Vzense UTool User Guide

Windows

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Vzense

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1 Overview

Welcome to the Vzense UTool User Guide. Vzense UTool (UTool) is a graphical Windows-based tool developed for Vzense TOF Cameras such as the DCAM710, DCAM305 , DCAM550 or DCAM560C.

Figure 1 – Vzense UTool

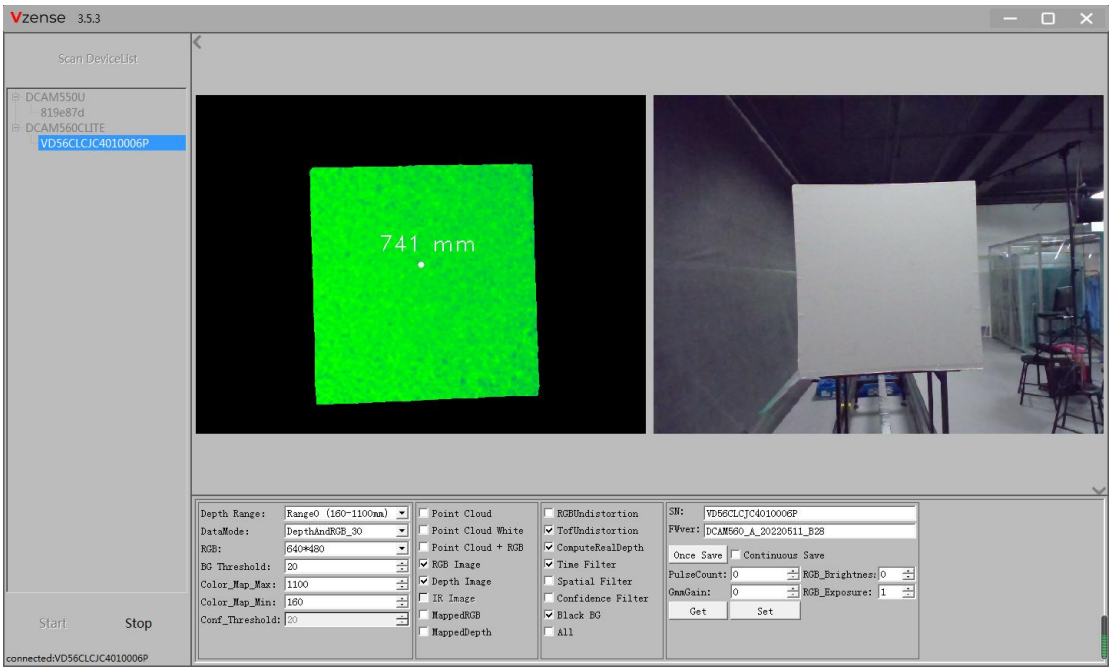


Figure 2 – Vzense UTool

The tool allows you to interact with the camera module to capture depth information and to control such functionality as camera modes, point clouds, anti-interference and anti-distortion, filter settings, and RGB mapping functions.

This document describes how to configure and use the Vzense UTool with the camera module.

2 Package Structure

2.1 SDK Structure on Windows

The Vzense UTool package for Windows contains the following notable directories and files:

- **opencv_world300.dll**: The OpenCV dependency DLL used by UTool.
- **Vzense_api.dll**: The Vzense DLL the enables UTool to interact with the camera.
- **VzenseUTool.exe**: The Vzense UTool Windows application.
- **UTool.ini**: Configuration file for UTool where settings are stored.

3 Requirements

UTool has the following requirements:

Supported Operating Systems: Windows 7 32/64 bit, Windows 10 32/64 bit

RAM: A minimum of 4GB

4 Setting up the Development Environment

4.1 Hardware Installation

Connect the camera module to a PC using a USB cable or a Network cable as shown in Figure 3:

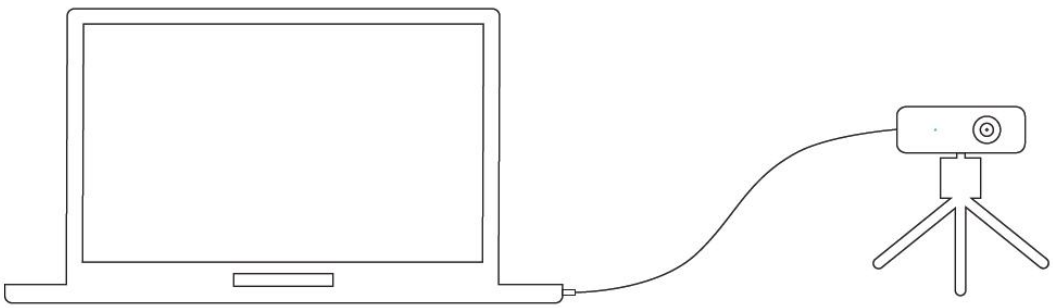


Figure 3 - Hardware installation.

4.1.1 USB Interface Product Setup (DCAM710 And DCAM550U)

Connect the camera module to PC USB interface through USB cable.

In Windows, when the camera module is successfully connected, it will pop up the notice of the device driver installation. After the driver is auto-installed successfully, it will display the **`Vzense TOF Camera`** device in Windows Device Manger.

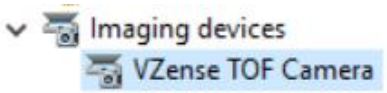


Figure 4 Vzense TOF Camera

Note:

If you use DCAM710 with range 1 or range 2,please plug in a 5V or 6V power supply.

4.1.2 Ethernet Product Setup(Only for DCAM550P,DCAM560CPRO and DCAM560CLITE)

There are two network Settings: fixed address and DHCP.

1. Fixed address

The fixed address connection can be directly connected to the camera and the computer, or it can be configured to be used in the switch of the same network segment.

Direct connection: one end is connected to the camera, and the other end is connected to the network cable interface of the PC host. The default IP of the camera is 192.168.1.101. On the PC side, set the subnet mask of "local connection" to 255.255.255.0, and the IP address to the same network segment (such as 192.168.1.100).

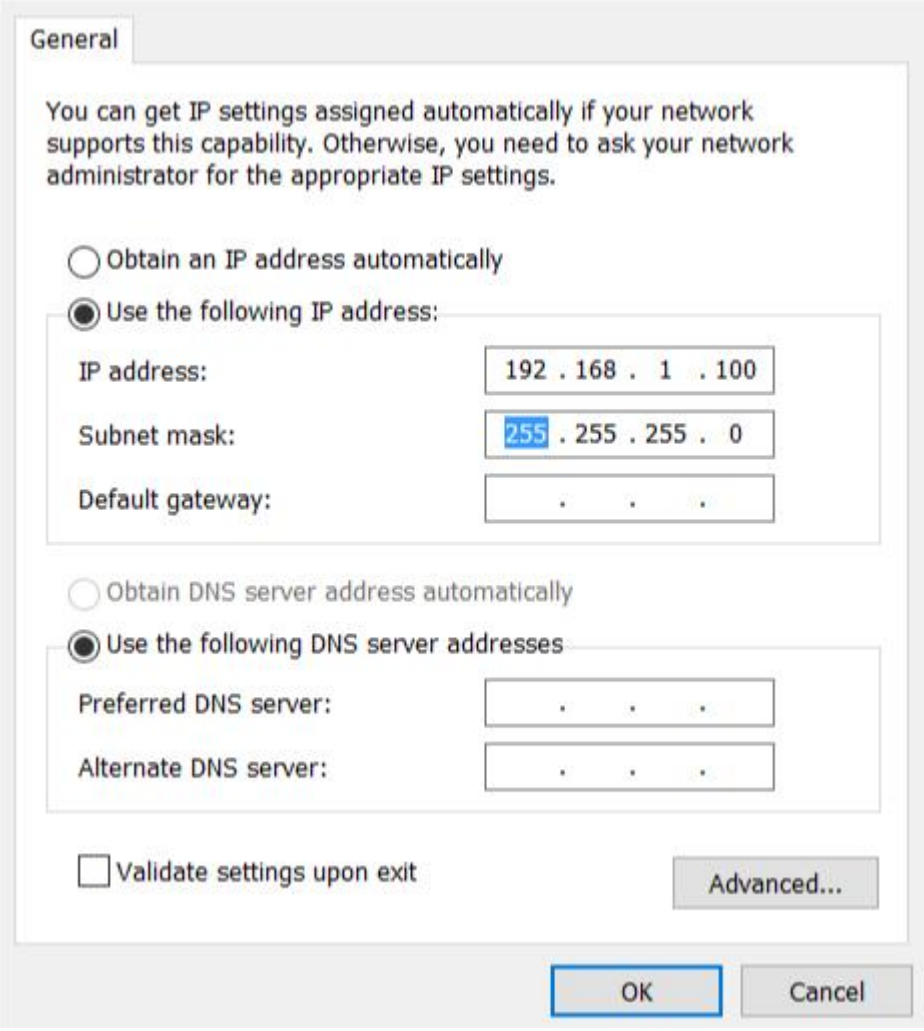


Figure 4.1 Direct connection

Notice:

If you want to change the IP with the camera please download VzenseConfigTool.

Download link：

China: https://gitee.com/Vzense/VzenseConfigTool

Oversea: https://github.com/Vzense/VzenseConfigTool

2. DHCP

For the DHCP connection mode, the camera needs to be connected to the router with DHCP enabled, and the PC in the same LAN is used for connection. It is recommended to set the "local connection" of the PC to obtain the IP address automatically.

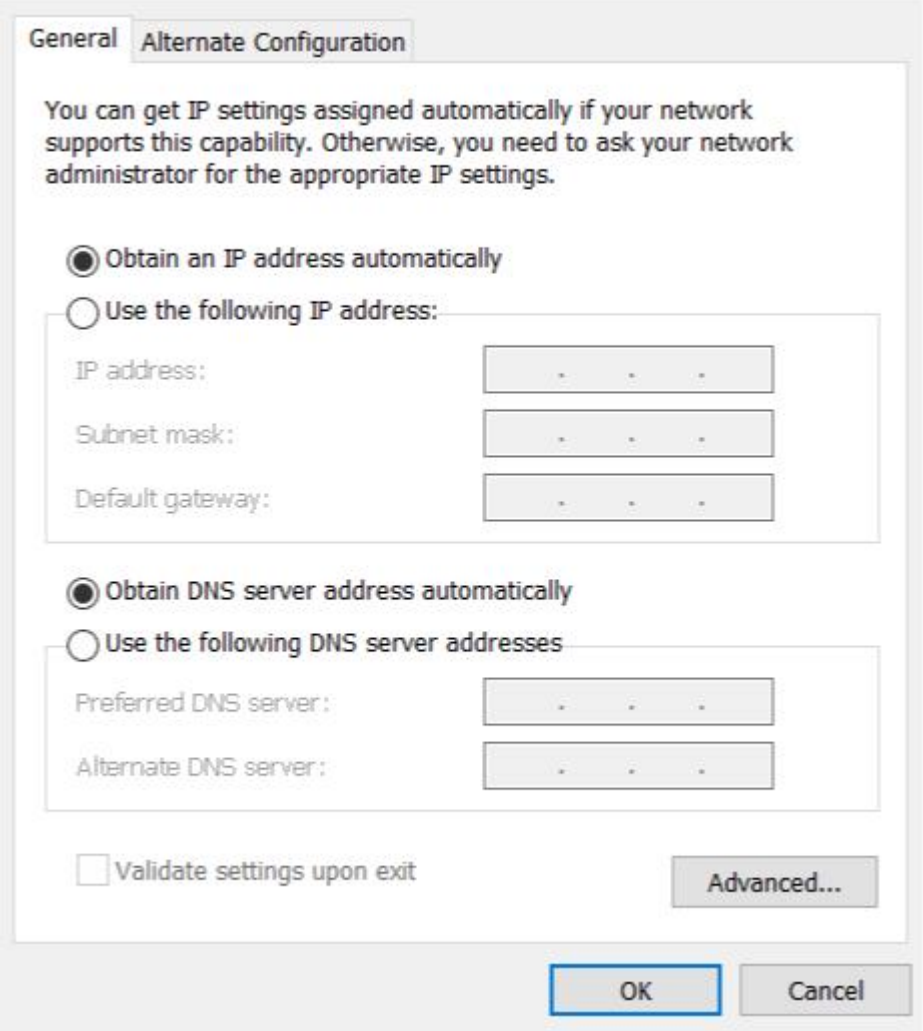


Figure 4.2 DHCP

Note:

1. The network card, router and switch used at the PC end shall meet the requirements of Gigabi
2. When you first run the SDK, set permissions for the SDK to pass through the system firewall.

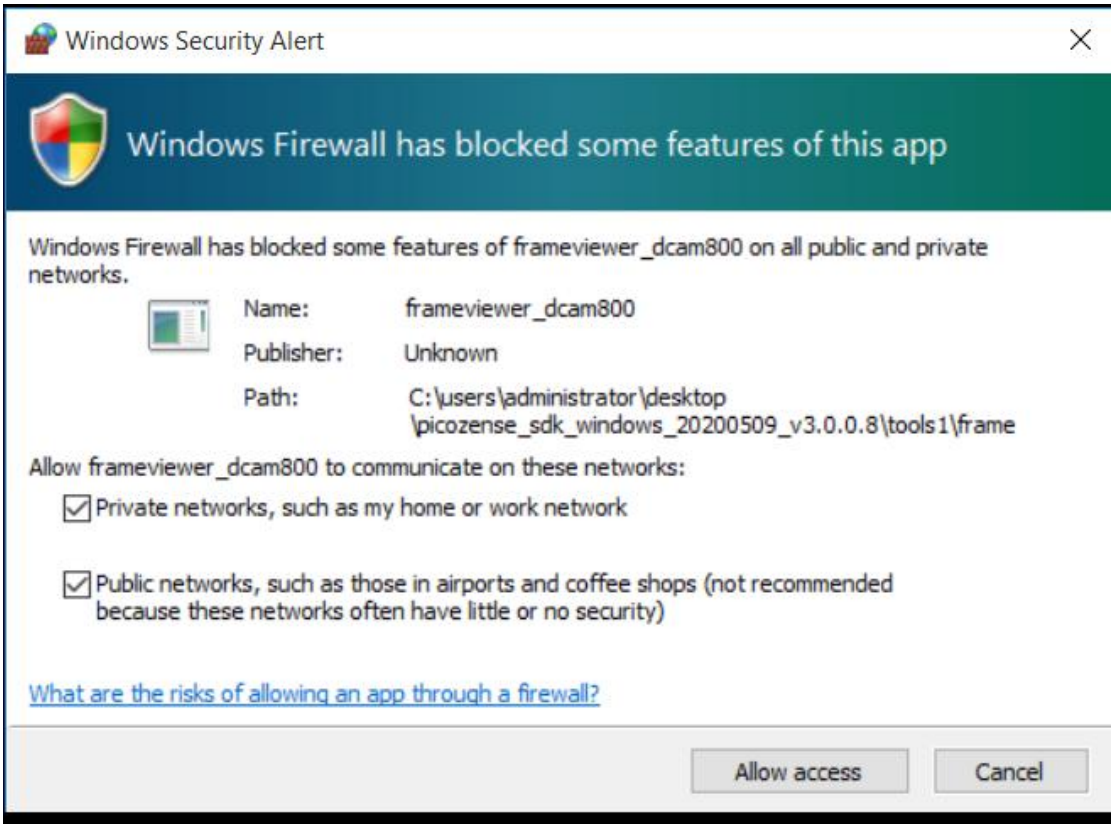


Figure 4.3 firewall setting

4.1.3 Running Single Camera Mode

Single camera mode allows you to capture and view information from a single camera module. Follow the steps below to use *single camera mode*:

1. Set up the camera module as described above in Section 4.1.
2. Wait for the front of the camera to light up.
3. Navigate to the root of the **Vzense UTool for Windows** package and run **VzenseUTool.exe**.
4. DoubleClick the Camera Mode in the devicelis or Click the Camera Mode first, then click **Start** in UTool to begin stream capture as shown in Figure 5

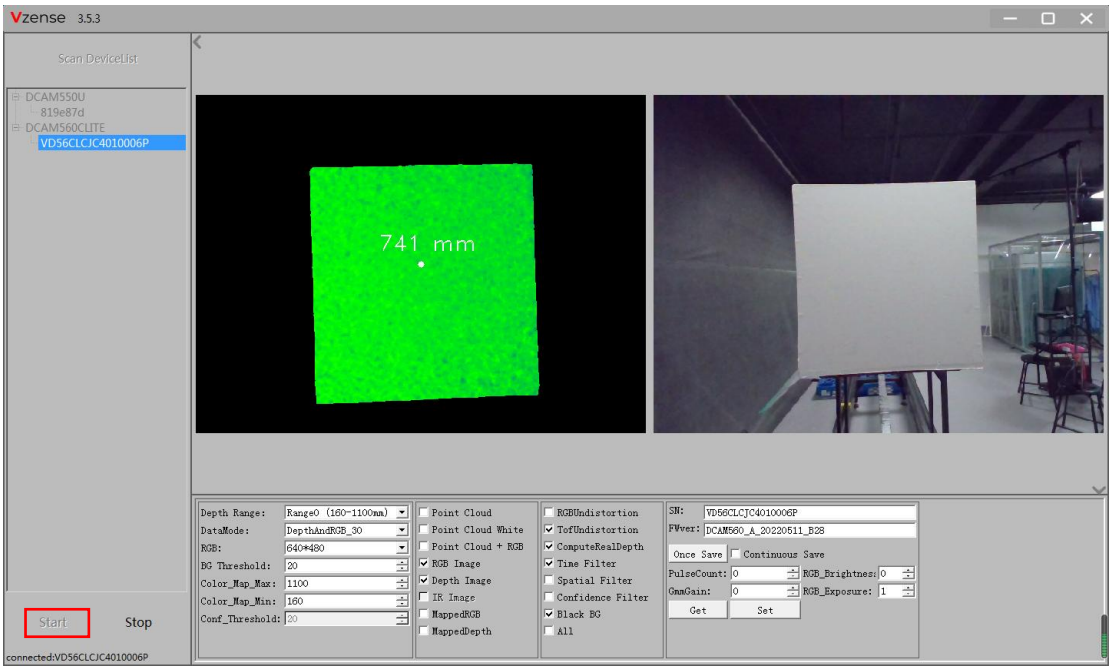


Figure 5 – Vzense UTool

5 UTool Settings and Functionality

The following subsections describe the settings and functionality of UTool.

5.1 DeviceList

Figure 5.1.1 - DeviceList .

Follow the steps to use the *DeviceList* :

1. DoubleClick the Camera Mode in the devicelis or Click the Camera Mode first, then click “**Start”** to begin stream capture. As is shown in figure 5.1.2.

Figure 5.1.2 - Connect device .

2. Click “**Stop**” to stop steam capture and clear the devicelist.As is shown in figure 5.1.3.

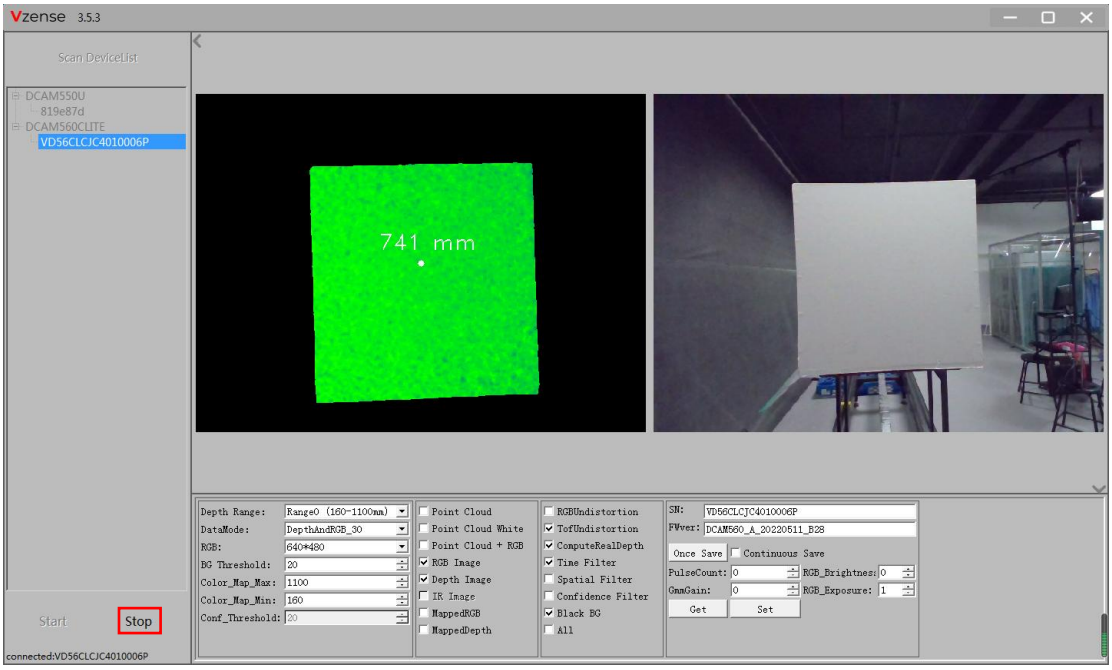


Figure 5.1.3 - Stop device .

3. Click “**Scan DeviceList**” to get the devicelist,then repeat the step 1 to operate another Camera Mode.As is shown in figure 5.1.4.

Figure 5.1.4 - DeviceList .

5.2 Image View

Image View displays a depth or IR image on the left side and a color image on the right side of UTool. In the *Depth Map* mode, In Depth Map mode, the middle value of the image on the left represents the Depth value of the real-time pixels, in millimeters. Figure 5.2 shows an example where the depth value is 576 mm.

Click the right mouse button at different positions on the depth map to display the depth value of the current position

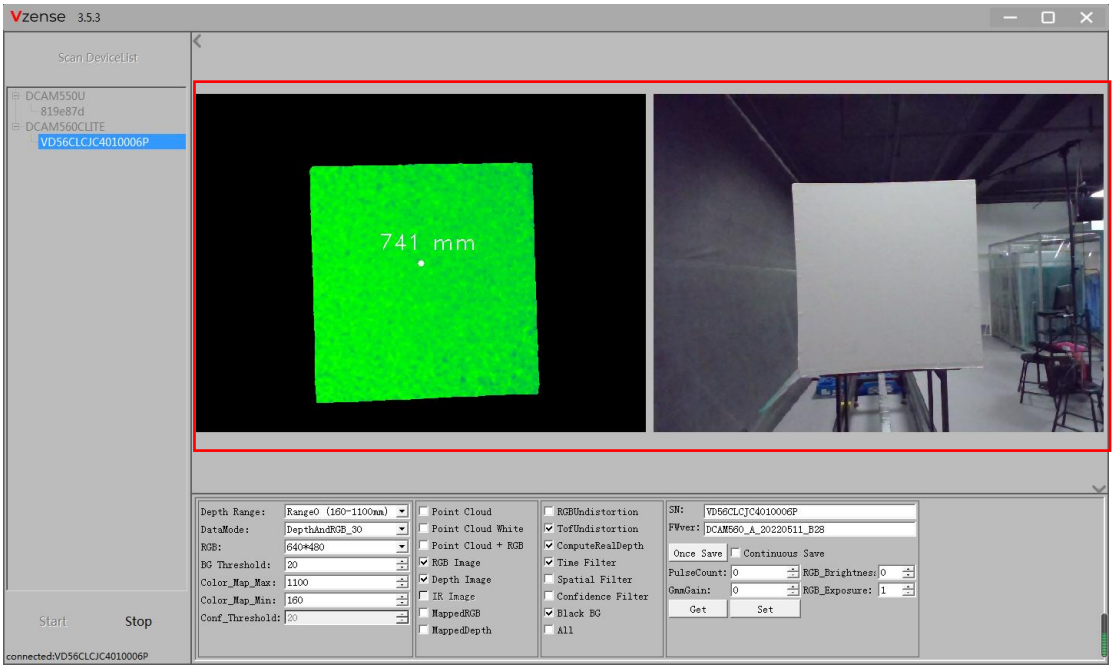


Figure 5.2 - Image View.

5.3 Settings View

Settings View allows you to modify view-specific settings as shown in Figure 5.3.1. These settings are described in the subsections below.

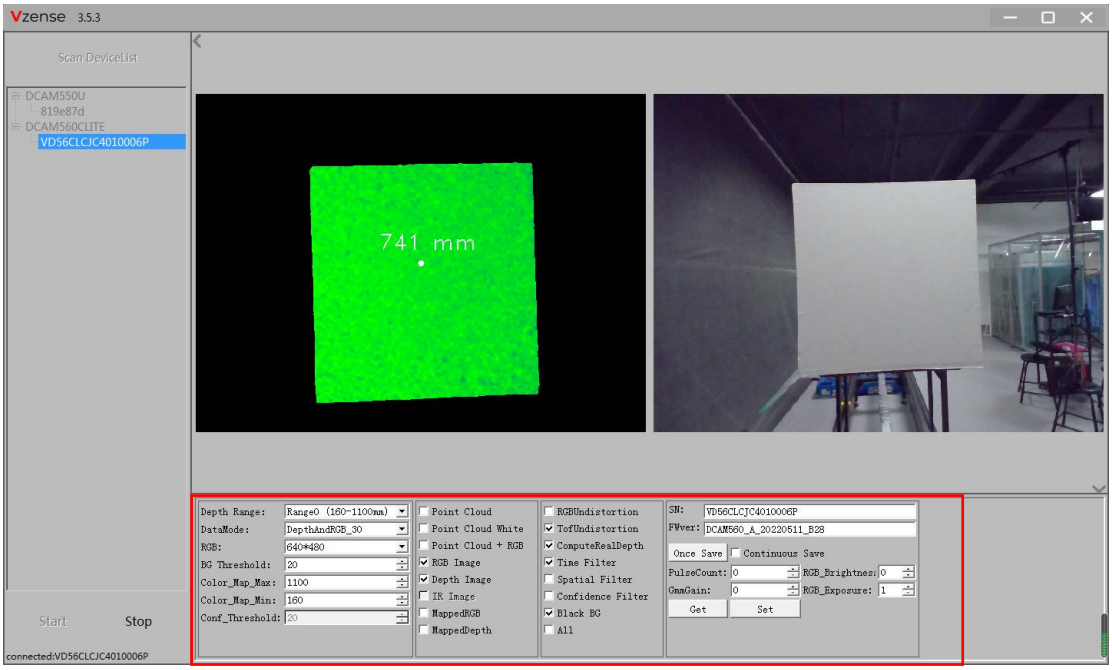


Figure 5.3.1 - Settings View.

5.3.1 Camera Settings

5.3.1.1 Depth Range

Depth Range defines the effective depth range of the camera module, which can be switched according to the requirements of a given mode. Table 1 lists the maximum effective value ranges for each mode, in millimeters:

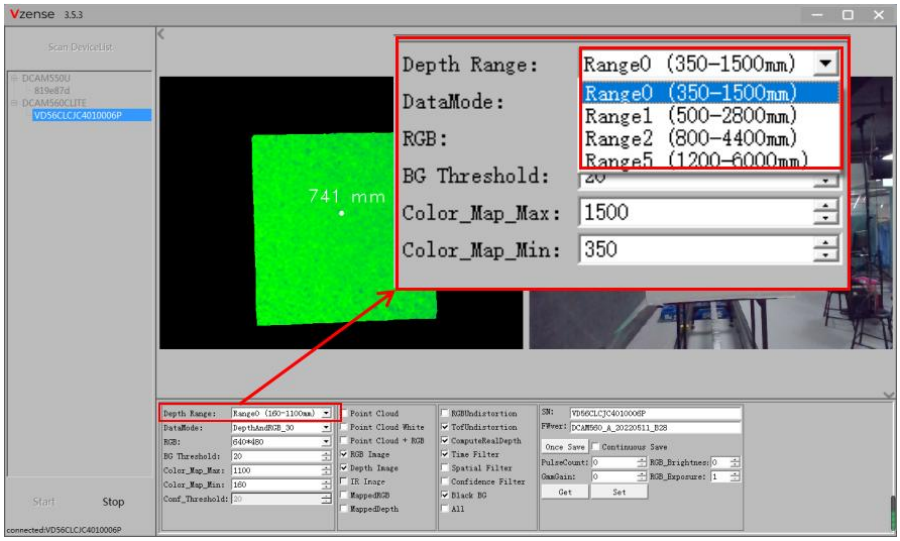


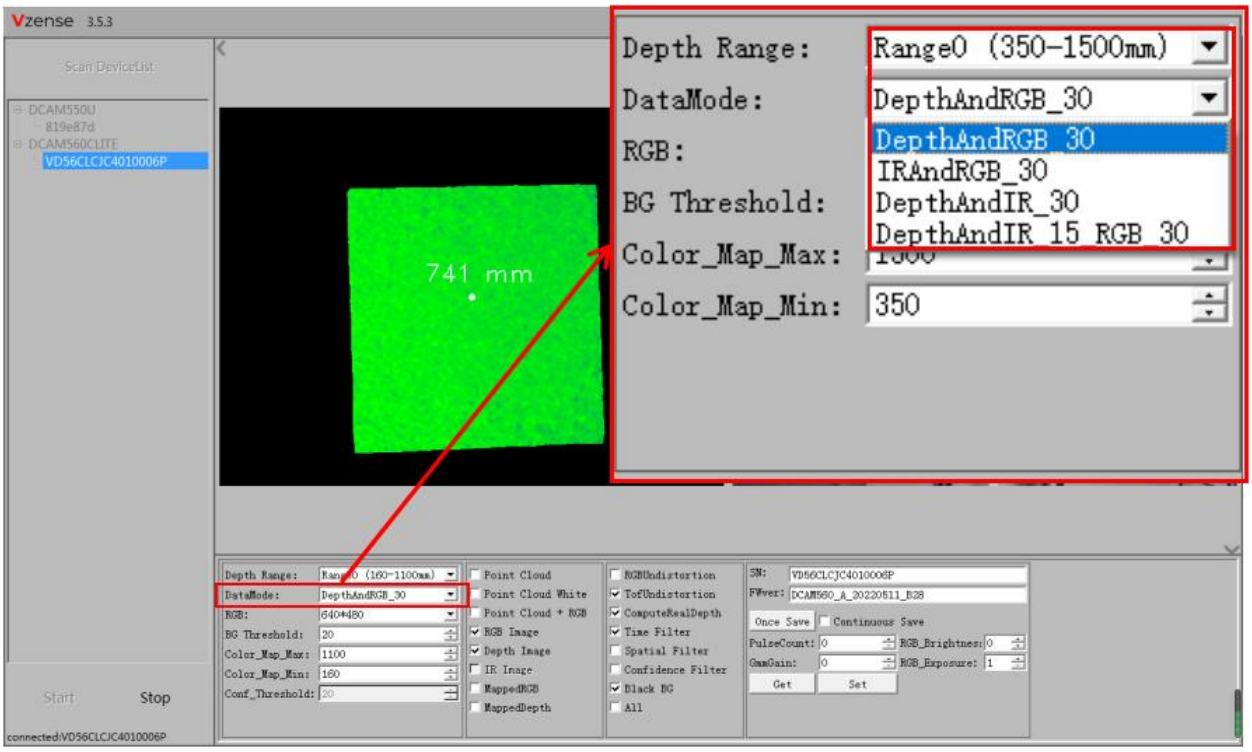
Figure 5.3.2 - Depth Range.

Table 1 – Maximum effective value ranges for each range mode, in millimeters.

Range	Depth (DACM710&DCAM550)	Depth (DCAM560C)
Range0	1500	1100
Range1	2800	2800
Range2	4400	4500
Range5	6000	6000

5.3.1.2 Data Mode

Data Mode specifies the type of images to display.



The DCAM560C Lite is used as an example. The following data modes are available:

- **DepthAndRGB_30**: Output depth and RGB images simultaneously at 30 fps. The depth image resolution is 640x48,0RGB image resolution can be set. DCAM710 supports four resolutions of 1080P, 720P, 480P, and 360P. DCAM560CPro and DCAM560CLite support three resolutions of 1200P, 600P, and 480P.As shown in Figure 5.3.3.

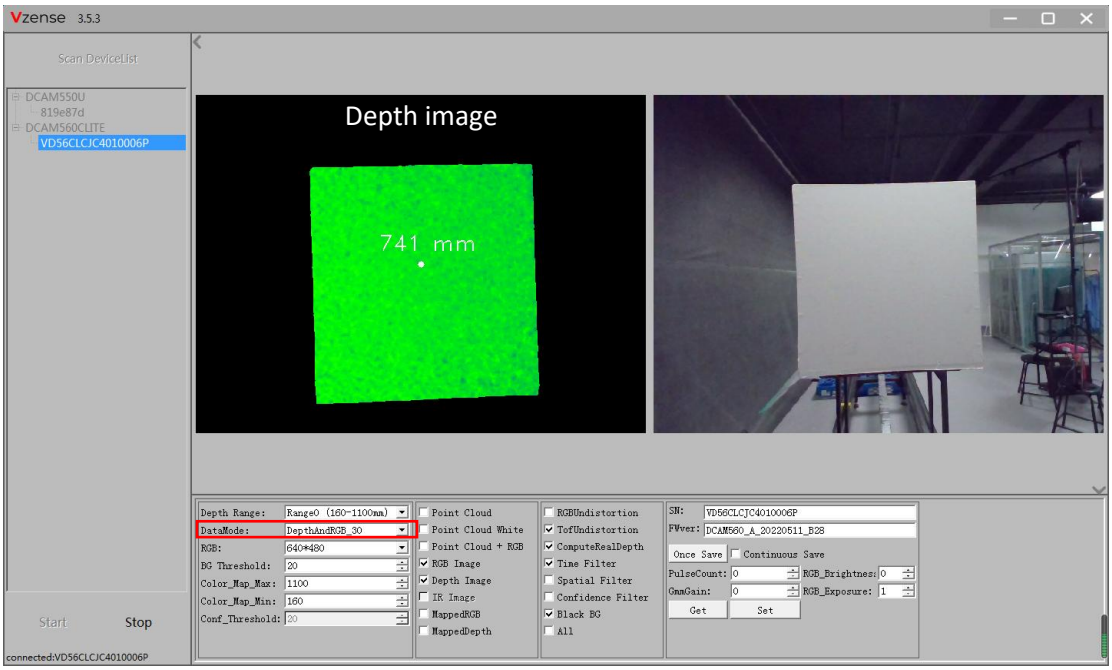


Figure 5.3.3 - DepthAndRGB_30.

- **IRAndRGB_30**: Output IR and RGB images at 30 fps. The resolution of an IR image is 640x480.As shown in Figure 5.3.4.

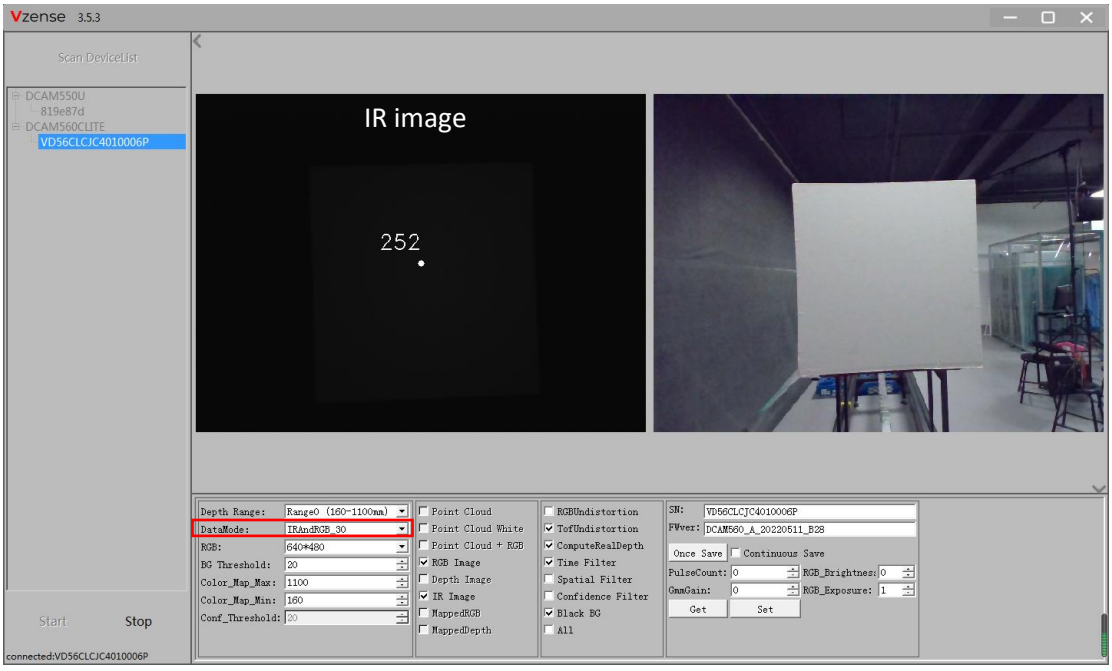


Figure 5.3.4 - IRAndRGB_30.

- **DepthAndIR_30**: Output depth and IR images simultaneously at 640*480, 30 fps. An example is shown in the left-hand image of Figure 5.3.5.**Only the DCAM710 supports this mode.**

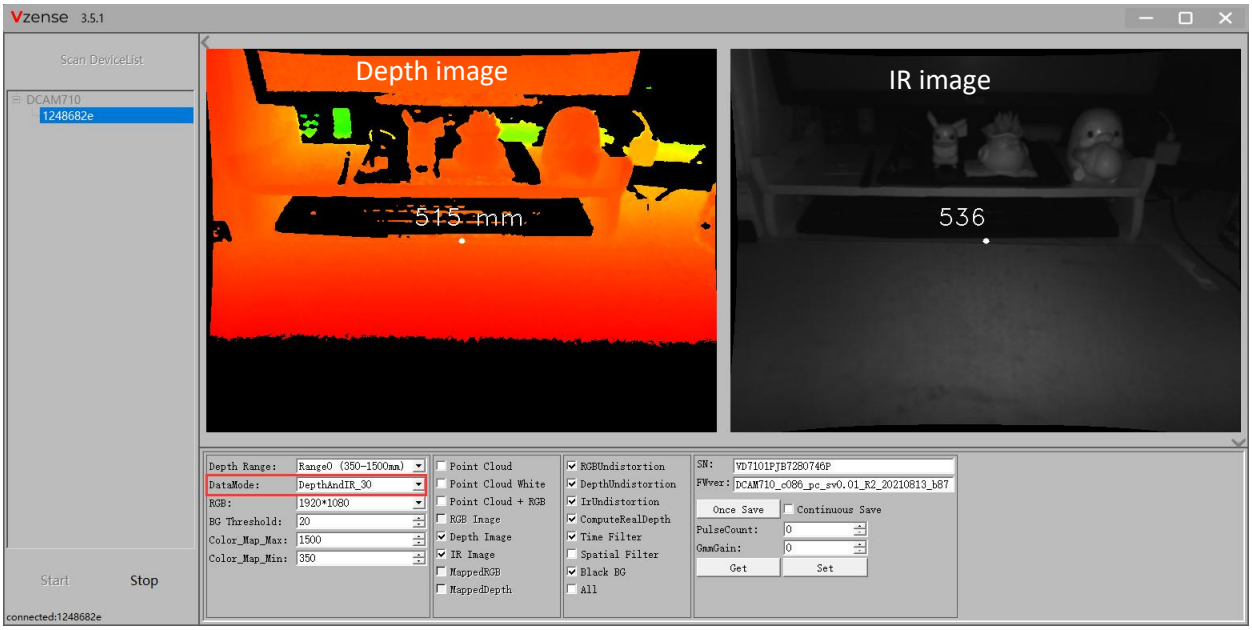


Figure 5.3.5 - IRAndRGB_30.

- **DepthAndIR_15_RGB_30**: Output depth and IR images at 640x480, 15 fps and RGB image at 30fps.As shown in Figure 5.3.6.

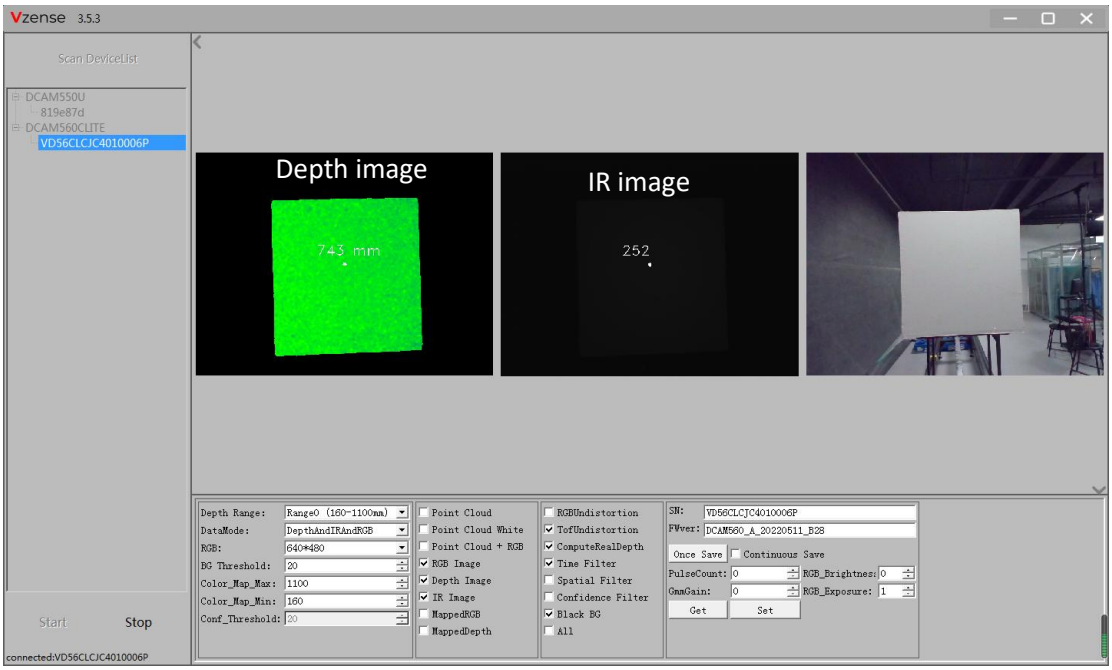


Figure 5.3.6 - IRAndRGB_30.

5.3.1.3 RGB Image Resolution(DCAM710 and DCAM560C)

As shown in Figure 5.3.8.

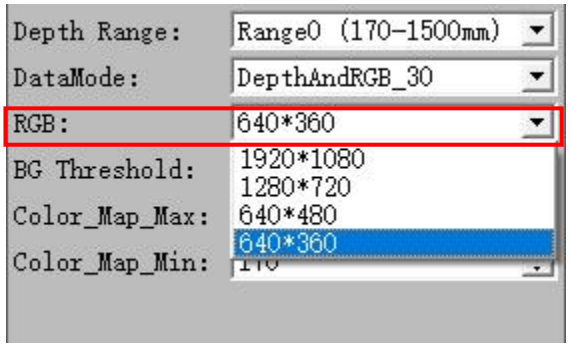


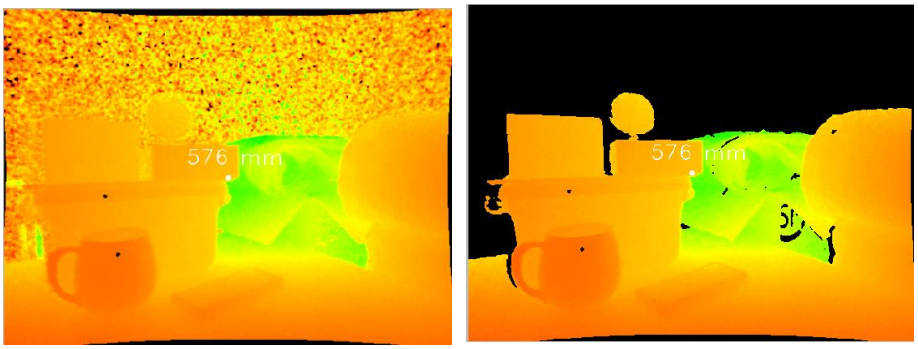
Figure 5.3.8 - RGB Image Resolution.

For DCAM710:RGB switches RGB images between 4 resolutions: 1920x1080, 1280x720, 640x480, and 640x360.

For DCAM560C:RGB switches RGB images between 3 resolutions: 1600x1200, 800x600 and 640x480.

5.3.1.4 Background Filtering

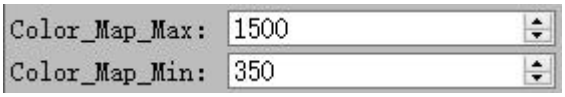
BG Threshold is a background filter adjusts the degree to which the background is filtered out. Set the background filter to 0 to turn off filtering, or to a larger value to set the filtering level as shown in Figure 5.3.9:



BG Threshold Disabled BG Threshold Set To 20

Figure 5.3.9 – Left: Background Filtering Disabled; Right: Background Filtering set to 20.

5.3.1.5 Color Map



Color_Map_Min and **Color_Map_Max** set the minimum and maximum color mapping values respectively.

For displaying the depth image intuitively, we map 16-bit depth image to 8-bit gray image. When mapping, we intercept the depth value in a given range: **Color_Map_Min** to **Color_Map_Max**, and then map it to 0-255 range. Finally, the gray image is transformed into a color image by using pseudo-color mapping, as shown in Figure 5.3.10.

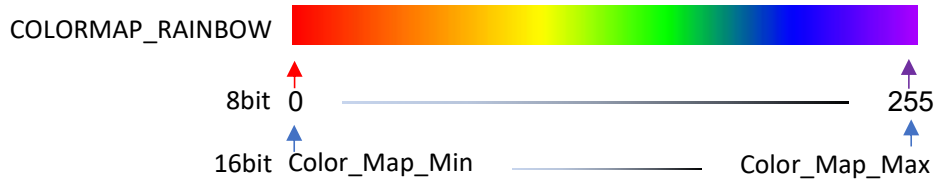


Figure 5.3.10 - Color Mapping

Figure 5.3.11 shows an example with color mapping maximum values set to 1500 and 2000 respectively:

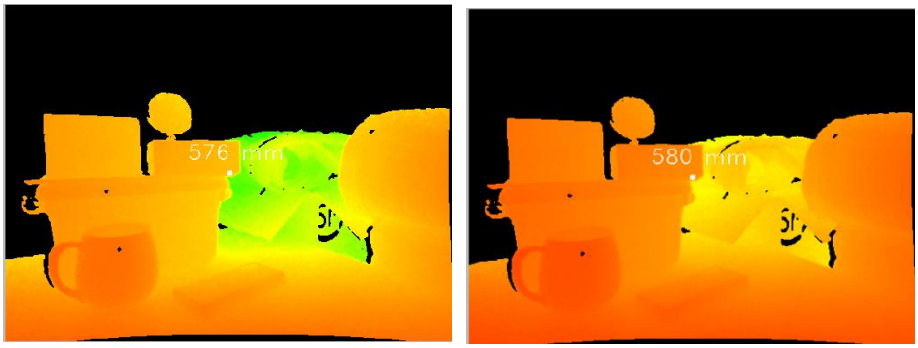
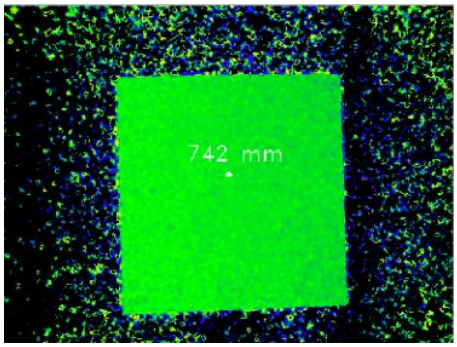


Figure 5.3.11 - Left: Color Mapping Maximum set to 1500; Right: Color Mapping Maximum set to 2000.

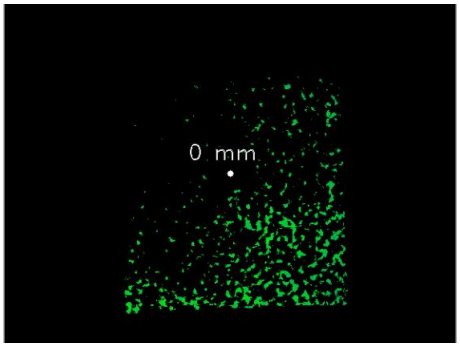
5.3.1.6 Confidence filter threshold

When Confidence Filter is enabled, the threshold of Confidence filtering can be set. 0 indicates that the filtering is disabled. The larger the value is, the more obvious the filtering effect of low Confidence is. This function is suitable for pallet and tray identification scenarios.

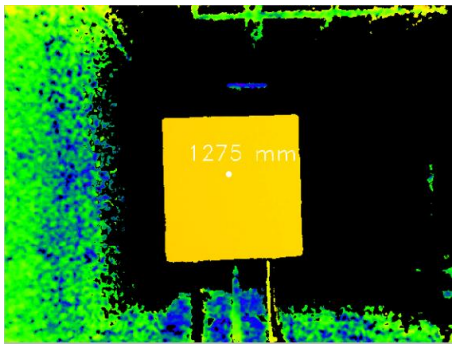
Note: The filter values vary from Range to Range, and can be adjusted to the most appropriate threshold according to the actual scene.



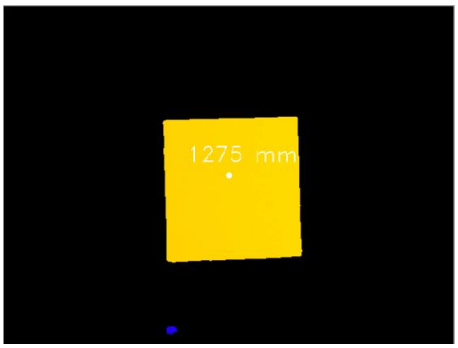
Range0： Conf_Treshold:0



Range0： Conf_Treshold:10



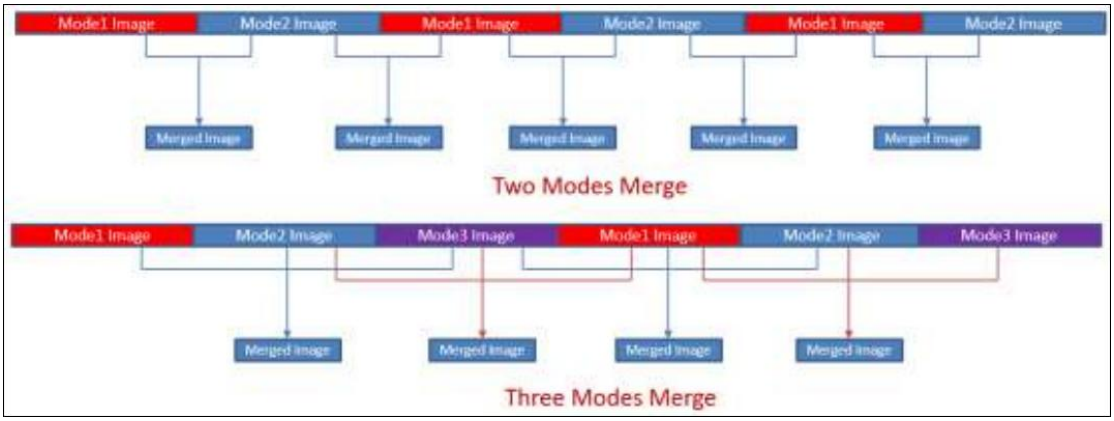
Range1： Conf_Treshold:5



Range1： Conf_Treshold:50

5.3.1.7 WDR Mode

In WDR (Wide Dynamic Range) mode, the camera can be set to output multiple ranges alternately to expand the detection Range. For example, if the camera needs to detect between 0.35m and 4.4m, it can be set to range0, 2 WDR mode. The camera's output frame will look like the following:



Alternate output mode: The camera alternates images from range0 to range 2 so that the user can detect data from 0.35m to 1.5m in range0 and from 0.8m to 4.4m in range 2.

Fusion output mode: Of course, you can also choose the appropriate interface distance value and use the algorithm of SDK to fuse image output, that is, the data of 0.35m~4.4m is fused into a 'W' image output.

Note: The camera's maximum frame rate is 30 frames per second, so the output frame rate for each single range drops when using WDR mode. For example, if you choose the WDR mode of range 0,1, range0 will output 15 frames per second and range1 will output 15 frames per second. If WDR mode is used for range0, 1,2, the output is 10 frames per second for range0, 10 frames per second for range1, and 10 frames per second for range 2.

In **WDR Mode**, the depth maps of different Depth Ranges of multiple frames (2 frames or 3 frames) are synthesized by algorithm. For example, a WDR_Depth image is fused by Range 0 and Range 2 depth images. as shown in the following schematic diagram.When the camera is set to WDR mode, WDR_Depth is displayed when opened with UTOOL. For standard cameras, WDR_Depth is not displayed with DataMode. You can use the ConfigTool to set the camera DataMode to WDR_Depth. For details, see the Vzense_ConfigTool User Manual.

Figure 5.3.12 shows two depth images and one WDR depth maps in the same scene:

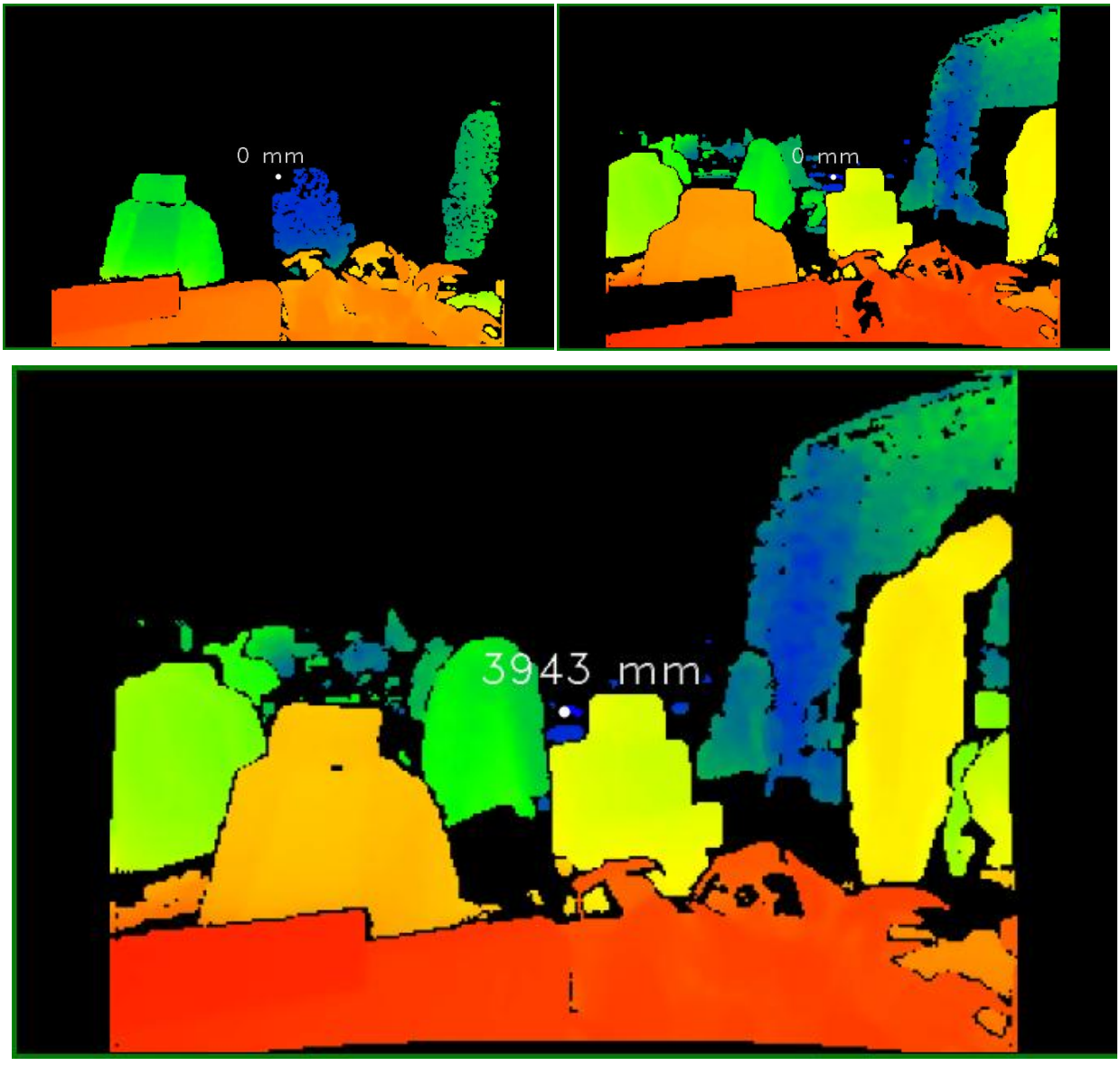


Figure 5.3.12 -Top- Left: Range0 depth image; Top- Right: Range2 depth image; Bottom: WDR_Depth image.

5.3.2 Image display and function

5.3.2.1 Point Cloud

Enable **Point Cloud** to display the point cloud diagram as shown in Figure 5.3.13:

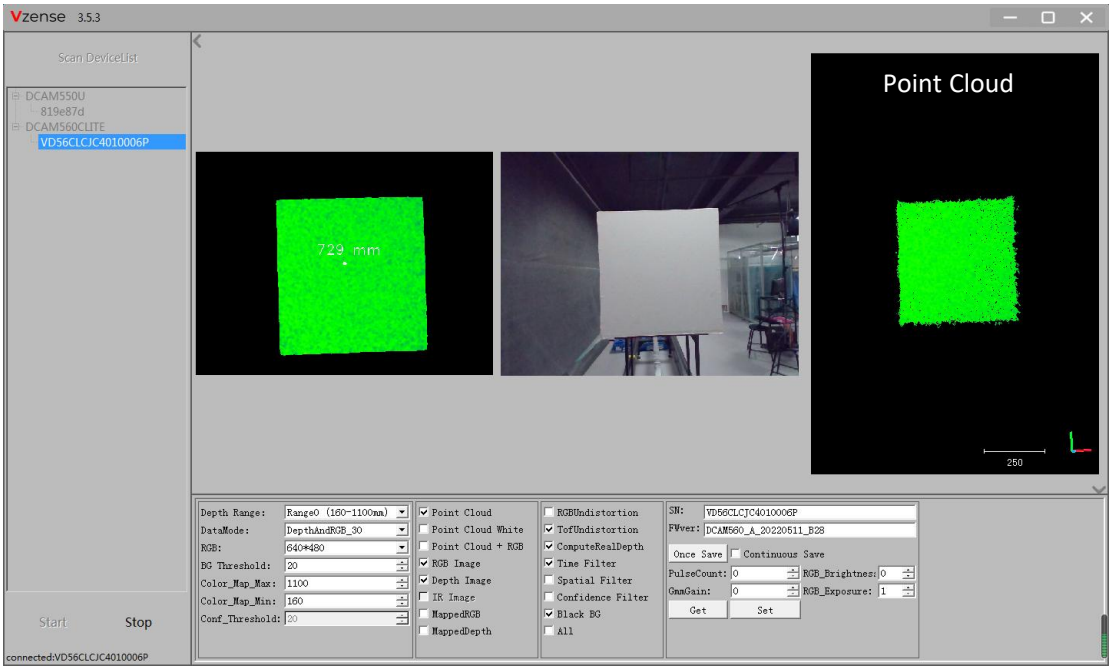


Figure 5.3.13 - Point Cloud.

Operations that can be performed on the point cloud:

Left mouse button: Rotate point cloud

Right mouse button: Move point cloud

Mouse wheel: Zoom in or out of point clouds

5.3.2.2 Point Cloud White

Enable **Point Cloud** to display the point cloud diagram as shown in

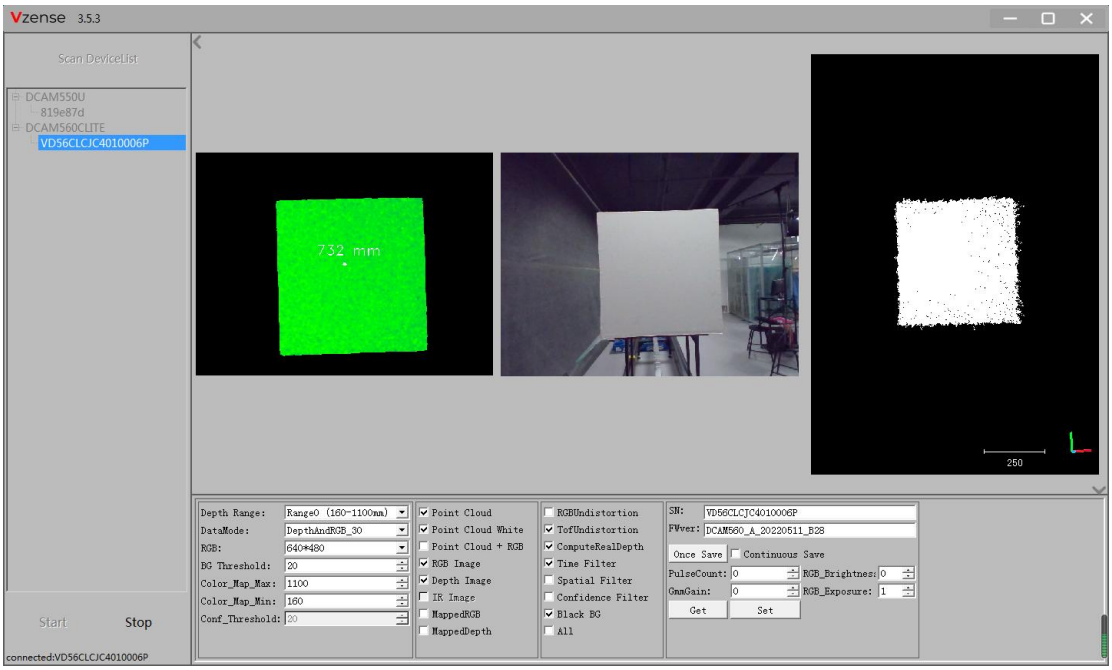


Figure 5.3.14 - Point Cloud White.

5.3.2.3 Point Cloud and RGB(DCAM710 and DCAM560C)

Enable **Point Cloud + RGB** to map the color image to the point cloud as shown in Figure 5.3.15:

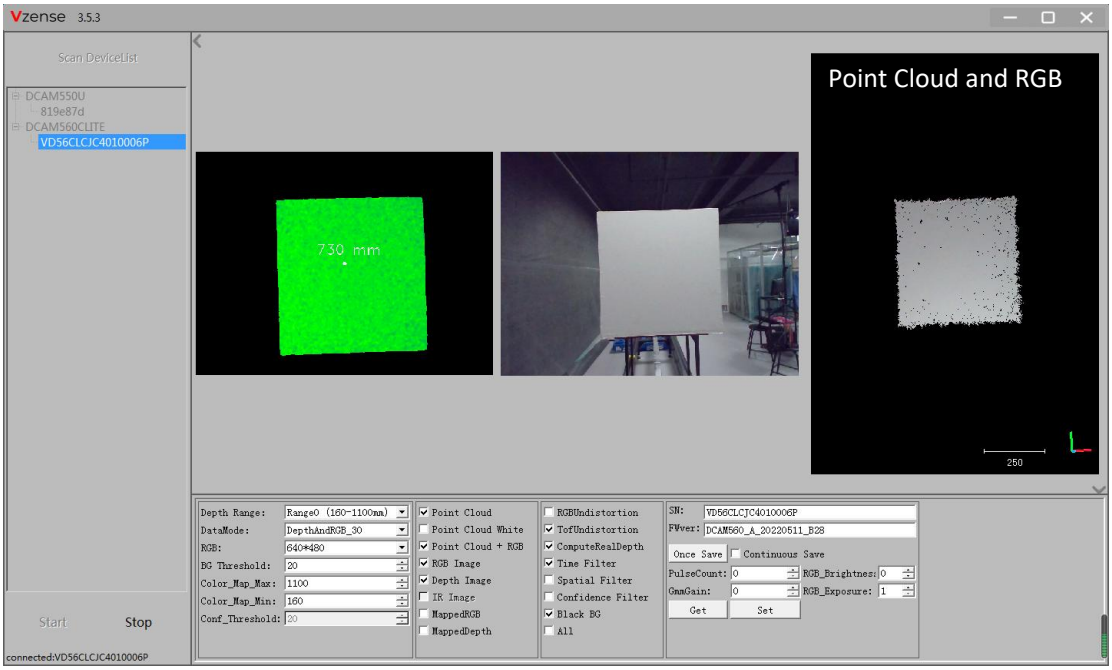


Figure 5.3.15 - Point Cloud + RGB

5.3.2.4 Image Display

One more images types can be enabled for display: **IR Image**, **RGB Image**, **Depth Image**.

Note: This Mode corresponds to Data Mode. If the Mode in Data Mode does not display IR graph, the IR Image switch is invalid

5.3.2.5 Alignment Mapper

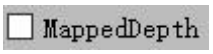
Enable **MappedRGB and MappedDepth** to turn on corresponding alignment mapping functions and the following images are available:

1.MappedRGB

- **MappedRGB**: RGB frame with 24bits per pixel in RGB/BGR format that is mapped to depth camera space and resolution is same as depth frame.

Figure 5.3.16 - Mapped RGB Image.

2.MappedDepth



- **MappedDepth:** Depth frame with 16bits per pixel in millimeters that is mapped to RGB camera space and resolution is same as RGB frame.

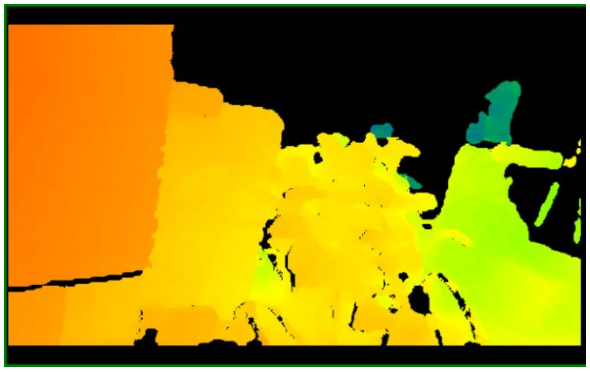


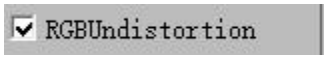
Figure 5.3.17 - Mapped Depth Image.

5.3.3 Image Processing

5.3.3.1 Distortion Correction

Distortion correction can be enabled for depth, IR, and RGB images using **DepthUndistortion**, **IrUndistortion**, **RGBUndistortion** and **ComputerRealDepth** respectively.

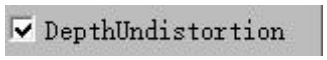
1.RGBUndistortion



Set RGBUndistortion enabled or not.Figure 5.3.16 shows the effect enabling the RGBUndistortion.

Figure 5.3.18 - Left: RGBUndistortion Enabled; Right: RGBUndistortion Disabled.

2.DepthUndistortion



Set DepthUndistortion enabled or not.Figure 5.3.19 shows the effect enabling the DepthUndistortion.

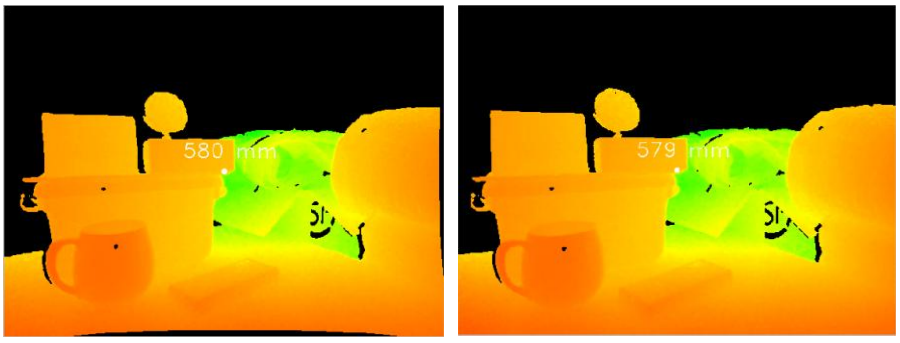
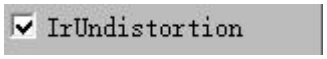


Figure 5.3.19 - Left: DepthUndistortion Enabled; Right: DepthUndistortion Disabled.

3.IrUndistortion



Set IrUndistortion enabled or not.Figure 5.3.20 shows the effect enabling the IRUndistortion.

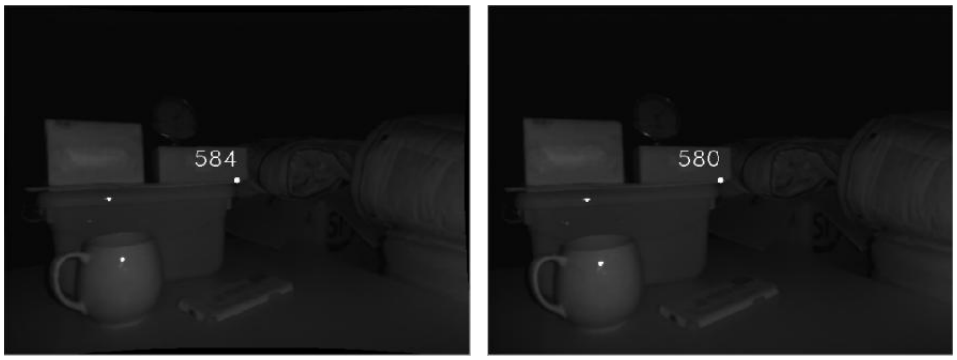


Figure 5.3.20 - Left: IrUndistortion Enabled; Right: IrUndistortion Disabled.

4. ComputerRealDepth

Set ComputerRealDepth enabled or not.Figure 5.3.21shows the effect enabling the ComputerRealDepth.

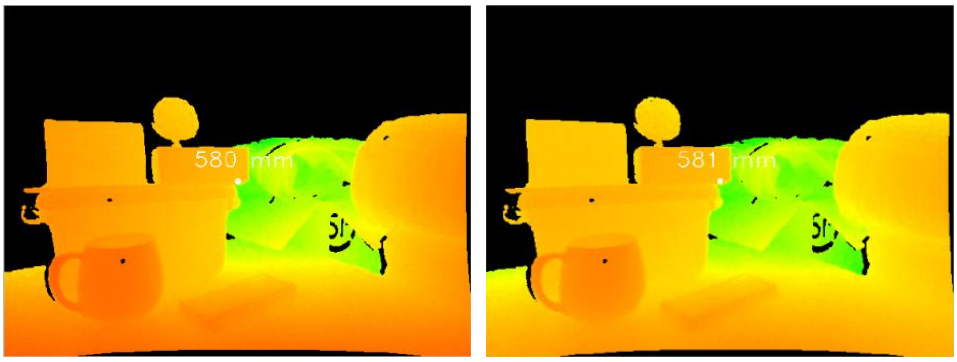
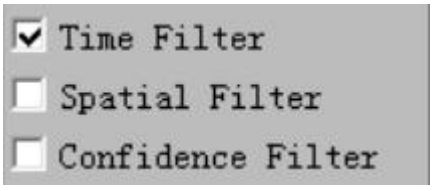


Figure 5.3.21 - Left: ComputerRealDepth Enabled; Right: ComputerRealDepth Disabled.

5.3.3.2 Filters



Enable **Time Filter**,**Spatial Filter and confidence filter** to turn on the filter contrast effect.The value of Confidence filtering can be adjusted. For the adjustment method and effect, see 5.3.1.6.

Figure 5.3.22 shows the effect enabling the spatial filter:

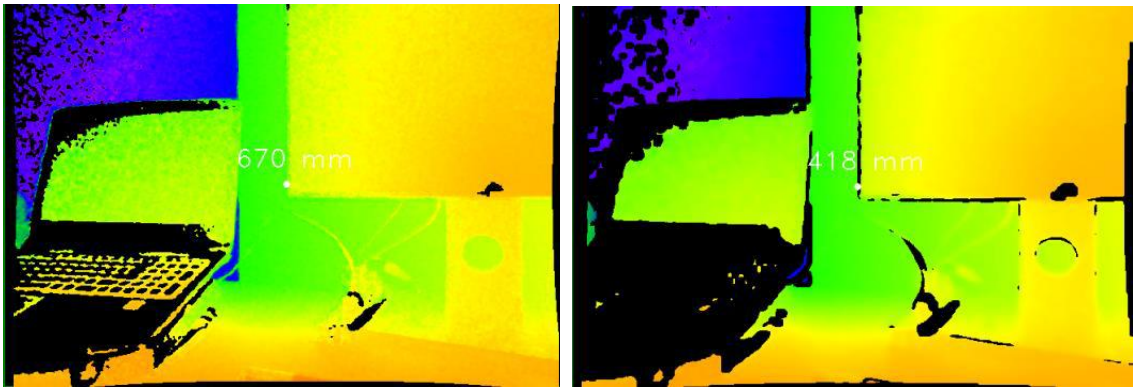


Figure 5.3.22 - Left: spatial Filter Disabled; Right: spatial Filter Enabled.

5.3.3.3 Black Background

Enable **Black BG** to set a black background. Figure 5.3.23 shows the effect of enabling the black background setting:

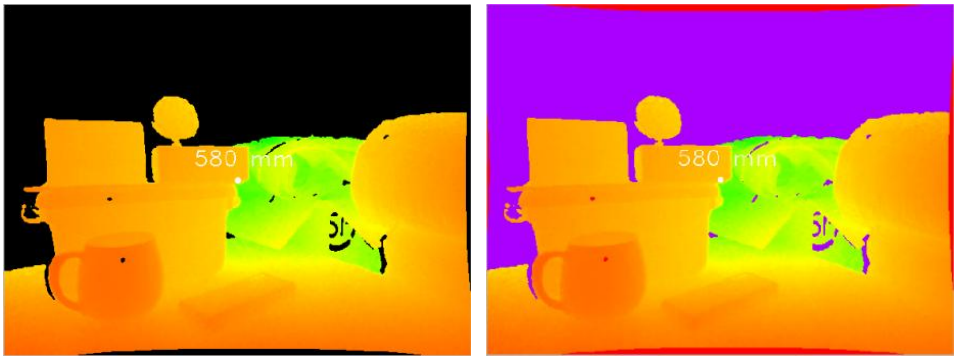
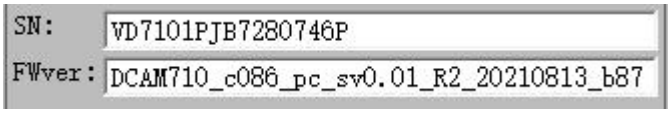


Figure 5.3.23- Left: Black Background Disabled; Right: Black Background Enabled.

5.3.4 Device Information

The following information is displayed for the camera module:

- **SN**: Serial number.
- **FWver**: Firmware version number.

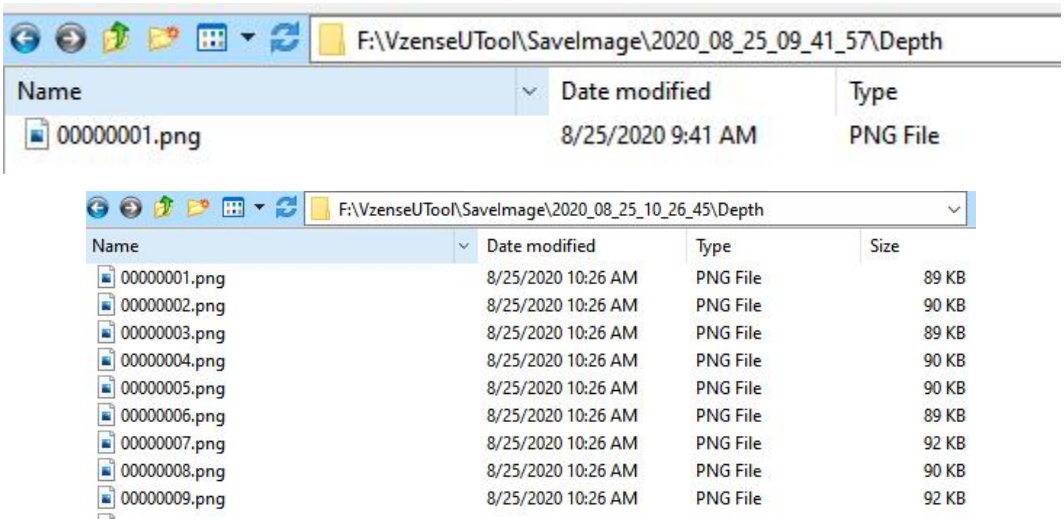


5.3.5 Save Image

Saves image data and point cloud data captured from the camera module using in the current mode.

The saved file is named in the following format:

xxxxxxxx.< format> (e.g., 00000001.png)



These images or point cloud files will be saved in a folder:

`VzenseUTool/SaveImage/<time>/Frame Type/`

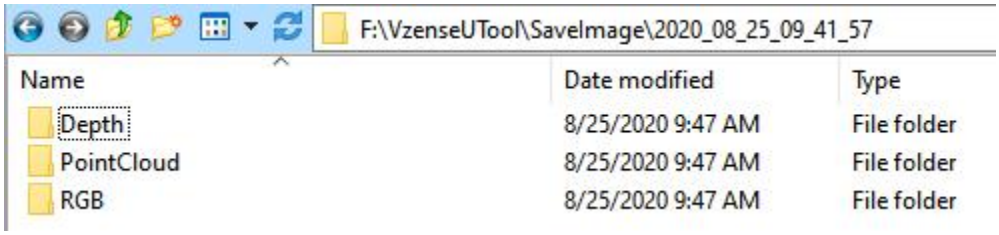


Table 2 lists the file format for each frame type:

Table 2 – File format.

Frame Type	File Format
Depth	png
IR	png
MappedDepth	png
WDRDepth	png
RGB	jpg
MappedRGB	jpg
PointCloud	txt

"Continuous Save" can not continuous saving point cloud data.

Note:

UTool saves depth maps as 16-bit single-channel PNG images, each pixel represented by two bytes in mm. The default image display tool can only display 8-bit single-channel images, so they look black. Ready-made tools can be used to display the **Image J**, pointing the mouse over it to read the distance values in the corresponding coordinates.

5.3.6 Other

PulseCount: Changes the light intensity of the module. Customer change is not recommended
GmmGain: Changes the parameter of IR brightness. The maximum value is 4095. Customers can adjust the value based on actual scenarios.
RGB_Brightness: Changes the brightness of the RGB images.
RGB_Exposure: Changes the exposure of RGB images.
The "Get" key can read the PulseCount、GmmGain、RGB_Brightness and RGB_Exposure values of the camera's current range.
The "Set" key temporarily sets the PulseCount、GmmGain、RGB_Brightness and RGB_Exposure values of the camera's current display range. After the camera is powered on again, the PulseCount、GmmGain、RGB_Brightness and RGB_Exposure values are restored to their default values.
Method for changing parameters:
Step1: click "Get" to obtain the parameters of the current mode
Step2: Change the parameter to the desired value
Step3: Click "Set" to save parameters
Note: The maximum PulseCount value is 530. The maximum GmmGain is 4095. The parameters changed in the preceding method are restored to factory default values only after the module is powered on again.

5.3.7 RGB_Manual_Exposure

RGB_Manual_Exposure is disabled by default. The value can be changed after this parameter is selected. The maximum value is 4000.
Set this parameter based on site requirements.

6 FAQ

Q1: Why does Depth Range switch to Range 2 or Data Mode switch to WDR mode and the camera stops working?

A1: The reason why the camera stops working may be the lack of USB power supply, which needs to be solved by connecting DC adapter. Explanation: The Range 2 and wider range modes and WDR modes of the camera require more power. Tip: After power connection, the camera indicator will turn red.

Q2: About “Not find Camera!”

A2: When the "Not find Camera!" prompt appeared, the program did not detect the camera connection. Make sure the camera is connected correctly, and then run UTool after the camera indicator lights up.

Q3: About “The Other Instance is Running!”

A3: “The Other Instance is Running!” represents that the existing UTool program is running. You can restart the UTool after closing the program. If this prompt still appears after closing, check the background process to close VzenseUTool.exe directly.

Q4: How to deal with the situation of picture stop?

A4: You can check the USB connection status of the camera to ensure the correct connection; check the power connection to ensure the normal power supply; observe the camera indicator lights to ensure the normal working status of the camera. If the screen is still not updated, after closing UTool, try to re-connect the camera and restart UTool.

Q5: How to deal with the camera indicator not on?

A5: You can check the connection status between the camera and the host to ensure that the connection is correct; after the connection is completed, wait a few seconds to check the status of the indicator.

Q6: Do We need to install a driver to drive the camera?

A6: Vzense DCAM710 cameras support standard USB communication protocols and do not require specific drivers to be installed before use.

Q7: Driver Install.exe cannot install the driver properly.

A7: Try to run DriverInstall.exe with administrator privileges.