

YDLIDAR TSA USER MANUAL



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1 YDLIDAR TSA LIDAR DEVELOPMENT KIT

The development kit of YDLIDAR TSA lidar (hereinafter referred to as TSA) is an accessory tool provided for performance evaluation and early development of the TSA. Through the TSA development kit, and with the evaluation software, users can observe point cloud data scanned by TSA on your environment or development on the SDK.

1.1 Development Kit

The TSA development kit has the following components:



TSA Lidar



USB Type-C Cable



USB Adapter Board

YDLIDAR TSA DEVELOPMENT KIT

CHART 1 YDLIDAR TSA LIDAR DEVELOPMENT KIT DESCRIPTION

Item	Qty.	Description
TSA Lidar	1	Standard version of the TSA Lidar, internal integrated motor drive, can realize motor stall control and motor control
USB Type-C Cable	1	Use with USB adapter board to connect TSA and PC. USB cable is both a power supply cable and a data cable
USB Adapter Board	1	Realize USB to UART, convenient for the rapid interconnection of TSA lidar and PC. In addition, it provides Micro USB power interface (PWR) for auxiliary power supply

Note: USB Adapter board has two interface: USB_DATA、USB_PWR.

USB_DATA: Data powered interface. In most cases, this interface can be used to meet power and communication requirements.

USB_PWR: Auxiliary power supply interface. The USB interface of some development platforms has weak current drive capability. At this time, auxiliary power supply can be used.

2 OPERATION UNDER WINDOWS

2.1 Device Connection

When TSA is evaluated and developed under windows, TSA and PC need to be interconnected. The specific process is as follows:

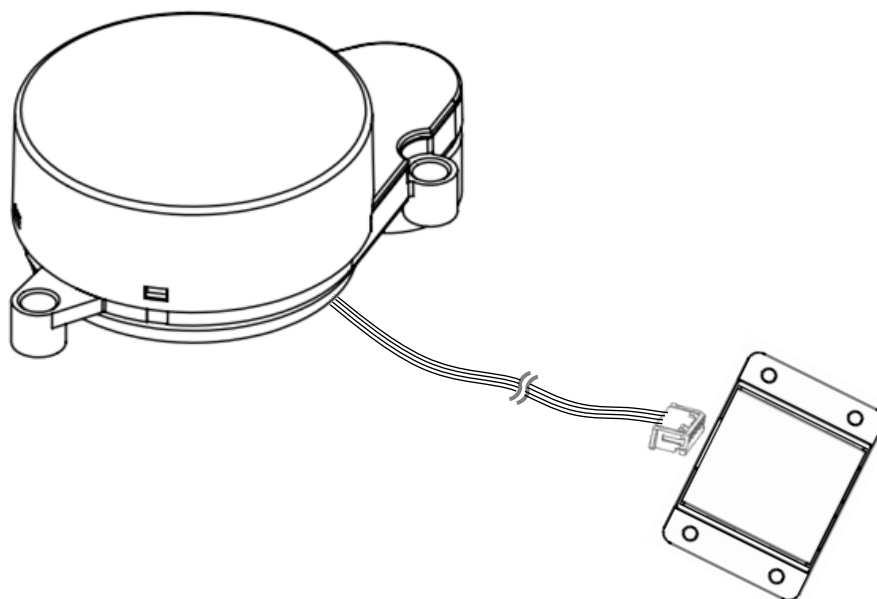


FIG 2 YDLIDAR TSA DEVICE CONNECTION STEP 1

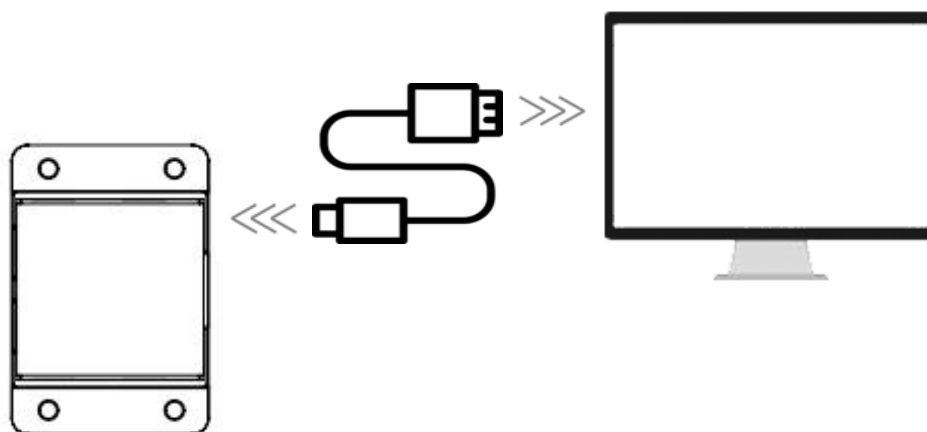


FIG 3 YDLIDAR TSA DEVICE CONNECTION STEP 2

Connect the adapter board with TSA first, then connect the USB cable to the USB port of the adapter board and the PC. Note that the Type-C interface of the USB cable is connected to the USB_DATA of the USB interface board, and the idle mode is used after TSA is powered on. The motor does not rotate.

The drive current of USB interface of some development platforms or PC is not sufficient. TSA need to be connected to the auxiliary power supply of +5V, otherwise the lidar will be abnormal.

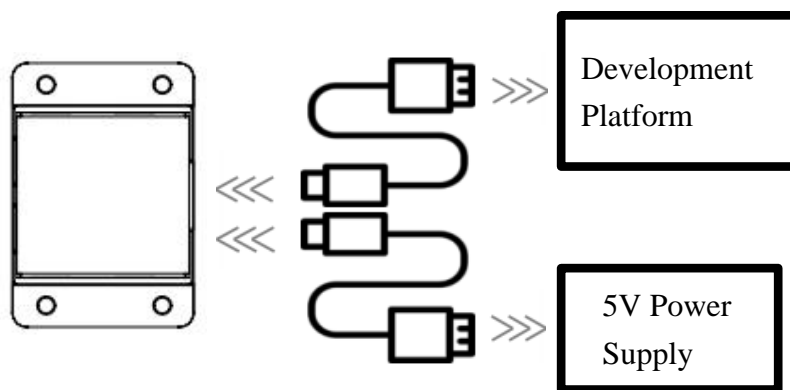


FIG 4 YDLIDAR TSA AUXILIARY POWER SUPPLY

2.2 Driver Installation

To evaluate and develop the TSA under Windows, you need to install the serial port driver of the USB adapter board. The USB adapter board of this kit adopts CP2102 chip to realize serial port (UART) to USB signal conversion. Its driver can be downloaded from our official website or downloaded from the official website of Silicon Labs.

<https://www.ydlidar.com/dowfile.html?id=97>

<http://cn.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>

After unzipping the driver package, run the CP2102's Windows driver installation file (exe file under CP210x_VCP_Windows). Please select the 32-bit version (x86) or 64-bit version (x64) installation program according to the version of the windows operating system.

x64	2013/10/25 11:39	文件夹	
x86	2013/10/25 11:39	文件夹	
CP210xVCPInstaller_x64.exe	2013/10/25 11:39	应用程序	1,026 KB
CP210xVCPInstaller_x86.exe	2013/10/25 11:39	应用程序	901 KB
dpinst.xml	2013/10/25 11:39	XML 文档	12 KB
ReleaseNotes.txt	2013/10/25 11:39	文本文档	10 KB
SLAB_License_Agreement_VCP_Windo...	2013/10/25 11:39	文本文档	9 KB
slabvcp.cat	2013/10/25 11:39	安全目录	12 KB
slabvcp.inf	2013/10/25 11:39	安装信息	5 KB

FIG 5 YDLIDAR TSA DRIVER VERSION SELECTION

Double-click the exe file and follow the prompts to install it.



FIG 6 YDLIDAR TSA DRIVER INSTALLING

After the installation is complete, you can right-click on [My Computer] and select [Properties]. On the open [System] screen, select [Device Manager] from the left menu to access the Device Manager.

Expand [Port] to see the serial port name corresponding to the identified USB adapter, that is, the driver installation is successful. The following figure shows COM3. (Note that the port must be checked in case of TSA and PC interconnection).

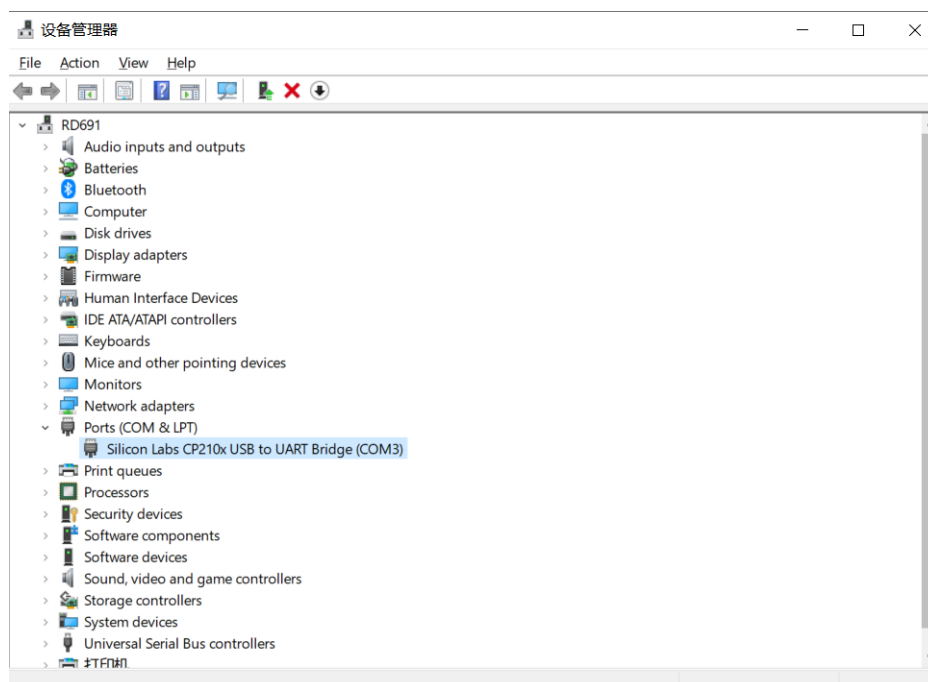


FIG 7 YDLIDAR TSA DRIVER INSTALLATION CHECK

2.3 How to use LidarViewer

YDLIDAR provides LidarViewer, a point cloud data visualization software for TSA real-time scanning. Users can use this software to visually observe the TSA scanning map: YDLIDAR provides TSA real-time point cloud data and real-time scanning frequency. At the same time, the scanned data can be saved offline to an external file for further analysis. Visualization software download link: <https://www.ydlidar.com/Public/upload/download/TOOL.zip>

Before using the YDLIDAR software, make sure that the TSA USB adapter board serial port driver is installed successfully, and interconnect the TSA with the USB port of the PC. Run the evaluation software: LidarViewer.exe, select the corresponding serial port number and model number. Meanwhile, users could choose language on the top right corner.



FIG 8 YDLIDAR TSA EVALUATION SOFTWARE

If there is no TSA model, please refer to the following to add TSA model.

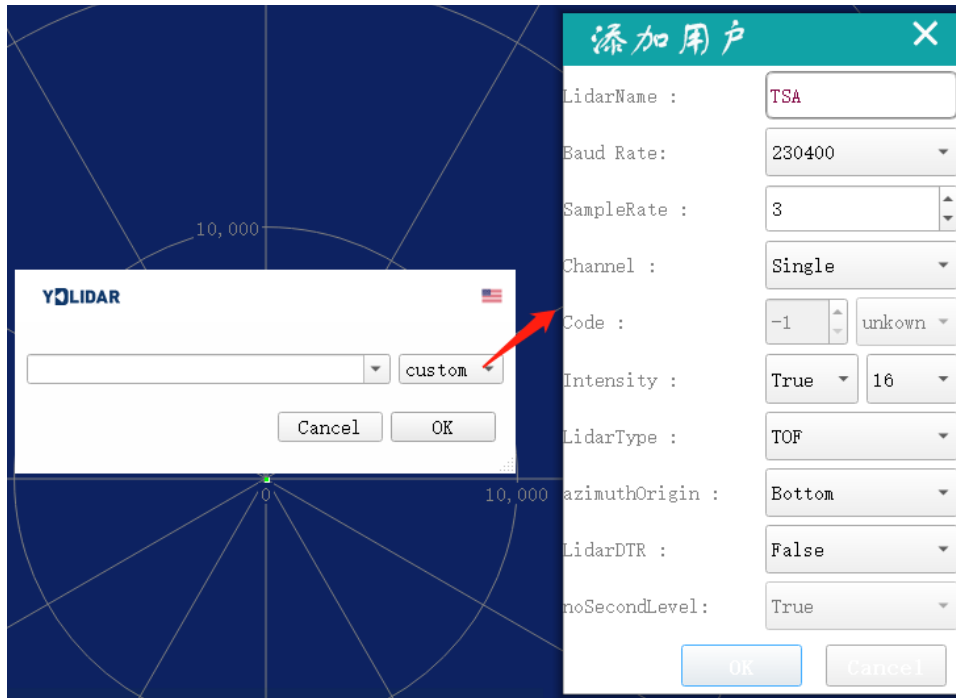


FIG 9 YDLIDAR TSA PARAMETER CONFIGURATION

If the connection is correct, you will see the following screen:

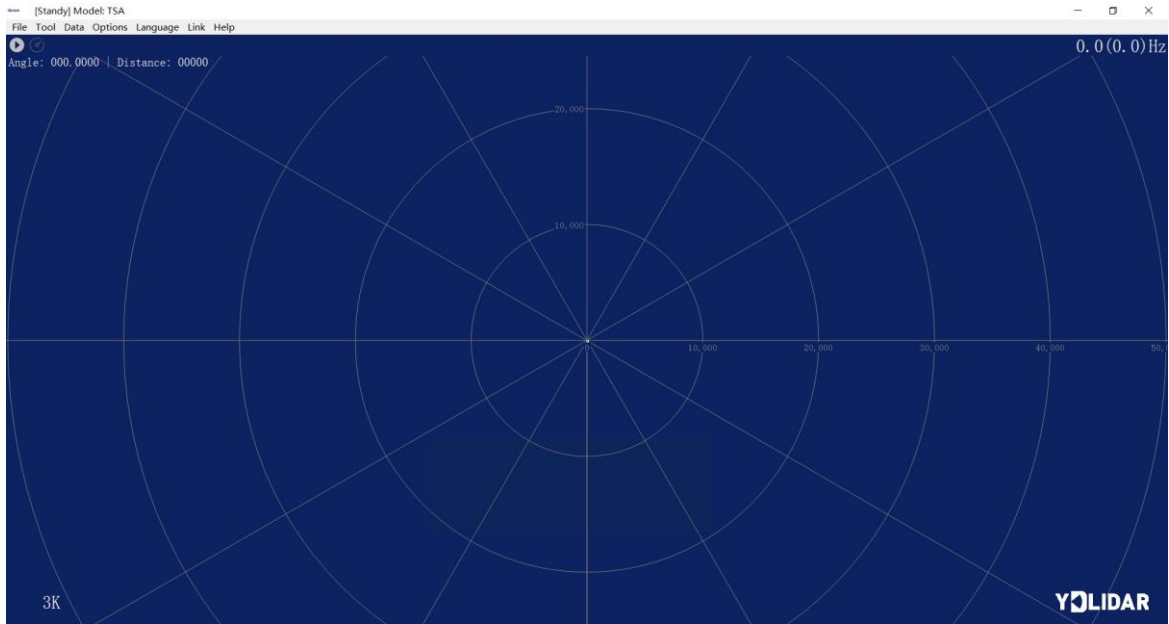




FIG 10 POINTCLOUD VIEWER INTERFACE

2.3.1 Start Scanning

Click  to start scanning and display the environment point cloud. Click  to stop it. as shown below:

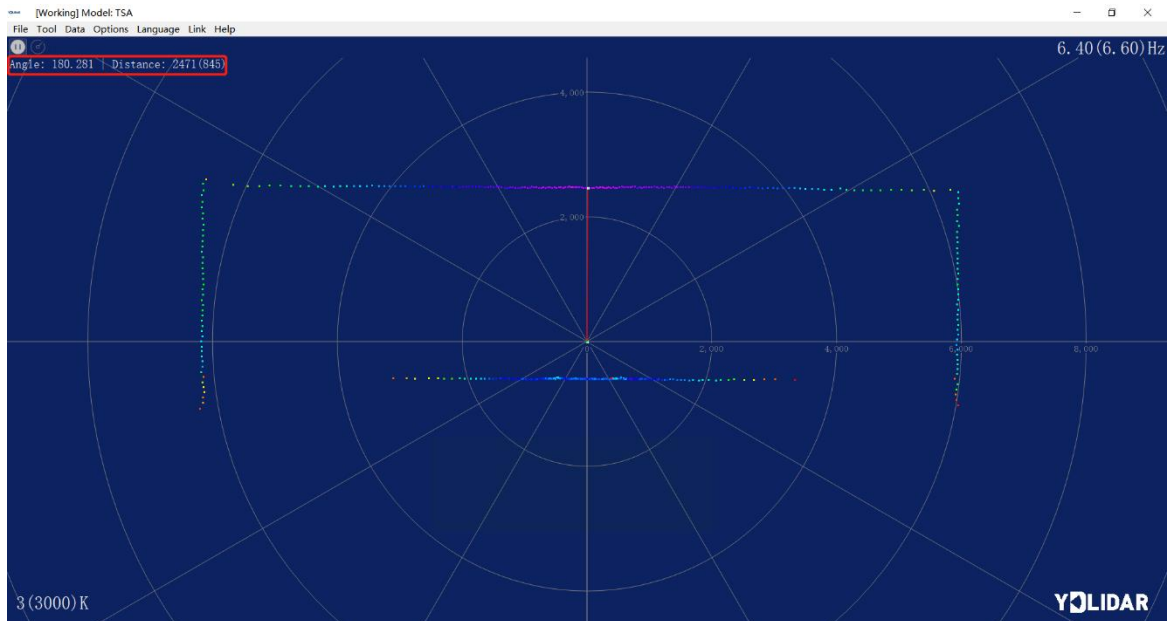


FIG 11 LIDAR SCANNING POINT CLOUD DISPLAY

2.3.2 Data Storage

During lidar scanning, click [File] in the main menu, select [Export to Excel], and save point cloud data according to the prompts. Then the system will save the point cloud information scanned in a circle in Excel format.

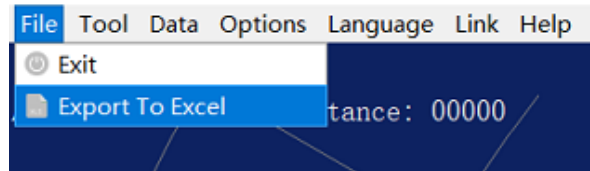


FIG 12 SAVE DATA

2.3.3 Display Mean and Standard Deviation

Click [Tools] in the main menu, then select [Mean And STD] - [View].

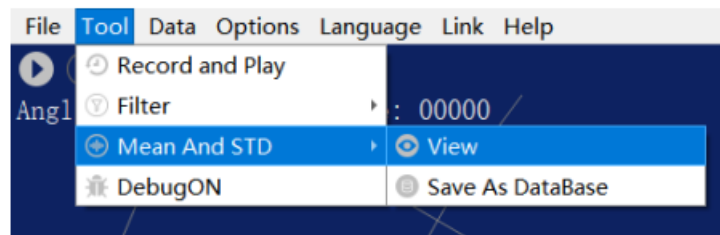


FIG 13 YDLIDAR TSA DISPLAY MEAN AND STANDARD DEVIATION

Choose one according to your needs, move the mouse to the test position, right-click the pop-up menu, and select [Lock Mouse Tracking].

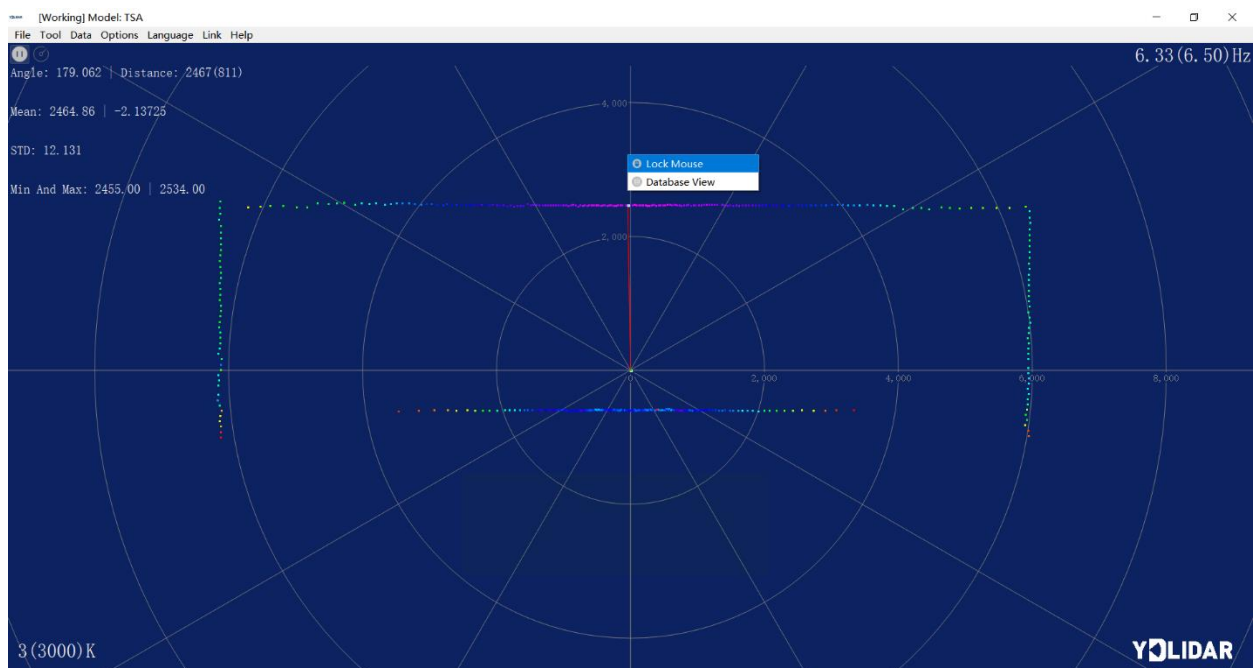


FIG 14 LOCK MOUSE TRACKING

2.3.4 Display intensity value

Click [Data] in the main menu and select [Intensity Histogram].

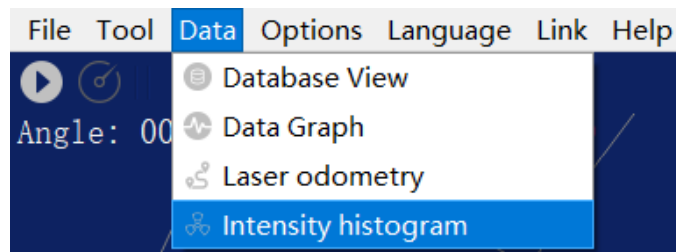


FIG 15 DISPLAY INTENSITY VALUE

The main window is displayed as follows, showing the intensity values of a total of 100 points on the left and right of the mouse lock position.

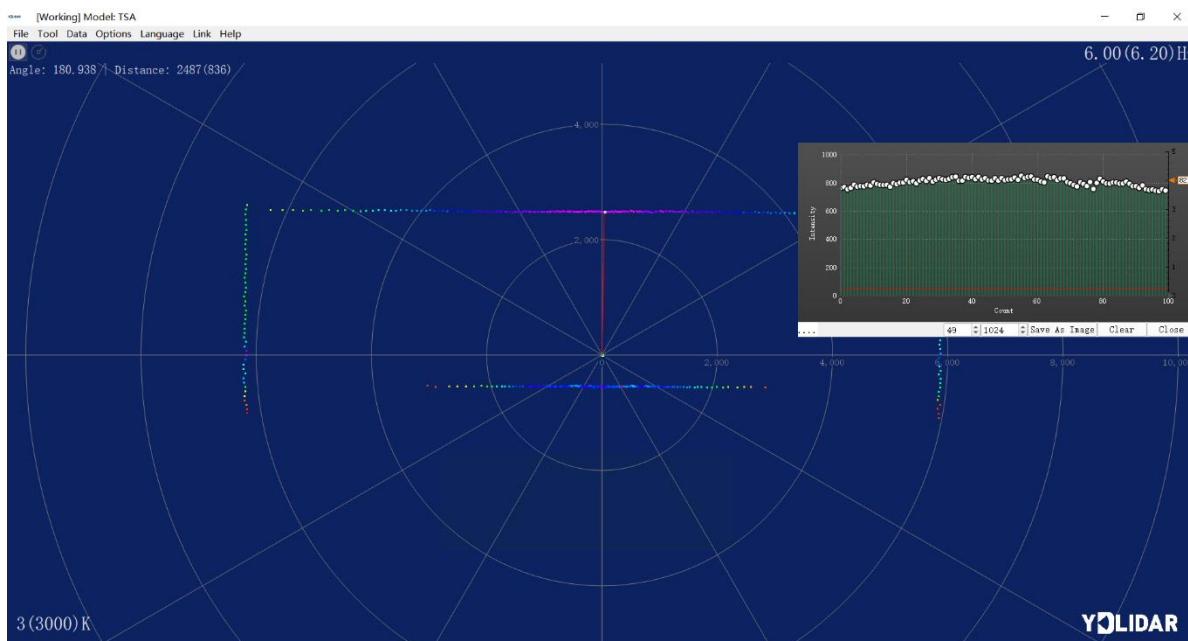


FIG 16 DISPLAY INTENSITY HISTOGRAM

2.3.5 Play and Record

Click [Tools] in the main menu, then select [Record and Play].

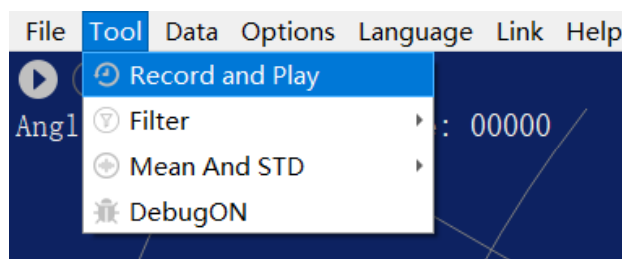



FIG 17 RECORD AND PLAY

The main window is displayed as follows:

To record lidar data, click  to start recording, and click  to stop recording.

In non-scanning mode, click  to start play.

The play process is as follows:

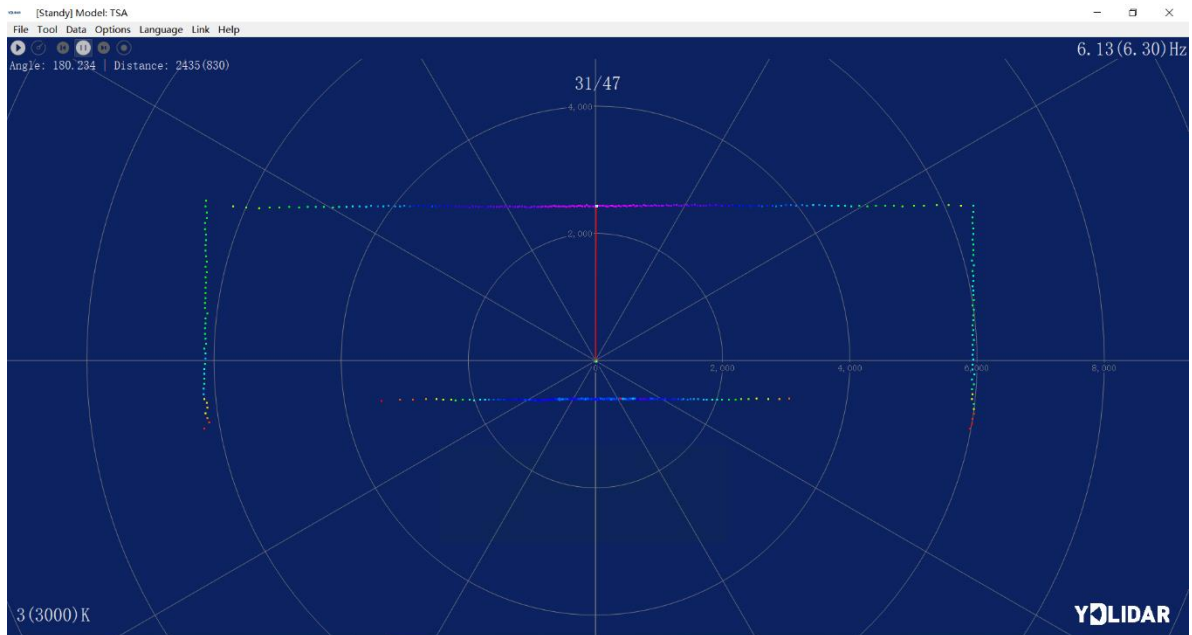


FIG 18 PLAY PROCESS

2.3.6 Debug

Click [Tools] in the main menu, and then select [DebugON] to output the raw lidar data to the "viewer_log.txt" and "viewer_log_err.txt" files.

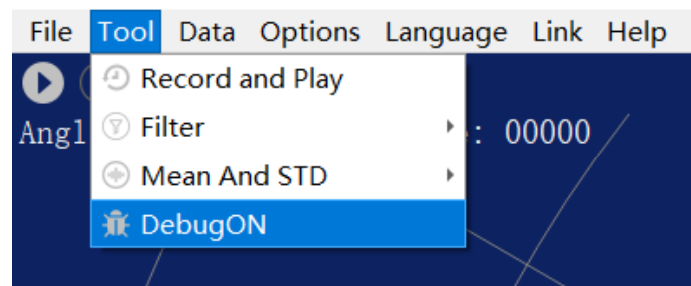


FIG 19 START DEBUGGING

2.3.7 Filter

Click [Tools] in the main menu, and then select [Filter] to add Lidar data filtering algorithm.

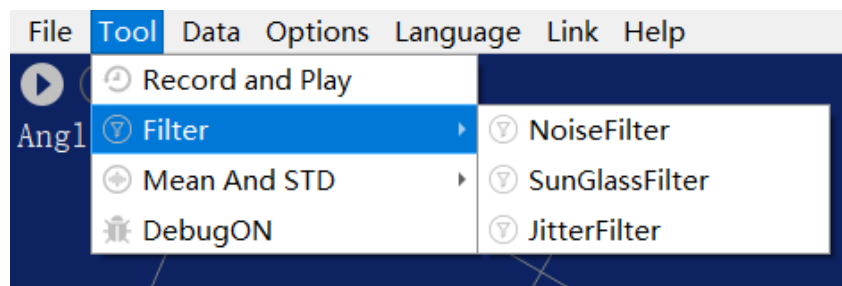


FIG 20 FILTER SETTING

Note: For more functions of LidarViewer, please click [Help], select [More Information], and learn more about how to use it.

3 LINUX ROS OPERATION

There are many Linux versions, this article only uses Ubuntu 18.04, Melodic version ROS as an example.

SDK driver address:

<https://github.com/YDLIDAR/YDLidar-SDK>

ROS driver address:

https://github.com/YDLIDAR/ydlidar_ros_driver

3.1 Device Connection

Under Linux, the TSA and PC interconnect processes are consistent with those under Windows. See [Device Connection under Window](#).

3.2 Compile and Install YDLidar-SDK

ydlidar_ros_driver depends on the YDLidar-SDK library. If you have never installed the YDLidar-SDK library, or it has expired, you must first install the YDLidar-SDK library. If you have the latest version of YDLidar-SDK installed, please skip this step, then go to the next step.

```
$ git clone https://github.com/YDLIDAR/YDLidar-SDK.git
$ cd YDLidar-SDK/build
$ cmake ..
$ make
$ sudo make install
```

3.3 ROS Driver Installation

- 1) Cloning GitHub's ydlidar_ros_driver Package:

```
$ git clone https://github.com/YDLIDAR/ydlidar_ros_driver.git
ydlidar_ws/src/ydlidar_ros_driver
```

- 2) Build the ydlidar_ros_driver software package:

```
$ cd ydlidar_ws
$ catkin_make
```

- 3) Package environment Settings:

```
$ source ./devel/setup.sh
```

Note: Add a permanent workspace environment variable. It will be very convenient if ROS environment variables are automatically added to your bash session every time you start a new shell:

```
$ echo "source ~/ydlidar_ws/devel/setup.bash" >> ~/.bashrc  
$ source ~/.bashrc
```

- 4) Verify that your package path is set, echo the ROS_PACKAGE_PATH variable.

```
$ echo $ROS_PACKAGE_PATH
```

You should see something like this: /home/tony/ydlidar_ws/src:/opt/ros/melodic/share.

- 5) Create Serial Port Alias [Optional]

```
$ chmod 0777 src/ydlidar_ros_driver/startup/*  
$ sudo sh src/ydlidar_ros_driver/startup/initenv.sh
```

Note: After completing the previous operation, re-insert the LiDAR again.

3.4 Run the ydlidar_ros_driver

Run ydlidar_ros_driver with startup file, as shown below:

```
$ roslaunch ydlidar_ros_driver TSA.launch
```

3.5 RVIZ scan result checking

```
$ roslaunch ydlidar_ros_driver lidar_view.launch
```

Note: Take G4 as an example by default. If you use other lidars, change the lidar.launch file in lidar_view.launch file to the corresponding **. (If using TSA lidar, change to TSA. Launch)



```
lidar_view.launch  
~/ydlidar_ws/src/ydlidar_ros_driver/launch  
保存(S) [Menu] [Fullscreen] [Close]  
<launch>  
  <include file="$ (find ydlidar_ros_driver)/launch/lidar.launch" />  
  <node name="rviz" pkg="rviz" type="rviz" args="-d $ (find ydlidar_ros_driver)/launch/lidar.rviz" />  
>  
</launch>
```

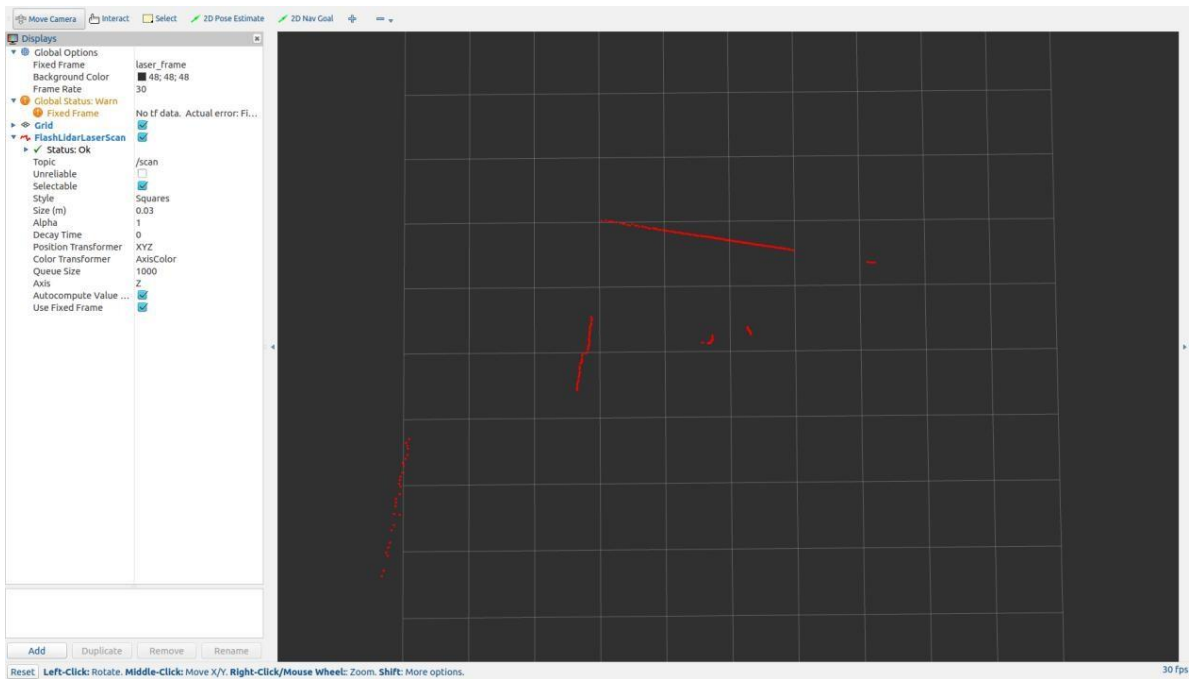


FIG 21 YDLIDAR TSA RVIZ

3.6 Modify Scan Angle

The scanning data seen by running the launch file is displayed by default with 360- degree data. To modify the display range, you need to modify the configuration parameters in the launch file. The specific operation is as follows:

- 1) Switch to the directory where the corresponding [launch file] is located, edit the file, and its content is as shown in the figure:

```
$ vim TSA.launch
```

```
<launch>
  <node name="ydlidar_lidar_publisher" pkg="ydlidar_ros_driver" type="ydlidar_ros_driver_node" output="screen"
    respawn="false" >
    <!-- string property -->
    <param name="port" type="string" value="/dev/ydlidar"/>
    <param name="frame_id" type="string" value="laser_frame"/>
    <param name="ignore_array" type="string" value=""/>

    <!-- int property -->
    <param name="baudrate" type="int" value="512000"/>
    <!-- 0:TYPE_TOF, 1:TYPE_TRIANGLE, 2:TYPE_TOF_NET -->
    <param name="lidar_type" type="int" value="0"/>
    <!-- 0:YDLIDAR_TYPE_SERIAL, 1:YDLIDAR_TYPE_TCP -->
    <param name="device_type" type="int" value="0"/>
    <param name="sample_rate" type="int" value="20"/>
    <param name="abnormal_check_count" type="int" value="4"/>

    <!-- bool property -->
    <param name="resolution_fixed" type="bool" value="true"/>
    <param name="auto_reconnect" type="bool" value="true"/>
    <param name="reversion" type="bool" value="true"/>
    <param name="inverted" type="bool" value="true"/>
    <param name="isSingleChannel" type="bool" value="false"/>
    <param name="intensity" type="bool" value="false"/>
    <param name="support_motor_dtr" type="bool" value="false"/>
    <param name="invalid_range_is_inf" type="bool" value="false"/>

    <!-- float property -->
    <param name="angle_min" type="double" value="-180" />
    <param name="angle_max" type="double" value="180" />
    <param name="range_min" type="double" value="0.01" />
    <param name="range_max" type="double" value="50.0" />
    <param name="frequency" type="double" value="10.0"/>
  </node>
  <node pkg="tf" type="static_transform_publisher" name="base_link_to_laser4"
    args="0.0 0.0 0.2 0.0 0.0 0.0 /base_footprint /laser_frame 40" />
</launch>
```

FIG 22 TSA.LAUNCH FILE

Note: For more information about the file contents, please refer to:

https://github.com/YDLIDAR/ydlidar_ros_driver#configure-ydlidar_ros_driver-internal-parameter

- 2) The TSA lidar coordinates follow the right-hand rule within ROS, with an angle range of [-180, 180]. "angle_min" is the start angle, and "angle_max" is the endangle. The specific scope needs to be modified according to actual use.

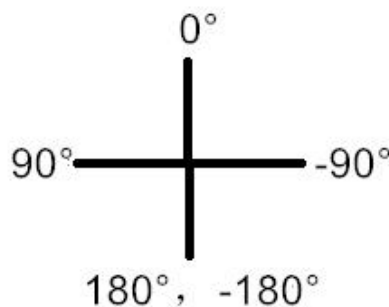


FIG 23 YDLIDAR TSA COORDINATES DEFINITION

4 CAUTION

4.1 Ambient Temperature

When the working environment temperature of TSA is too high or too low, it will affect the accuracy of the distance measuring system. It may also damage the structure of the scanning system and reduce the life of the TSA lidar. Avoid use in high temperature (>50 degrees Celsius) and low temperature (<0 degrees Celsius) conditions.

4.2 Ambient Lighting

The ideal working environment of TSA is indoor, and the indoor environment light (including no light) will not affect the work of TSA. However, please avoid using strong light sources (such as high-power lasers) to directly illuminate the G6's vision system.

If you need to use it outdoors, please avoid the TSA's vision system directly facing the sun, which may cause permanent damage to the vision system's photosensitive chip, which will invalidate the range finding.

The TSA standard version will cause interference in the distance measurement under the conditions of outdoor strong sunlight reflection, please pay attention to it.

4.3 Power Supply

During the development process, since the drive current of the USB interface of each platform or the USB interface of the computer may be too low to drive the TSA, the external power supply of the +5V to the TSA needs to be provided through the USB_PWR interface of the USB interface board. It is not recommended to use mobile phone power bank because the voltage ripple of power bank is too large.

5 REVISE

Date	Version	Content
2021-08-05	1.0	Composing a first draft