AFM 711 Millimeter Wave Radar

Application manual

Version history

Date	Version	Version description
2024-10-14	1.0	AFM711 Millimeter Wave Radar Application Manual First Edition

Table of contents

1 Introduction to AFM 711 Millimeter Wave Radar

AFM711 is a short-range W-band millimeter-wave radar with a detection range of 20 meters. It adopts FMCW modulation mode and can accurately detect the distance, speed and angle of moving targets by using the difference between the transmitted radio wave and the received echo. It has high ranging and speed measurement accuracy.

AFM711 is small in size (40 * 40 * 22.5mm with shell), large in measurement angle (horizontal 120 °, pitch 120 °), capable of detecting object height, leading in performance, integrated peripheral interface (can interface/485 interface/TTL interface), and has the functions of special vehicle (low speed) forward, reversing warning and obstacle avoidance of engineering vehicle. It can meet the rapidly growing market demand for low-speed vehicles.

Figure 1 AFM 711 Product Dimensional Drawing

Note:

AFM711 millimeter wave radar is equipped with standard cable, and the length can be customized according to the requirements.

2 Precautions for product use

"Precautions" are very important and should be paid attention to.

(1) During installation, the antenna surface (flat surface) of the module shall face the detection area and shall not be covered by any metal object;

(2) Always test outdoors in an open area.

If you encounter problems that can not be solved in the process of installation and use, please contact the customer service staff of Nanoradar Technology, we will serve you wholeheartedly!

3 Shipping list

The delivery list includes: AFM711 millimeter wave radar 1x (as shown in Figure 2) and connecting cable 1x. By default, a connecting line is provided during delivery. Please note the length of the line.

Figure 2. AFM 711 Millimeter Wave Radar

Note: There are 2 screw holes on the back of AFM711, which can be fixed with 2 M3 screws.

4 Quick Use Guide

4.1 Installation of connecting line

The AFM711 leads are described in the following figure:

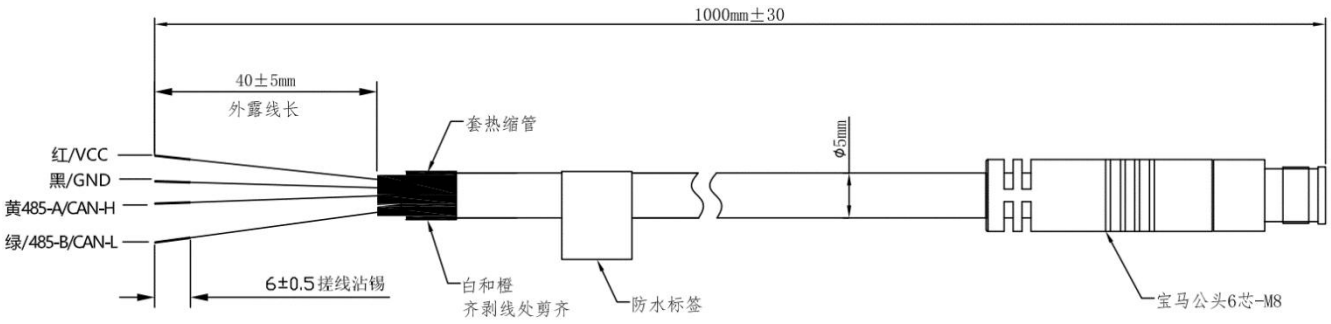

Figure 3. AFM711 Lead Description

The detailed interface definition (configuration cable) of AFM711 is shown in the following table:

Table 1 AFM711 Pin Definition

Serial number	Definition	Range	Cable color
1	POWER IN	9~24V DC	Red
2	GND		Black
3	CAN_H/485-A		Yellow
4	CAN_L/485-B		Green

4.2 AFM711 Mounting and Coordinate System

In forward and backward detection and related applications, the AFM711 should be installed at a height of 0.4 to 1.5 meters above the ground, with the radar antenna facing straight ahead. The installation specifications are shown in Figure 4:

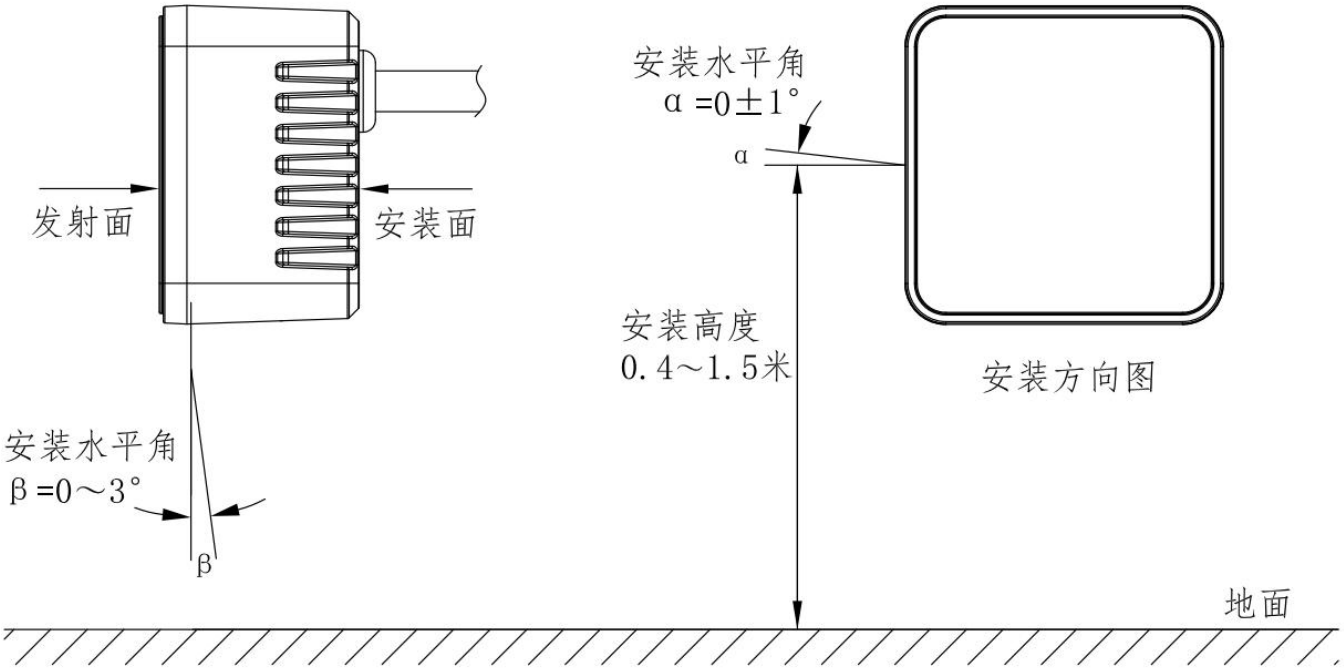

Figure 4 Installation diagram of AFM 711 radar

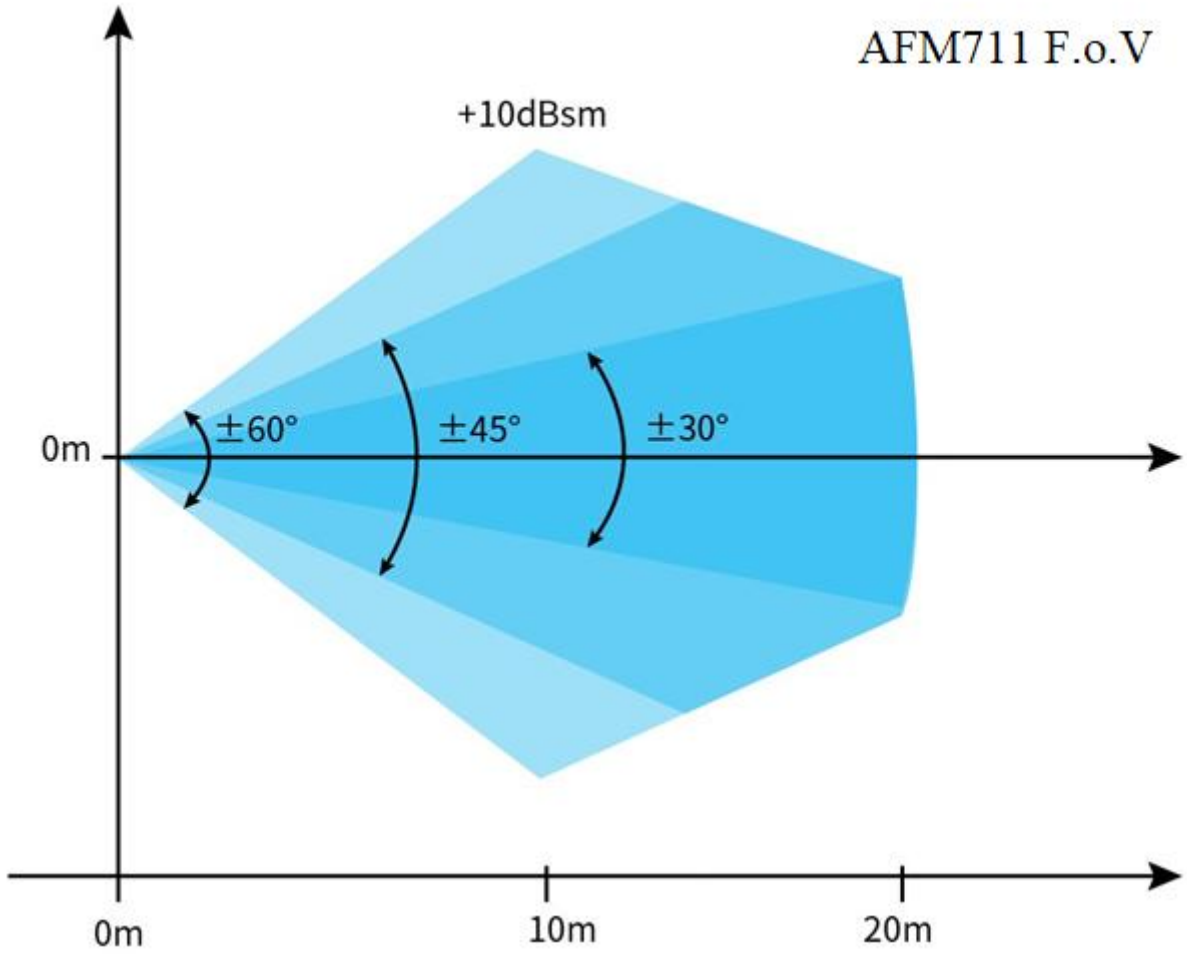

Figure 5. AFM 711 Detection Area

Note:

1、The front of the radar shall not be blocked by various materials.

2、The installation direction of radar test shall be as shown in Fig. 4, and it shall not be installed reversely.

4.3 Test usage

The "NSM _ 77 Tools" test software NSM _ 77 Tools compressed package (upper computer test software), user manual and USBCAN box driver. Install and configure the upper computer test software according to the user manual.

Note:

1) During the function test, the radar shall be tested according to the installation parameters recommended in Figure 4.

2) NSM _ 77 Tools uses the USBCAN adapter as shown in Figure 6 below to communicate with AFM711. Currently, other types of USB CAN adapters are not recommended, and the shipping list does not include the USBCAN adapter by default. Customers can obtain the link address of USBCAN adapter from Nanoradar customer service to purchase it by themselves, and Nanoradar can also help customers to purchase it on behalf of others.

Figure 6 USB CAN box for test

The test steps are as follows:

1) The tools or software used for the test are as follows:

Table 2 Tools for product testing

Serial number	Device name	Quantity
1	AFM 711 Millimeter Wave Radar	1
2	PC	1
3	Connecting line	1
4	12 V DC power supply	1
5	Upper computer test software	1
6	USBCAN box	1

2) Connect PC and AFM711 radar millimeter wave radar through USBCAN adapter, and the connection diagram is as follows:

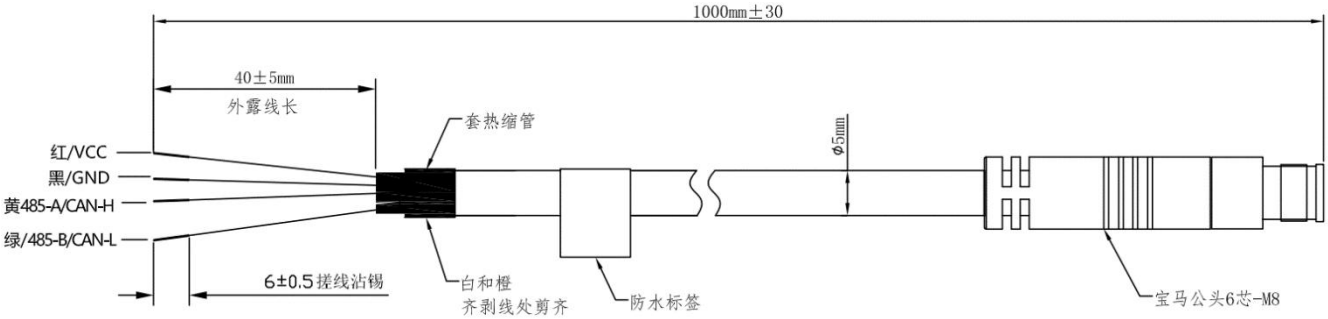

Figure 7 Schematic diagram of CANBUS connection test

3) Open the NSM _ 77 Tools upper computer, and the test interface is as shown in Figure 8:

Figure 8 Test Interface

4) After selecting the SR71, click Connect Device (Figure 9). The test interface is shown in the figure below, and the radar starts to work. As shown in the figure below, the radar has detected 4 targets.

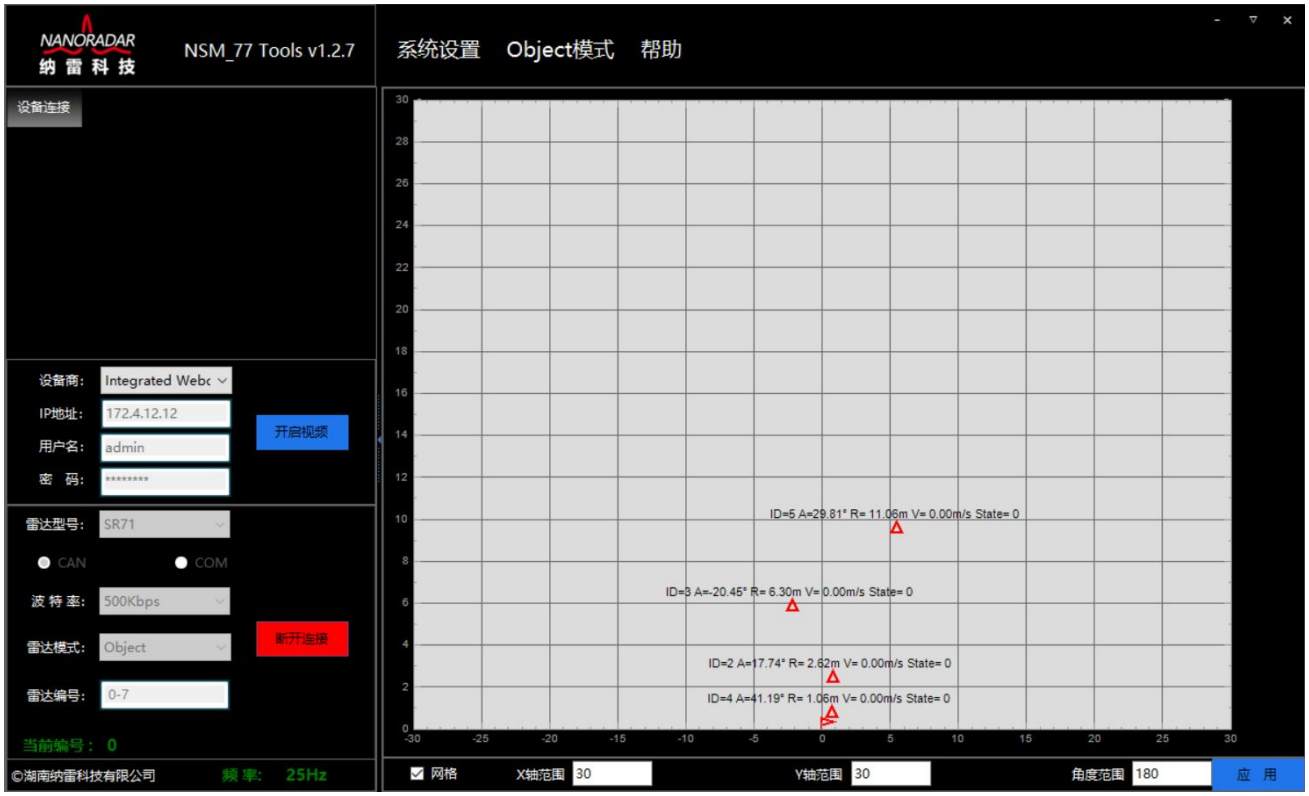

Figure 9 Parameter Configuration Interface

4.4 Modify radar target output display parameter

According to the customer's needs, the customer can click System Settings-Text Configuration to selectively output information such as distance, speed, angle, target type, etc., mark " √ " in the corresponding box, click Apply, then click "×" to close the text configuration, and then click Connect Device to output the corresponding data of the target;

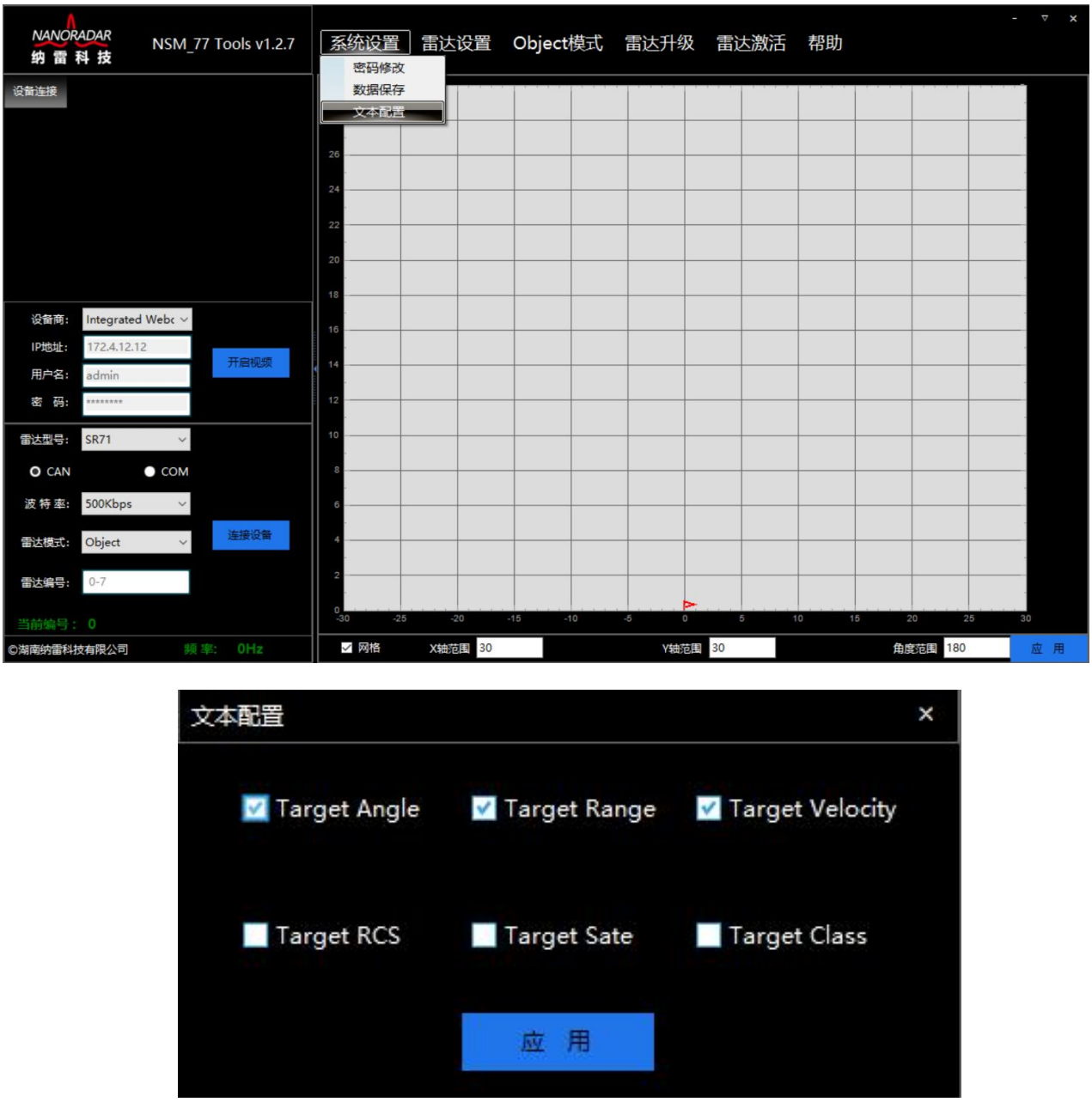

Figure 10 Parameter output configuration interface

Test Site Recommendations: Always test the AFM711 outdoors in an open area. In indoor test, there are many interferences, which will lead to the discontinuity of the target trajectory.

4.5 Modify the radar ID

The "NSM _ 77 Tools" test software provided by Nanoradar Technology can view and modify the radar ID.

1) Connect the radar to the computer according to the previous section, and open the

millimeter wave radar NSM _ 77 Tools test software.

2) Modify ID: click to disconnect, and then click the radar setting menu bar to select radar setting, as shown below.

Figure 11 Select radar setting after successful connection

3) Click the Read button to obtain the ID of the current radar, which is 0, as shown in

the following figure.

Figure 12 Obtaining the current radar ID

4) Modify the current radar ID to 5 (see the figure below);

A) Change ID from 0 to 5, and mark √ in the box in front of radar ID;

B) NVM saves the previous box √ and selects the Active mode;

C) Click Apply to save the new ID.

Figure 13 Change the current radar ID to 5

4.6 Product Online Firmware Upgrade

AFM711 supports online upgrade. After the customer purchases the product, if the product program needs to be upgraded, it can be upgraded according to the following figure.

Figure 14 AFM711 Radar Upgrade Interface

The upgrade operation is shown in the following figure:

A）SR71 is selected as the radar model;

B）Click "Select" to select the radar to upgrade the firmware;

C）The current version and radar number information can be obtained by point acquisition;

D）Click the upgrade button to enter the upgrade status, and the upgrade is successful.

Figure 15 AFM711 Radar Upgrade Interface

5 Installation and risk instructions

5.1 Installation principles

Installation principle of millimeter wave radar:

1、 Keep away from the signal antenna in the vehicle body as far as possible during installation;

2、 Keep away from the place where large electrical equipment is frequently started during installation;

3、 Keep away from motor actuators and drivers.

It is not recommended to install the radar in the protective cover. Like the radome, the material of the bumper will also have a greater impact on the radar performance. In essence, the bumper affects the radar performance in three aspects. The first is that the radar wave can not completely penetrate the radome to reduce the effective radiation power of the radar, including reflection loss and dielectric loss. The second is that the distortion of the radar antenna beam changes the radar action area. It may cause the radar to be interfered by backward targets, and the third is that the radome makes the radar standing wave worse. Radome reduces radar detection sensitivity and coverage.

If it must be installed in the protective cover, the following principles shall be followed as far as possible:

1、Lecting a region with a smooth surface;

2、Avoid corners or areas of varying thickness;

3、Avoid chrome plating or any other additional "special decorative shape design" areas;

4、It is forbidden to apply glue on the radar antenna surface.

5.2 Notice on risk of use

The AFM711 millimeter-wave is developed for applications related to obstacle avoidance, and users need to have relevant technical knowledge. The product can only be used by those who have relevant training. Users should inform the customer service personnel of Nanoradar Technology Company in time when they find the safety defects of the products.

- ✓ When installing the millimeter-wave radar, make sure that the radome surface is free of ice particles or water mist.
- ✓ Welding activities shall not be carried out in the vicinity of the MMW radar location.
- ✓ Millimeter wave radar can only use wet, lint-free cotton cloth to wipe the dust on the surface, and must not scratch the surface of millimeter wave radar.
- ✓ The equipment needs to be checked on a daily basis before it is put into service.