Human Presence Sensor Radar
HLK-LD1115H-24G User Manual

Due to product upgrades or other reasons, the content of this document will be updated. This document is intended as a guide only and neither the information nor the recommendations stated shall constitute any express or implied warranty.

V1.2

2021-12-6

Content

1. Product Overviews

HLK-LD1115H-24G is a high sensitivity 24GHz millimeter wave human presence detection radar module. Different from the traditional radar, which judges the existence of the human body by detecting the large-scale movements of the human body or the small-scale body movements, the main feature of this module is that on the basis of the function of the traditional human-body induction radar, it also has the ability to detect and accumulate small-scale movements such as human respiration. , to determine the function of the existence of the human body. Therefore, compared with traditional Doppler radar, it has presence detection within a certain range, with higher accuracy, and is not easy to miss reports.

Indoor human presence detection

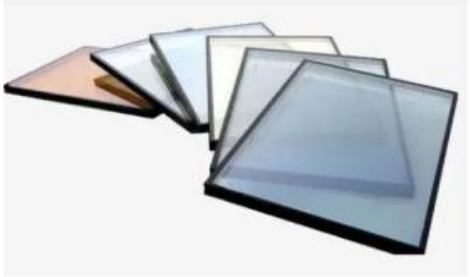
Human body micro-motion induction

Modules can penetrate non-metallic enclosures without openings. Common materials include plastic, glass, wood, ceramic, and more. Especially for human presence detection applications, wall-mounted plastic 86-box panels and ceiling-mounted ceiling buckle enclosures are recommended.

86 boxes of plastic panels (recommended)

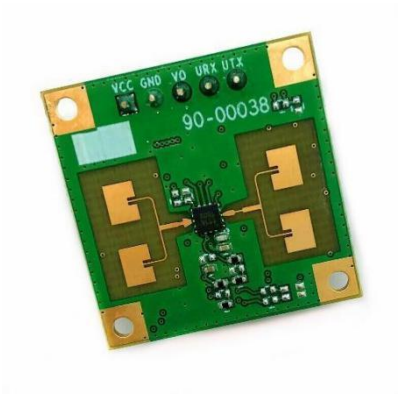
Embedded ceiling buckle shell (recommended)

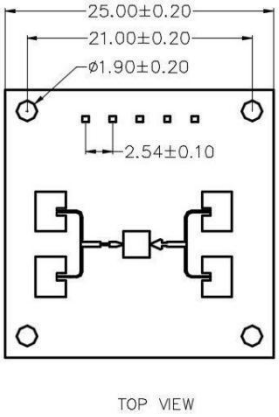
Assorted acrylic

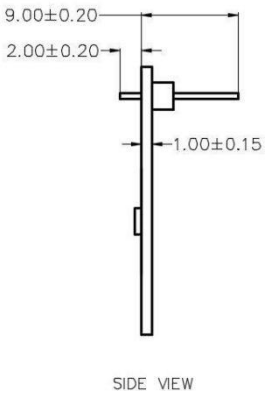


Glass

2. Module appearance and interface

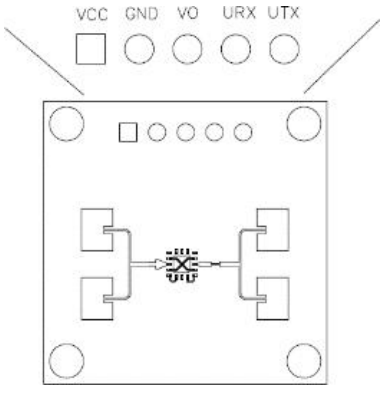






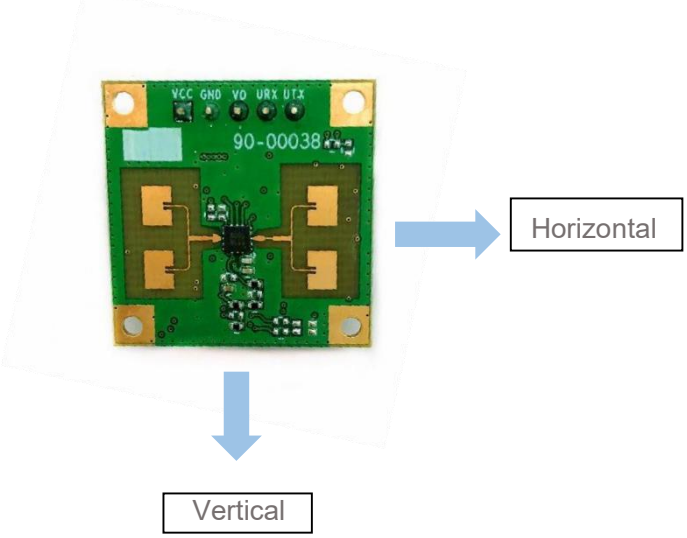
Pin interface definition: (2.54mm pitch pin header connector is recommended for the interface)

Pin	Name	Remark
1	VCC	Vlotage 5V power supply
2	GND	Ground
3	VO	Induction output pin (optional)
4	URX	TTL serial receive
5	UTX	TTL serial transmission



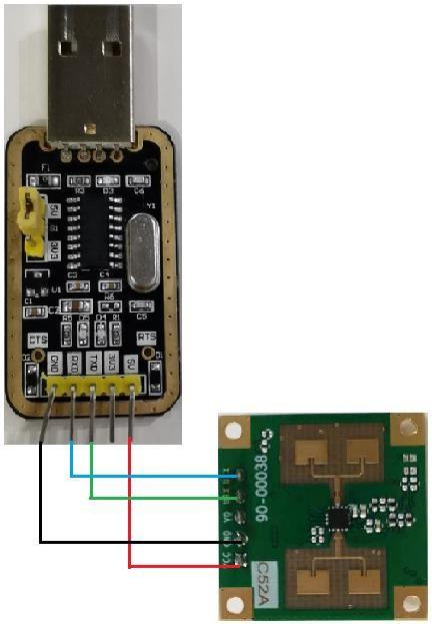
3. Module performance

Parameter	Typical value
Frequency	24G-24.25GHz
Modulation	CW
Detection distance	>4m Static human presence detection，>16m motion detection
Scope	The hanging height is 3m, the static body detection coverage radius is 2m, and the mobile detection radius is >5m
Voltage	3.6-5V
Current	70mA
Output serial	3.3V
Detection cycle	Adaptive
Antenna half power angle	Horizontal ±57°, vertical ±24° (see the figure below for the definition of the horizontal/vertical direction of the antenna)
Data Format	Serial ASCII output/or high and low level
Start Time	About 15 s



4. Debug wiring

HLK-LD1115H-2.4G uses the serial port to output the test results in string format, so when users test the module, they can first perform a quick test evaluation on the serial port assistant.



The module and serial board can be connected according to the figure on the left:
Module 1 pin is connected to the serial board 5V
Module 2 pin is connected to the serial board GND
Module 4 pin is connected to the serial board TX
Module 5 pin is connected to the serial board RX
(There is a silk screen on the pins of the radar module, which can be directly connected)

Pin	Name	Remark
1	VCC	Vlotage 5V power supply
2	GND	Ground
3	VO	Induction output pin (optional)
4	URX	TTL serial receive
5	UTX	TTL serial transmission

5. Debug configuration

You can debug and test on the computer through the serial port assistant HLK-LD1115H-24G.
Use any serial debugging tool. The baud rate is 115200, 8 data bits, 1 stop bit, check bit and flow control are None, select ASCII for receive settings, and select ASCII for send settings.

Product supports UART text protocol		
1	Baud rate	115200
2	Word width	8bit
3	Stop bit	1
4	Parity	None

Configuration directives

th1=,** set the motion detection sensitivity. Integer setting. The default configuration is th1=120. The higher the value, the less sensitive the module is. The sensing distance and range are smaller. The FOV under the reference sensitivity setting is given later.

th2=,**set the presence detection sensitivity. Integer setting. The default configuration is th2=250. The higher the value, the less sensitive the module is to presence detection. The sensing distance and range are smaller. The FOV at the reference sensitivity setting is given later. Generally, the sensitivity can not be adjusted.

dtime=,** set the GPIO delay detection time. Integer setting. The default configuration is dtime=5. A value of 5 is 5S.

mov_sn=,** set the GPIO to pull up the GPIO when it detects several large-scale data. The default configuration is mov_sn=3, the larger the setting, the less sensitive it is, and it can be increased when there are large false positives.

occ_sn=,** set how many times small amplitude data is detected after GPIO is pulled high to maintain GPIO high level. The default configuration is occ_sn=5, the larger the setting, the less sensitive it is. It is not recommended to increase it.

save, save the parameter settings. If save is not sent, the power-down will fail.

get_all, the module outputs the current parameter settings.

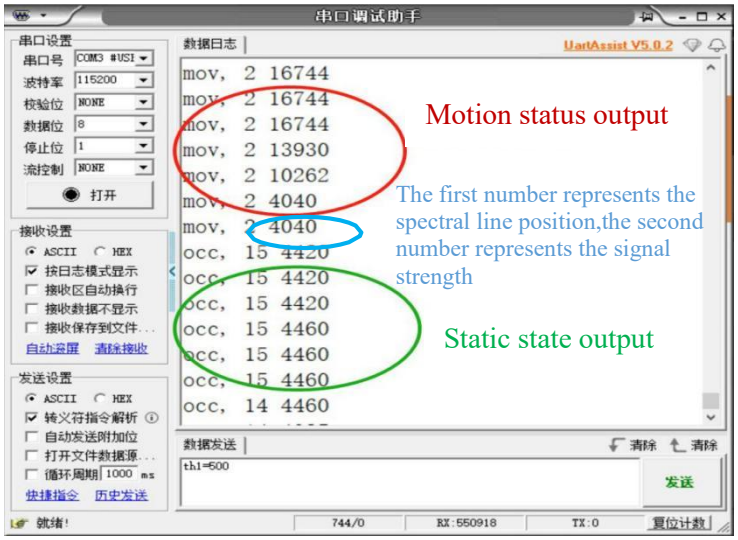
All commands sent with carriage return and line feed are valid.

Radar output

When the radar detects a larger motion, it outputs mov, ******. (The second number represents the signal strength)

When the radar detects the static state of the human body or small amplitude movements, it will output occ, ******. (The second number represents the signal strength)

When the radar cannot detect the target, it stops outputting. The user can make a certain delay in the upper layer to avoid frequent unmanned state when the signal is weak. (The first number represents the spectral line position, the user can ignore it directly)



Note: The startup time of the module is about 15 seconds, and it starts to output data after 15 seconds of power-on. Because the module makes existence judgment by accumulating signal characteristics for a period of time, when the person disappears from the radar detection range, the radar will continue to accumulate signals for a period of time, so the radar will stop outputting after a period of lag time.

Using the host computer

We provide a matching host computer for users to use for evaluation. Different from the direct observation of the module output through the serial port, the host computer can do some upper-layer delay processing after receiving the serial port signal output by the module.

- After connecting the module, click **the serial port detection** - **serial port selection** - **open the serial port**, and the display interface will display the current status. **Someone moves** the corresponding module serial port mov output.

- Enter an integer greater than 1 in **the switch static window**. When the number of times the host computer receives occ continuously is greater than the set value, the host computer displays that someone is in a static state, corresponding to the occ output of the module serial port. Enter an integer greater than 1 in **the switch man status window**. When the host computer enters the man static state, when the number of consecutive move received is greater than the set value, the host computer displays that there is someone moving.

- Enter an integer greater than 1 in **Toggle Unattended** Window, the window unit is seconds. When the upper computer does not receive any signal longer than the set time, the upper computer displays **the unmanned state**.

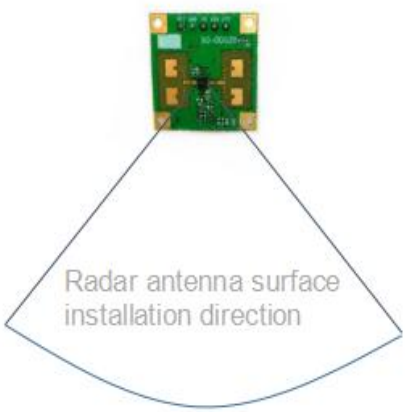
- Click **the setting interface**, and the **sensitivity setting** and **saving parameters window** will appear. The Sensitivity drop-down menu can select 1-30, 1 is the default sensitivity setting, and each increase by 1 increases the sensitivity threshold th1/th2 by 10%. The module does not support flash **save** temporarily, and the save button of the host computer can be ignored. Parameters such as sensitivity need to be reconfigured after power failure. **The right side of the window** will also display the output signal of the module's serial port.

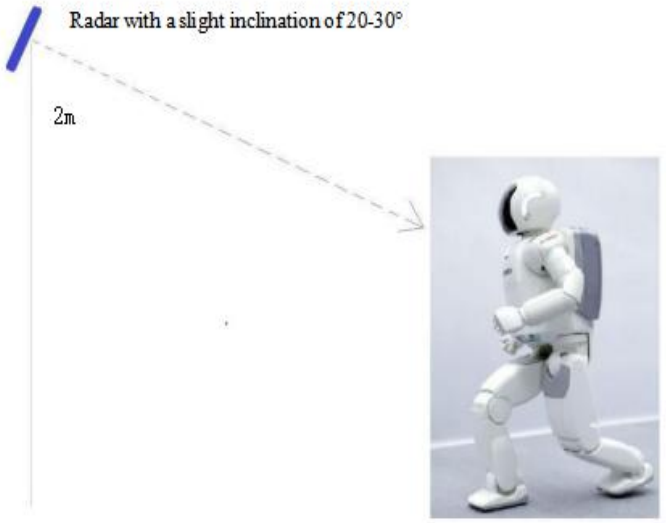
Note: When performing the setting operation of each window in the upper computer, you need to click the button to close the serial port of the upper computer. After setting, click to open the serial port.

6. Radar installation and testing

Test Application Scenario 1: Wall Mounting Linear Test

The installation height is 2 meters, and the human body is facing the radar when measuring. Test coverage in both standing and walking states. (There will be a test environment display in the appendix)



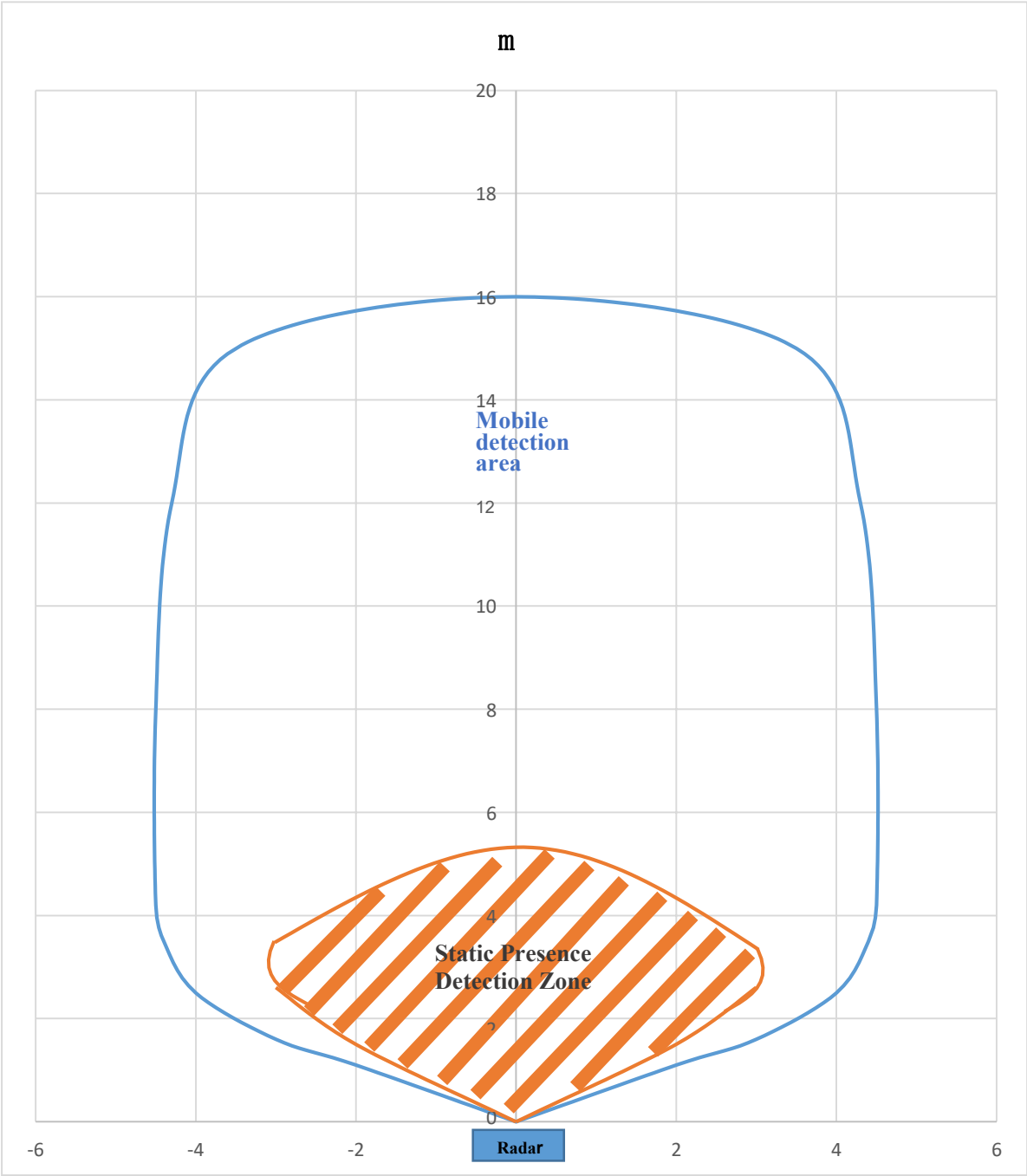


Reference coverage

The figure below shows the radar coverage for **stationary standing (orange area)** and **motion (blue area)**. for reference. (The left and right range of the blue motion detection is limited by the test site, and only 4.5 meters on the left and right can be measured. The actual coverage may be larger. For details, please refer to the Appendix Test Environment

Reference sensitivity configuration 1:

th1=120 (corresponding to motion detection sensitivity)
th2=250 (corresponding to presence detection sensitivity)

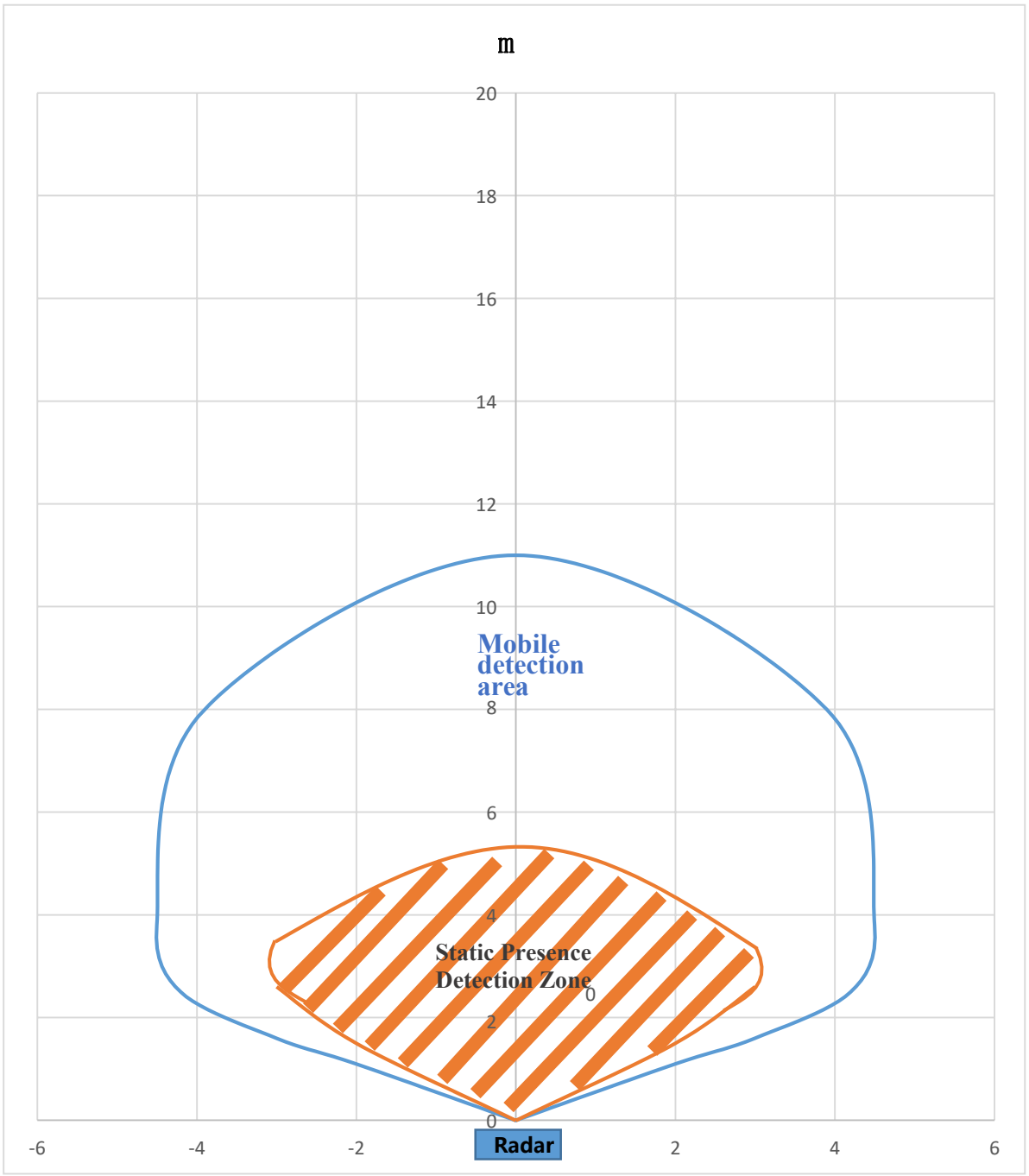

m
20
18
16
14
12
10
8
6
4
0
-6
-4
-2
2
4
6
Mobile detection area
Static Presence Detection Zone
Radar

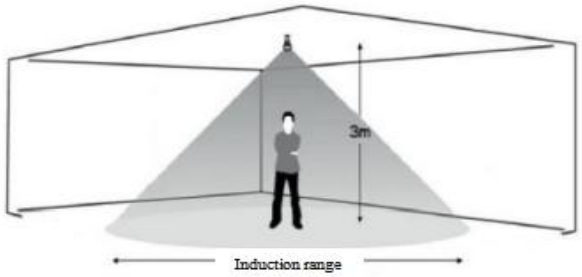
Reference sensitivity configuration 2:

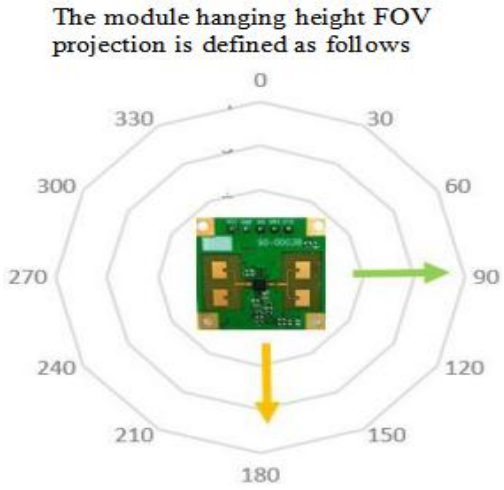
th1=500 (corresponding to motion detection sensitivity)
th2=250 (corresponding to presence detection sensitivity)

Test Application Scenario 2: Hanging Height Vertical Test

This module can also be hung up for human presence detection. Our test scenario is to hang at a height of 3 meters and measure the FOV of the human body **sitting still (orange area)** and **moving state (blue area)**. (There will be a test environment display in the appendix)

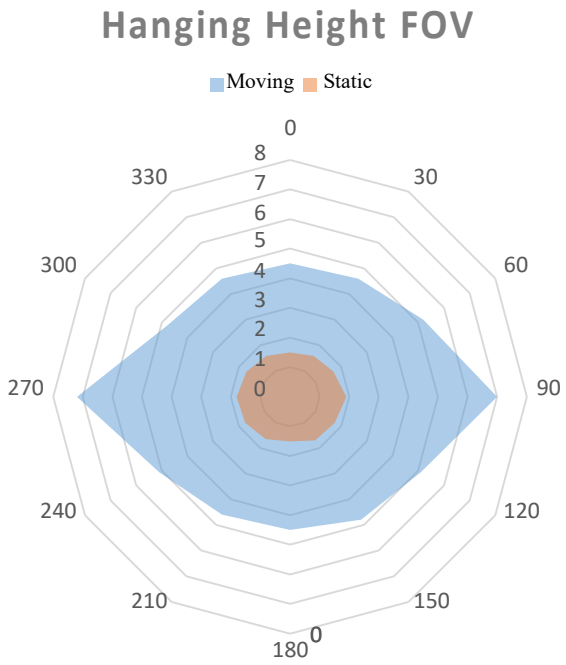






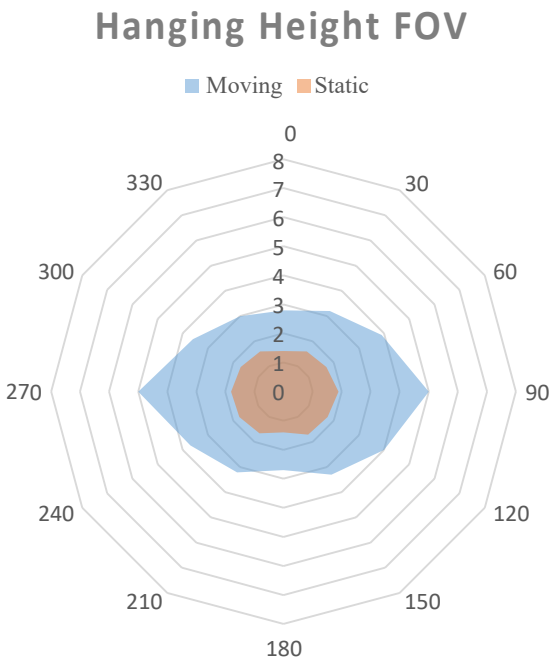
Reference sensitivity configuration 1:

th1=120 (corresponding to motion detection sensitivity)
th2=250 (corresponding to presence detection sensitivity)



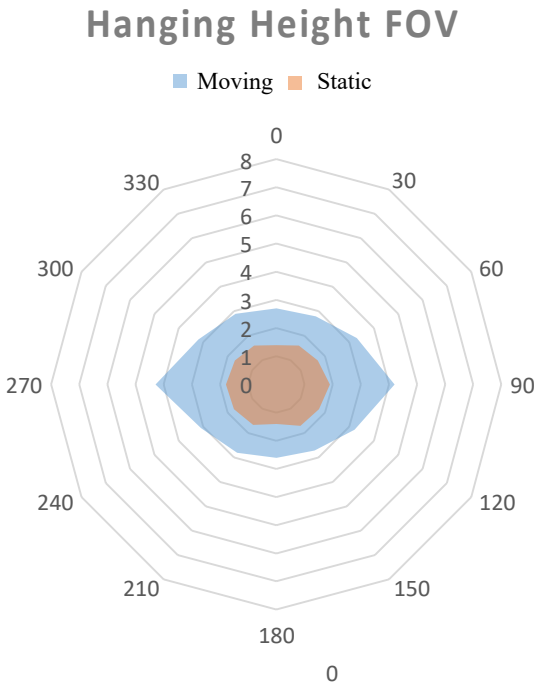
Reference sensitivity configuration 2:

th1=200 (corresponding to motion detection sensitivity)
th2=250 (corresponding to presence detection sensitivity)



Reference sensitivity configuration 3:

th1=300 (corresponding to motion detection sensitivity)
th2=250 (corresponding to presence detection sensitivity)



7. Precautions

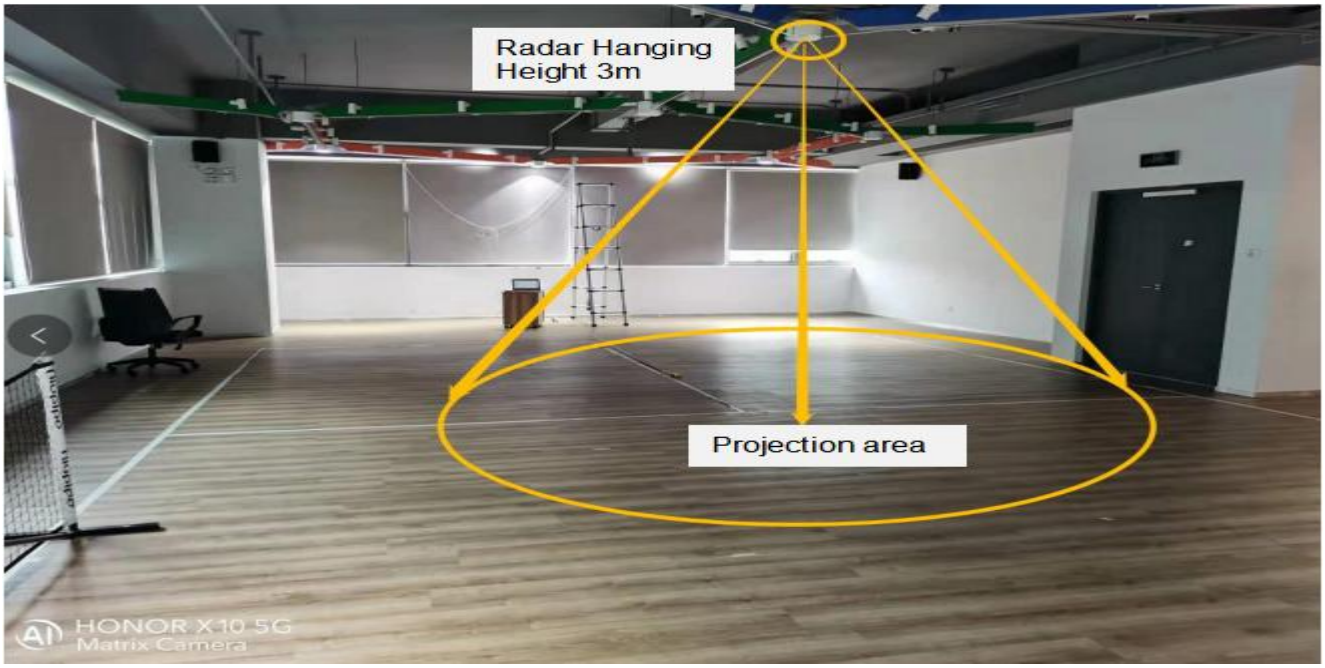
- During installation, avoid metal and other objects blocking the transmission of electromagnetic waves in front of the module to block the antenna.
- Different housing materials and the distance between the module and the inner surface of the housing will result in different spectral energy returned and parameter settings, which need to be fine-tuned according to actual conditions. It is generally recommended that the module be 5-6mm away from the housing, which can be adjusted according to the actual measurement.
- We recommend users to test according to the default settings of the module. If the effect is not as expected, you can send the shell structure to the original factory, and the original factory will test and adjust a reference setting.
- It is recommended to use plastic as the casing, because the radar is a very sensitive module in the presence of the human body. If the casing is made of a material with large attenuation, it may affect the detection.
- If the person under test sits quietly with his back to the radar, the sensing effect will decrease. The rise and fall of the chest or abdomen caused by breathing cannot be detected when the back is facing the radar.
- Install to avoid the air outlet of the air conditioner, fans and other objects. Shaking equipment and objects may be detected by radar to determine the presence of persons.
- When multiple modules are installed and used at the same time, the distance between the modules should be greater than 0.5 meters, and the antennas of different modules should not face each other.
- According to user scenarios, the sensitivity is adjustable. Users can adjust the sensitivity according to their actual application scenarios. The sensitivity settings given in this manual can be used for users' reference. The FOV given in the manual is only for our test environment, and the actual FOV may deviate due to different actual scene environments or factors such as housing.
- If you need more technical support, you can contact sales.

8. Appendix

Module test environment display

1. Wall hanging test:

2. Hanging height installation test:



Appendix:about power supply

■ An isolated power supply must be used. At the same time, the AC rectifier bridge and transformer should avoid direct contact with the module, and try not to make the transformer and rectifier face the module. The shielding layer can be staggered or added.

■ The power supply ripple should be less than 50mV as far as possible to avoid spikes in the power supply.

■ Do not add devices such as anti-reverse diodes in the DC power supply chain. Adding any device to the DC power supply chain will increase the power supply noise and cause false alarms.

■ The power drive current should not be less than the normal operating current of the module.