in the [WiFi Mode](#) edit box(The factory default configuration is [AP](#) mode).

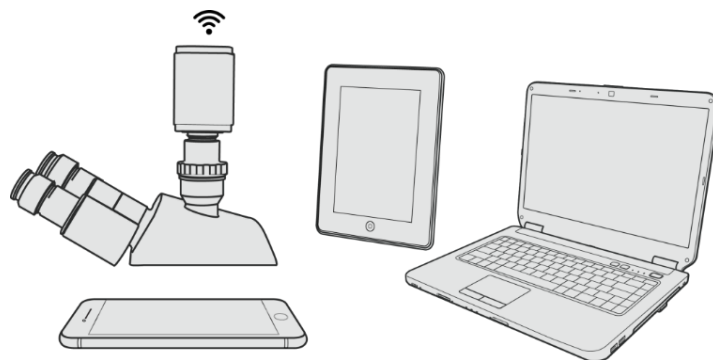


Plug the [USB WiFi](#) adapter into the camera's USB3.0 port, the upper left corner of the HDMI graphics interface will display "[AP mode](#)";



Install [ToupView/ToupLite](#) on your PC or install [ToupView App](#) on the mobile device, connect the PC or mobile device to the camera's [WiFi AP](#) point; The network name (SSID) and the [WiFi](#) password (The default one is 12345678)

can be found on the camera's [Setting>Network> WiFi](#) page in [AP](#) mode.



Start [ToupView/ToupLite](#) software or [ToupView App](#) and check the configuration. Normally, the active X8FCAM4K series cameras will be automatically recognized. The live image of each camera is shown in Figure 9. For the display, the [Camera List](#) group is used in [ToupView/ToupLite](#) software, and the [Camera Thumbnail](#) is used in [ToupView App](#).

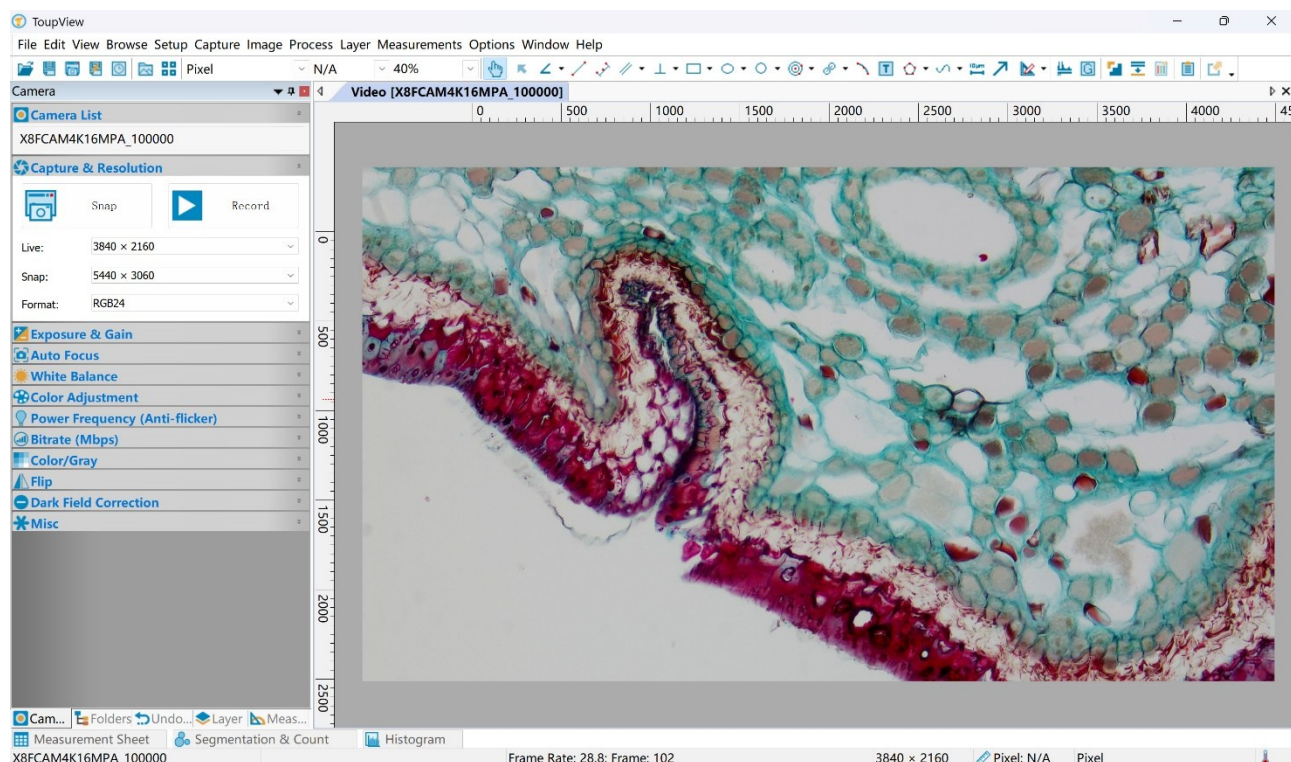


Figure 9 ToupView and X8FCAM4K Series Camera in WiFi AP Mode

6.4 Connecting camera to the PC with LAN port

This application uses the camera as the network camera. User must configure the IP of the camera and PC manually and ensure their IP addresses in the same net. The subnet mask and gateway of the camera and PC must be the same.

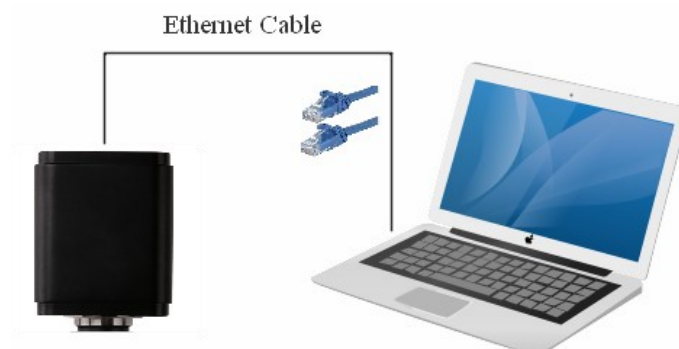


Figure 10 Connecting theX8FCAM4K Series Camera with Ethernet Cable to the PC

Start the camera according to Sec. 6.1 after the camera is running, clicking  button on the [Synthesis Camera Control Toolbar](#) at the bottom of the video window(See Figure 6), a small window called [Settings](#) will pop up as shown below on the left side, clicking [LAN](#) property page, uncheck the DHCP item. Input [IP Address](#), [Subnet Mask](#) and [Default Gateway](#) for the camera. Designate [Internet Protocol Version 4 \(TCP/IPv4\) Settings](#) page's IP address on the PC with similar configuration as shown below on the right side but with different [IP address](#).

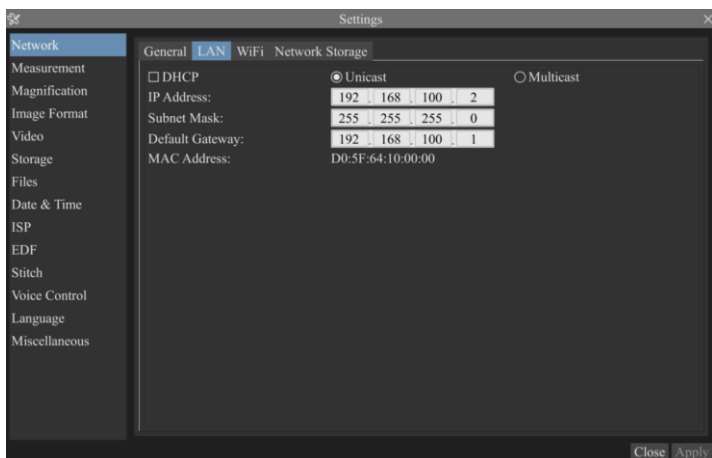


Figure 11 Configure the X8FCAM4K Series Camera IP

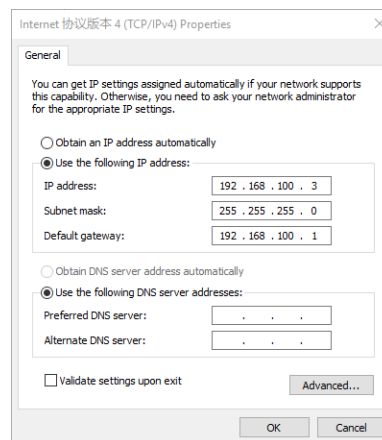
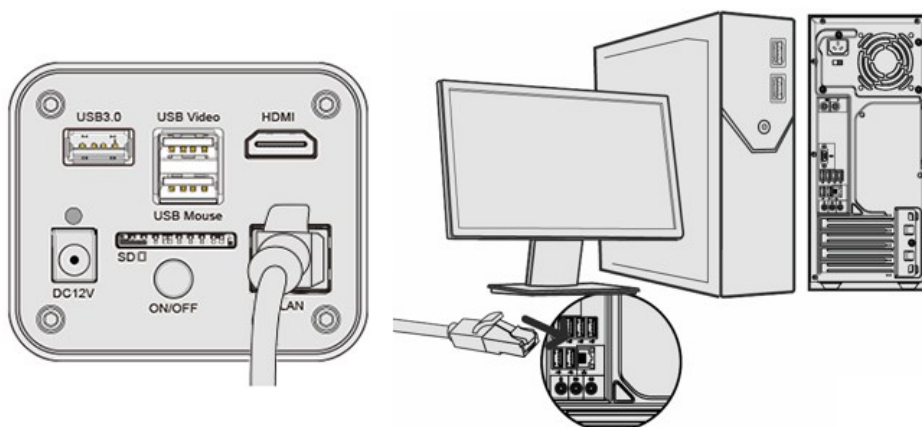


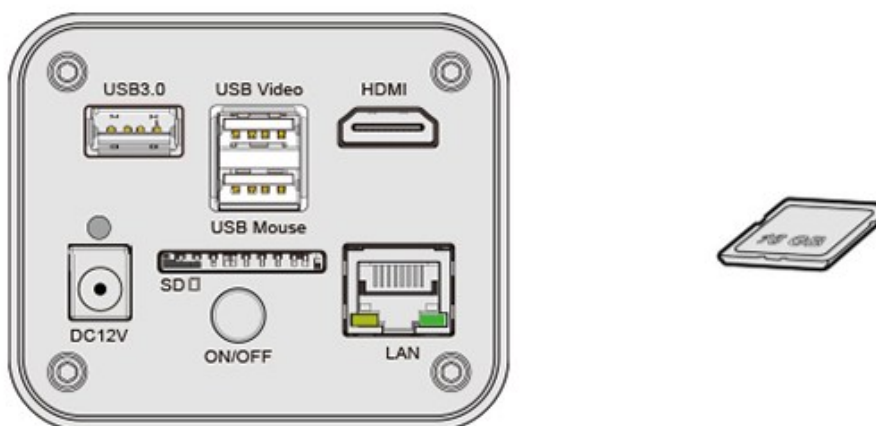
Figure 12 Configure the PC's IP

After the above configurations are finished, user can connect the X8FCAM4K series camera to the computer through the Ethernet cable as shown below:

Connect the [LAN](#) port with the Ethernet cable to the PC's network port, the upper left corner of the HDMI graphics interface will display [IP address](#);



Insert the supplied SD card/USB flash drive into the X8FCAM4K series camera's SD card slot/USB3.0 slot;



Install [ToupView/ToupLite](#) on your PC or install [ToupView App](#) on the mobile device; Run the software [ToupView/ToupLite](#), clicking the camera name in the camera list starts the live video as shown in Figure 9.

6.5 Connecting multi-cameras to the router through the LAN port/ WiFi STA mode for the network application

In [LAN/ WiFi STA](#) mode, the camera connects to the router by [LAN](#) port/ [WiFi STA](#) mode. If a router with [LAN/](#)

WiFi capability is used, users could connect the router with Ethernet cable/ WiFi to control the camera.

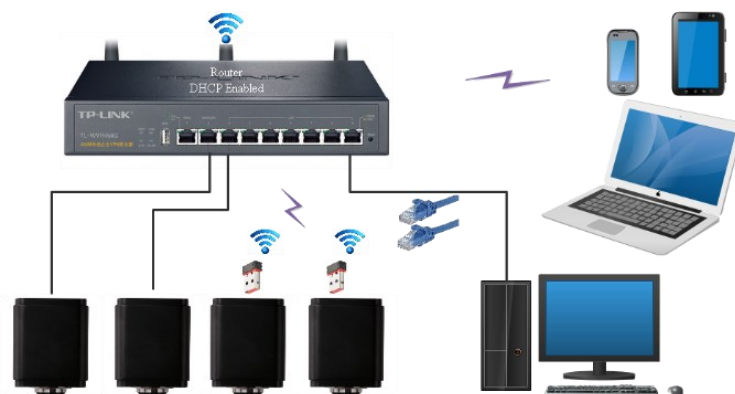
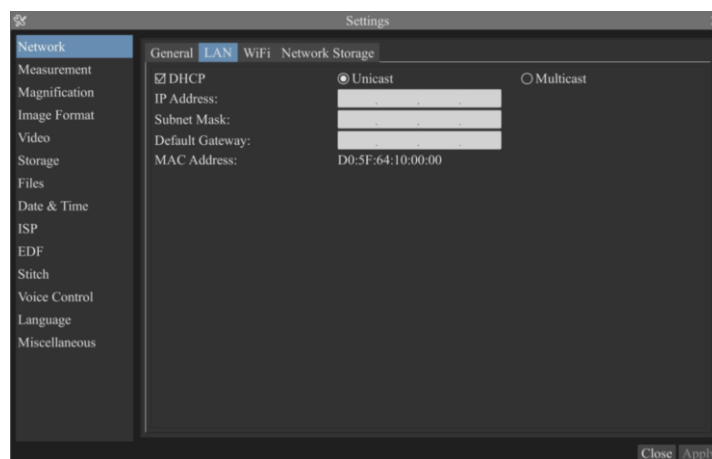


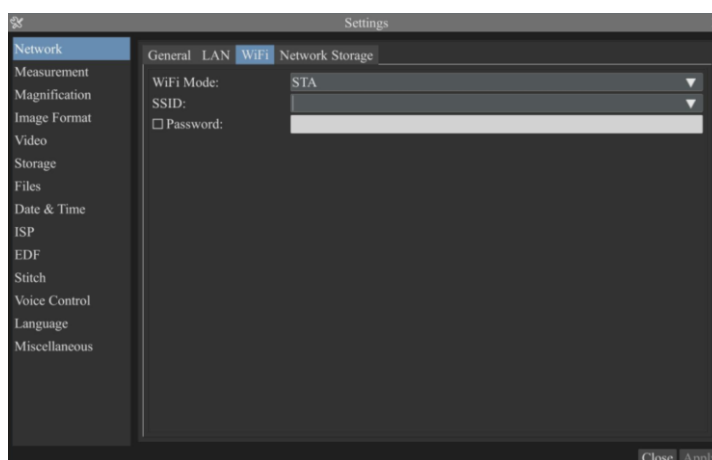
Figure 13 Multi X8FCAM4K Series Cameras Connecting to the Router through the LAN Port/ WiFi Style

The connection and configuration are just the same as in Sec.6.1 or Sec. 6.4. But here, users need to check **DHCP**. If **Multicast** is disabled or is not supported, users should only select **Unicast**. If **Multicast** is supported by the network, users could select **Multicast** to achieve a better performance, especially in the case that multi-users connecting to the same camera. In addition, please guarantee that the broadcasting function is enabled in the network.

Active X8FCAM4K series camera is recognized by **ToupView/ToupLite** software or **ToupView App** and they are displayed as a camera list or thumbnail in the software or app as shown in Figure 9.

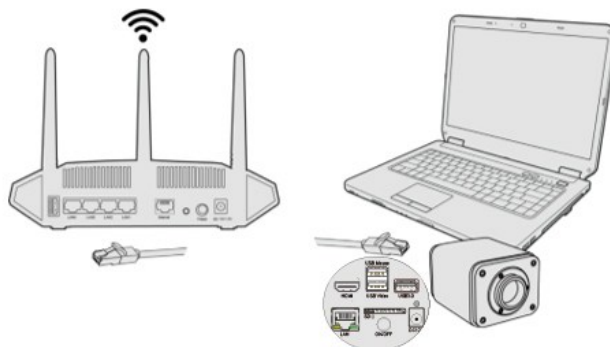


Or start the camera according to Sec. 6.1. After the camera is running, move the mouse to the bottom of the video window and clicking the  button on the **Synthesis Camera Control Toolbar** at the bottom of the video window, a small window called **Settings** will pop up as shown below. Clicking **Network> WiFi** property page and choosing the **STA** in the **WiFi Mode** edit box (The factory default configuration is **AP** mode). Choice or input the to be connected router's **SSID** and **Password** as shown below:

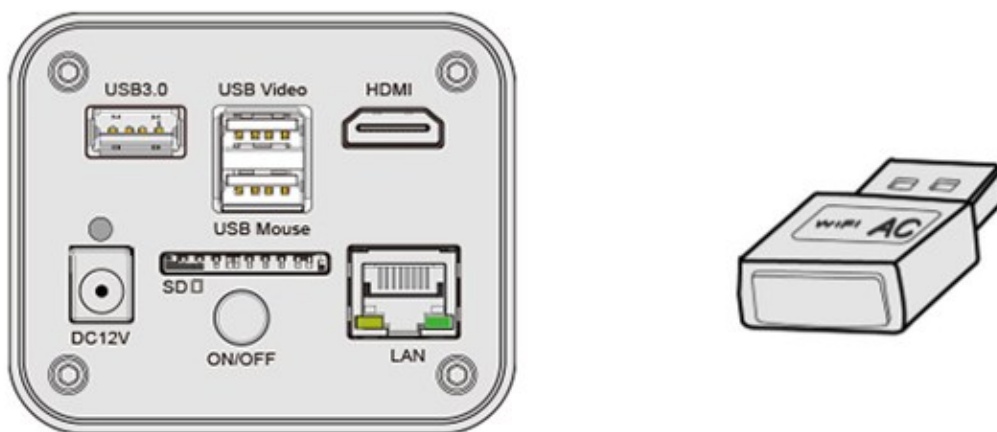


Install **ToupView /ToupLite** software on your PC. Alternatively, install the free **ToupView App** on the mobile device;

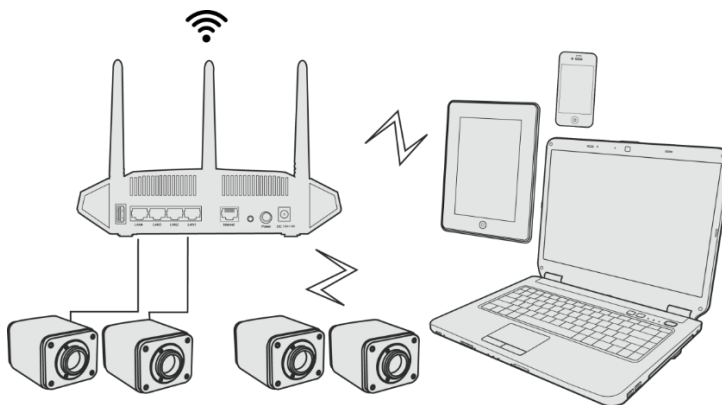
Plug the Ethernet cable into the camera's **LAN** port and the other end to the PC (for those connected to router with **LAN Port**), the upper left corner of the HDMI graphics interface will display **IP address**;



Or plug the [USB WiFi](#) adapter into the camera's USB3.0 port(for those connected to router with [WiFi STA](#) mode), the upper left corner of the HDMI graphics interface will display "[STA Mode](#)" ;



Finally, as shown below, 2 X8FCAM4K series cameras are connected to the router with LAN cable and 2 X8FCAM4K series cameras are connected to the same router with [WiFi STA](#) mode (The number of the cameras, the connection mode ([LAN](#) or [WiFi STA](#)) connected to the router are determined by the router performance).



Make sure that your PC or your mobile device is connected to the [LAN](#) or [WiFi](#) of the router; Start [ToupView/ToupLite](#) software or [ToupView App](#) and check the configuration. Normally, active X8FCAM4K series cameras are automatically recognized. The live image of each camera is displayed. For the display, [Camera List](#) group is used in [ToupView/ToupLite](#) software, and [Camera Thumbnail](#) is used in [ToupView App](#); Select the X8FCAM4K series camera you are interested in. To do so, double click the camera's name in [Camera List](#) tool window if you use [ToupView/ToupLite](#) software; If you use [ToupView App](#), tap the camera's thumbnail in [Camera List](#) page(See Figure 14)

About the routers/switches

It is suggested that routers/switches supporting WiFi 5G should be selected to achieve better wireless connection experience.

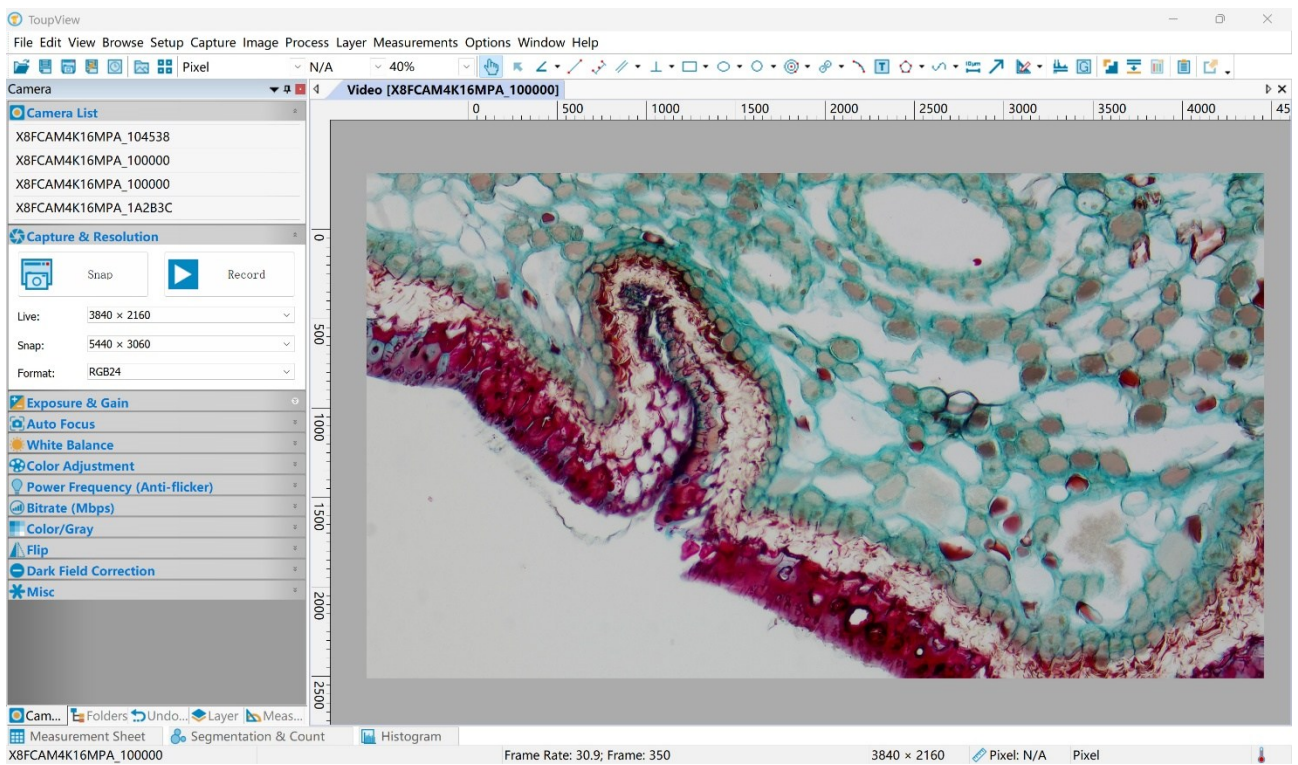


Figure 14 ToupView and X8FCAM4K Series Camera in LAN port/ WiFi STA mode

7 Brief Introduction of X8FCAM4K Series UI and Its Functions

7.1 XCamView UI

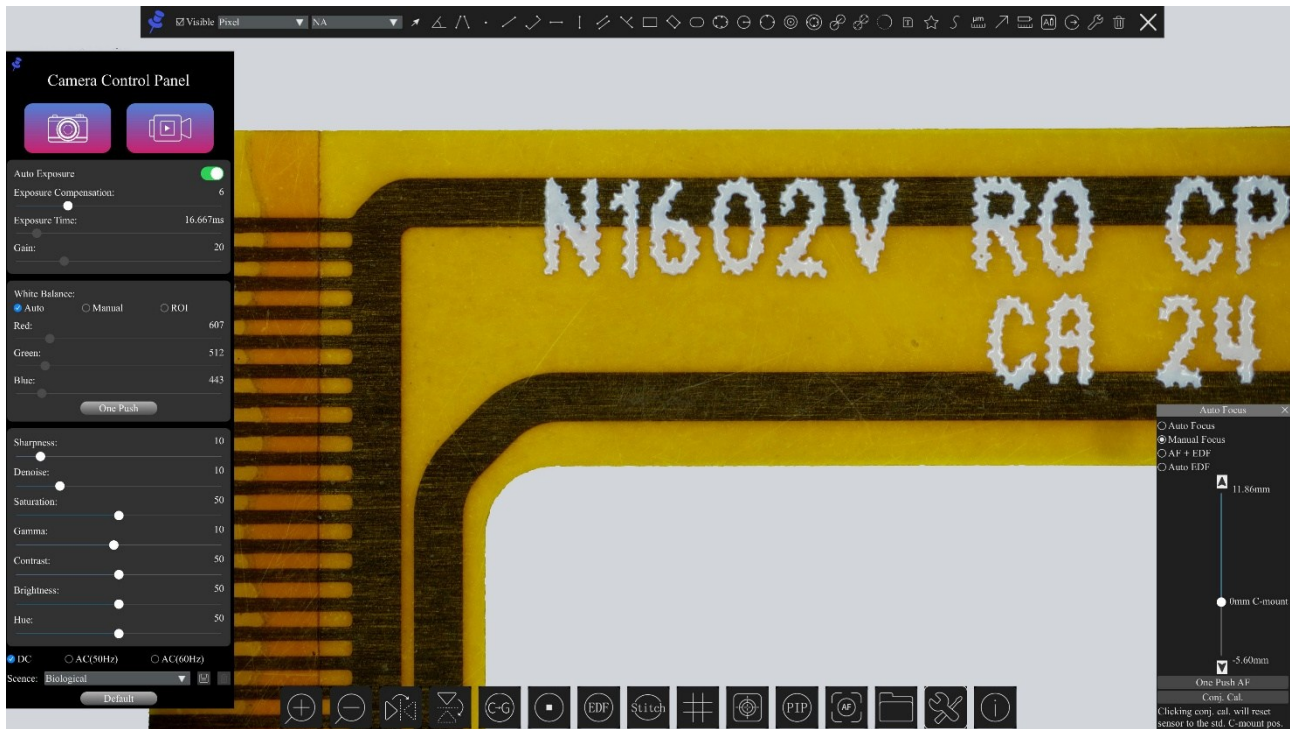


Figure 15 XCamView UI

The X8FCAM4K Series UI shown in Figure 15 includes a [Camera Control Panel](#) on the left of the video window, a [Measurement Toolbar](#) on the top of the video window and a [Synthesis Camera Control Toolbar](#) on the bottom of the video window.

Notes	
1	To show the Camera Control Panel , move your mouse to the left or right of the video window. See Sec.7.2 for details
2	Move the mouse cursor to the top of the video window, a Measurement Toolbar will pop up for calibration and measurement operations. When user left-clicks the Float/Fixed button  on the Measurement Toolbar , the Measurement Toolbar will be fixed. In this case the Camera Control Panel will not pop up automatically even if users move mouse cursor to left or right side of the video window. Only when user left-clicks the  button on the Measurement Toolbar to exit from measuring procedure will they be able to do other operations on the Camera Control Panel , or the Synthesis Camera Control Toolbar . During the measuring process, when a specific measuring object is selected, an Object Location & Attributes Control Bar  will appear for changing location and properties of the selected object. See Sec.7.3 for details.
3	When users move mouse cursor to the bottom of the video window, the Synthesis Camera Control Toolbar will pop up automatically.  See Sec.7.4 for details.
4	When users move mouse cursor to the bottom of the video window, the Synthesis Camera Control Toolbar will pop up automatically. Clicking the  button and the Auto Focus Control Panel will appear for autofocus operation.

7.2 The camera control panel on the left or right side of the video window

The [Camera Control Panel](#) controls the camera to achieve the best video or image quality according to the specific applications; It will pop up automatically when the mouse cursor is moved to the left or right side of the video window (in measurement status, the [Camera Control Panel](#) will not pop up. The [Camera Control Panel](#) will only pop up when the measurement process is finished or terminated while user's cursor on the left edge of the video window). Left-clicking  button to achieve [Display/Auto Hide](#) switch of the [Camera Control Panel](#).

Camera Control Panel	Function	Function Description
	Snap	Capture image and save it to the SD card or USB flash drive
	Record	Record video and save it to the SD card or USB flash drive
	Auto Exposure	When Auto Exposure is checked, the system will automatically adjust exposure time and gain according to the value of exposure compensation
	Exposure Compensation	Available when Auto Exposure is checked. Slide to left or right to adjust Exposure Compensation according to the current video brightness to achieve proper brightness value
	Exposure Time	Available when Auto Exposure is unchecked. Slide to left or right to reduce or increase exposure time, adjusting brightness of the video

 相机控制面板 自动曝光: ☒ 曝光补偿: 7 曝光时间: 16.667ms 增益: 54 白平衡: ☒ 自动 ☐ 手动 ☐ ROI 红色: 519 绿色: 512 蓝色: 444 一键白平衡 锐度: 20 降噪: 10 饱和度: 50 伽玛: 7 对比度: 50 亮度: 50 色调: 50 ☒ 直流 ☐ 交流 (50Hz) ☐ 交流 (60Hz) 场景: 默认	Gain	Adjust Gain to reduce or increase brightness of video. The Noise will be reduced or increased accordingly
	Red	Slide to left or right to decrease or increase the proportion of Red in RGB on video
	Green	Slide to left or right to decrease or increase the proportion of Green in RGB on video
	Blue	Slide to left or right to decrease or increase the proportion of Blue in RGB on the video
	Auto	White Balance adjustment according to the window video every time the button is clicked
	Manual	Adjust the Red 、 Green or Blue item to set the video White Balance
	ROI	Check the ROI item will display a red ROI rectangle on the video window, drag it to the interested area will perform the White Balance according to the area video data
	One Push	Perform a global white balance based on image conditions
	Sharpness	Adjust Sharpness level of the video
	Denoise	Slide left or right to Denoise the video
	Saturation	Adjust Saturation level of the video
	Gamma	Adjust Gamma level of the video. Slide to the right side to increase Gamma and to the left to decrease Gamma .
	Contrast	Adjust Contrast level of the video. Slide to the right side to increase Contrast and to the left to decrease Contrast .
	Brightness	Adjust Brightness level of the video. Slide to the right side to increase Brightness and to the left to decrease Brightness .
	Hue	Adjust Hue level of the video. Slide to the right side to increase Hue and to the left to decrease Hue .
	DC	For DC illumination, there will be no fluctuation in light source so no need for compensating light flickering
	AC (50HZ)	Check AC (50HZ) to eliminate flickering caused by 50Hz illumination
	AC (60HZ)	Check AC (60HZ) to eliminate flickering caused by 60Hz illumination
	Scene	Select different default parameters according to the type of microscope
	Default	Restore all the settings in the Camera Control Panel to default values
		Right click to select different default parameters according to the type of microscope

7.3 The Measurement Toolbar on top of the video window

The [Measurement Toolbar](#) will pop up when moving mouse cursor to any place near the upper edge of the video window. Here is the introduction of the various functions on the [Measurement Toolbar](#):



Figure 16 The Measurement Toolbar on the Upper Side of the Video Window

Icon	Function
	Float/ Fix switch of the Measurement Toolbar
☒ Visible	Show / Hide Measurement Objects
Pixel	Select the desired Measurement Unit
NA	Select Magnification for Measurement after Calibration
	Object Select
	Angle
	4 Points Angle
	Point (Point Counter)
	Arbitrary Line
	3 Points Line
	Horizontal Line
	Vertical Line
	3 Points Vertical Line
	Parallel
	Rectangle
	3 Points Rectangle
	Ellipse
	5 Points Ellipse
	Circle

	3 Points Circle
	Annulus
	3 Points Annulus
	Two Circles and its Center Distance
	3 Points Two Circles and its Center Distance
	Arc
	Text
	Polygon
	Curve
	Scale Bar
	Arrow
	Execute Calibration to determine the corresponding relation between magnification and resolution, which will establish the corresponding relationship between measurement unit and the sensor pixel size. Calibration needs to be done with the help of a micrometer. For detailed steps of carrying out Calibration please refer to ToupView help manual.
	Auto Measurement: Two Points Parallel, Circle Detect, Annulus Detect, Rectangle Detect, Polygon
	Export the Measurement information to CSV file(*.csv)
	Measurement Setup
	Delete all the measurement objects
	Exit from Measurement mode
	When the measurement ends, left-click on a single measuring object and the Object Location & Properties Control Bar will show up. User could move the object by dragging the object with the mouse. But more accurate movement could be done with the control bar. The icons on the control bar mean Move Left , Move Right , Move Up , Move Down , Color Adjustment and Delete .

Note:

1) When user left-clicks [Display/Hide](#) button on [Measurement Toolbar](#), [Measurement Toolbar](#) will be fixed. In this case [Camera Control Panel](#) will not pop up automatically even if moving the mouse cursor to the left edge of the video window. Only when user left-click the button on [Measurement Toolbar](#) to exit from the measurement mode will they be able to doing other operations on [Camera Control Panel](#) or [Synthesis Camera Control Toolbar](#).

2) When a specific [Measurement Object](#) is selected during the measurement process, [Object Location & Attributes Control Bar](#) will appear for changing the object location and properties of the selected objects.

7.4 Icons and functions of the Synthesis Camera Control Toolbar at the bottom of the video window



Figure 17 The Synthesis Camera Control Toolbar on the Bottom of the Video Window

Icon	Function	Icon	Function
	Zoom In the Video Window		Zoom Out the Video Window
	Horizontal Flip		Vertical Flip
	Color/gray		Video Freeze
	EDF		Stitch
	Grids		Image Overlay
	PIP		Auto Focus
	Browse images and videos in the SD Card or USB flash drive		Settings
	Check the Version of XCamView		

The [Browsing](#) function, for detailed introduction, please refer to Section 7.4.1.

The [Setting](#) function, for detailed introduction, please refer to Sections 7.4.2 to 7.4.15.

7.4.1 Browse

Clicking the  to browse the dxf, images, videos, and other files saved on the SD card or USB flash drive, as shown in the following figure.

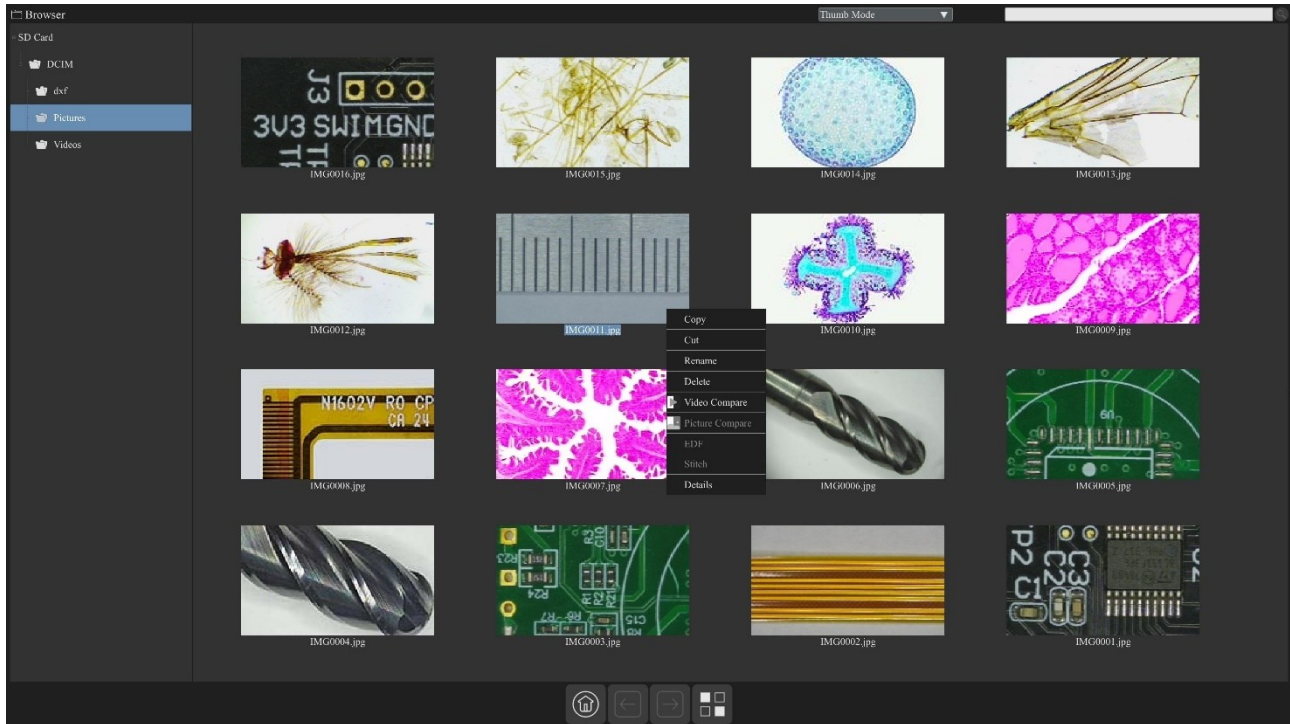


Figure 18 Browsing UI

There are two browsing modes: [List mode](#) and [Thumb mode](#). The default is [Thumb mode](#).

Right click on an empty area to create a new folder.

Double-click the search bar in the upper right corner of the mouse and enter the file name to perform the search.

Right click on an image file to [Copy](#), [Cut](#), [Rename](#), [Delete](#), [Video Compare](#), [Picture Compare](#), [EDF](#), [Stitch](#) and [Details](#). Clicking on a thumb to select the 1st image, and clicking on another thumb to select the 2nd image (or selecting 2 images with frame), then clicking the right mouse button to bring up the context menu and select [Picture Compare](#) to analyze and compare the two images (Four images can also be compared). Clicking on a thumb to select 3 (or box select 3) pictures focusing on different targets in the same scene, you can perform depth of field compositing on the selected pictures. Clicking on a thumb to select 2~32 (or box select 2~32) pictures, The selected images can be stitch in ascending order of the numerical numbers in the file name.

Right click on a video file to [Copy](#), [Cut](#), [Rename](#), [Delete](#), [Video Compare](#), and view detailed information([Details](#)).

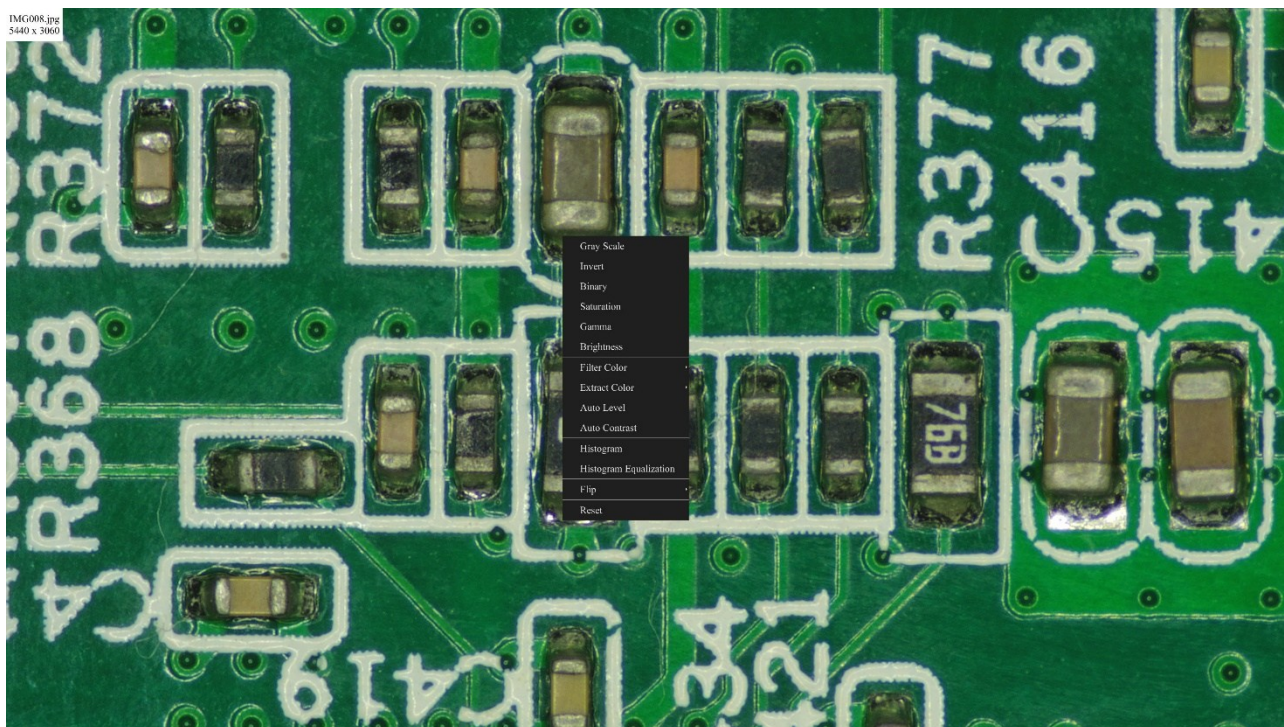


Figure 19 Image Processing

Double-click the thumbnail of the picture with the left mouse button to open the picture, and then right-click the picture to [Gray Scale](#), [Invert](#), [Binary](#), [Saturation](#), [Gamma](#), [Brightness](#), [Filter Color](#), [Extract Color](#), [Auto Level](#), [Auto Contrast](#), [Histogram](#), [Histogram Equalization](#), [Flip](#), and other image processing functions, and then after the processing is completed, you can choose reset to revert back to the original picture, and also you can choose save or save as in the lower sidebar of the picture. The description of each function is as follows:

Gray Scale	Choose Gray Scale command to convert a color image to a Gray Scale image
Invert	Choose Invert command to reverse the pixel values of the active image
Binary	Binary is a kind of gray level process. If the gray of the pixel is greater than the given threshold, the pixel's color will be changed into white. Otherwise, the pixel's color will be changed into black
Saturation	Adjust the Saturation of the image
Gamma	Adjust the Gamma of the image
Brightness	Adjust the Brightness of the image
Filter Color	Choose Filter Color command to filter a special color channel from a color image. Select either Red, or Green, or Blue color to filter. For every pixel, if select Red color to filter, only information about the Red channel will be discarded, the Green and Blue information will remain there.
Extract Color	Choose Extract Color command to extract a special color channel from a color image. Select either Red or Green, or Blue color to extract. For every pixel, if selecting Red color to extract, only information about the Red channel will be kept, the Green and Blue information will be discarded.
Auto Level	The Auto Level command moves the level's sliders automatically to set highlight and shadow. It defines the lightest and darkest pixels in each color channel as white and black and then redistributes the pixels' color values proportionately
Auto Contrast	The Auto Contrast command automatically adjusts the overall contrast in an RGB image
Histogram	Used to show the distribution of brightness, R, G, B of an image over an image
Histogram Equalization	Used to improved image contrast
Flip	Flip image Horizontally / Vertically

7.4.2 Settings>Network

7.4.2.1 Settings>Network>General

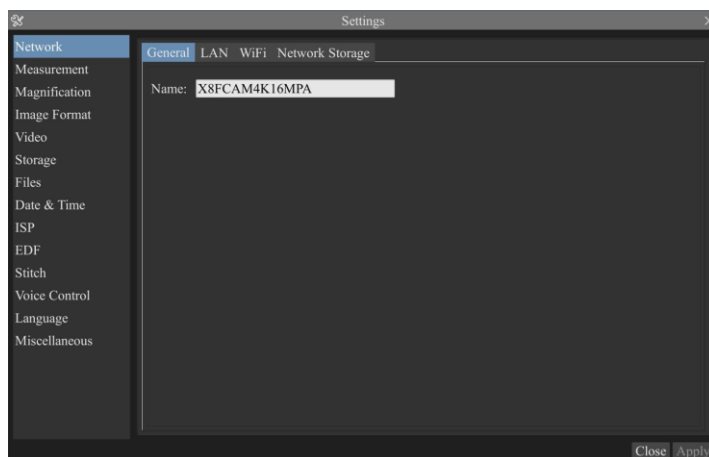


Figure 20 Comprehensive Network General Settings Page

Name	The current camera name recognized as the network name
------	--

7.4.2.2 Settings>Network>LAN

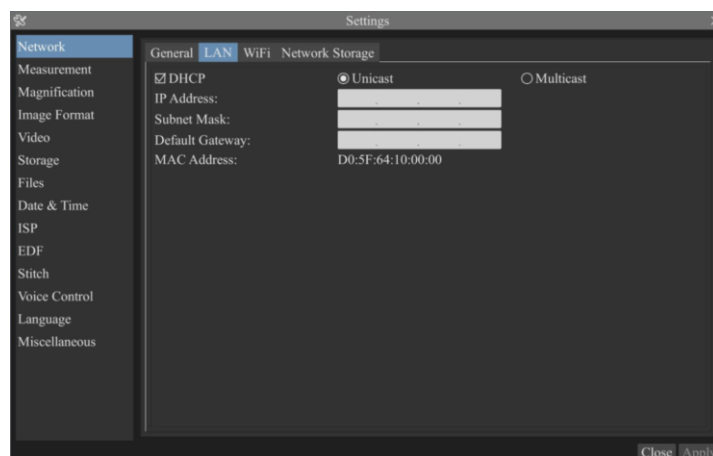


Figure 21 Comprehensive Network LAN Settings Page

DHCP	Dynamic host control protocol allows DHCP server to automatically assign IP information to the camera. Only in Sec 6.4 LAN networking this item should be checked, so that cameras can automatically get IP information from routers/switches to facilitate networking operation;
Unicast/Multicast	By default, unicast function is used. Only in Sec 6.4 networking environment, when the router/switch has multicast function, camera can switch to multicast mode, which can save the network bandwidth consumed by the camera and facilitate the connection of more cameras in the same network;
IP Address	Every machine on a network has a unique identifier. Just as you would address a letter to send in the mail, computers use the unique identifier to send data to specific computers on a network. Most networks today, including all computers on the Internet, use the TCP/IP protocol as the standard for how to communicate on the network. In the TCP/IP protocol, the unique identifier for a computer is called IP address. There are two standards for IP address: IP Version 4 (IPv4) and IP Version 6 (IPv6). All computers with IP addresses have an IPv4 address, and many are starting to use the new IPv6 address system as well. Users must manually configure their IP addresses on the camera side and computer side. The IP addresses set on the camera side and computer side should be in the same network segment. The specific settings are shown Figure 22 . It's usually a private address. Private address is a non-registered address used exclusively within an organization. The internal private addresses retained are listed below: Class A 10.0.0-10.255.255; Class B 172.16.0-172.31.255.255; Class C 192.168.0-192.168.255.255. The suggested IP address is Class C.
Subnet Mask	Subnet Mask is used to distinguish network domain from host domain in 32-bit IP address;
Default Gateway	A default gateway allows computers on a network to communicate with computers on another network. Without it, the network is isolated from the outside. Basically, computers send data that is bound for other networks (one that does not belong to its local IP range) through the default gateway; Network administrators configure the computer's routing capability with an IP range's starting address as the default gateway and point all clients to that IP address.
MAC Address	Camera-independent physical address that identifies the network device.

Uncheck the [DHCP](#) and select the [Unicast](#) item, user still need to set the [IP](#) address, [Subnet](#) mask and [Default](#)

Gateway as shown below:

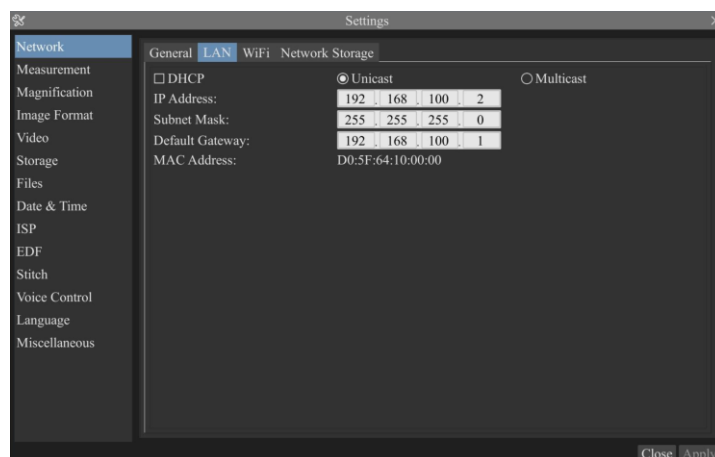


Figure 22 Manual DHCP and Unicast

Uncheck the **DHCP** and select the **Multicast** item, user still need to set the **IP address**, **Subnet Mask** and **Default Gateway** as shown below:

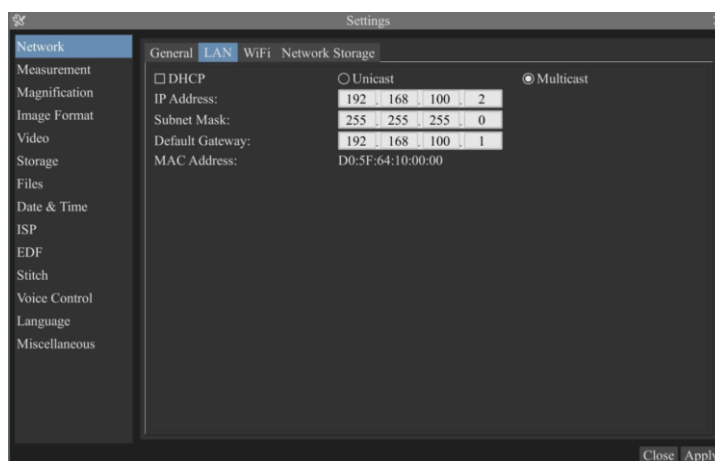


Figure 23 Manual DHCP and Multicast

7.4.2.3 Settings>Network> WiFi

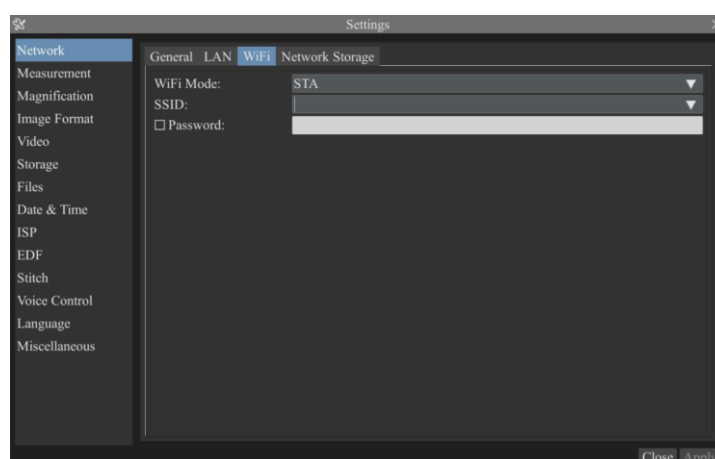


Figure 24 Network Setup

Wi-Fi Mode	AP/STA mode to select;
Channel/SSID	Channel for the AP mode and SSID for the STA mode. Choice or input the to be connected router's SSID. Here, the SSID is the router's SSID;
Password	Camera Password for the AP mode. Router Password for the STA mode

7.4.2.4 Settings>Network> Network Storage

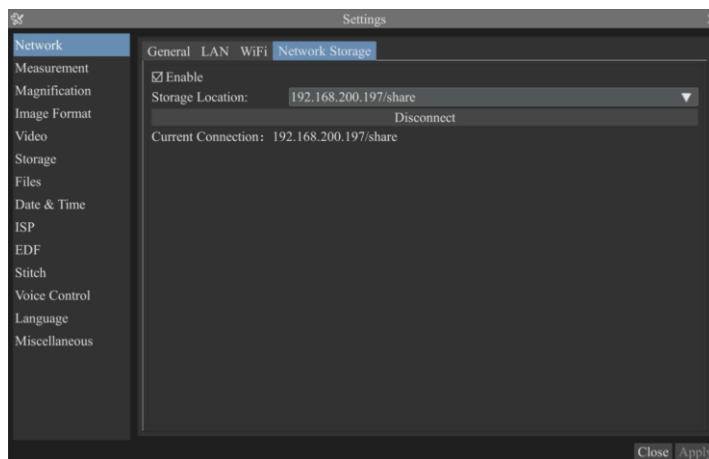


Figure 25 Comprehensive Network Storage Settings Page

Network Storage	Select whether to enable Network Storage;
Storage Location	When the WiFi mode is in AP mode, ensure that the PC is connected to the camera's AP, open the Server, Select Network Storage Function, click Update, and the IP address assigned by the camera to the PC will be displayed. Ensure that the Server has enabled; The camera will automatically detect available storage location. Select the desired storage location and click Connect. The left corner of the interface will display "Connected to Server", indicating successful connection. Click the snap button/click the left mouse button/use an external device to snap/ Click the record button / click the right mouse button / use an external device to record, shared images or videos will appear in the save path set on the PC, indicating successful network storage. When the WiFi mode is in STA mode, ensure that both the PC and camera are connected to the router's WiFi; When connected via LAN, ensure that the PC and camera are on the same LAN, open the Server, Select Network Storage Function, click Update, and the IP address assigned by the camera to the PC will be displayed. Ensure that the Server has enabled; The camera will automatically detect available storage location. Select the desired storage location and click Connect. The left corner of the interface will display "Connected to Server", indicating successful connection. Click the snap button/click the left mouse button/use an external device to snap/ Click the record button / click the right mouse button / use an external device to record, shared images or videos will appear in the save path set on the PC, indicating successful network storage.
Current Connection	Display the storage location of the current connection;
Note: The Network Storage function requires the installation of Server software on the computer. Enable Network Storage function, unable to save pictures to SD card or USB drive; If you need to save pictures to an SD card or USB drive, you need to first turn off the Network Storage function. For detailed instructions on the Network Storage function and the Server on the upper computer, please consult our company for more information.	

7.4.3 Settings>Measurement

This page is used for the define of the [Measurement Object](#) properties.

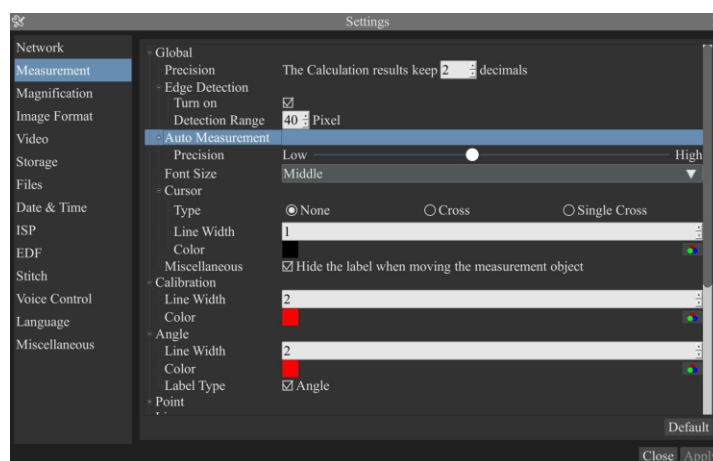


Figure 26 The Measurement Setup

Global	Precision	Used for setting digits behind the decimal point for measurement results;
	Edge Detection	Select whether to enable the automatic edge search function and set the detection range;
	Auto Measurement	Used for define the level of accuracy used for auto measurement;
	Font Size	The font size of measurement data can be divided into three types: large, Middle, and Small;
	Cursor	Select whether the cursor is a single crosshair and set the color of the single cross;
	Miscellaneous	Whether to hide the label when moving the measurement objects;

Calibration	Line Width	Used for defining width of the lines for calibration;
	Color	Used for defining color of the lines for calibration;
	EndPoint	Type: Used for defining shape of the endpoints of lines for calibration: Null means no EndPoint, rectangle means rectangle type of endpoints. It makes alignment more easily;
Point, Angle, Line, Horizontal Line, Vertical Line, Rectangle, Circle, Ellipse, Annulus, Two Circles, Polygon, Curve		
	Left-click the  along with the Measurement command mentioned above will unfold the corresponding attribute settings to set the individual property of the Measurement Objects.	

7.4.4 Settings>Magnification

This page's items are formed by the Measurement Toolbar's Calibration command.

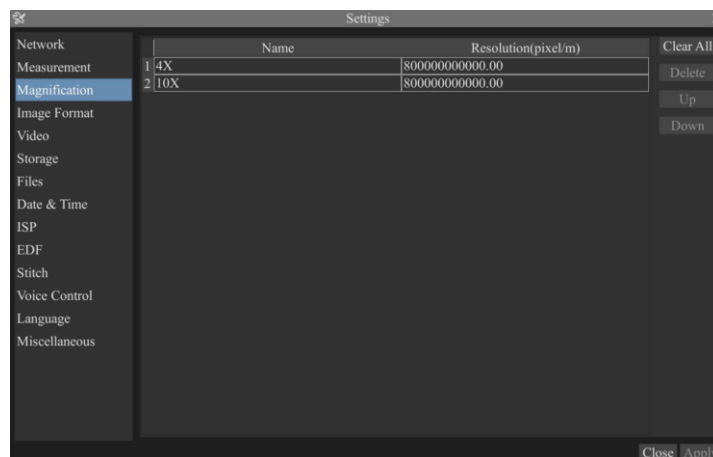


Figure 27 Comprehensive Magnification Settings Page

Name	Names such as 10X, 40X, 100X are based on magnification of the microscopes. For continuous zoom microscopes, ensure that the selected magnification coincides with the scale alignment line on the microscope zoom knob; Users could also edit the name of the magnification with other information, for example, microscope mode, users name, etc.
Resolution	Pixels per meter. Image device like microscopes have high Resolution value;
Clear All	Click the Clear All button will clear the calibrated magnifications;
Delete	Click Delete to delete the selected magnification;
Up	Select a row in the magnification and click Move Up to move up the currently selected magnification;
Down	Select a row in the magnification and click Move Down to move up the currently selected magnification;

7.4.5 Settings>Image Format

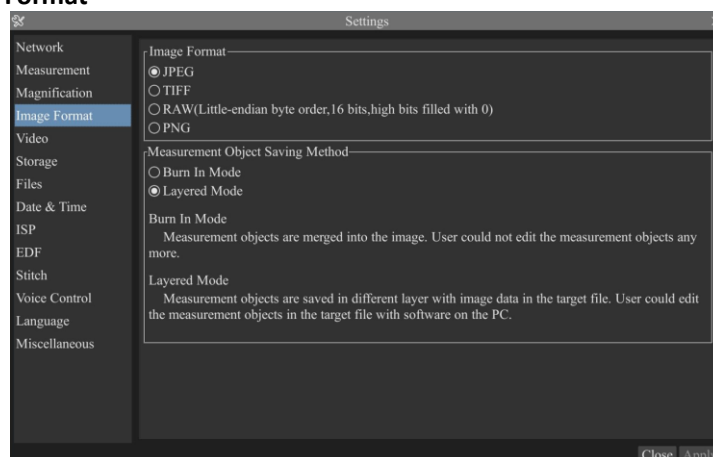


Figure 28 Comprehensive Image Format Settings Page

Image Format	JPEG: The extension of JPEG file can get very high compression rate and display very rich and vivid images by removing redundant images and color data. In other words, it can get better image quality with the least disk space. If measurement objects are available, the measurement objects will be burned into the image and the measurement cannot be edited. TIFF: TIFF is a flexible bitmap format mainly used to store images including photos and artistic images. RAW (Little-ending byte order, 16bits, high bits filled with 0): RAW is an uncompressed and unprocessed image format that preserves all raw data directly obtained from the sensor of a digital camera. PNG: PNG is a lossless compression image format that supports transparency and high color depth, making it ideal for graphics, logos, and web images where sharp details and transparent backgrounds are required.
Measurement Object Saving Method	Burn in Mode: The measurement objects are merged into the current image. User could not edit the measurement objects any more. This mode is not reversible. Layered Mode: The measurement objects are saved in different layer with current image data in the target file. User could edit the measurement objects in the target file with some software on the PC. This mode is reversible.

7.4.6 Settings>Video

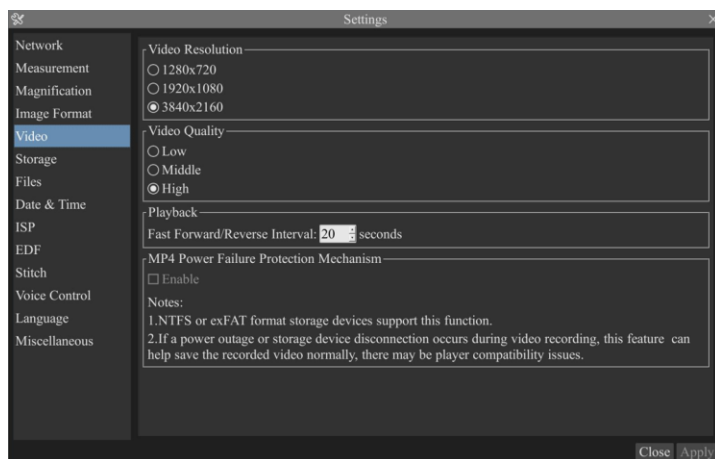


Figure 29 Comprehensive Setting of Video page

Video Resolution	Select a Video Resolution of 1280 x720, 1920x1080 or 3840x2160;
Video Quality	Select Video Quality as low, medium, or high;
Video Playback	Fast Forward/Reverse interval in second unite for Video Playback
MP4 Power Failure Protection Mechanism	1. NTFS or exFAT format storage devices support this function. 2. If a power outage or storage device disconnection occurs during video recording, this feature can help save the recorded video normally, there may be player compatibility issues;
Time Watermark	The Time Watermark function overlays on videos and pictures, but introduces 2 frames of processing latency. Its use is not recommended in high real-time scenarios.

7.4.7 Settings>Storage

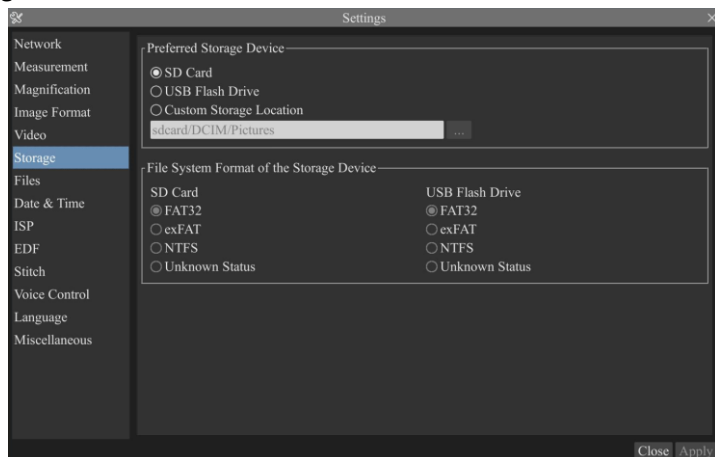


Figure 30 Comprehensive Setting of Storage Page

Preferred Storage Page	SD Card: Select it to save the video and image to the SD Card. USB Flash Drive: Select it to save the video and image to the USB Flash Drive. Custom Storage Location: Select it to save the video and image to the USB Flash Drive.
File System Format of the Storage Device	List the file system format of the current storage device FAT32 : The file system of SD Card is FAT32 . The maximum video file size of single file in FAT32 file system is 4G Bytes; exFAT : The file system of SD Card is exFAT . The maximum video file size of single file in FAT32 file system is 16E Bytes; NTFS : The file system of SD Card is NTFS . The maximum video file size of single file is 2T Bytes. Unknown Status : SD Card not detected or the file system is not identified;
Note : For USB Flash Drive, USB 3.0 interface is preferred.	

7.4.8 Settings>Files

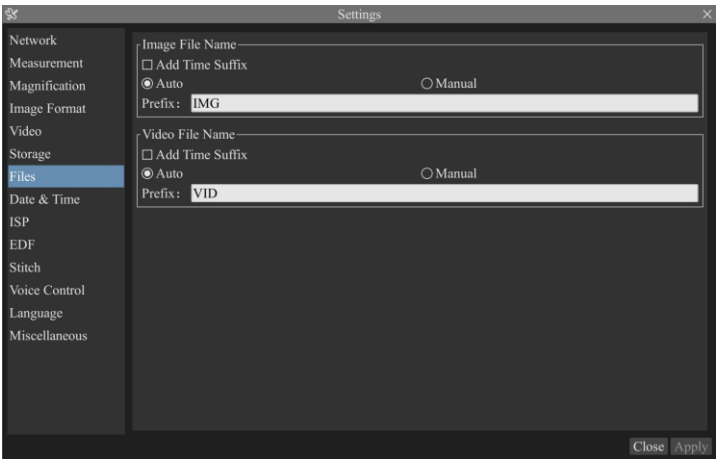


Figure 31 Comprehensive Setting of Files Name

Image or Video File Name Paradigm	Provide Auto or Manual naming paradigm for Image or Video file;
Auto	With specified name as the Prefix and XCamView will add digital after the Prefix for the Image or Video file;
Manual	A file dialog will pop up to enter the Image or Video file name for the captured Image or Video .

7.4.9 Settings> Date &Time

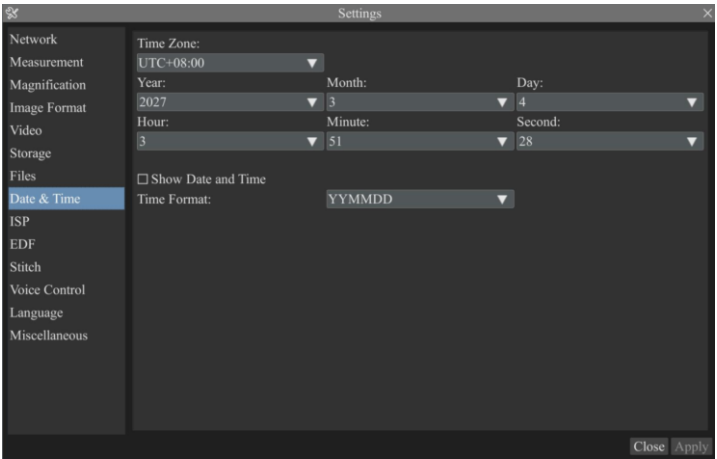


Figure 32 Time Setting

Date & Time	Users can enter precise clock parameters in the respective input fields for Year : Month : Day : Hour : Minute : Second . They may also choose whether to display the date and time in the lower-right corner of the HDMI interface.
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7.4.10 Settings>ISP

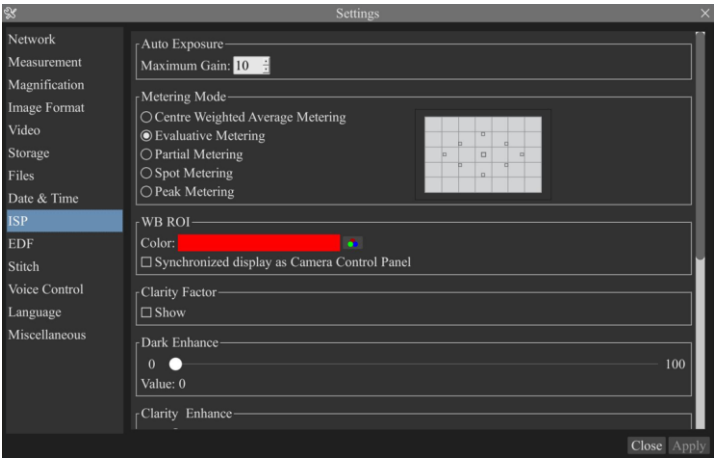


Figure 33 Comprehensive Setting of ISP Page

Auto Exposure	Define the maximum automatic exposure gain;
Metering Mode	Select the Metering mode as the Central Weighted Average Metering, Evaluative Metering, Partial Metering, or Spot Metering or Peak Metering; Peak Metering Mode : Provides metering intensity configuration, default is 8; The larger the value, the stronger the overexposure inhibition

WB ROI Color	Choosing the ROI rectangle line color and whether it is synchronized display as Camera Control Panel;
Clarity Factor	Select to display the clarity factor in the video window, otherwise the clarity factor will not be displayed;
Dark Enhance	Define the intensity value of dark enhancement;
Clarity Enhance	Define the intensity value of Clarity Enhance;
Brightness Enhance	Define the intensity value of Brightness Enhance;
Purple Reduction	Define the intensity value for purple reduction edges;
Sensor Gain Mode	Select to HCG (High Conversion Gain) or LCG (Low Conversion Gain) mode; (Only X8FCAM4K8MPB supports this function);
Work Mode	Select the working mode as High Frame Rate/Low Delay; High Frame Rate: The highest frame rate is 90fps Low Delay: The average delay is 40ms, and the highest frame rate is 60fps; (Only X8FCAM4K8MPB supports this function);
Auto Focus	Select the default mode for startup as Auto Focus/Manual Focus; Select focus mode: Microscope Mode / Industrial Mode Micro Mode: For high optical magnification scenarios Industrial Mode: For low optical magnification scenarios, supporting configurable motor search precision more widely applicable to optical magnification, allowing for motor search precision to be configured based on the current optical magnification Adjust the AF area and focus frame color;

7.4.11 Settings>EDF



Figure 34 Comprehensive Setting of EDF

Automatic Alignment	Optionally turn on auto-alignment when there is significant displacement or scaling between images;
Sensitivity	Select the sensitivity of EDF;
Window size	Select the window size for displaying real-time images during EDF;
Description	Automatic alignment: Solves offset issues of fused images, but slows down the fusion process. Sensitivity: Improves the detection accuracy of depth of field, perhaps reduce the quality of fused image.

7.4.12 Settings>Stitch

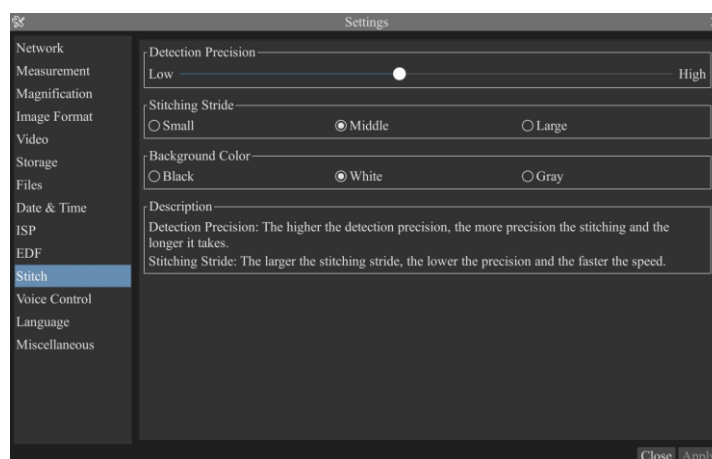


Figure 35 Comprehensive Setting of Stitch

Detection Precision	Define the level of detection precision;
Stitching Stride	Select the stitching stride;
Background Color	Select the background color of stitch;
Description	Detection Precision: The higher the detection precision, the more precision the stitching and the longer it takes Stitching Stride: The larger the stitching stride, the lower the precision and the faster the speed.

7.4.13 Settings>Voice Control

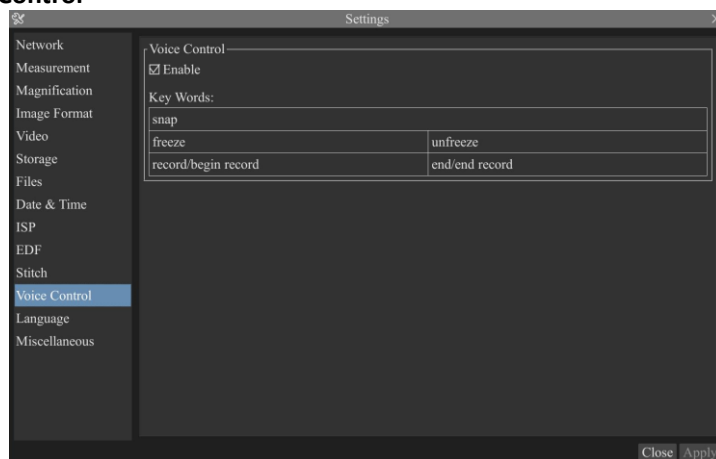


Figure 36 Comprehensive Setting of Voice Control

Voice Control	Select whether to enable or not;
Key Words	Provide Key Words for “snap”;
	Provide Key Words for “freeze”, “unfreeze”;
	Provide Key Words for “record/begin record”, “end/end record”;
Note: After the camera is turned on, if the voice control module is not plugged in, the Key Words information will not be displayed by default;	

7.4.14 Settings>Language

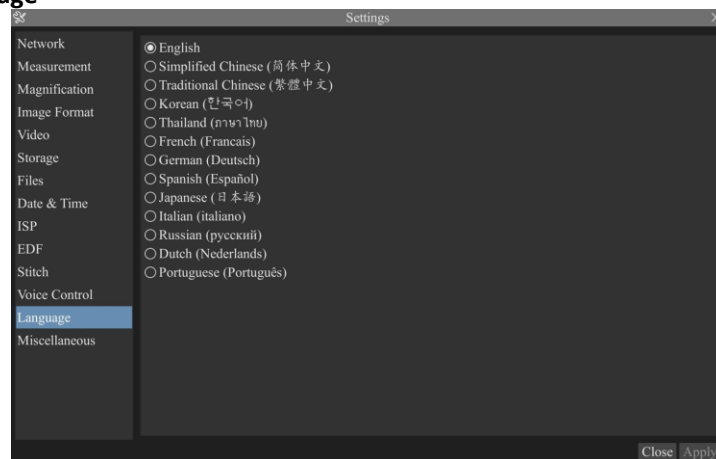


Figure 37 Comprehensive Setting of Language Selection Setting Page

English	Set language of the whole software into English;
Simplified Chinese	Set language of the whole software into Simplified Chinese;
Traditional Chinese	Set language of the whole software into Traditional Chinese;
Korean:	Set language of the whole software into Korean;
Thailand	Set language of the whole software into Thailand;
French	Set language of the whole software into French;
German	Set language of the whole software into German;
Spanish	Set language of the whole software into Spanish;
Japanese	Set language of the whole software into Japanese;
Italian	Set language of the whole software into Italian;
Russian	Set language of the whole software into Russian;
Dutch	Set language of the whole software into Dutch;
Portuguese	Set language of the whole software into Portuguese;

7.4.15 Settings>Miscellaneous

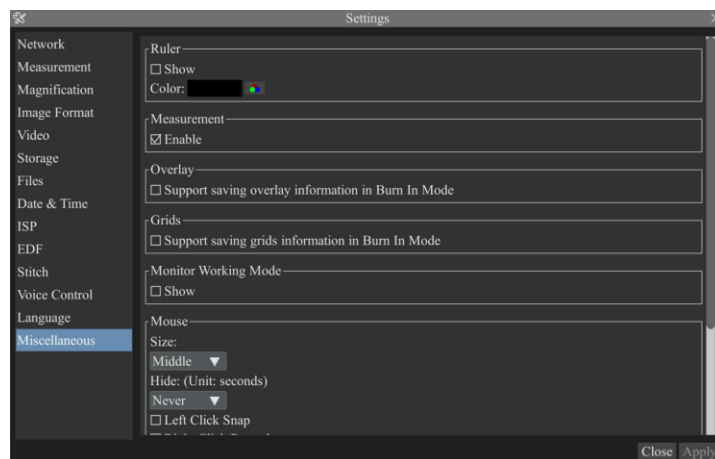


Figure 38 Comprehensive Miscellaneous Settings Page

Ruler	Select to display the ruler in the video window, otherwise not to display the ruler. You can choose the ruler color;
Measurement	Select to display the measurement toolbar in the video window, otherwise not to display the measurement toolbar;
Overlay	Select to support saving graphics overlay information in fusion mode, otherwise it will not support;
Grids	Select to support saving mesh information in fusion mode, otherwise not to support;
Monitor Working Mode	Select to display the Monitor Working Mode in the video window, otherwise the Monitor Working Mode will not be displayed;
Mouse	Select the mouse size and hide time; Select to capture the video with the left button and the right button. If not selected, the video will not be captured with the left button or the right button;
Camera Control Panel Display Location	Select the camera control panel to display on the left, right, or both sides of the HDMI interface;
Camera Parameters Import	Import the Camera Parameters from the SD Card or USB flash drive to use the previously exported Camera Parameters ;
Camera Parameters Export	Export the Camera Parameters to the SD Card or USB flash drive to use the previously exported Camera Parameters ;
Reset to factory defaults	Restore camera parameters to its factory status;

7.5 Auto Focus Control Panel on the right side of the Video Window

	Auto Focus	With Auto Focus button checked, the system will start autofocus according to status of the specimen till it stays in focus;
	Manual Focus	With Manual Focus checked, users should reset position of the camera sensor by using the mouse to scroll up and down till the specimen stays in focus;
	AF+EDF	With AF+EDF checked, system turns on the autofocus mode, which requires the user to change the focus area in sequence to focus on multiple different targets in the same scene. After all targets are successfully focused, move the mouse to the bottom of the video window, click  , and then the camera will perform EDF on the previously focused images and output the fused image.
	Auto EDF	With Auto EDF checked, system turns on the autofocus mode. The system will automatically synthesize the depth of field for multiple different targets based on the current scene within the focus area. After all targets are successfully synthesized, the camera will output the synthesized image.
	One Push AF	Click One Push AF button can carry out autofocus operation for just once;
	Conjugate Correction	Left-click the Conjugate Correction button can reset the camera sensor to standard C-mount position. Conjugate Correction allows users to get sensor position calibrated while ensuring that the camera video window is clear as well as image seen from eyepiece is clear. Suggest users do Conjugate Correction when using the camera for the first time to ensure the camera sensor at the standard C-mount position. This ensures the object plane, eyepiece image plane and camera adapter image plane at the standard position; Note: 1) When height of the specimen changes, users must make sure the sensor at the standard C-mount position while adjusting the coarse and fine focus knob of microscope to focus; 2) Before doing measurement please do Conjugate Correction to make sure accuracy of the measurement results (please refer to Measurement Toolbar > Conjugate Correction for details).

7.6 Focus Region in the Video Window

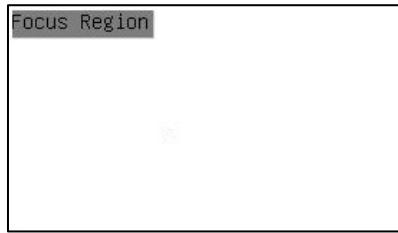


Figure 39 Focus Region

The [Focus Region](#) is used for selecting the region of interest for [Auto Focus](#) operation. When user clicks the  button on the [Synthesis Camera Control Toolbar](#), the [Focus Region](#) will show up as well with the [Auto Focus Control Panel](#). Users can click any part of video window to reset the focus region for [Auto Focus](#) operation.

8 X8FCAM4K Series Camera AF + EDF Function Description

AF + EDF is a new function that combines the camera's unique focus function with EDF. Users can focus on different areas in high-magnification scenes, and then fuse their respective clear areas to finally obtain a large depth-of-field image.

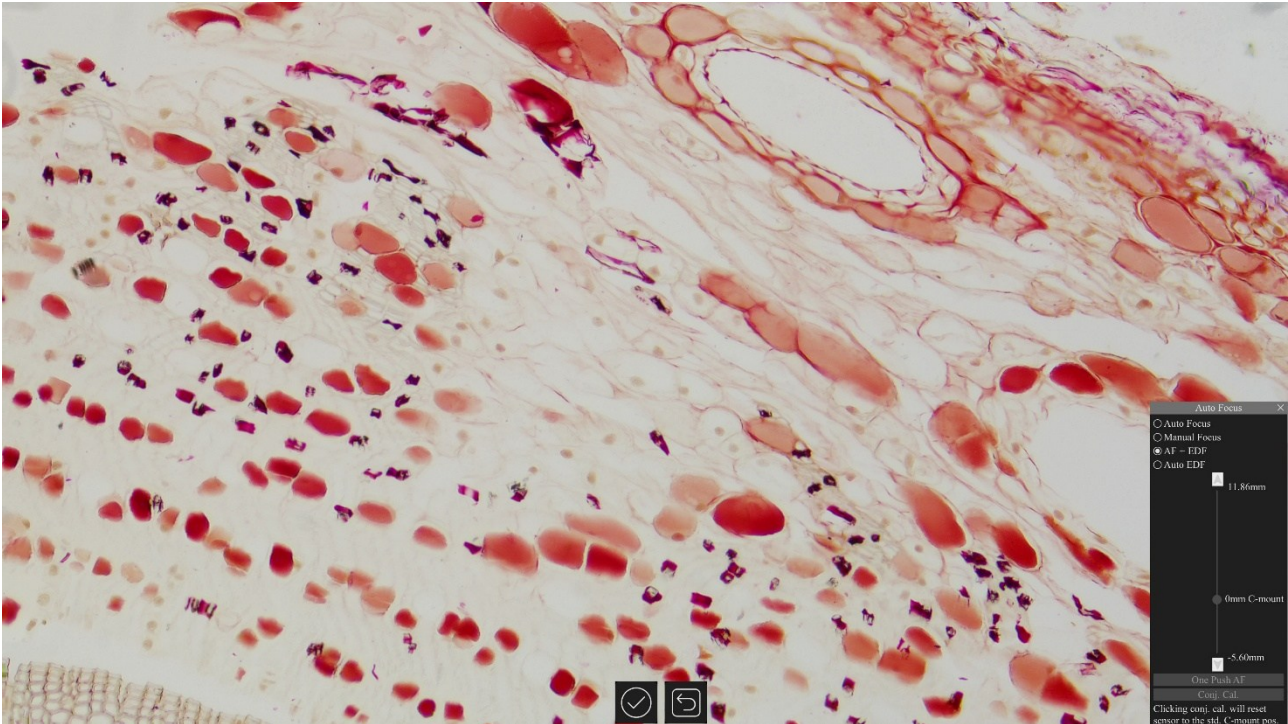


Figure 40 Auto Focus Control Panel

Specifically the usage steps are as follows:

- Click the **AF+EDF** option above the **Auto Focus Control Panel**. At this time, the word “EDF” will be displayed in the upper right corner of the video interface. The user clicks on the first focus area, and the system will perform an autofocus. If the focus is completed, “**FOCUSED**” will be displayed in the upper right corner. Once completed, the system will automatically obtain a frame of data containing the current clear area; use the mouse to switch to a different **Focus Region**, and the system will automatically focus again and obtain data. If the focus fails, “**DEFOCUS**” will be displayed in the upper right corner, and the system will not obtain the current frame data.
- Repeat the above steps. After obtaining clear data of multiple **Focus Region**, move the mouse to the bottom of the video interface and click . The camera will perform EDF on the cached frame data containing clear area information and output the fused picture. For use by users

The following are pictures obtained using the **AF+EDF** function of the X8FCAM4K Series camera:

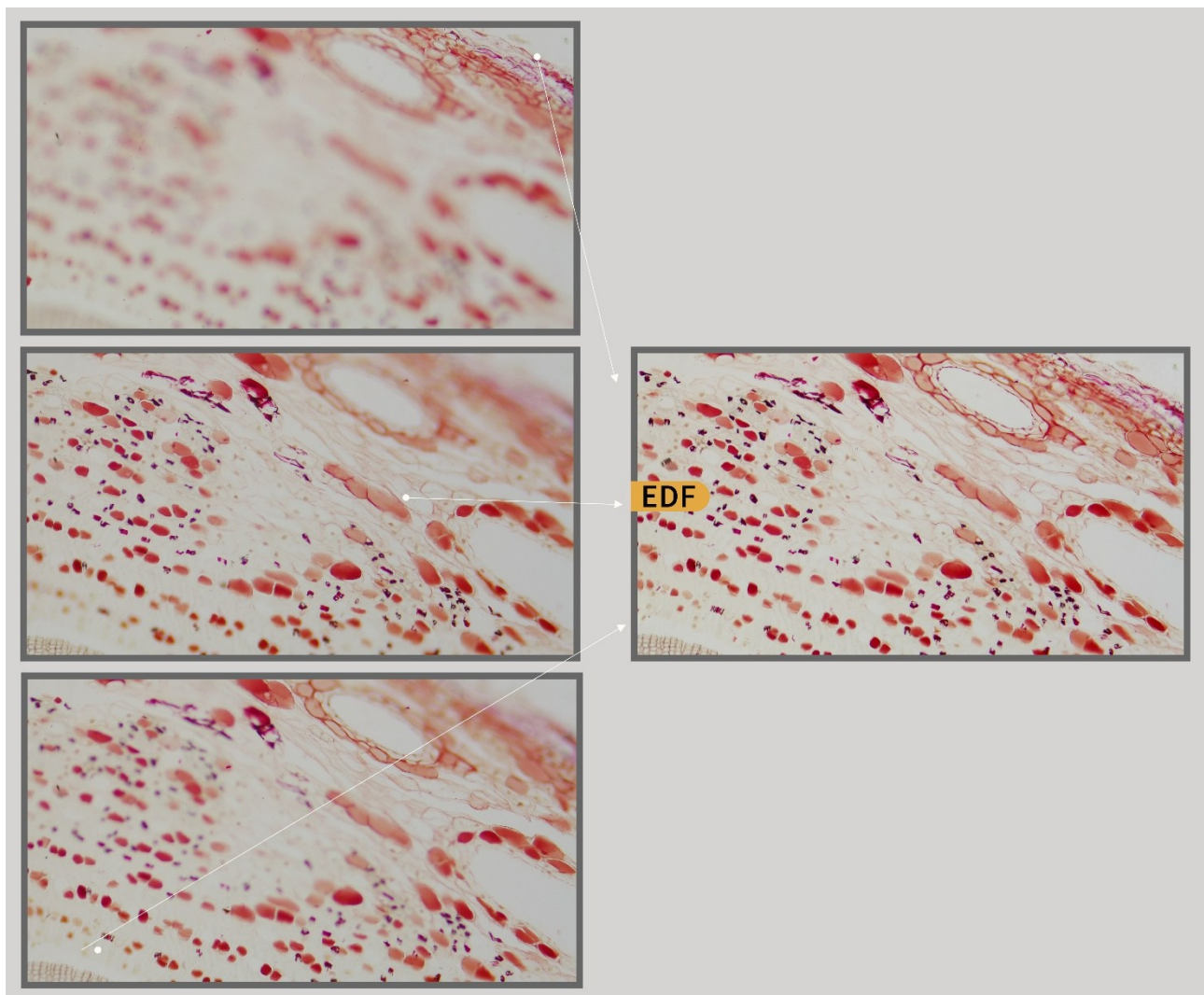


Figure 41 Pine Stem Slice EDF Effect

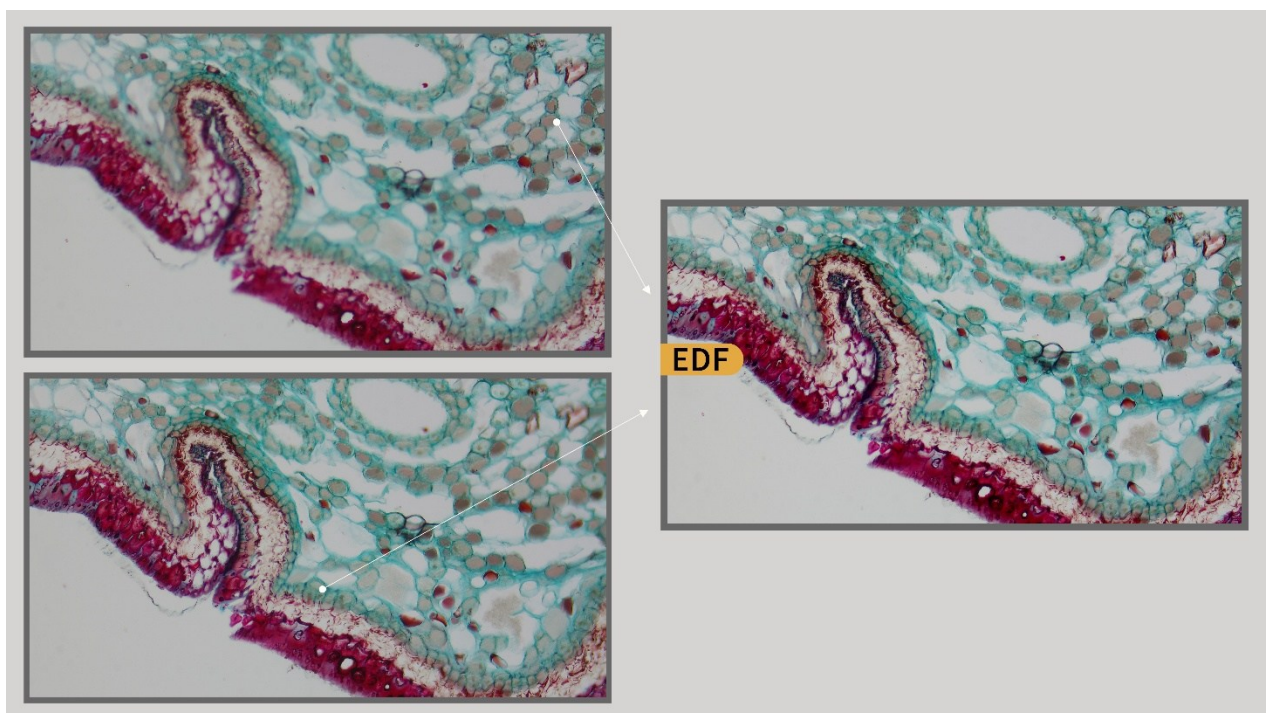


Figure 42 Corn Stem Slice EDF Effect

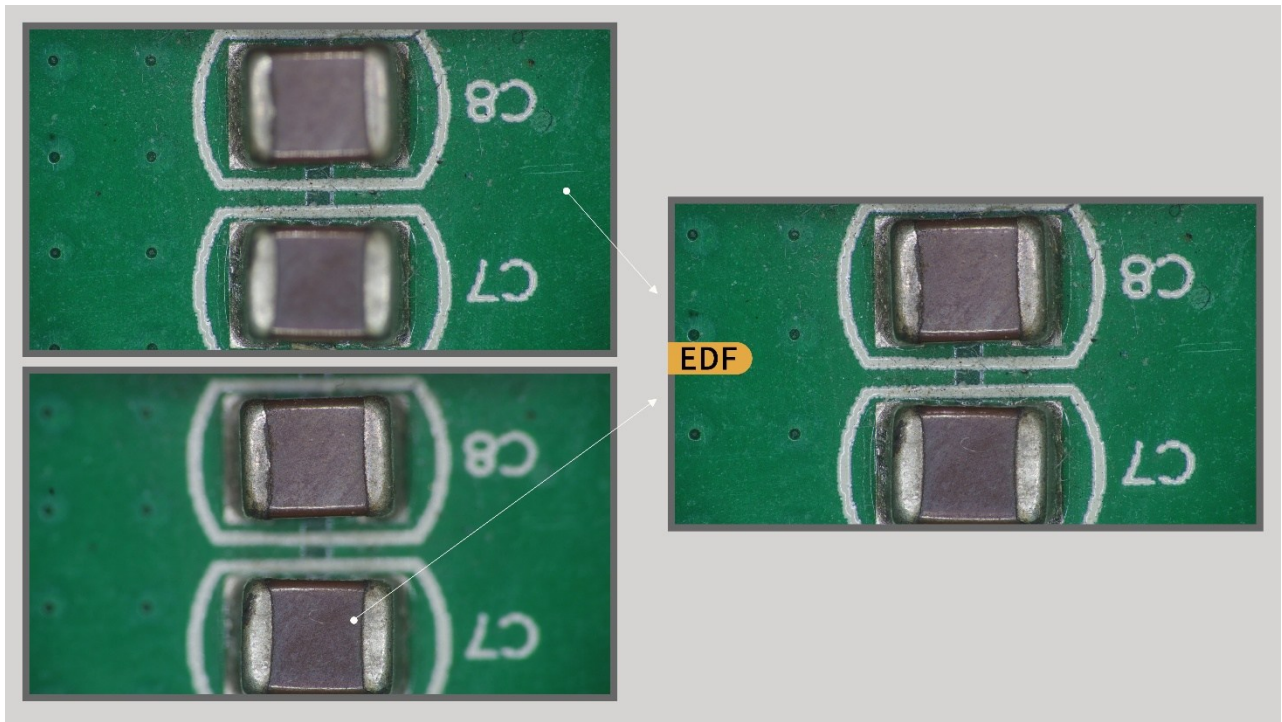


Figure 43 Circuit Board EDF Effect

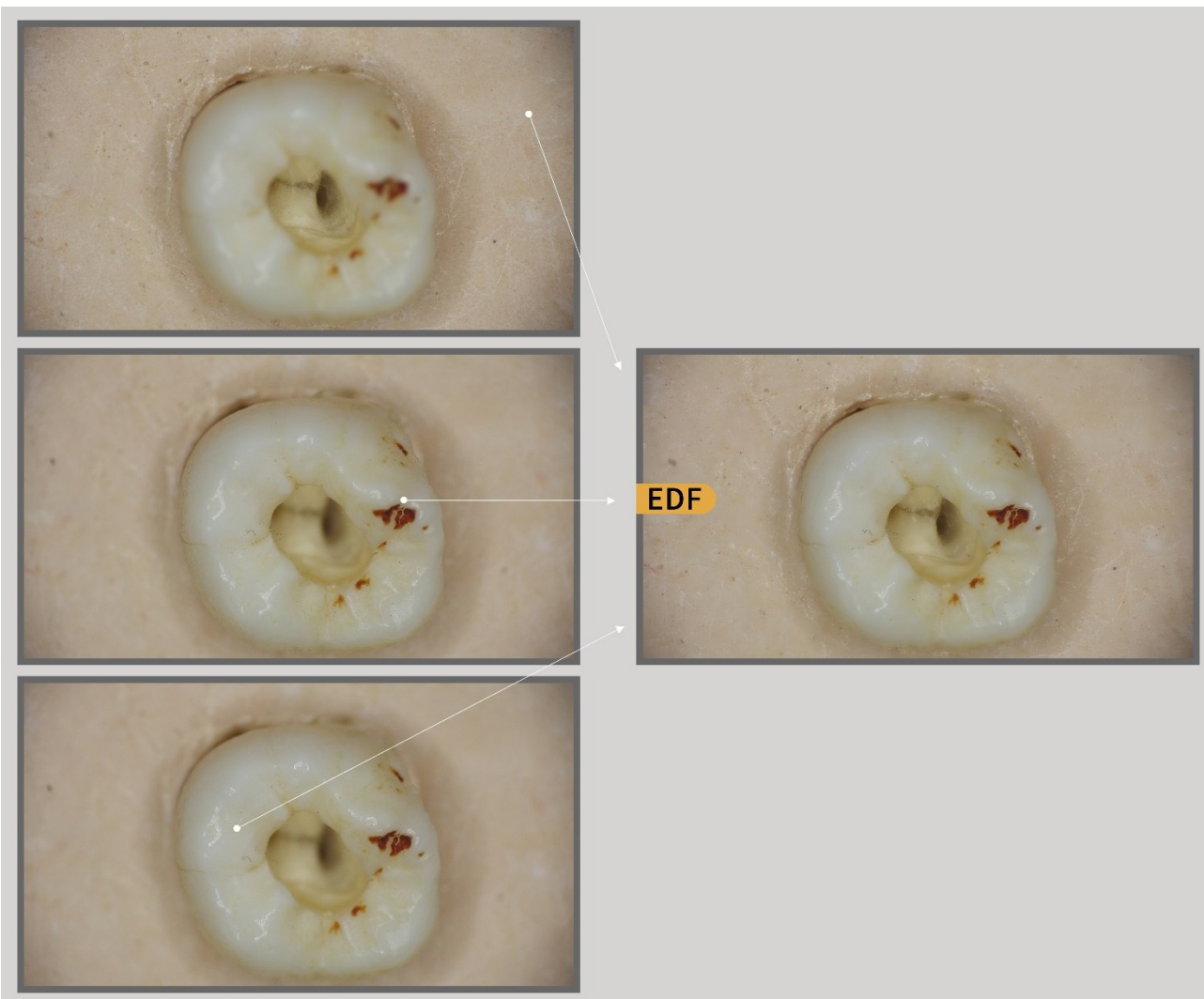


Figure 44 Tooth EDF Effect

9 ToupTek®-- Contact Information

	杭州图谱光电科技有限公司	
	杭州市西湖区西园五路6号奥强大厦1号楼15层	
	杭州, 310030, 浙江,	
	中国	
	Hangzhou ToupTek Photonics Co., Ltd	
	15F, Aoqiang Building 1, No. 6, Xiyuan 5th Rd.,	
	Hangzhou, 310030, Zhejiang,	
	P.R.China	
	+86-571-8111-0735	
	+86-571-8111-0730	
	+86-571-8810-2638,	
	+86-18058780750 (手机/Mobile Phone)	
	FAX: +86-571-8668-3738	
	tphz@touptek.com	
	Skype:	18058780750/ToupTek Photonics
	QQ	2426878316
	Wechat	18058780750