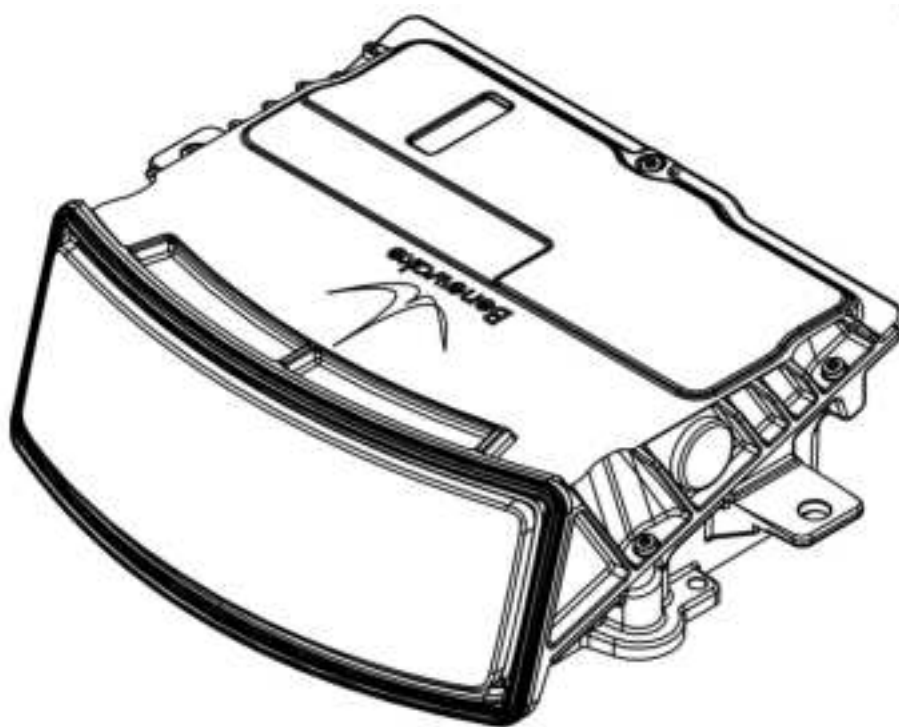


Benewake

Benewake LiDAR Viewer GUI User Manual



Contents

| | |
|--|----------|
| 1 Brief Introduction | 1 |
| 1.1 Objective | 1 |
| 1.2 System Introduction | 1 |
| 1.3 Terms and Abbreviations | 1 |
| 1.4 Precautions before use | 2 |
| 2 File Structure | 4 |
| 3 Interface Introduction | 5 |
| 4 Functions Introduction | 7 |
| 4.1 Point Cloud Display Adjustment | 7 |
| 4.1.1 Point cloud display | 7 |
| 4.1.2 Point Cloud Display Adjustments | 9 |
| 4.2 Record and Playback Point Cloud Data | 12 |
| 4.2.1 Recording & Playback *.PCD file | 12 |
| 4.2.2 Recording & Playback *.PCAP file | 13 |
| 4.2.3 Save *.CSV file | 15 |
| 4.3 Functions Related to Device Management Bar | 16 |
| 4.4 Toolbar Related Functions | 17 |
| 4.4.1 Scale Display | 17 |
| 4.4.2 Hue Indicator | 17 |
| 4.4.3 Distance Measurement | 18 |
| 4.4.4 Point Cloud Frame Selection | 19 |
| 4.4.5 Perspective Projection | 20 |
| 4.4.6 Orthographic Projection | 20 |
| 4.4.7 Rotation Function | 21 |
| 4.5 Menu Bar Related Functions | 21 |
| 4.5.1 File | 21 |
| 4.5.2 Window | 22 |
| 4.5.3 Device Information | 22 |
| 4.5.4 Configuring Device | 23 |
| 4.5.5 Point Cloud Display | 24 |
| 4.5.6 Help Menu | 25 |

1 Brief Introduction

1.1 Objective

The purpose of this article is to explain the basic functions, operation methods and precautions of Benewake LiDAR Viewer GUI (hereinafter referred to as BLV).

1.2 System Introduction

BLV is a GUI software used by AD2 LiDAR, which is mainly used for real-time display, recording and playback of point cloud data. BLV is compiled on the Windows 10 platform, and it is recommended to install and use it on Windows 10 and above systems.

1.3 Terms and Abbreviations

| Terms and abbreviations | Meaning |
|-------------------------|---|
| IP | The IP address of the network protocol used by the LiDAR communication |
| MDOP | Primary data transfer port |
| DCSP | Device control command transmission port |
| DSOP | The port where the device status information is transmitted |
| *.pcd | A file format in which the GUI saves point cloud data, which can be directly read and played back by the GUI |
| *.csv | The GUI saves a file with this format for point cloud data, which can be viewed directly in Excel or Word |
| *.pcap | A file format in which the GUI saves point cloud data, which can be directly read and played back by the GUI. |

Table. 1: Terms and abbreviations

1.4 Precautions before use

1. Before using the LiDAR, you need to change the IP address of your computer.

Network and Internet → Ethernet → Change adapter options → Properties → Internet Protocol version 4 (TCP/IPv4), set the host IP address to remain on the same network segment as the LiDAR IP address (i.e., segment 0), subnet mask 255.255.255.0, and host IP address used in this instruction manual is 192.168.0.10 (the last byte is different from the IP address of the connected device).



Figure. 1: Configuring IP address

1. Make sure that your computer's firewall is turned off (this is optional: if you can't connect properly, try this step again). Control Panel → System and Security → Windows Defender → Turn on/off Windows Defender Firewall.

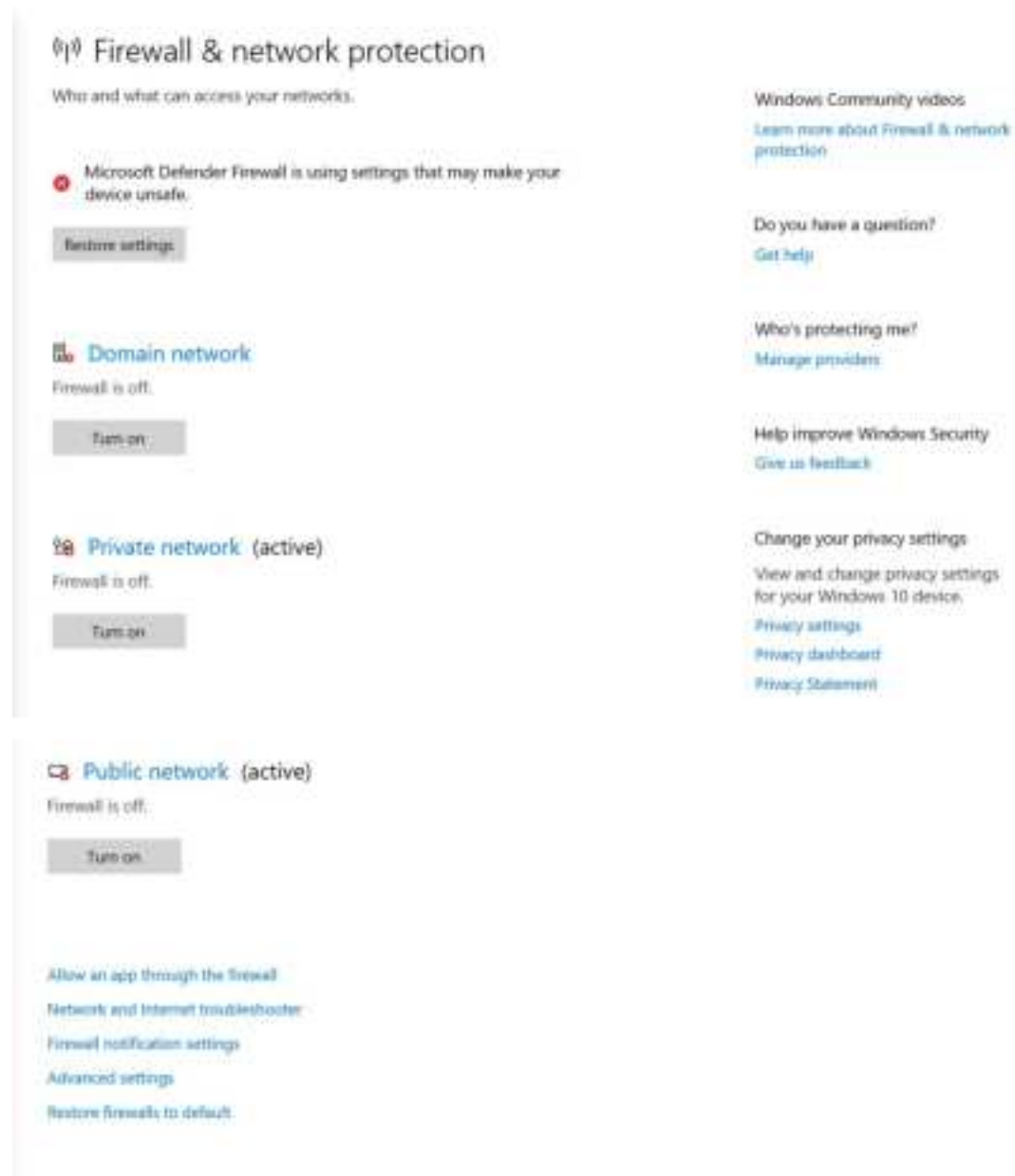
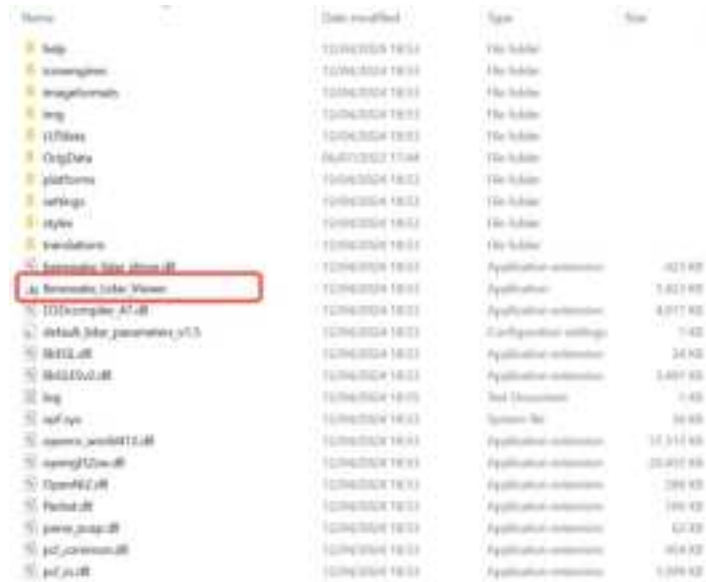


Figure. 2: Turning off firewall

2 File Structure

BLV file structure (part of the file) as shown in the figure, double-click **Benewake_LiDAR_Viewer.exe** to open the GUI program.



| Name | Date modified | Type | Size |
|----------------------------------|------------------|------------------------|-----------|
| Help | 12/04/2024 18:53 | File folder | |
| resources | 12/04/2024 18:53 | File folder | |
| imageformats | 12/04/2024 18:53 | File folder | |
| img | 12/04/2024 18:53 | File folder | |
| UIFiles | 12/04/2024 18:53 | File folder | |
| OrgData | 06/07/2023 17:44 | File folder | |
| platform | 12/04/2024 18:53 | File folder | |
| settings | 12/04/2024 18:53 | File folder | |
| style | 12/04/2024 18:53 | File folder | |
| translations | 12/04/2024 18:53 | File folder | |
| Benewake_LiDAR_viewer.qss | 12/04/2024 18:53 | Application extension | 402 B |
| Benewake_LiDAR_Viewer.exe | 12/04/2024 18:53 | Application | 5,823 KB |
| DDICompile_A2.qss | 12/04/2024 18:53 | Application extension | 4,017 KB |
| default lidar parameters.yml | 12/04/2024 18:53 | Configuration settings | 1 KB |
| libEGL.dll | 12/04/2024 18:53 | Application extension | 24 KB |
| libEGLv2.dll | 12/04/2024 18:53 | Application extension | 3,487 KB |
| log | 12/04/2024 18:53 | Text Document | 1 KB |
| logo.png | 12/04/2024 18:53 | Image file | 36 KB |
| opencv_world412.dll | 12/04/2024 18:53 | Application extension | 33,314 KB |
| opencv_world412.dll | 12/04/2024 18:53 | Application extension | 33,411 KB |
| OpenNI2.dll | 12/04/2024 18:53 | Application extension | 288 KB |
| Project.qss | 12/04/2024 18:53 | Application extension | 186 KB |
| qtconv_qt.qss | 12/04/2024 18:53 | Application extension | 67 KB |
| qtconv.qss | 12/04/2024 18:53 | Application extension | 46 KB |
| qt.qss | 12/04/2024 18:53 | Application extension | 5,204 KB |

Figure. 3: Screenshot of file structure

3 Interface Introduction

The main interface of BLV is shown in the following figure:

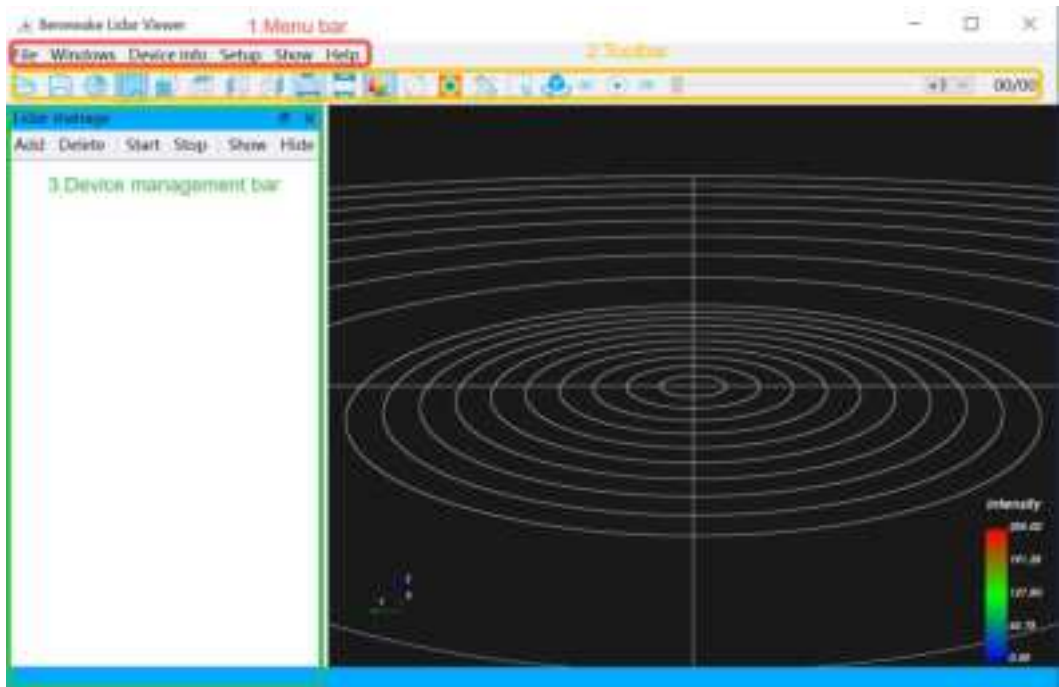


Figure. 4: Benewake LiDAR Viewer main interface

- 1. **Menu Bar:** Basic configuration options
- 2. **Toolbar:** Basic function options, the specific functions are as follows:

| Icon | Function | Icon | Function |
|------|---|------|-------------------------------|
| | Playback *. PCD file | | Ortho Projection |
| | Save*. PCD file (from LiDAR). | | Display the hue indicator map |
| | Search for devices in the current network | | Set the point size |
| | Display the scale | | Ranging |
| | Front view | | Box selection |
| | Top view | | Roaming rotation |
| | Left view | | Play |
| | Right view | | Time out |
| | Perspective projection | | |

Table. 2: Toolbar icons

- 3. **Device Management Bar:** Manage device addition and deletion,

control device start and stop, display device information and connection status, etc.

4. **Point cloud display area:** Displays real-time point clouds or plays point cloud data files.

4 Functions Introduction

4.1 Point Cloud Display Adjustment

4.1.1 Point cloud display

1. Please complete the configuration before use according to Chapter [1.4](#).
2. Open the BLV software, there are two ways to add LiDAR:

[Method 1]

- (1) Click **Device Management Bar** → **Add** button to set the IP, PORT, DSOP of the LiDAR.

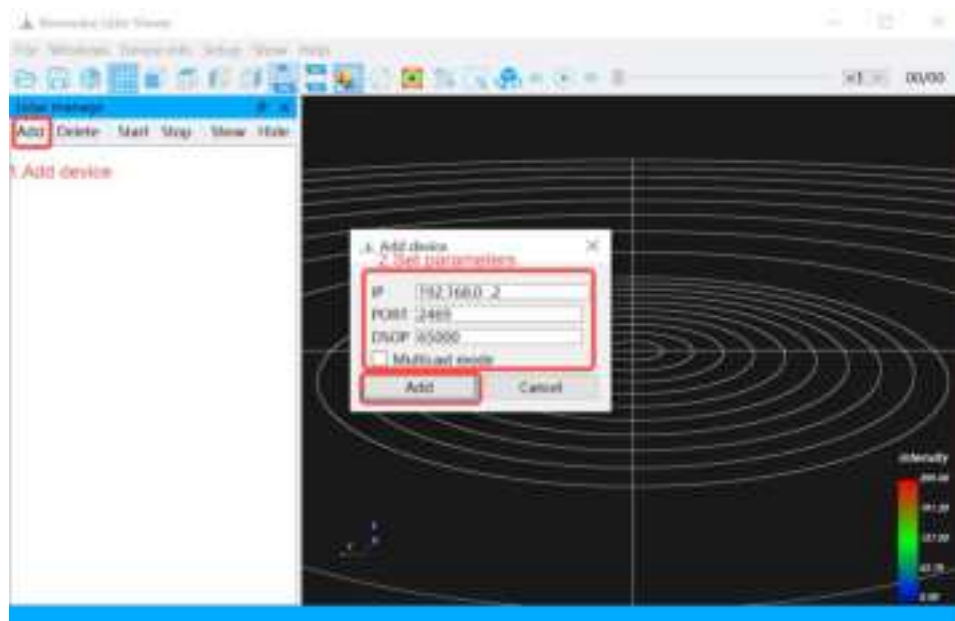


Figure. 5: Add device information


In general, the following table describes the parameters:

| Parameter items | Parameter value |
|-----------------|-----------------|
| IP | 192.168.0.2 |
| PORT | 2469 |
| DSOP | 62702 |
| Multicast mode | Unchecked |

Table. 3: Parameters for adding LiDAR

- (3) Finally, confirm the addition.

[Method 2]

- (1) Click the icon in the toolbar  to search for the device (the search port is 62702), as shown in the figure, and click OK to complete the addition.

Display Area in real time. Click the **Stop** button to stop the LiDAR from working.

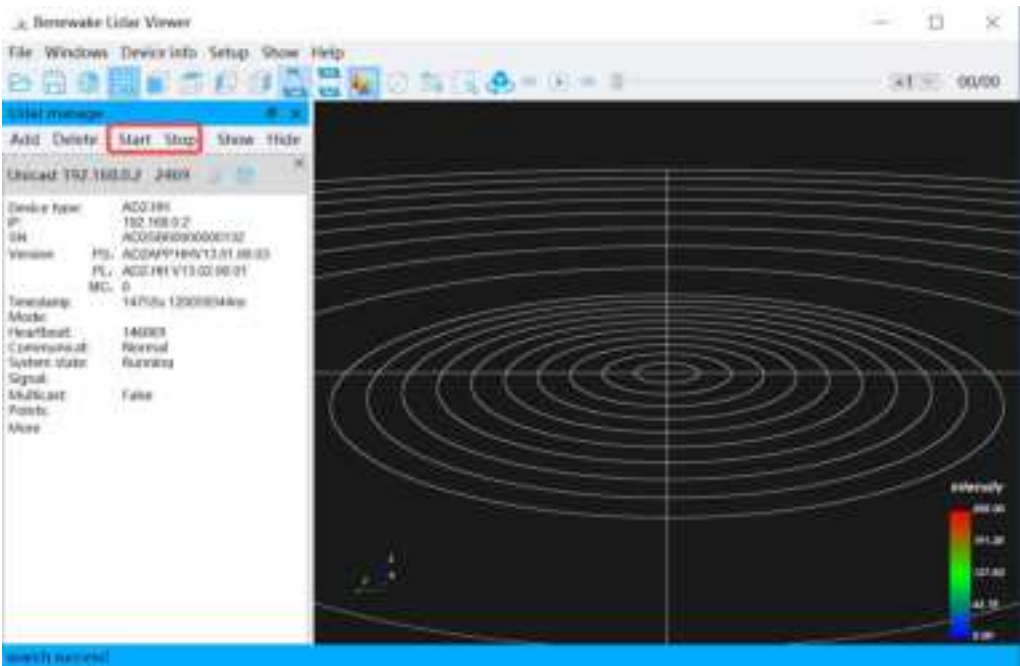


Figure. 8: Device start/shut down buttons

4.1.2 Point Cloud Display Adjustments

1.Point cloud display adjustment: as shown in the red box, the area encircled

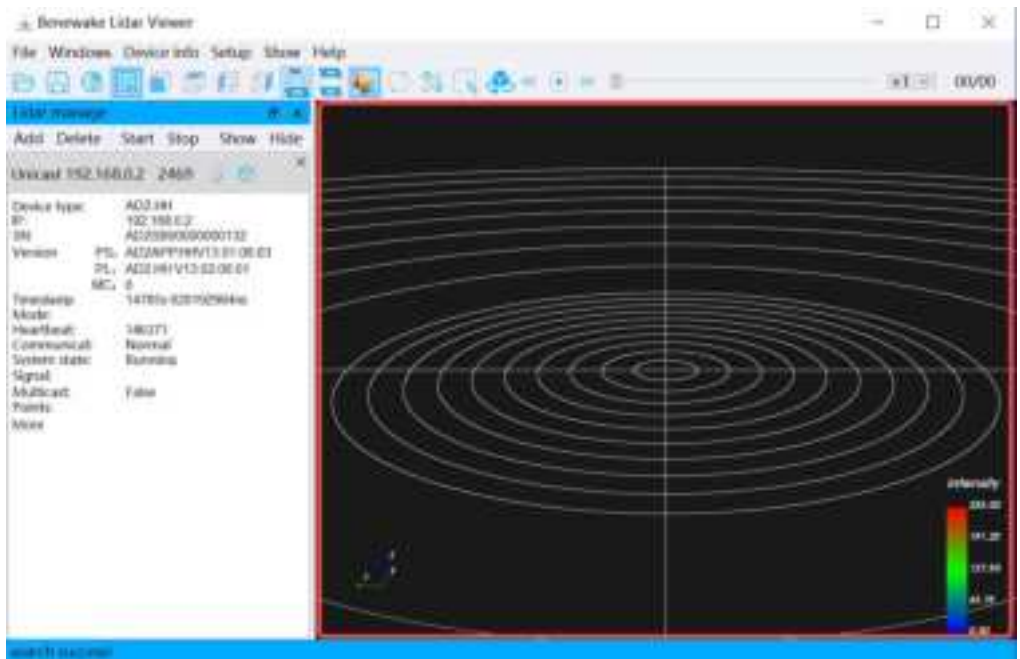


Figure.9: Point cloud display area

The following table describes how to do this:

| Adjustment results: | How to do it: |
|---------------------------------|---------------------------------|
| Change the viewing angle of the | Hold down the left mouse button |

| | |
|---|---|
| point cloud display | and drag in different directions |
| Zoom in/out of the point cloud display | Slide the mouse wheel |
| Move the point cloud display as a whole | Hold down the mouse wheel (middle button) and drag in different directions. |

Table. 4: Point cloud display adjustment method

Note: When you cannot continue to zoom in on the point cloud display using the mouse wheel, you can continue to zoom in on the point cloud display by clicking the **F key** on the keyboard. At this point, the point cloud display continues to zoom in centered on the mouse-over position:

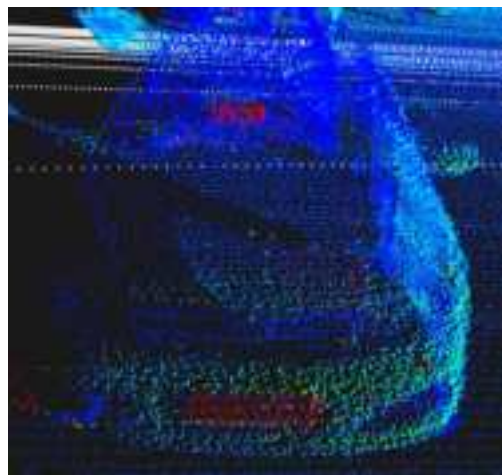
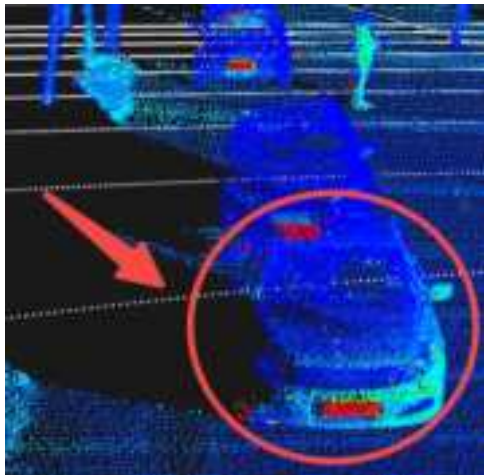


Figure. 10-a: Before zooming in with F key Figure. 10-b: After zooming in with F key

2.Angle Adjustment: select the following icons in the Toolbar to adjust the point cloud data display view, or in the Menu Bar → Point Cloud Display → Set View.






| Icon | Function |
|---|------------|
|  | Front view |
|  | Top view |
|  | Left view |
|  | Right view |

Table. 5: Angle of view adjustment

3.Point Size Adjustment: Click the icon  in the Toolbar to change the size of the point, and a pop-up window will appear as shown in the following figure after clicking it (or set it in the Menu Bar → Point Cloud Display → Set Point Size). The point size range is 1~10, and the default setting is 2.

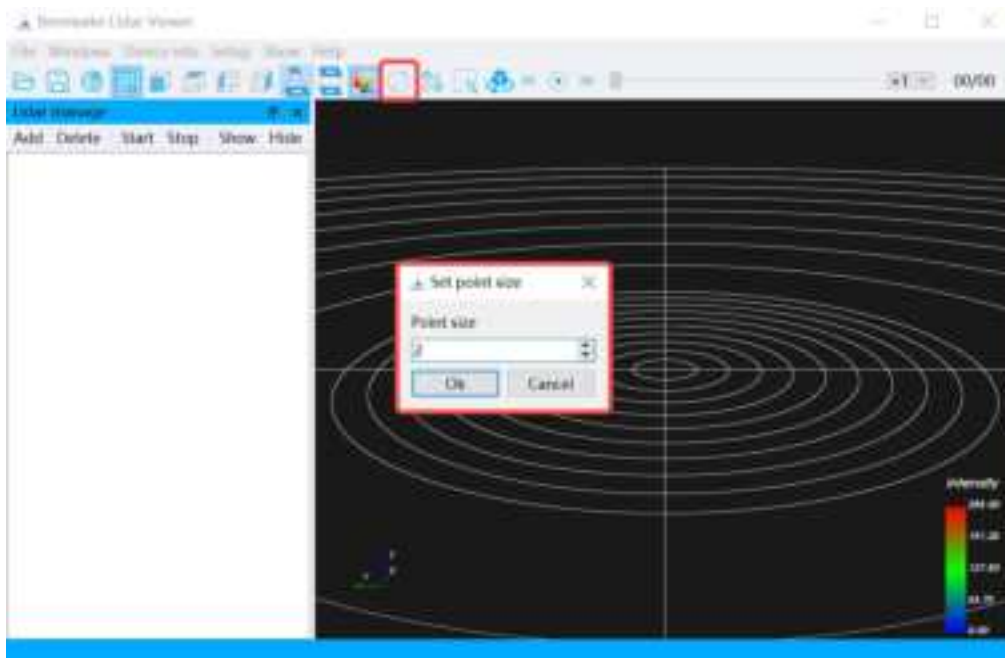


Figure. 11: Setting the point size

4. Set the color scheme: Set the color scheme in the Menu Bar → Point Cloud Display → Set color scheme to render point cloud display according to reflectivity, distance, and elevation

(In general, the default rendering color is to render at reflectivity).

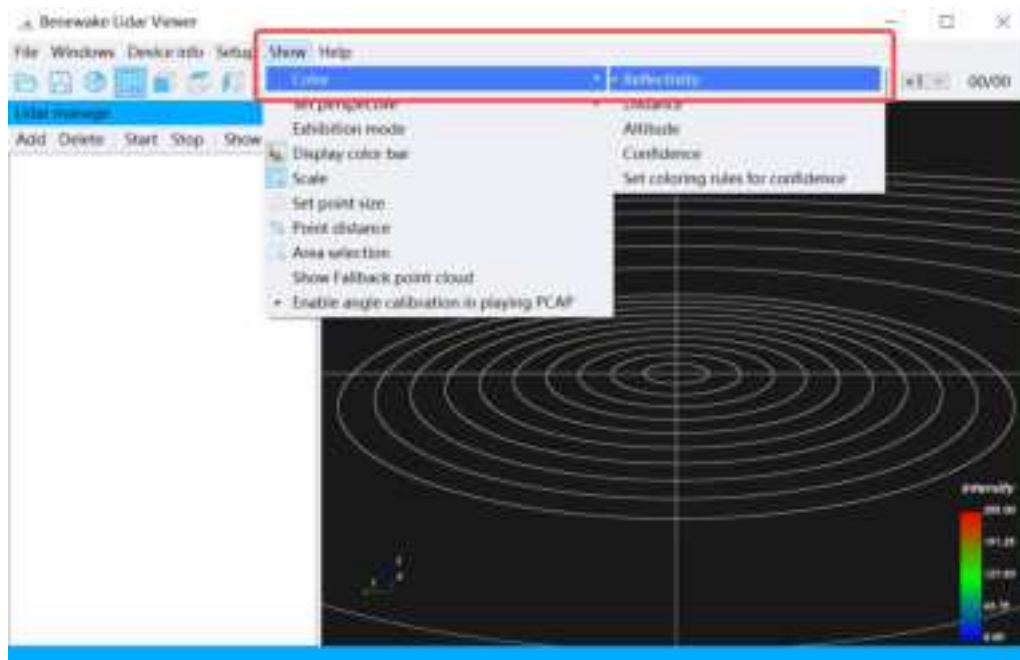




Figure. 12: Setting color scheme

4.2 Record and Playback Point Cloud Data

4.2.1 Recording & Playback *.PCD file

1. Click the **Menu Bar → File → Save File → Save PCD File** (from the device), select the save path to start recording (or click the Toolbar  icon). If you need to end the recording, click the **Menu Bar → File → Save File → Stop Saving PCD File (From Device)** option to stop the recording (or click the Toolbar  icon).

(**Note:** You need to choose the storage location, it is recommended to create a new dedicated folder to save *PCD data).

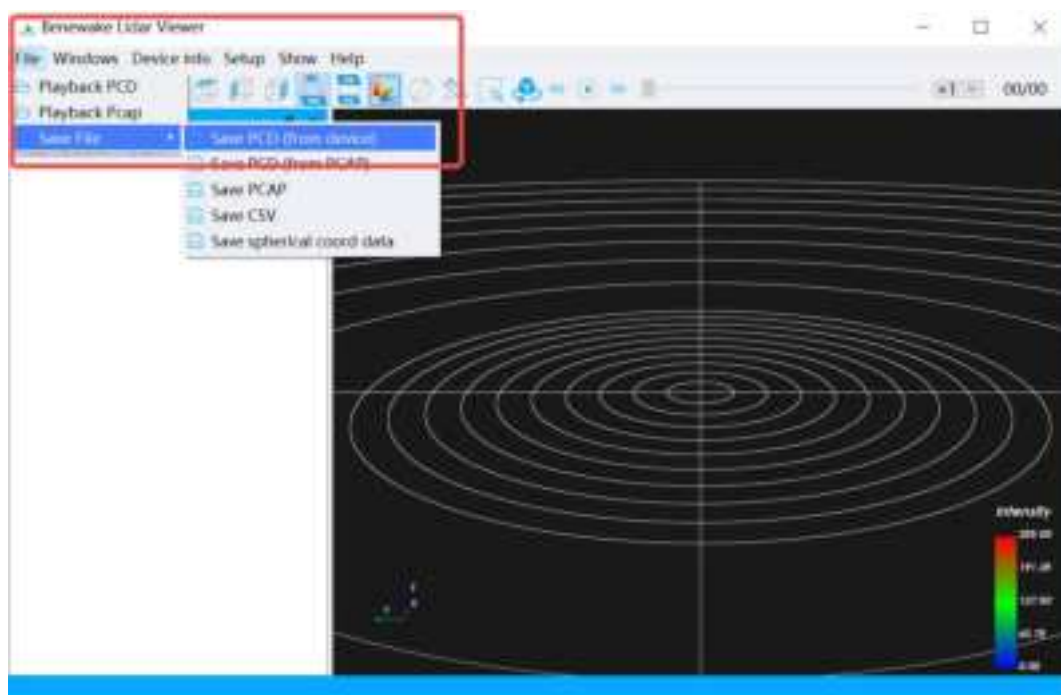



Figure. 13: Recording PCD file

2. After you start recording, you can find the generated *.PCD files under the saved path of the settings, which are the corresponding point cloud data, are named according to the timestamp.

| Year | Population | Population | Population |
|------|------------|------------|------------|
| 1970 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1971 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1972 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1973 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1974 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1975 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1976 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1977 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1978 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1979 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1980 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1981 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1982 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1983 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1984 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1985 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1986 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1987 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1988 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1989 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1990 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1991 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1992 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1993 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1994 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1995 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1996 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1997 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1998 | 1,000,000 | 1,000,000 | 1,000,000 |
| 1999 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2000 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2001 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2002 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2003 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2004 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2005 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2006 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2007 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2008 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2009 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2010 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2011 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2012 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2013 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2014 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2015 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2016 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2017 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2018 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2019 | 1,000,000 | 1,000,000 | 1,000,000 |
| 2020 | 1,000,000 | 1,000,000 | 1,000,000 |

Figure. 14: *.PCD files generated during recording

- Click the **Menu Bar** → **File** → **Playback PCD File** option (or click the **toolbar**  icon) to find the saved path you have set after waiting for

a while, click the icon  in the **toolbar** to play back *.PCD files.

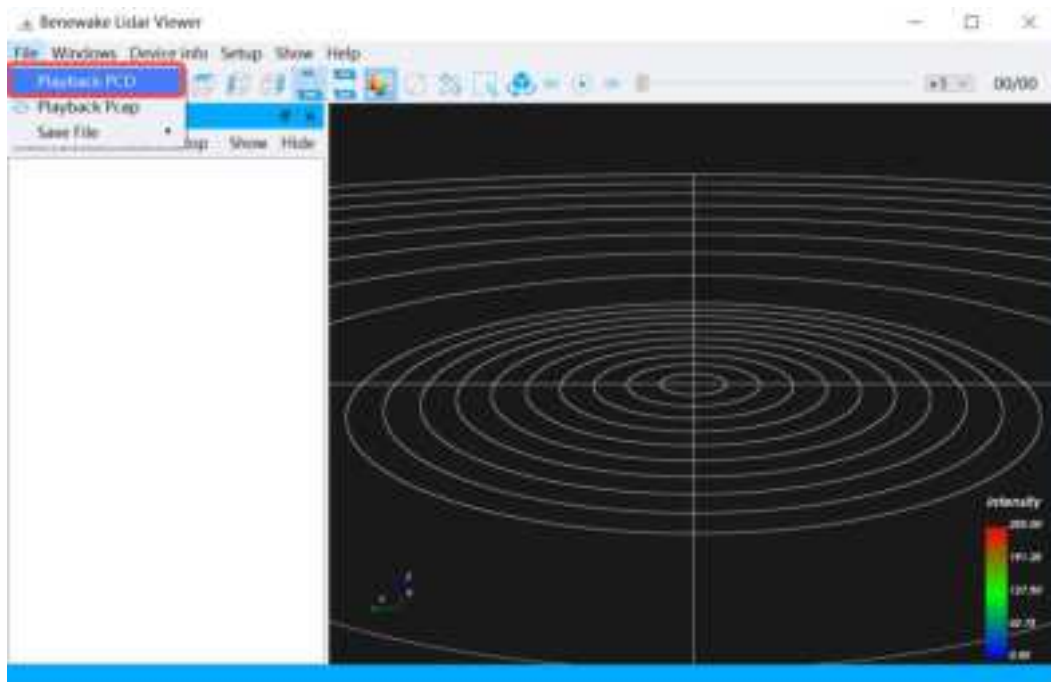




Figure. 15: Playback *. PCD file

4. Once playback starts, the  icon will change to  an icon, and you can tap to pause the playback data at any time. You can drag the progress bar to view the point cloud data you want to focus on.

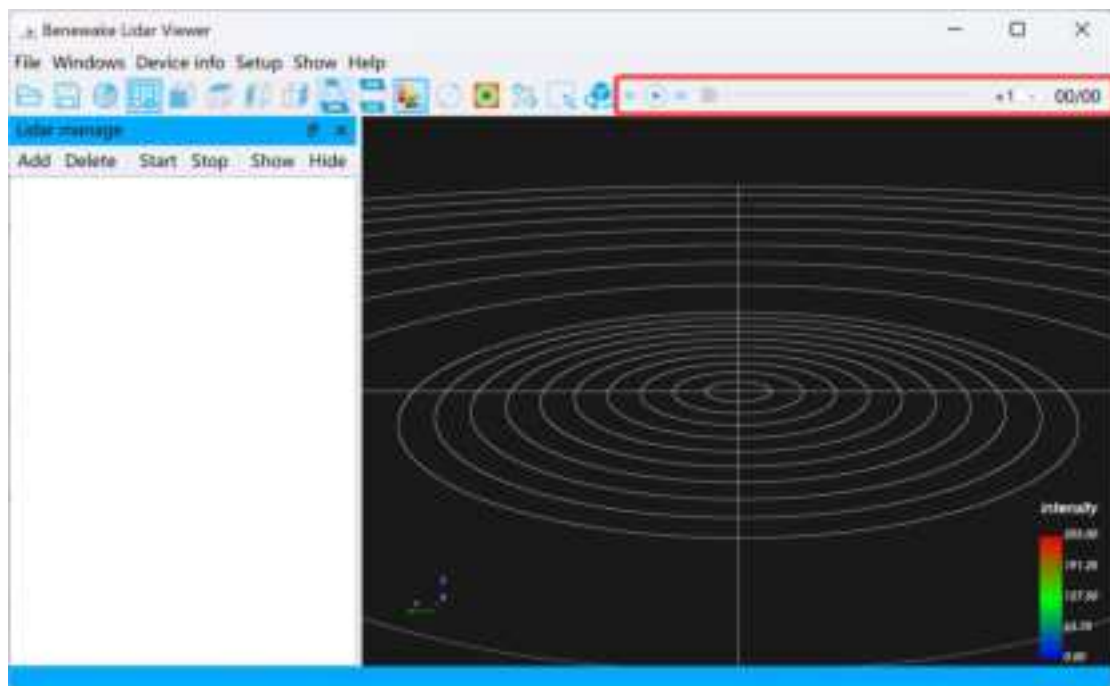


Figure. 16: Point cloud playback control bar

4.2.2 Recording & Playback *.PCAP file

1. Click the **Menu Bar** → **File** → **Save File** → **Save PCAP File** options, select the save path, set the file name, and start recording. If you

need to end the recording, click the **Menu Bar** → **File** → **Save File** → **Stop Saving PCAP File** options to **stop** the recording. If the recording is successfully stopped, a pop-up window will prompt that the saving is successful.

(**Note:** You need to choose the storage location, it is recommended to create a new dedicated folder to save *.PCAP data).

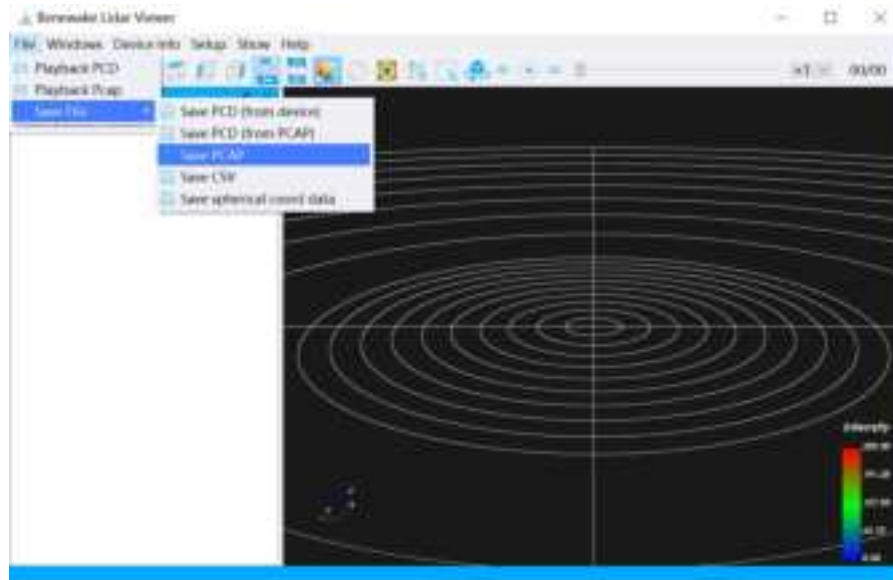



Figure. 17: Save *.PCAP file

2. Click on the **Menu Bar** → **File** → **Playback PCAP File** option, and select the finished *.PCAP file, after a while, a pop-up window will prompt that the file has been successfully imported. Click the icon  in the **toolbar** to play back *.PCAP file.

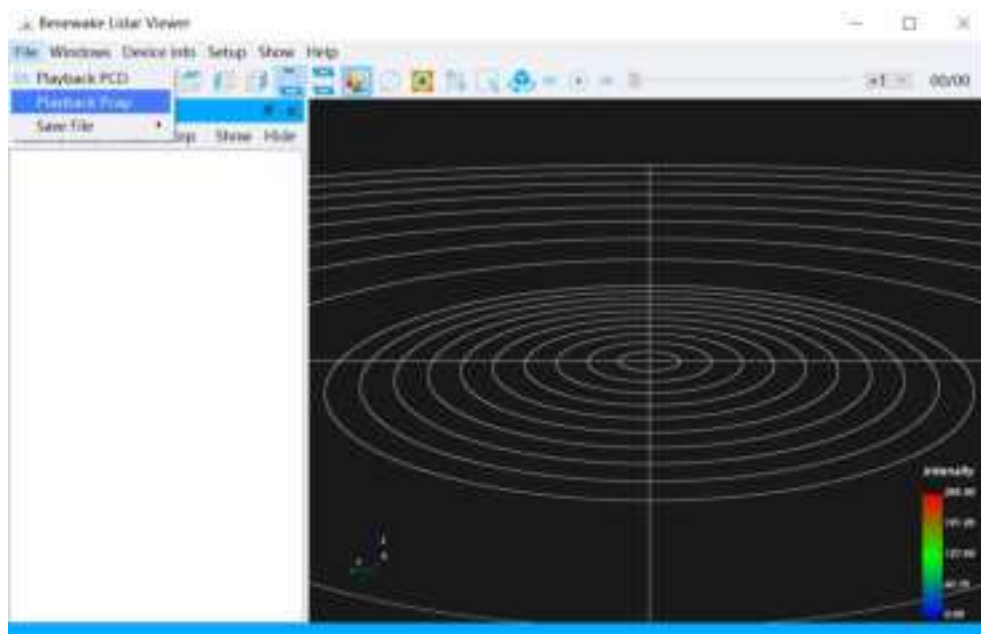


Figure. 18: Playback *.PCAP file

3. Follow-up and playback *. PCD files.

4.2.3 Save *.CSV file

1. Click the **Menu Bar → File → Save File → Save CSV File** option, and select the save path, you can save a frame of data in the save path, and the recorded file will be named according to the timestamp. Use Excel to open a saved *.CSV file.

(Note: You need to choose the storage location by yourself, it is recommended to create a new dedicated folder to save *.CSV data).

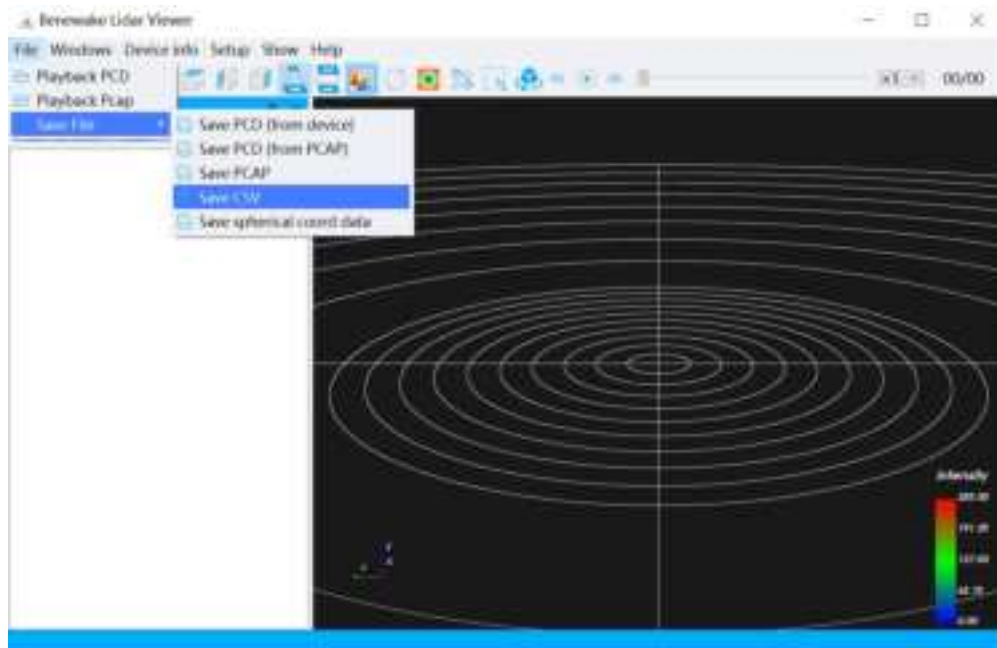


Figure. 19: Save *.CSV file

| 名称 | 修改日期 | 类型 | 大小 |
|------------------|----------------|----------------------|----------|
| 10_51_00_461.csv | 2024.3.1 10:51 | Microsoft Excel 进... | 8,617 KB |

Figure. 20: Save the finished one*.CSV file

4.3 Functions Related to Device Management Bar

As shown in the figure below, click the corresponding button in the Device Management Bar to use the corresponding functions.

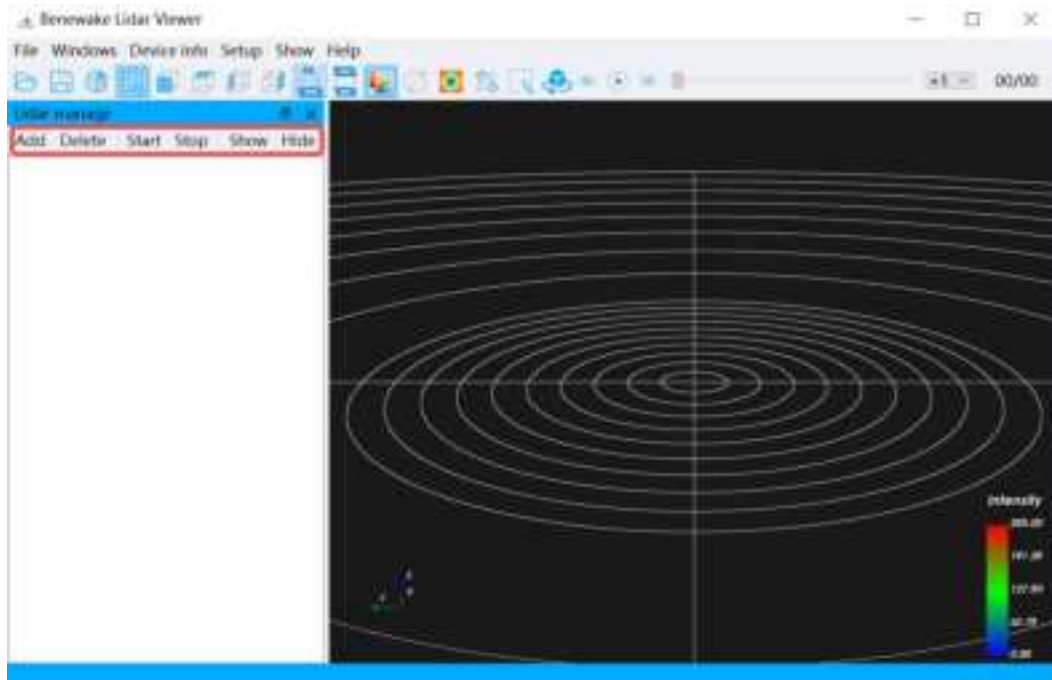


Figure. 21: Optional functions in device management bar

1. **Add:** Add a new LiDAR device
2. **Delete:** Delete the added device
3. **Start:** Run the devices that have been added
4. **Stop:** Stop the running device that you added
5. **Display:** Display the point cloud data of the selected device in the point cloud display area
6. **Hide:** Hide the point cloud data of the selected device

4.4 Toolbar Related Functions

4.4.1 Scale Display

Select/invert the icon in the toolbar  to control whether the scale is displayed, and the contrast (comparison) effect is shown in the following figure:

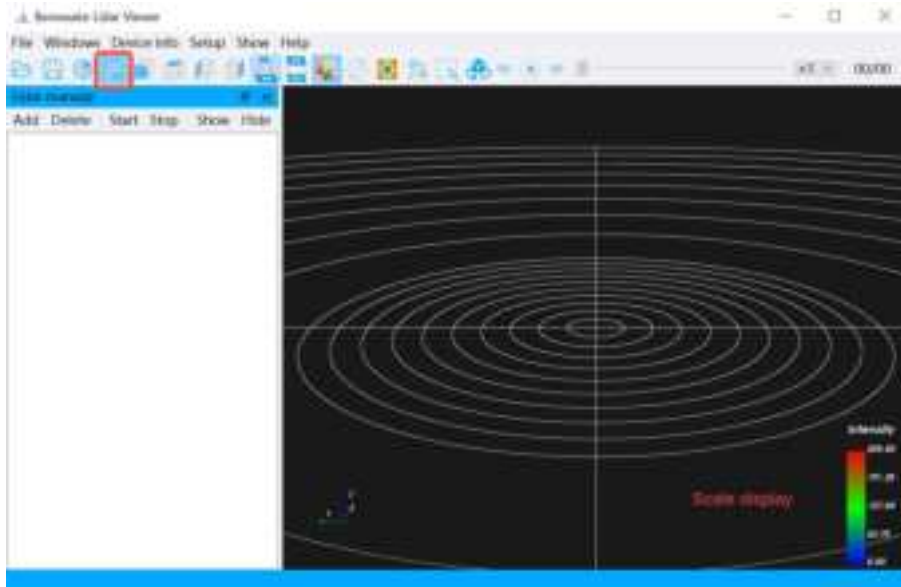


Figure. 22-a: Scale shows contrast (comparison)

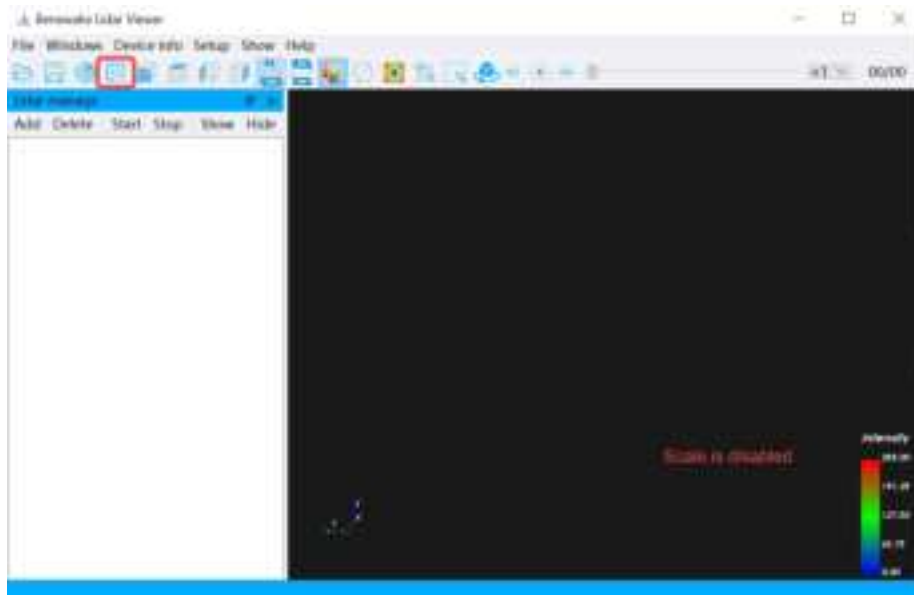



Figure. 22-b: Scale is disabled

4.4.2 Hue Indicator

Select/invert the icon in the toolbar  to control whether the hue indicator bar is displayed, and the contrast effect is shown in the following figure:

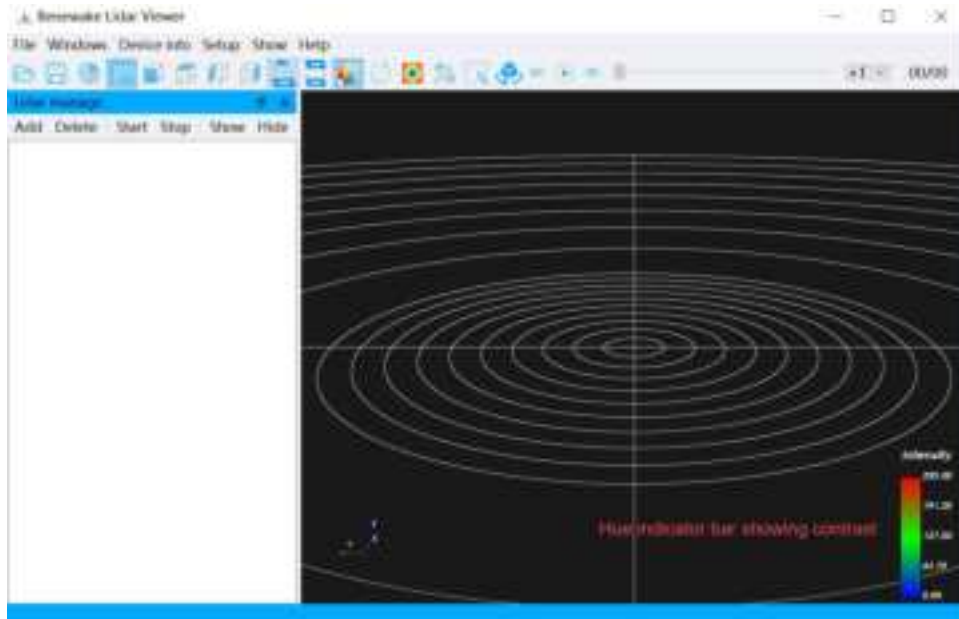


Figure. 23-a: Hue indicator bar showing contrast (comparison)

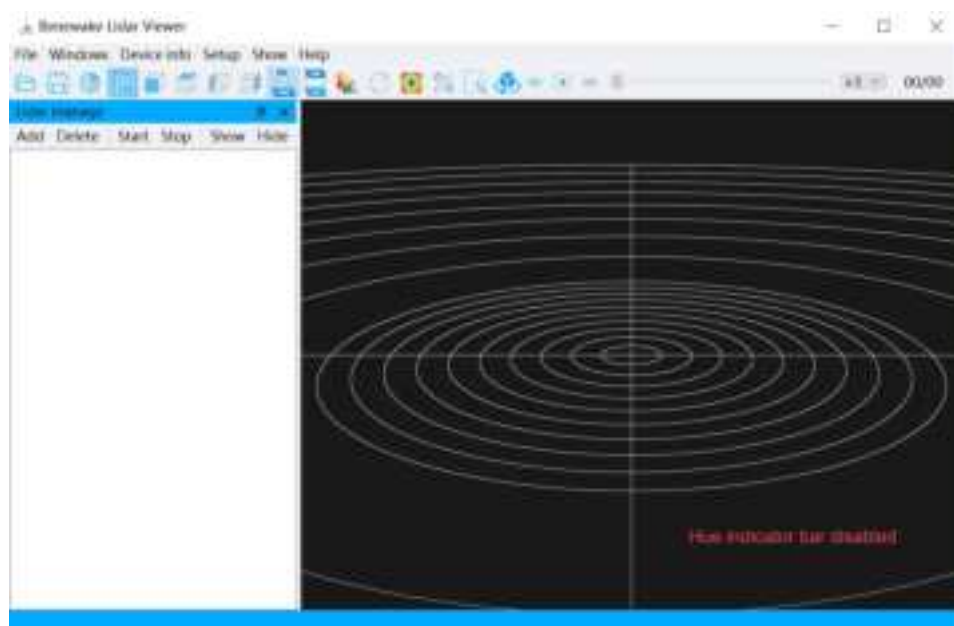


Figure. 23-b: Hue indicator bar disabled

4.4.3 Distance Measurement







Click the icon in the **toolbar**  to perform ranging operations on the point cloud. Stop the device, click  the icon, use the **left mouse button** to select the point to be measured on the point cloud data in the point cloud display area, the selected point will be displayed in red, after selecting two points, the distance between the two points can be automatically calculated, and the distance information will be displayed near the ranging line, and the distance measurement function can be turned off by clicking the icon  again.



Figure. 24: Point cloud ranging

4.4.4 Point Cloud Frame Selection

Click the icon  in the toolbar to select the point cloud. After clicking the icon , click the **Left Mouse Button** once in the **Point Cloud Display Area**, press the **X** key on the keyboard, then press and hold the **Left Mouse Button** to select the point cloud image (can be selected multiple times), and release the **Left Mouse Button** to complete the box selection. The selected **point cloud data** is shown in red, and an information window will appear on the right side of the **BLV interface** to display detailed information of the selected point cloud. Then press the X key on your keyboard and invert the icon  to turn off the box selection.

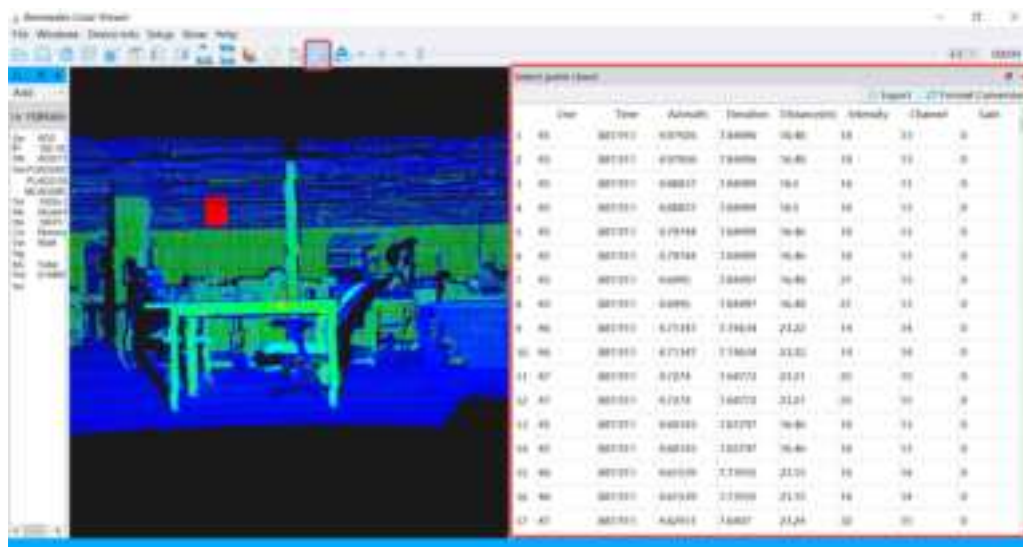



Figure.25: Point cloud box selection

4.4.5 Perspective Projection

Depending on your display requirements, select the icon  in the **Toolbar** to change the display of point cloud data. The point cloud display effect of perspective projection is closer to the visual effect of human eye.

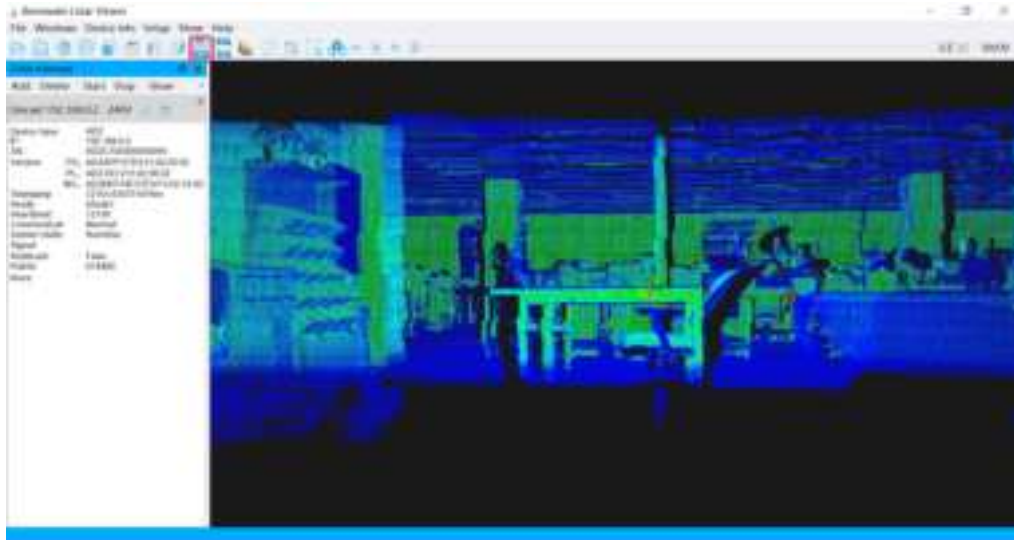



Figure. 26: Perspective projection display effect

4.4.6 Orthographic Projection

According to your requirements, click the icon  in the **Toolbar** to change the display effect of the point cloud data to ortho projection. In the ortho projection effect, objects near and far are scaled at the same scale.

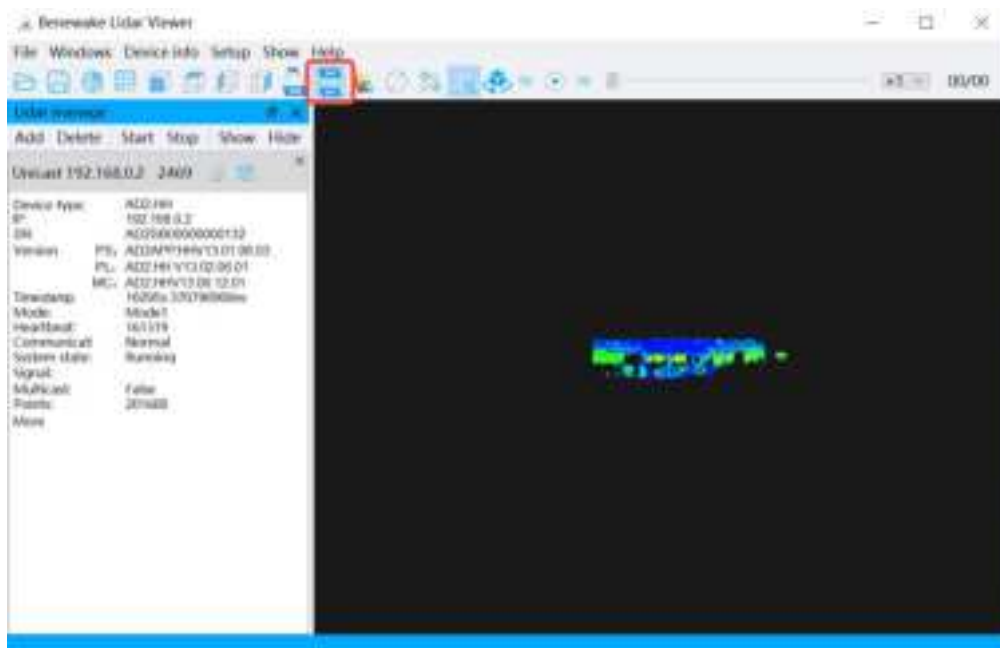



Figure. 27: Orthographic display effect

4.4.7 Rotation Function

Click the icon  in the **toolbar** to turn on the rotation function. When enabled, the point cloud display will rotate slowly 360° horizontally along the plane formed by the **X-axis** and **Y-axis** of the LiDAR with the **Z-axis** of LiDAR as the rotation axis.

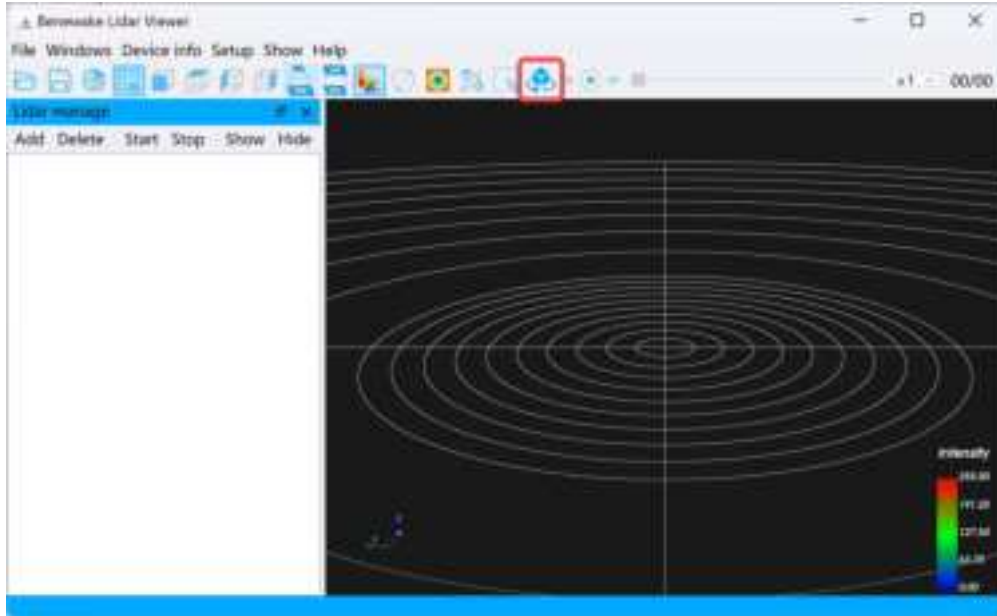


Figure. 28: Rotation function

4.5 Menu Bar Related Functions

4.5.1 File

As shown in the figure, file menu main functions are: playback PCD file, play back PCAP file, save PCD file, save CSV file, save the PCAP file, etc. For more information, please see [4.2 Chapter](#).

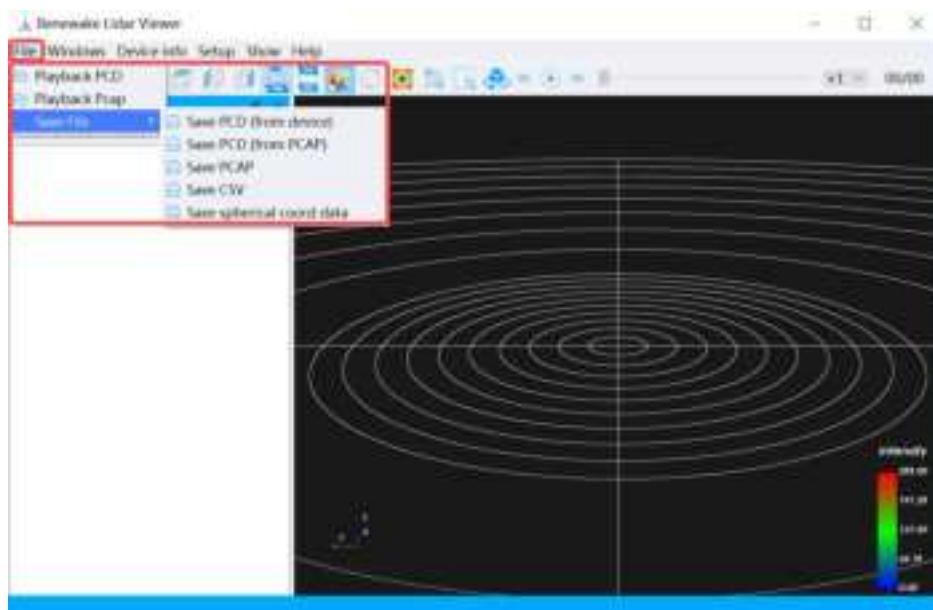


Figure. 29: File menu

4.5.2 Window

As shown in the figure, click the **Menu Bar** → **Window** → **Open/Close Device Window** options to display and hide the device management bar.

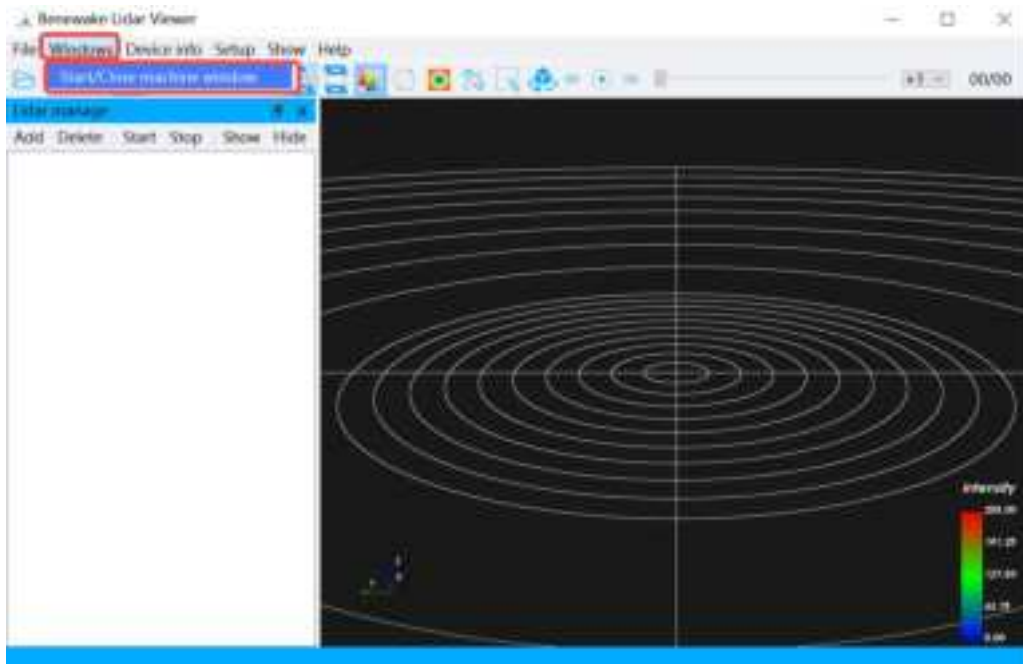


Figure. 30-a: Display device management bar

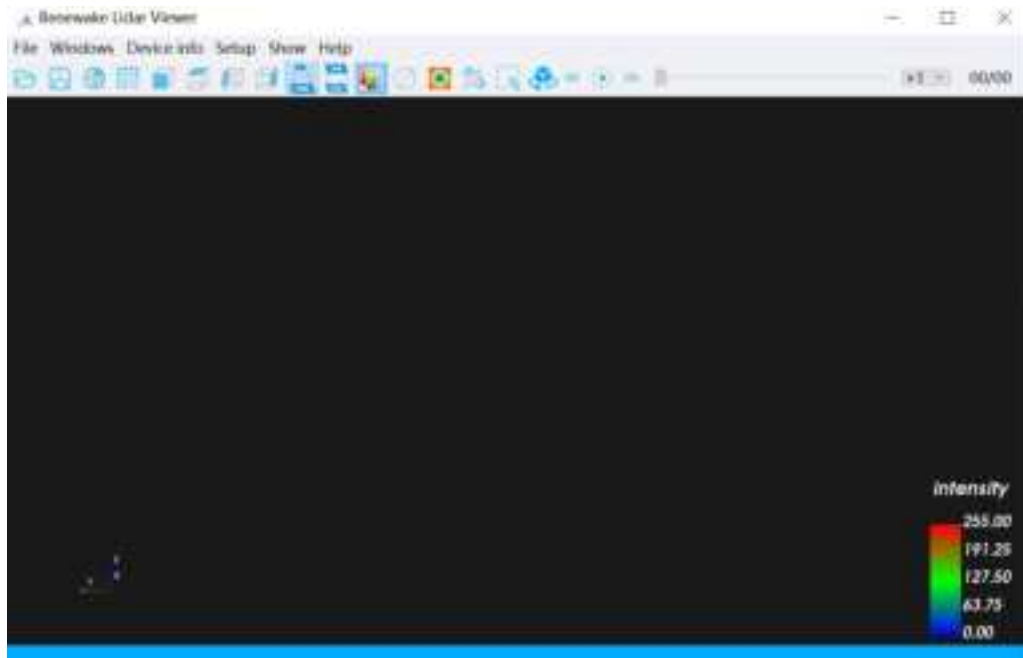


Figure. 30-b: Hide device management bar

4.5.3 Device Information

As shown in the figure, click the **Menu Bar** → **Device Information** option, and secondary options such as **Get Device Information**, **Get Device Heartbeat Information**, **Get Device Logs**, and **Search for Devices** in the

Current Network will appear. By clicking these options, you can understand the basic information of the LiDAR device.

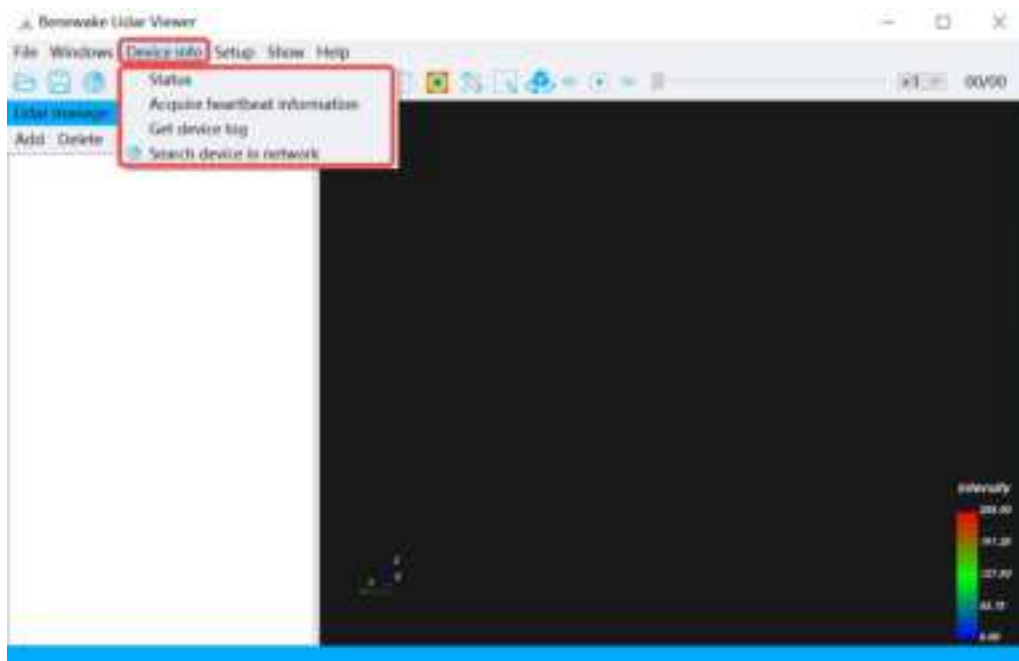


Figure. 31: Device information

1. **Get Device Information:** The SN number and firmware version of the current device are displayed.
2. **Obtain device heartbeat information:** The heartbeat signal of the current device can be detected.
3. **Get Device Logs:** displays the log information of the current device.
4. **Search for devices on the current network:** Search for radars waiting to connect in the current network segment.

4.5.4 Configuring Device

Click the **Menu Bar → Configure Device** option to configure some functions of the device (**Note:** If the LiDAR is in the running state, the **Configure Device** function is not available).

1. Click the **Menu Bar → Configure Device → LiDAR Operation Settings → Set Mode** options to make the LiDAR operate in different working modes. If you want to know the parameters of each mode, please contact Benewake technical support: support@benewake.com

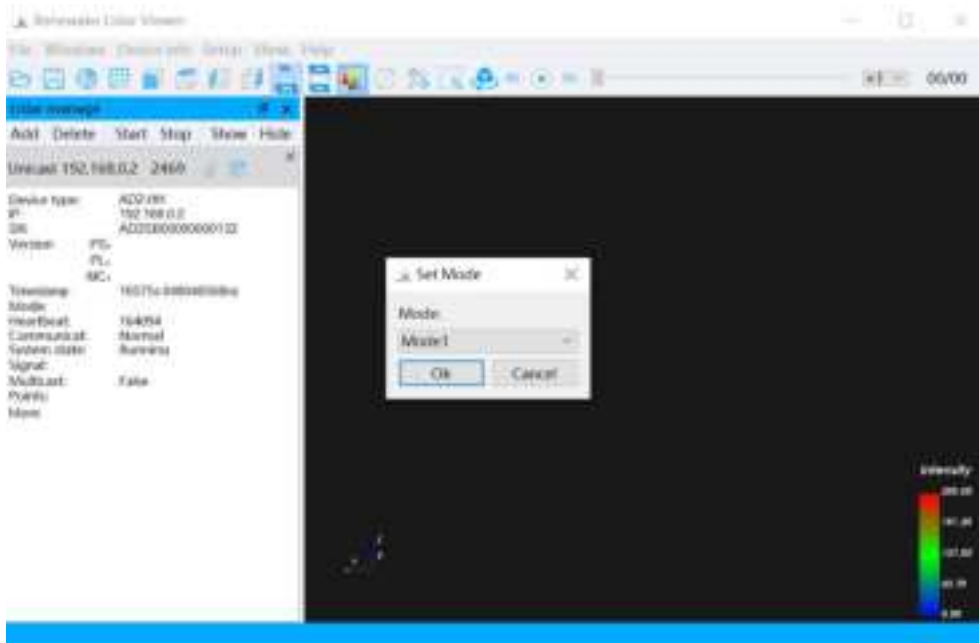


Figure. 32: Setting different modes

2. For other function configurations, please contact Benewake technical support team: support@benewake.com, and use the sensor under professional guidance.

4.5.5 Point Cloud Display

Point cloud display, the main functions are: set the color scheme, set the view, exhibition mode, display color bar, display scale, ranging box selection, set point size and so on. For more information, please visit [4.1](#) & [4.4](#) Chapter.

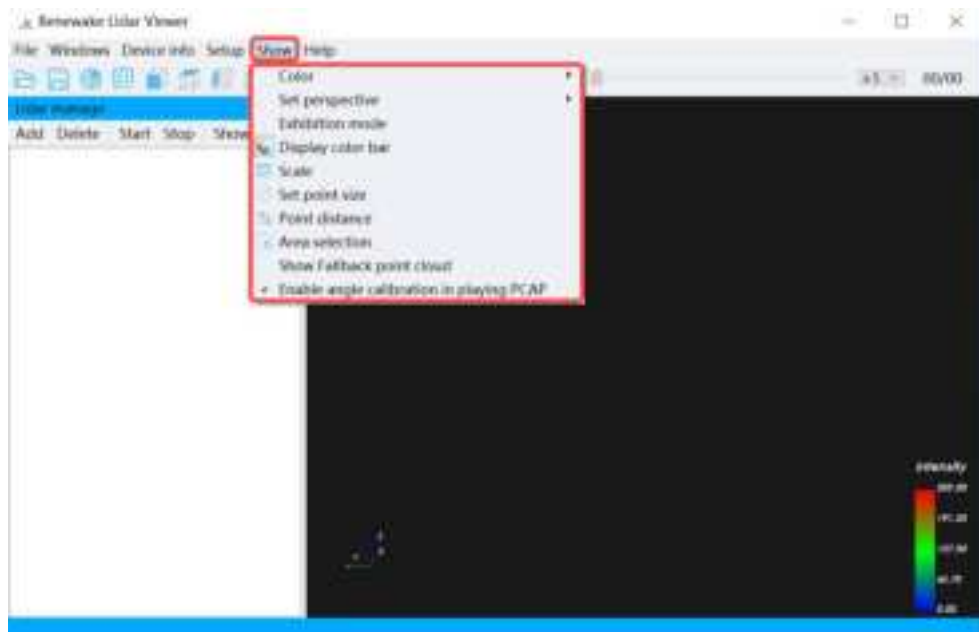


Figure. 33: Point cloud display

4.5.6 Help Menu

In addition to the above features, BLV offers a number of other features. Click the **Menu Bar** → **Help** option to view.

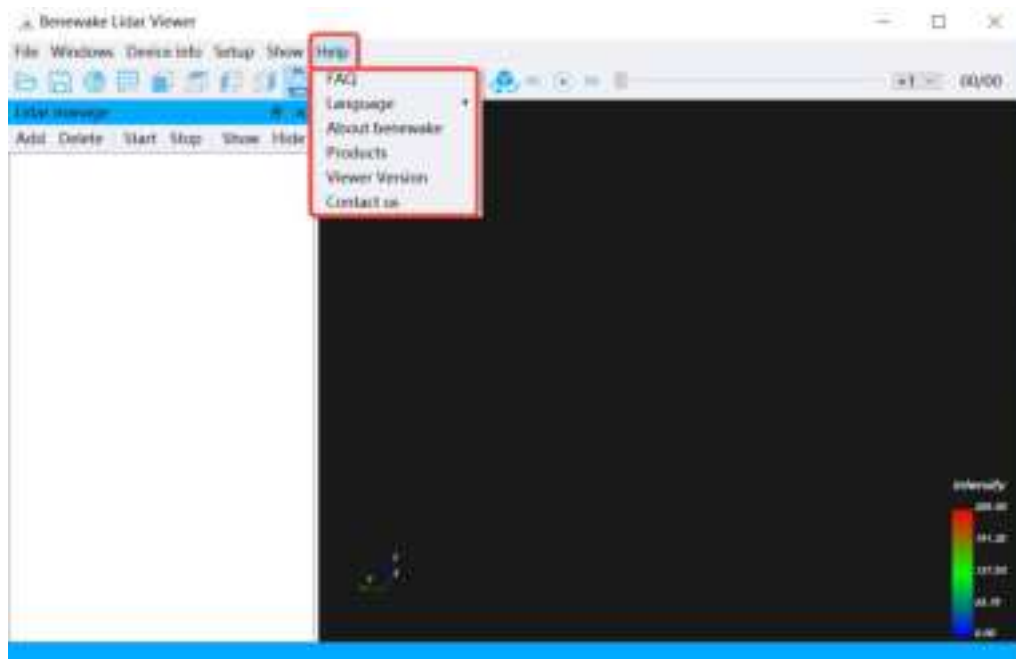


Figure. 34: Help menu

- **Frequently Asked Questions and Answers:** Frequently asked questions and explanations, including: the device does not start, the point cloud is displayed incorrectly or cannot be displayed, etc.
- **Select Language:** Select the display language of BLV interface.
- **About Benewake:** Company Introduction.
- **Product introduction:** Benewake product positioning, application fields, etc., please refer to the product introduction page of the official website for details.
- **Viewer Version:** GUI software version and release date.
- **Contact us:** If you encounter any problems during use, please contact Benewake technical support.