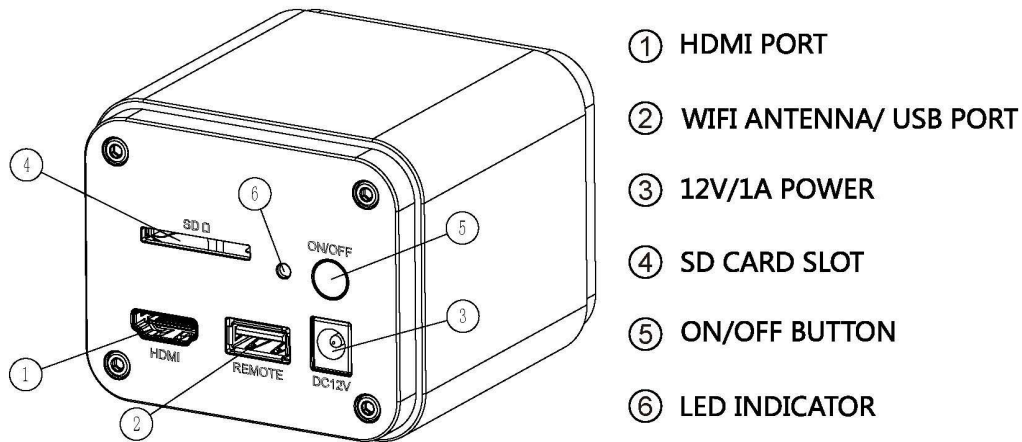# 1　　The XFCAM Camera Rear Cover Function

Figure 7　　The Layout of XFCAM1080PHB/PHD Camera Rear Cover

The **XFCAM1080PHB/PHD** is a HDMI camera with auto focus function. Through the precise control of the sensor position, the image can be focused automatically for the stereo or biological microscope. However, this autofocus principle will destruct the microscope's imaging conjugate principle and we think only a minor focus adjustment can be made to keep the image with high quality.

But for the online basic observation, the **XFCAM1080PHB/PHD** camera can greatly increase the working efficiency and eliminate manual focus operations.

2   Quick Instructions for XFCAM1080PHB/PHD camera

Before starting the camera please connect the standard **XFCAM1080PHB/PHD** C-mount camera to camera adapter and connect it to the microscope's 3ʳᵈ tube which will relay microscope object's middle image to the camera sensor.

2.1   WiFi Mode

1. Plug **12V/ 1A** power cable into **Power Interface** ③ to supply power for the camera. The **LED Indicator** ⑥ will turn into red;
2. Press **ON/ OFF Button** ⑤ to start the camera and the **LED Indicator** ⑥ will turn into blue;
3. Plug the **WiFi** antenna which comes with the camera into **WiFi ANTENNA/ USB PORT** ② to generate **WiFi** signal;
4. After the indicator on the **WiFi** antenna starting blinking, connect computer (may be Pad or Phone) to **WiFi** signal whose name starts with **XFCAM1080PHB/PHD**. The **Password** is 12345678;
5. Open **ImageView** software, start **XFCAM1080PHB/PHD** by clicking the camera model name listed in **Camera List**. For more details please refer to the **ImageView** help manual;

2.2   HDMI MODE

1. Plug the HDMI cable into the **HDMI Port** ① to connect the **XFCAM1080PHD** camera to HDMI display;
2. Plug a USB mouse into **USB Port** ② to get control of the camera by using built-in software **XCamView**;
3. Plug 12V/ 1A power adapter into **Power Interface** ③ to supply power for the camera. The **LED Indicator** ⑥ will turn into red;
4. Insert SD card into **SD Card Slot** ④ for saving captured images and recorded videos;
5. Press **ON/ OFF Button** ⑤ to start the camera. **LED Indicator** ⑥ will turn into blue;
6. Move mouse cursor to the left side of the video window, The **Camera Control Panel** will appear. It includes **Manual/ Automatic Exposure**, **White Balance**, **Sharpness**, **Denoise** and other functions, please refer to 2.3 for details;
7. Move the mouse cursor to the upper side of the video window, a **Measurement Toolbar** with calibration and other measurement tools will appear, please refer to 2.3 for details; The measurement data can be output with ***.CSV** format.
8. Move the mouse cursor to the bottom of the video window and a **Synthesis Camera Control Toolbar** will appear. Operations like **Zoom In**, **Zoom Out**, **Flip**, **Freeze**, **Cross Line**, **WDR** and etc. can be realized. Please refer to 2.3 for details;
9. Move the mouse cursor to bottom of the video window, the **Synthesis Camera Control Toolbar** will pop up automatically. Click the button and **Auto Focus Control Panel** will show up for conducting autofocus operation;

2.3 Brief Introduction of XFCAM UI and Functions

The **XFCAM** UI shown in Fig. 8 includes the **Camera Control Panel** on the left side of the video window, the **Measurement Toolbar** on the upper side of the video window, the **Synthesis Camera Control Toolbar** on the bottom of the video window and the **Auto Focus Control Panel** on right side of the video window.
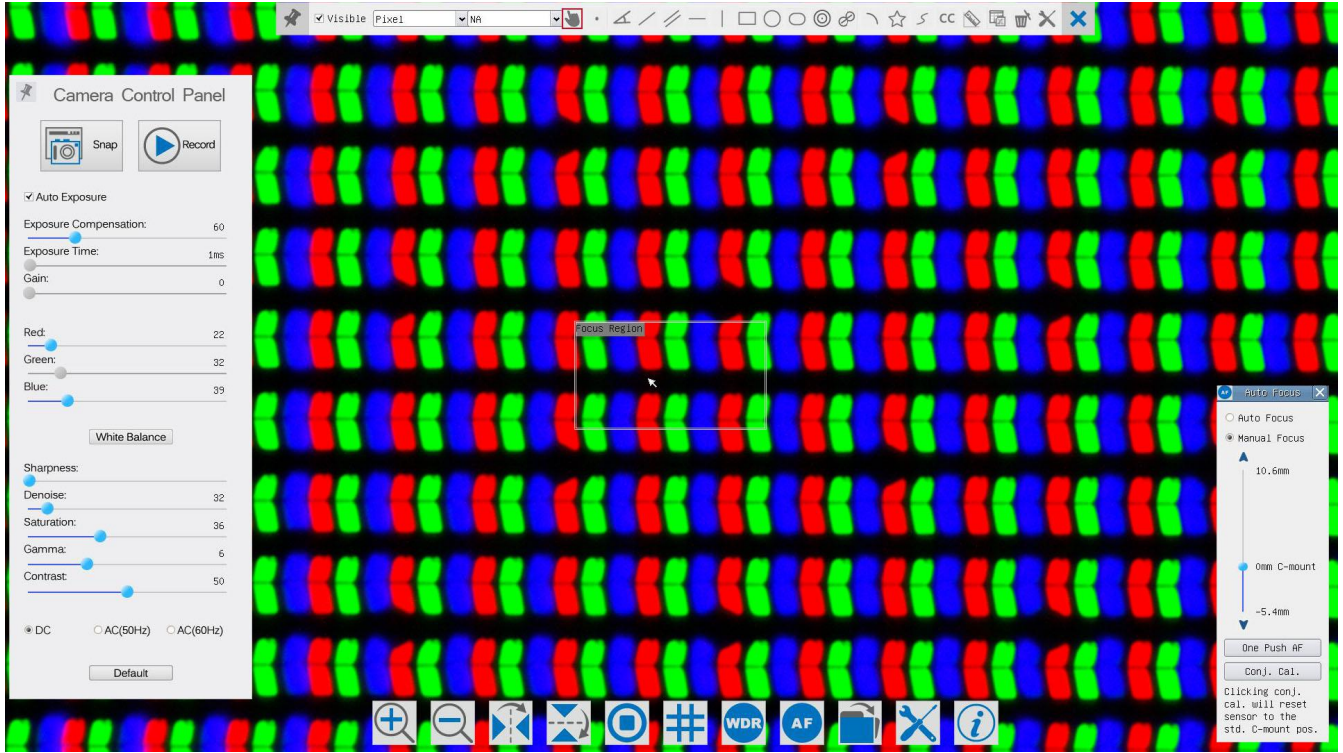

Figure 8 The XFCAM Camera Control UI

Notes
1   When users move the mouse cursor to the left side of the video window, the **Camera Control Panel** will pop up automatically;
2   When users move the mouse cursor to the bottom of the video window, the **Synthesis Camera Control Toolbar** will pop up automatically;
3   When user moves the mouse cursor to the bottom of the video window, the **Synthesis Camera Control** Toolbar will pop up automatically. Click the ![AF] button and the **Auto Focus Control Panel** will appear for autofocus operation;
4   Move the mouse cursor to the upper side of the video window, the **Measurement Toolbar** will pop up for the 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 side of the video windows. Only when user left-clicks the ![X] button on the **Measurement Toolbar** to exit from measuring procedure will they be able to do other operations on the **Camera Control Panel**, **Auto Focus Control Panel** or **Synthesis Camera Control Toolbar**. During the measuring process, when a specific measuring object is selected an **Object Location & Attributes Control Bar** ![icons] will appear for changing location and properties of the selected objects.

2.3.1   The Camera Control Panel on the Left Side of the Video Window

Camera Control Panel	Function	Function Description
	Snap	Capture or **Snap** image from the current video window
	Record	Record video from the current video window
	Auto Exposure	When **Automatic Exposure** is checked, the system will automatically adjusts exposure time according to the value of **Exposure Compensation** value
	Exposure Compensation	Available when **Auto Exposure** is checked. Slide to left or right to adjust **Exposure Compensation** according to current video brightness to achieve proper brightness value
	Exposure Time	Available when **Auto Exposure** is unchecked. Slide to left or right to decrease or increase exposure time to adjust the video brightness
	Gain	Adjust **Gain** to decrease or increase the video brightness. The noise will be reduced or increased accordingly
	Red	Slide to left or right to decrease or increase the proportion of **Red** in video window
	Green	**Green** is a base for reference and cannot be adjusted
	Blue	Slide to left or right to decrease or increase the proportion of **Blue** for the video
	White Balance	Auto **White Balance** adjustment according to the window video
	Sharpeness	Adjust **Sharpness** level of the video window
	Denoise	Adjust **Denoise** level of the video window
	Saturation	Adjust **Saturation** level of the video window
	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
	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 "strap" caused by 50Hz illumination
	AC(60HZ)	Check **AC(60HZ)** to eliminate flickering "strap" caused by 60Hz illumination
	Default	Set all the settings in the **Camera Control Panel** to the default values

The **Camera Control Panel** controls the camera to achieve the best image quality according to the specific applications; It will pop up automatically when the mouse cursor is moved to the left side of the video window (in measurement status, the **Camera Control Panel** will not pop up. Only when measurement process is terminated will the **Camera Control Panel** pop up by moving mouse cursor to the left side of the video window). Left-clicking button to achieve **Display/ Auto Hide** switch of the **Camera Control Panel**;

2.3.2　　Icons and Functions of the Synthesis Camera Control Toolbar at the Bottom of the Video Window

Icon	Function	Icon	Function
🔍	**Zoom In** the Video Window	🔍	**Zoom Out** the Video Window
⬓	**Horizontal Flip**	⬓	**Vertical Flip**
◉	**Video Freeze**	▦	Display **Cross Line**
WDR	**WDR**	AF	Start **Auto Focus Control Panel**
📁	**Browse Images and Videos in the SD Card**	✕	**Settings**
ⓘ	**Check Version of XCamView**		

The ✕ Setting function is relatively more complicated than the other functions. Here are more info about it:
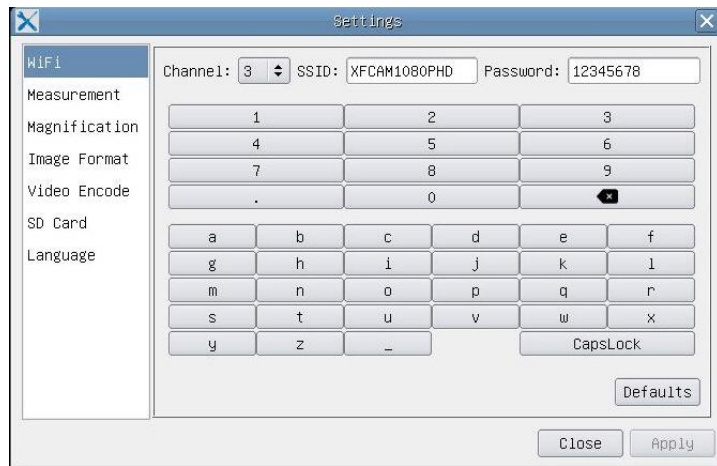
Figure 9 Comprehensive Setting of WiFi Settings Page

Channel: WiFi signal **Channel**. Avoid interference caused by using the same channel. Suggest choosing different channels for different cameras when several WiFi cameras are running at the same time;

SSID: Name of the WiFi signal. Can be user-defined by using the soft keyboard below;

Password: **Password** of the WiFi signal. The **Password** can be user-defined by using the soft keyboard below;

Default: Set **Channel**, **SSID**, **Password** to the default values;
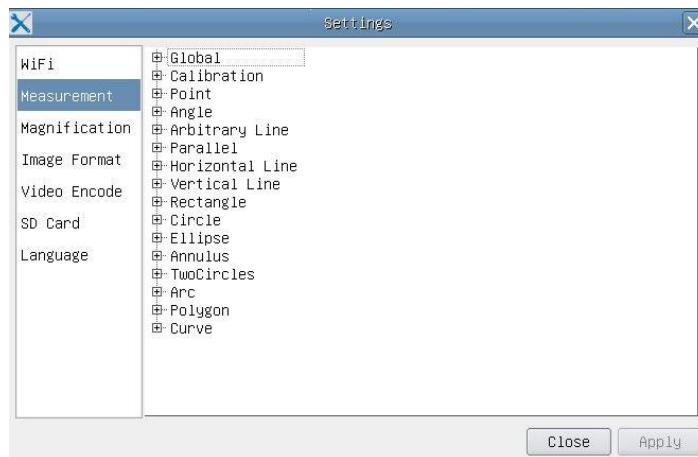
Figure 10 Comprehensive Measurement Settings Page

Global：　Used for setting digits behind the decimal point for measurement results;

Calibration   **Line Width**:   Used for defining width of the lines in measurement and calibration;

Color: Used for defining color of the lines in measurement and calibration;

EndPoint   Type: Used for defining shape of the endpoints of lines in measurement and calibration: Null means no endpoints, rectangle means rectangle type of endpoints. It makes it easier to calibrate;

Point, Angle, Line, Horizontal Line, Vertical Line, Rectangle, Circle, Ellipse, Annulus, Two Circles, Polygon, Curve:

Left-click the ⊞ besides the measuring patterns mentioned above will unfold the corresponding attribute settings to set the individual property of the measuring objects.
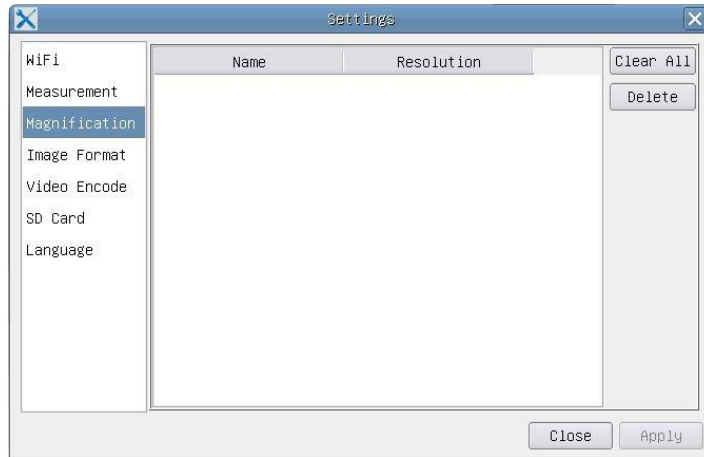
Figure 11 Comprehensive Measuring Units, Calibration, Magnification Management Settings Page

Name: Names such as 4X, 10X, 20X ,40X , 100X are based on magnification of microscopes. For continuous zoom microscopes, ensure that the selected magnification coincides with the scale alignment line;

Resolution: Pixels per meter. Devices like microscopes have high resolution value;

Clear All: **Clear All** the calibrated magnifications and resolutions;

Delete: Click **Delete** to delete the selected item for specific resolution;
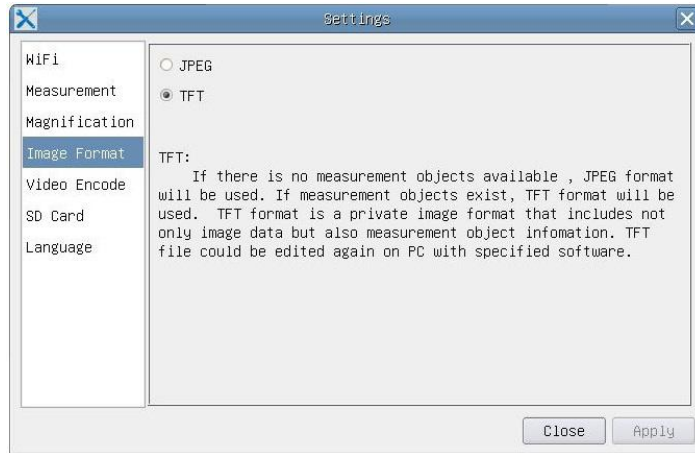
Figure 12 Image Format Setting Page

JPEG：Save captured image in **JPEG** format into SD card;

TFT：Save captured image in **TFT** format into SD card. The **TFT** format saves not only image data but also the measurement data over the image. The camera control & imaging processing software ToupView is capable of opening **TFT** file;
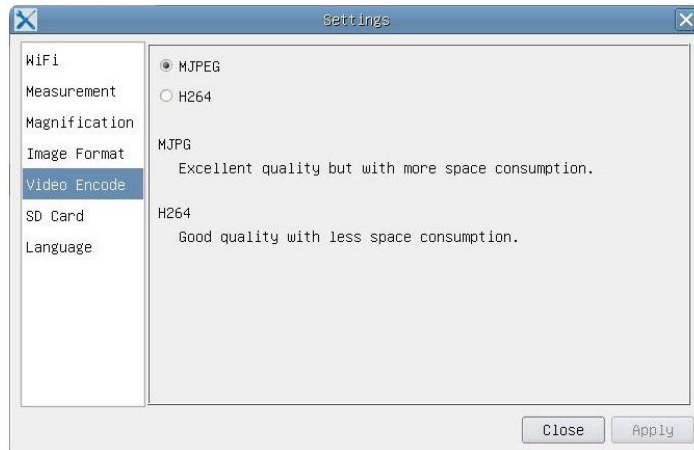
Figure 13 Comprehensive Setting of Video Encode Setting Page

MJPEG：   Save recorded videos in **MJPEG** coded format;

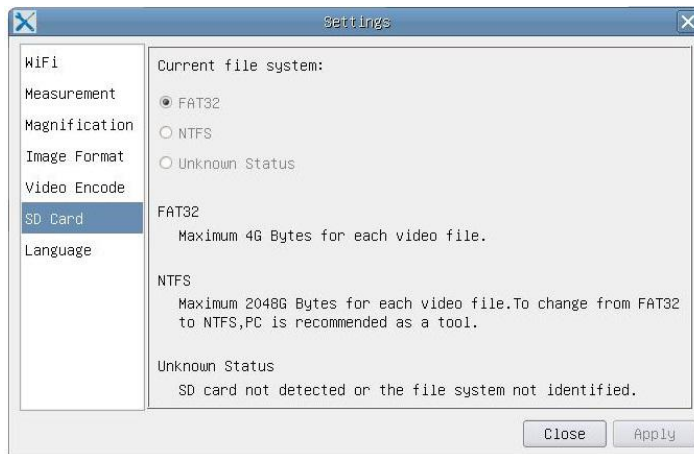**H264**：   Save recorded videos in **H264** coded format;

Figure 14 Comprehensive Setting of SD Card Setting Page

Current File System: The maximum file **FAT32** can store is of 4G Bytes; for **NTFS** it's 2048G Bytes. Suggest converting **FAT32** file into **NTFS** format on a PC; **Unknown Status**: SD card not detected or the file system is not identified;

Figure 15 XFCAM 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;

2.3.3   The Measurement Toolbar on the Upper Side of the Video Window

The **Measurement Toolbar** will pop up when moving mouse cursor to any place near the upper side of the video window. Here are the introduction of the various functions on the **Measurement Toolbar**:

Figure 16 The Measurement Toolbar Button on the Upper Side of the Video window

Icon	Function
	Float/ Fix switch of the **Measurement Toolbar**
☑ Visible	Define measuring object in **Show up/ Hide** mode
Pixel	Select the desired **Measurement Unit**
NA	Choose the same **Magnification** as the microscope to ensure accuracy of measurement result when measurement unit is not in Pixel unite
	Object Select
	Point
	Angle
	Arbitrary Line
	Parallel
	Horizontal Line
	Vertical Line
	Rectangle
	Circle
	Ellipse
	Annulus
	Two Circles and Center Distance
	Arc

☆	**Polygon**
∫	**Curve**
◿	**Make Calibration to determine the corresponding relation between magnification and resolution, this 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.**
CC	**Conjugate Correction**: Click CC to do the **Conjugate Correction** before doing any calibration. Then manually adjust the coarse and fine focus knob of microscope to make sure the video is clear. Make sure the magnification in the software stays in accordance with microscope magnification, and then select the corresponding **Measurement Unit** for doing the measurement.
▦	Export the measurement information to **CSV** file (***.csv**)
🗑	**Delete All the Measurement Objects**
✕	**Setting**
✖	**Exit from Current Measurement Mode**
◀ ▶ ▲ ▼ ● 🗑	When the measurement ends, left-click on a single measuring object and the **Object Location & Properties Control Bar** will show up. 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 the **Measurement Toolbar**, the **Measurement Toolbar** will be fixed. In this case the **Camera Control Panel** will not pop up automatically even if moving mouse cursor to the left side of the video window. Only when 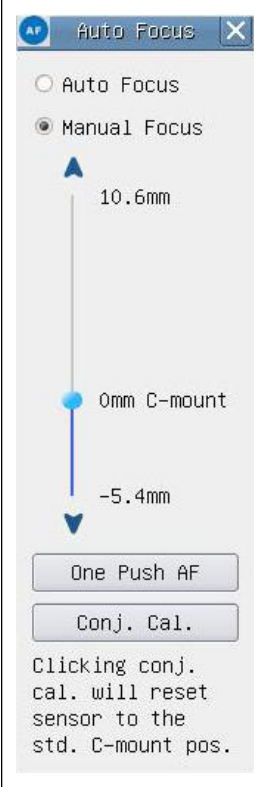users left click the ✖ button on the **Measurement Toolbar** to exit from the measurement mode will they be able to doing other operations in the **Camera Control Panel**, the **Auto Focus Control Panel** or the **Synthesis Camera Control Toolbar**.

2) When a specific measuring object is selected during the measuring process, the **Object Location & Attributes Control Bar** ◀ ▶ ▲ ▼ ● 🗑 will appear for changing the object location and properties of the selected objects.

3) To ensure accuracy of the measurement, please click the **Conjugate Correction** button CC to reset the camera sensor to the standard **C-mount** position before calibration. The measurements can be started after calibration is completed and the video is focused.

4) In case calibration is completed but camera sensor is not on the C-mount position, The **Conjugate Correction** should be done to reset sensor to the standard **C-mount** position and the video is focused before measurement is started.

2.3.4　　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;
	One Push AF	Click **One Push** 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).

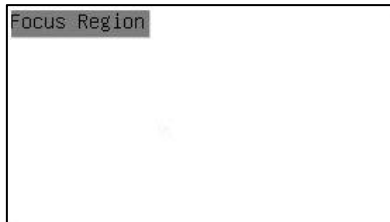## 2.3.5　　Focus Region in the Video Window

Figure 17 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 the video window to reset the focus region for **Auto Focus** operation.

When users close the **Auto Focus Control Panel**, the **Focus Region** will also be closed automatically.

Note: When **Auto Focus** is working, moving mouse cursor to upper side of the video window does not make the **Measurement Toolbar** pop up.