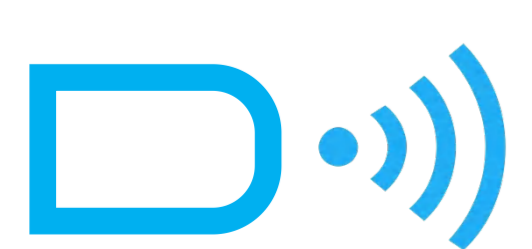


DYP
Smart Sensor



A25 SERIES SENSOR MODULE

DATASHEET



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SHENZHEN DIANYINGPU TECHNOLOGY Co.,LTD.

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1. Product introduction

1.1 Overview

A25-module is an ultrasonic obstacle avoidance sensor designed based on robot automatic control application, which is designed for the current market for ultrasonic sensor module with large blind spot, large measuring angle, long response time, poor installation adaptability and other problems.

A25-module has a series of advantages, such as small blind spot, small measuring angle, short response time, filtering the interference of the same frequency, small size, high mounting adaptability, dustproof and waterproof, long life, high reliability and so on.

Combined with our self-developed heterodyne acoustic wave processing technology, which can identify and filter heterodyne acoustic waves, the output data is more stable and reliable, which makes the A25-module reduce the probability of ultrasonic homodyne interference to a certain extent, and meets the user's needs for the application of complex environments in the field of robotic automatic control.

The A25 series modules are divided into "A25A" and "A25B," and the A25 series modules are hereinafter referred to as "modules" for explanatory purposes.

1.2 Functional Summary

- Wide voltage supply, working voltage: 3.3~12V;
- 3cm standard blind spot;
- The A25A's measuring range is adjustable, with 5 range levels: 50cm, 150cm, 200cm, 400cm, and 500cm, which can be set via commands.
- The A25B's measuring range is adjustable, with three range levels: 50cm, 150cm, and 200cm, which can be set via commands.;
- Multiple output modes are available, including UART auto/controlled, RS485 output, and PWM; the output modes are different, but the functions are exactly the same.
- Default baud rate is 115200, can support to modify to 4800, 9600, 14400, 19200, 38400, 57600, 76800;
- Ms-level response time, data output time can up to 10ms fastest.
- Built-in noise reduction function which can support the 5-grade noise reduction level setting, suitable for battery power supply, short and long distance USB power supply, switch power supply and large noise power supply;
- Waterproof structure design, waterproof rating IP67;
- Highly adaptable for installation, easy to install, solid and reliable;

- Ultra-wide temperature design, operating temperature -15°C to +60°C;
- Electrostatic protection design, input and output interfaces add electrostatic protection devices, in line with IEC61000-4-2 standard.

1.3 Product advantages

- Wide supply voltage
- Small blind spot
- Output method selectable
- Supports range modification
- Supports baud rate modification
- Supports address modification
- Supports angle setting
- Supports power supply noise reduction level setting
- Effectively reduces the probability of co-channel interference.
- High waterproof rating
- Compact size and easy installation
- Wide operating temperature
- Strong anti-static
- High measurement accuracy
- Stable and reliable measurement data

1.4 Scope of application

- Robot obstacle avoidance and automatic control
- Horizontal distance measurement, object approach and presence detection
- Industrial AGV (Automated Guided Vehicle) Applications
- Tennis ball retrieval robot application
- Commercial service robot applications
- Lawn mowing robot applications
- Applications of swimming pool surface cleaning robots

1.5 Basic parameters

Parameters	UART Auto	UART Controlled	PWM pulse width	RS485	Unit	Remark
Operating voltage			3.3~12V		V	DC
Standby Current	/		≤10	/	uA	(1)

Average operating current		≤ 10	mA	(2)
Blind spot distance		≤ 3	cm	
A25A Range		3~500	cm	(3)
A25B Range		3~200	cm	(3)
Output Response Time	100	10~50	ms	(4)
Power-up operating time		≤ 50	ms	
Working cycle	100	> 65	ms	
Output method	Auto	Controlled	/	
Measuring Error		$\pm 1+(S*0.5\%)$	cm	(3)
Temperature compensation		Yes	/	
A25A		Level: 40 - 60	°	(5)
		Vertical: 90 - 120	°	(6)
A25B		Level: 20 - 40	°	(5)
		Vertical: 50 - 80	°	(6)

Remark: (1) When the module's UART is under controlled output, it will enter a low-power sleep state if no control command is received for more than 5 seconds. The current at this time is the sleep current.

Note: The communication level between the module's TX and RX pins is 3.3V. If the user's TX and RX pin communication level is greater than 3.3V, it will affect the low-power sleep current.

(2) The typical data obtained from tests conducted at a temperature of $25 \pm 3^\circ\text{C}$, humidity of 65% RH, power supply of 5V, and a duty cycle of 100ms.

(3) Temperature $25 \pm 3^\circ\text{C}$, humidity 65% RH, the object being measured is a $50\text{cm} \times 60\text{cm}$ flat cardboard box, the transducer should be as perpendicular to the object being measured as possible, and S represents the measurement distance.

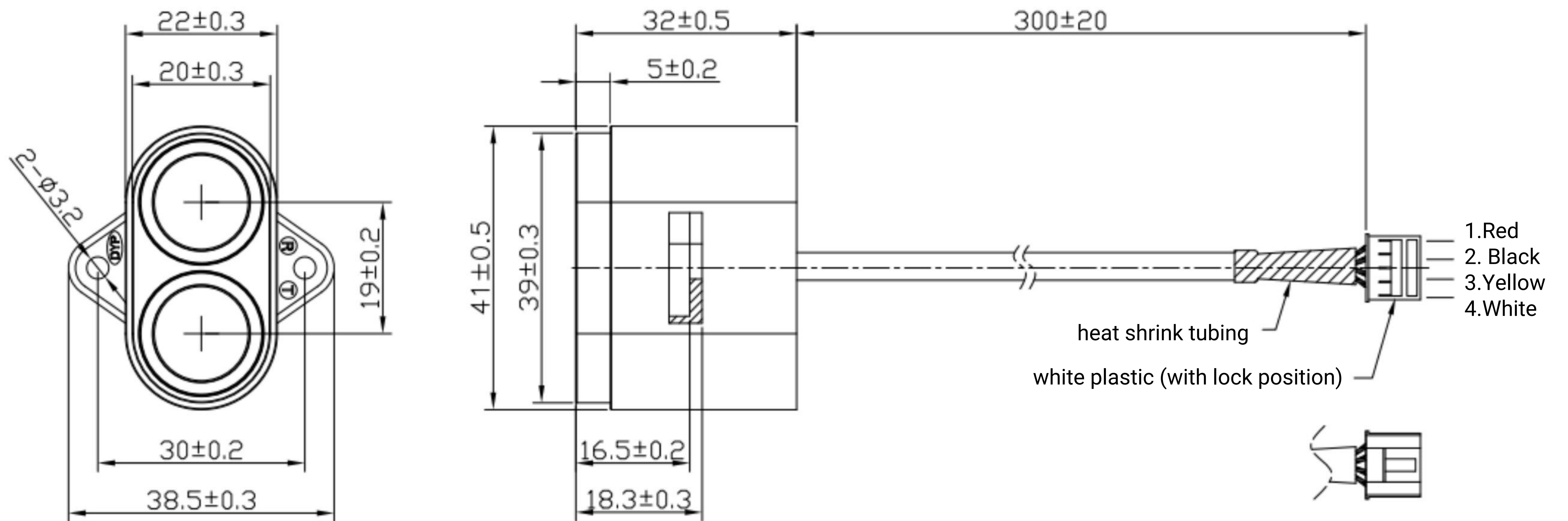
(4) The output real-time value response time is obtained from the measurement range of 0.5 to 5 meters. The shorter the range, the faster the response time.

(5) The data was obtained from a test where the center line connecting the two probes was horizontally aligned with the ground. The tested object was a $\varphi 7.5 \times 100\text{cm}$ white PVC pipe. The reference data was obtained from a test at a distance of 40cm with the module's default angle level 2.

(6)The data was obtained from a test where the center line of the two probes was perpendicular to the ground. The tested object was a $\varphi 7.5 \times 100\text{cm}$ white PVC pipe. The reference data was obtained from a test at a distance of 40cm with the module's default angle level 2.

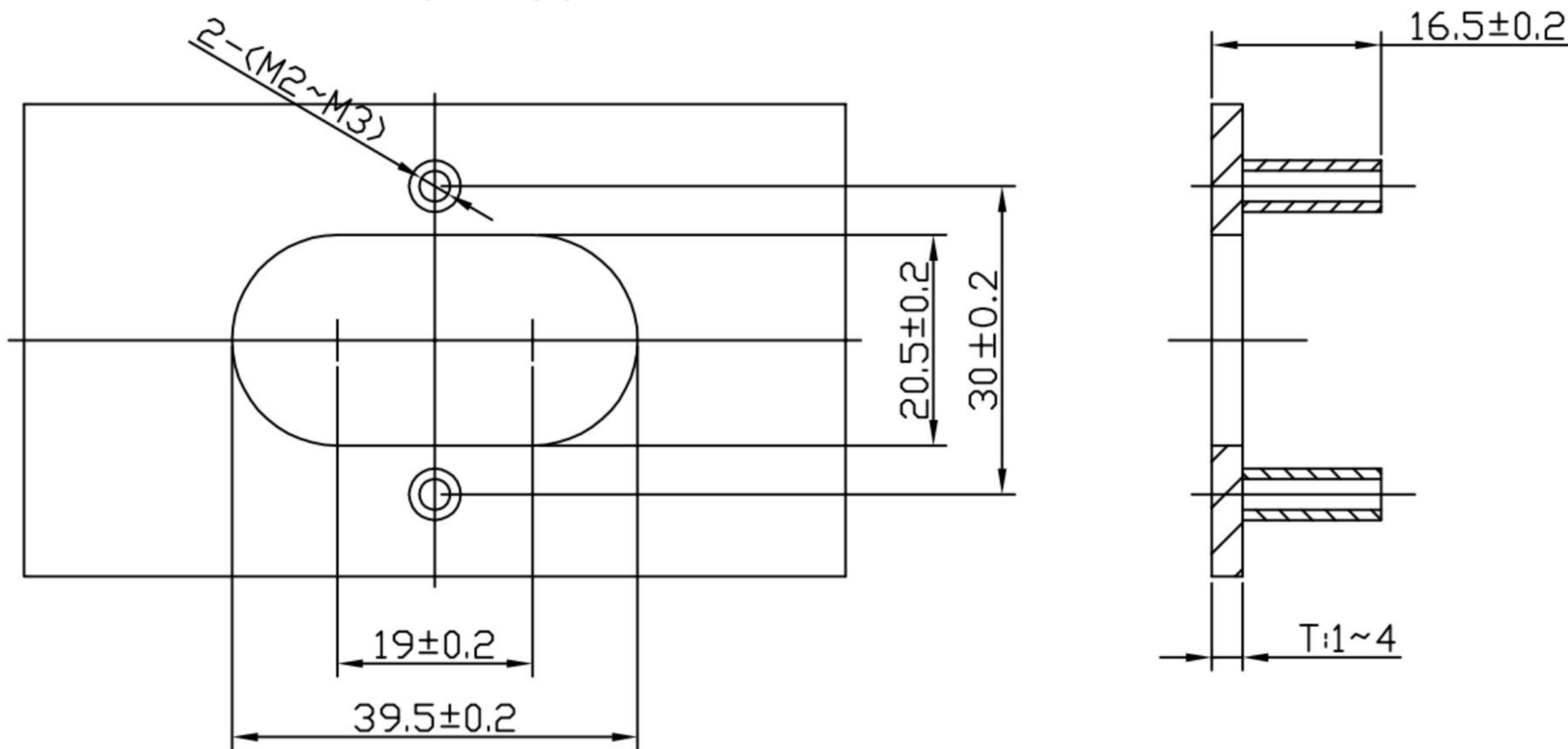
1.6 Mechanical characteristics

Product structure size (mm-inch) :

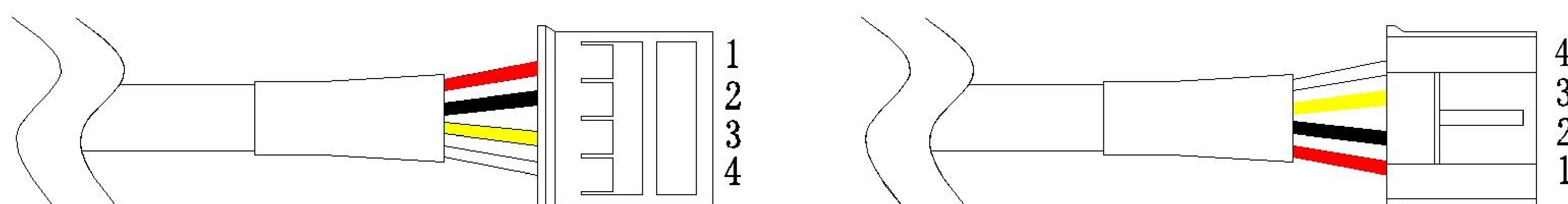


wire specification: blackPVC 2464 26AWG 4 cores wire(Red;Black;Yellow;White) unshielded OD:4.0mm

Installation Opening Suggestions:



1.7 Interface Definitions



PIN #	PIN name	PIN description	Remarks
1	VCC	Power Input PIN	
2	GND	Power Ground PIN	
3	RX	Functional PIN	(1)
4	TX	Functional PIN	(1)

Remarks:

(1)Lead wire, pin function and output mode of product model correspond one-to-one, and cannot coexist with other output modes. The average communication power is 0V~3.3V.

2.Limit parameters

2.1.Rated environment conditions

Item	Minimum	Typical value	Maximum	Unit	Remark
Storage temperature	-25	25	70	°C	
Storage humidity		65%	90%	RH	(1)
Operating temperature	-15	25	60	°C	
Operating humidity		65%	80%	RH	(1)

Remarks:

(1) a. When the ambient temperature is 0-39° C, the maximum humidity is 90% (non-condensing)

b. When the ambient temperature is 40-50° C, the highest humidity is the highest humidity in nature at the current temperature (no condensation).

2.2. Rated electrical conditions

Parameter	Specification			Unit	Remarks
Operating voltage	3.3	5	12	V	
Peak current			150	mA	
Input Ripple			50	mV	Peak to peak
Input noise			100	mV	Peak to peak
ESD			$\pm 4K/\pm 8K$	V	(1)

Remarks: (1) Connection leads and pins are in accordance with IEC61000-4-2.

3. Output Modes

3.1. UART Automatic Output Description

3.1.1 UART Automatic Output Description

Pin number	Pin name	Pin Description	note
1	VCC	Power Input	
2	GND	Power Ground	
3	RX	Processed and real-time value output selection	(1)
4	TX	UART Output	(1)

Remarks: (1) Lead wire, pin function and output method of product models correspond to each other, and cannot co-exist with other output methods.

3.1.2 UART Communication Description

When the serial Modbus configuration register 0x0502 is 1 (default), the module outputs according to the processed value, the data is more stable, and the response time is 300~500ms; when the configuration register 0x0502 is 0 (default), the response time is 100ms.

Outputs 0xFFE1 data as a reminder when too much electromagnetic interference exists in the detection environment, and outputs 0xFFFFD when no object can be detected.

UART	Data Bit	Stop Bit	Parity Check	Baud
TTL level	8	1	No	115200bps

3.1.3 UART Output Format

Frame Data	Clarification	Byte
Frame header	Fixed to 0XFF	1 byte
Data_H	Higher 8 bits of distance data	1 byte
Data_L	Lower 8 bits of distance data	1 byte
SUM	Communication checksum	1 byte

Note: Depending on the parameter value of modbus register 0x0209, there is a difference in data output units, mm or us units.

3.1.4 UART Output Example

Frame Header	Data_H	Data_L	SUM
0XFF	0X07	0XA1	0XA7

Note: The checksum retains only the lower 8 bits of the accumulated value;

$$\text{SUM} = (\text{Frame Header} + \text{Data}_H + \text{Data}_L) \& 0x00FF$$

$$= (0XFF + 0X07 + 0XA1) \& 0x00FF$$

$$= 0XA7;$$

$$\text{Distance value} = \text{Data}_H * 256 + \text{Data}_L = 0X07A1;$$

Converted to decimal equals 1953;

When the parameter value of modbus register 0x0209 is 0x00 in mm, it means that the current measured distance value is 1953 mm;

When the parameter value of modbus register 0x0209 is 0x01, the unit is us, it means that the current measured distance echo time value is 1953us, and this value is divided by 5.75 to get the distance value in mm unit = 1953/5.75≈340mm.

3.2 UART Controlled Output Description

3.2.1 Definition of Output Pins

Pin Number	Pin Name	Pin Description	note
1	VCC	Power Input	
2	GND	Power Ground	
3	RX	Trigger Input	(1)
4	TX	UART Output	(1)

Remarks: (1) Lead wire, pin function and output method of product models correspond to each other, and cannot co-exist with other output methods.

3.2.2 UART Communication Description

When the trigger input lead "RX" receives a trigger pulse with a falling edge or any serial data, the falling edge will trigger the module to work once, and the output lead "TX" will output the measurement data once, the trigger period of the module must be more than 65ms.

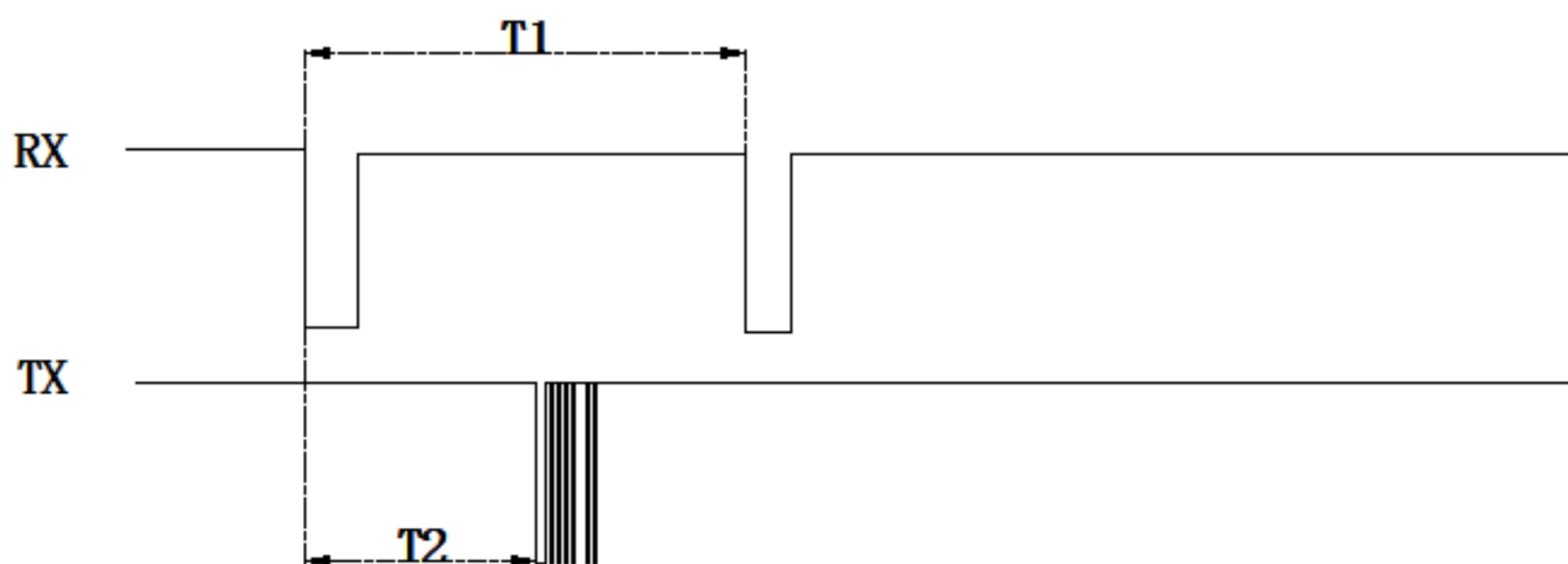
When no trigger pulse is received from the "RX" pin for more than 1 second, the module will enter into sleep state with the lowest power consumption. When the module receives the "RX" trigger pulse when it is sleeping, it will wake up immediately, but the response time will be 12ms longer than when it is not sleeping.

Outputs 0xFFE1 data as a reminder when too much electromagnetic interference exists in the detection environment, and outputs 0xFFFFD when no object can be detected.

Real-time communication can be carried out 50 ms after power-on. When the module receives more than 3 bytes, it enters the mode of receiving instruction, after waiting for more than 5ms, it send the actual instruction and waiting for a product response. It will be maintained 5s after entering the model of receiving instruction. This 5-second holding time is recalculated when new serial data is received. During this period, the module cannot be triggered and only receives and processes serial data. If no data is received after 5 seconds, it reverts to normal ranging mode.

UART	Data Bit	Stop Bit	Parity Check	Baud
TTL level	8	1	No	115200bps

3.2.3 Timing Diagrams



Note: $T1 > T2 + 15ms$; $T2 = 10$ to $50ms$; measured in non-dormant mode mode.

3.2.4 UART Output Format

Frame Data	Instructions	Byte
header	Fixed to 0XFF	1 byte
Data_H	Higher 8 bits of distance data	1 byte
Data_L	Lower 8 bits of distance data	1 byte
SUM	Communications checksum	1 byte

3.2.5 UART Output Example

Header	Data_H	Data_L	SUM
0XFF	0X07	0XA1	0XA7

Note: The checksum retains only the lower 8 bits of the accumulated value;

$$\text{SUM} = (\text{Frame Header} + \text{Data}_H + \text{Data}_L) \& 0x00FF$$

$$= (0XFF + 0X07 + 0XA1) \& 0x00FF$$

$$= 0XA7;$$

$$\text{Distance value} = \text{Data}_H * 256 + \text{Data}_L = 0X07A1;$$

Converted to decimal equals 1953;

When the parameter value of modbus register 0x0209 is 0x00, the unit is mm, which means the current measured distance value is 1953mm;

When the parameter value of modbus register 0x0209 is 0x01, the unit is us, it means that the current measured distance echo time value is 1953us, and this value is divided by 5.75 to get the distance value in mm unit = 1953/5.75≈340mm.

3.3 PWM Pulse Width Output Description

3.3.1 Output Lead Definition

Pin number	Pin name	Pin Description	Remark
1	VCC	Power Input	
2	GND	Power Ground	
3	RX	Trigger the input lead	(1)
4	TX	PWM output lead	(1)

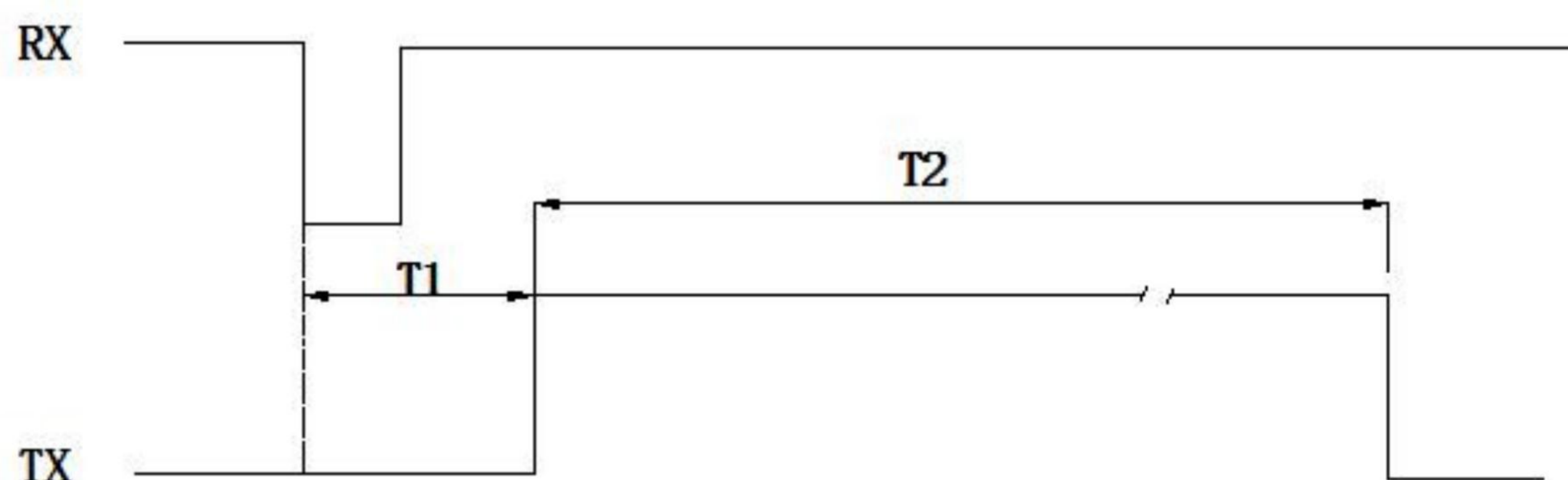
Remarks: (1) Lead wire, pin function and output method of product models correspond to each other, and cannot co-exist with other output methods.

3.3.2. Description of PWM trigger

When the trigger input lead "RX" receives a trigger pulse with a falling edge or any serial port data, the falling edge will trigger the module to work once, and the output lead "TX" will output one measurement data. The trigger cycle of the module must be greater than 65ms.

When the trigger pulse of the "RX" foot is not received for more than 5 seconds, the module goes dormant with the lowest power consumption. When the "RX" trigger pulse is received while dormant, it awakens the work immediately, but the response time increases by 12ms than when not dormant.

3.3.3. Timing diagram



Note: T1=4~6ms (measured in non dormant mode); A25A: T2=0.15~31ms, A25B; T2=0.15~14ms; (PWM high-level pulse width time) The detected co-frequency interference output has a pulse width of approximately 10 us.

3.3.4. Calculation method

Formula: $S=T*V/2$ (S is the distance value, T is the PWM high-level pulse width time, and V is the sound propagation speed in the air). Under normal temperature, the sound velocity V is 348M/S, and the formula can be simplified to get $S=T/57.5$ (the distance S is in centimeters and the time T is in microseconds).

Example: When the PWM high-level pulse width time T3 of the output lead "TX" is 10000us, $S=T/57.5=10000/57.5\approx 173.9(\text{cm})$, which means that the currently measured distance value is 173.9 cm.

3.4. RS485 Output Description

3.4.1. RS485 output leads definition

Pin #	Pin name	Pin description	Remarks
1	VCC	Power input	
2	GND	Ground	
3	B	485 Communication anti-phase terminal	(1)
4	A	485 Communication in the same terminal	(1)

Remarks: (1) Lead wire, pin function and output mode of product model correspond one-to-one, and cannot coexist with other output modes.

3.4.2. RS485 interface parameters

Interface	Data bit	Stop bit	Parity check	Baud rate
RS485 level	8	1	No	115200bps(default)

3.4.3. RS485 interface protocol

Adopt the Modbus protocol, please refer to the“Modbus protocol specification”chapter.

3.5 Modbus Protocol Description

3.5.1 Modbus Protocol Parameters

Paradigm	Calibration	Sensor Address	Read Function Codes	Write Function Code
Modbus-RTU	CRC-16/MODBUS	Settable, default 0x01	0x03	0x06

3.5.2 Modbus Protocol Format

The user machine is the master device and this module is the slave device.

Host Transmit (Read):

Name	Device Address	Function Code 0x03	Register Address	Number of Registers	CRC16 Check
Length (Byte)	1	1	2	2	2

Respond (read) from the machine:

Name	Device Address	Function Code 0x03	Return bytes number	Data field	CRC16 Check
Length (Byte)	1	1	1	N	2

Host Send (Write):

Name	Device Address	Function Code 0x06	Register Address	Data field	CRC16 Check
Length (Byte)	1	1	2	2	2

Slave Response (Write):

Name	Device Address	Function Code 0x06	Register Address	Data field	CRC16 Check
Length (Byte)	1	1	2	2	2

3.5.3 Modbus Registers

The register data is the high byte first and the low byte second.

(1) Modbus register table 1

Authority	Address	Function	Data Type	Instructions
Read-only	0x0100	Processing value	Unsigned int, 16bit	Upon receiving the instruction, distance measurement is initiated, and after processing by the algorithm, the distance value is output. Unit:mm, response time is about 125~350ms(varying with different ranges).
Read-only	0x0101	Real-time value	Unsigned int, 16bit	After receiving the instruction, the module starts ranging once, and outputs the real-time distance value, unit: mm, response time is about 15~50ms(varying with different ranges).
Read-only	0x0102	Temperature	Signed int, 16bit	Unit: 0.1°C, Resolution: 0.5°C, Response time about 10~50ms (varying with different ranges).
Read-only	0x010A	Echo time	Unsigned int, 16bit	After receiving the instruction, the module starts ranging once, and outputs the real-time echo time, unit: us, this value is divided by 5.75 to obtain a distance value in mm unit, response time is about 10~40ms(varying with different ranges).
Read-only	0x01E0	Abnormal state	Unsigned int, 16bit	0x00: No abnormal state. A bit of 1 indicates an abnormality, and a bit of 0 indicates normal operation. bit2: Blind zone too large (requires a distance measurement value $\geq 40\text{cm}$ for detection) bit3: NTC anomaly (detected under non-extreme temperature conditions)0xFFE5 : Temperature too high bit4: MCU power supply voltage abnormal

Note:(1)Response time is obtained from 0.5 to 5 meters range test, the shorter the range, the faster the response time.

(2)0x0100/0x0101/0x010A register, outputs 0xFFE1 data as a reminder when there is too much, electromagnetic interference in the detection environment, and outputs 0xFFFFD when no object can be detected.

(2) Modbus register table 2

Authority	Address	Function	Data Type	Instruction
Read-write	0x0200	Slave Address	Unsigned int, 16bit	Range: 0x01 to 0xFE (default 0x01), 0xFF is the broadcast address
Read-write	0x0201	Baud rate	Unsigned int,16bit	The serial port baud rate (default 115200), unit: bps, takes effect immediately after setting, and the baud rate corresponding to the register value is as follows: 0x02:4800, 0x03:9600, 0x04:14400, 0x05:19200, 0x06:38400, 0x07:57600, 0x08:76800, 0x09:115200
Read-write	0x0208	Detection Angle level	Unsigned int, 16bit	The angle level can be set from 0x01 to 0x04 (level 2 is the default); the higher the level, the larger the detection angle and the more sensitive the sensing, and vice versa.
Read-write	0x0209	Output distance value data unit	Unsigned int, 16bit	Controlled/Auto output protocol distance value units, 0x00-mm, 0x01-us (divide this value by 5.75 to get the distance value in mm), only available for UART Auto and UART Controlled modes.
Read-write	0x021A	Power Supply Noise Reduction Rating	Unsigned int, 16bit	The power supply noise reduction level is divided into 1 to 5 levels (default 1) to apply to different power supply scenarios; the higher the level, the greater the noise suppression, while the overall angle will be affected, the higher the level the more the angle is affected by the situation. Description of different levels: 1 - Suitable for battery-powered applications; 2 - Suitable for USB power supply and other occasions where there is a certain amount of high- frequency noise; 3 - Suitable for longer distance USB power supply; 4- Suitable for the occasion of switching power supply; 5-Suitable for switching power supply, environmental interference complex occasions, generally not recommended to use.

Read-write	0x021F	Measurement Range Rating	Unsigned int, 16bit	Ranging range class 1 to 5 (default is 3), measurement range: 0x01: About 50 cm, response time 10-15ms for real-time values and 125-150ms for processed values; 0x02: About 150 cm, response time 10-25ms for real-time values and 125-200ms for processed values; 0x03: About 200 cm, response time 10-30ms for real-time values and 125-250ms for processed values; 0x04: About 400 cm, response time 10-40ms for real-time values and 125-300ms for processed values; 0x05: About 500 cm, response time 10-50ms for real-time values and 125-350ms for processed values.
Read-write	0x0308	Detection Mode	Unsigned int, 16bit	There are 2 types of detection modes: 0x00: A25A, large Angle, high sensitivity, long measurement distance, It is recommended for detecting planar or human. 0x01: A25B, with a relatively small angle, is suitable for low-position installation scenarios and is recommended for lawn mowing robots and pool surface cleaning robots.
Read-write	0x0502	Data Model	Unsigned int, 16bit	The output data can be set to either real-time or processed values (automatic mode only). Real-time data has a fast response time but is relatively unstable and prone to fluctuations. Processed data has a slower response time but is more stable due to algorithmic processing. 0x00: Real-time value 0x01: Processed value (default)
Only-write	0x023C	Enter hibernation mode	Unsigned int, 16bit	0X01: Quickly enter hibernation (only effective in controlled mode)

(3) Impact of baud rate on single packet communication duration

No.	Baud rate	Communication Time	Remark
1	4800	16ms	
2	9600	8ms	
3	14400	5.6ms	

4	19200	4ms	
5	38400	2.4ms	
6	57600	1.6ms	
7	76800	0.8ms	
8	115200	0.6ms	

Note: The higher the baud rate, the shorter the communication time of a single packet.

3.5.4. Examples of Modbus Communication

Example 1: Reading processed value data

Mainframe: 01 03 01 00 00 01 85 F6

Slave: 01 03 02 02 F2 38 A1

Note: The sensor address is 0x01, and the processed distance value is 0x02F2, which is converted to a decimal 754mm.

Example 2: Reading real-time value data

Mainframe: 01 03 01 01 00 01 D4 36

Slave: 01 03 02 02 EF F8 A8

Note: The sensor address is 0x01 and the real-time distance value is 0x02EF, which is converted a decimal into 751mm.

Example 3: Read the fault status

Mainframe: 01 03 01 E0 00 01 84 00

Slave: 01 03 04 00 00 00 24 FA 28

Note: The module address is 0x01, The error code is Hex: 00 00 00 24, which corresponds to the binary code: 00000000 00000000 00000000 00100100. Bit 2 and Bit 5 are both 1, indicating that the blind spot is amplified and the temperature is too high.

Example 4: Modifying the Slave Address

Mainframe: 01 06 02 00 00 05 48 71

Slave: 01 06 02 00 00 05 48 71

Note: The sensor address is changed from 0x01 to 0x05.

Example 5: Reading Baud Rate

Mainframe: 01 03 02 01 00 01 D4 72

Slave: 01 03 02 00 03 F8 45

Description: Read the baud rate, the baud rate read is: 9600bps

Example 6: Setting the Baud Rate

Mainframe: 01 06 02 01 00 03 99 B3

Slave: 01 06 02 01 00 03 99 B3

Description: Set the baud rate to 9600bps.

Example 7: Accessing Illegal Registers

Mainframe: 01 03 FF FF 00 01 84 2E

Slave: 01 82 02 C1 61

Explanation: 0x82 means that the operation register 0xFFFF is illegal

Example 8: Illegal register setting range

Mainframe: 01 06 02 01 00 FF 99 F2

Slave: 01 81 00 40 50

Explanation: 0x81 indicates that the baud rate setting range is illegal.

4.Module Selection Explanation

This series of distance measurement modules are classified into 4 types based on output methods, totaling 8 models. Users can choose the corresponding ones according to their actual applications the model.

If there are special requirements for modification of response time, angle, communication protocol, etc., you need to communicate with our FAE engineers when purchasing.

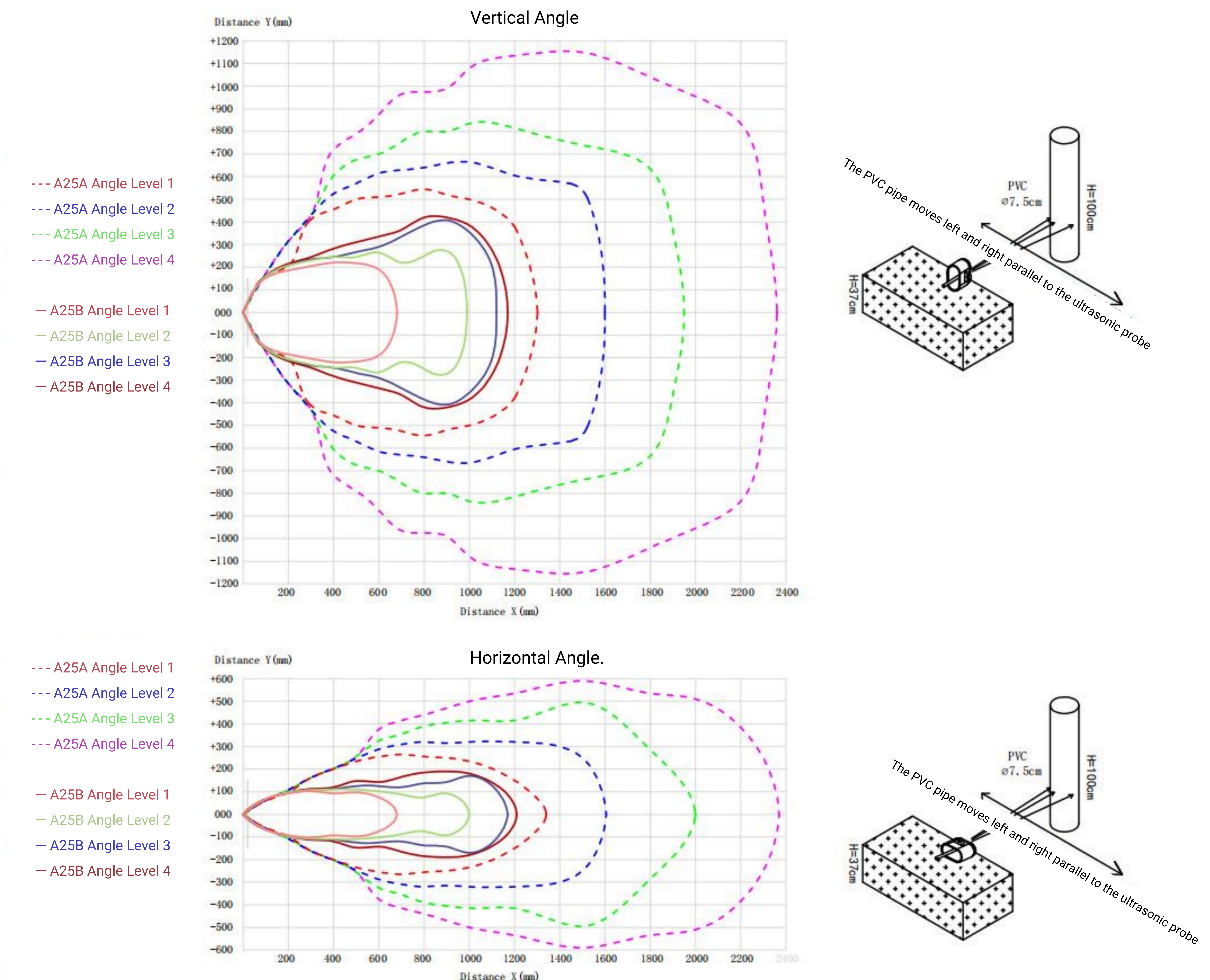
No.	A25 Series Model		Product features and applications	Output Method
1	A25A	DYP-A25AYYUW-V1.0	Wide angle, high sensitivity, long measurement distance; recommended for plane or human body distance measurement.	UART Auto
2		DYP-A25AYYTW-V1.0		UART Controlled
3		DYP-A25AYY4W-V1.0		RS485
4		DYP-A25AYYMW-V1.0		PWM
5	A25B	DYP-A25BYYUW-V1.0	The angle is relatively small, making it suitable for low-position installation scenarios. It is	UART Auto

6	DYP-A25BYYTW-V1.0	recommended for use with lawn mowing robots and pool surface cleaning robots.	UART Controlled
7	DYP-A25BYY4W-V1.0		RS485
8	DYP-A25BYMW-V1.0		PWM

5. Reference diagram of the effective detection range

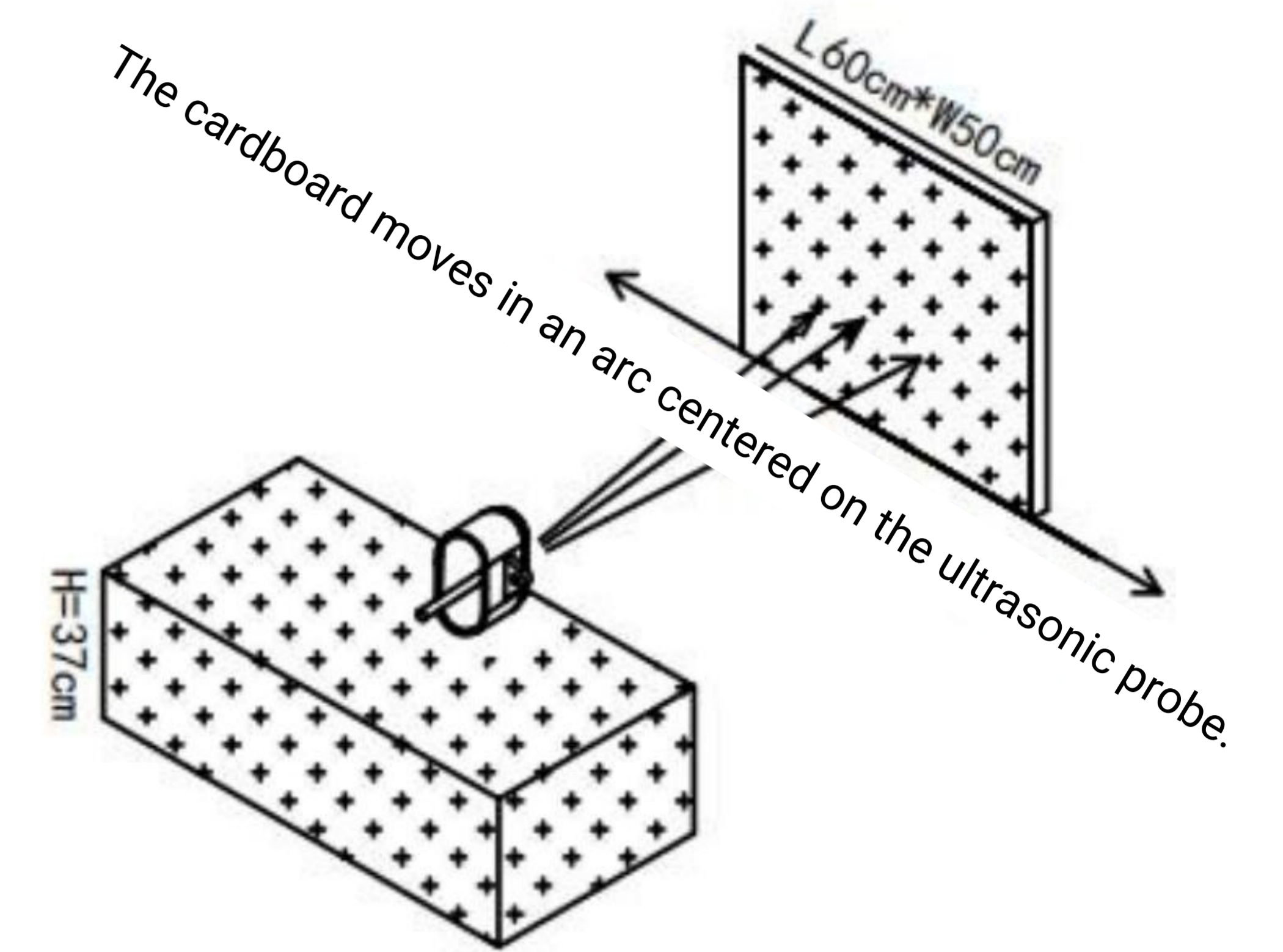
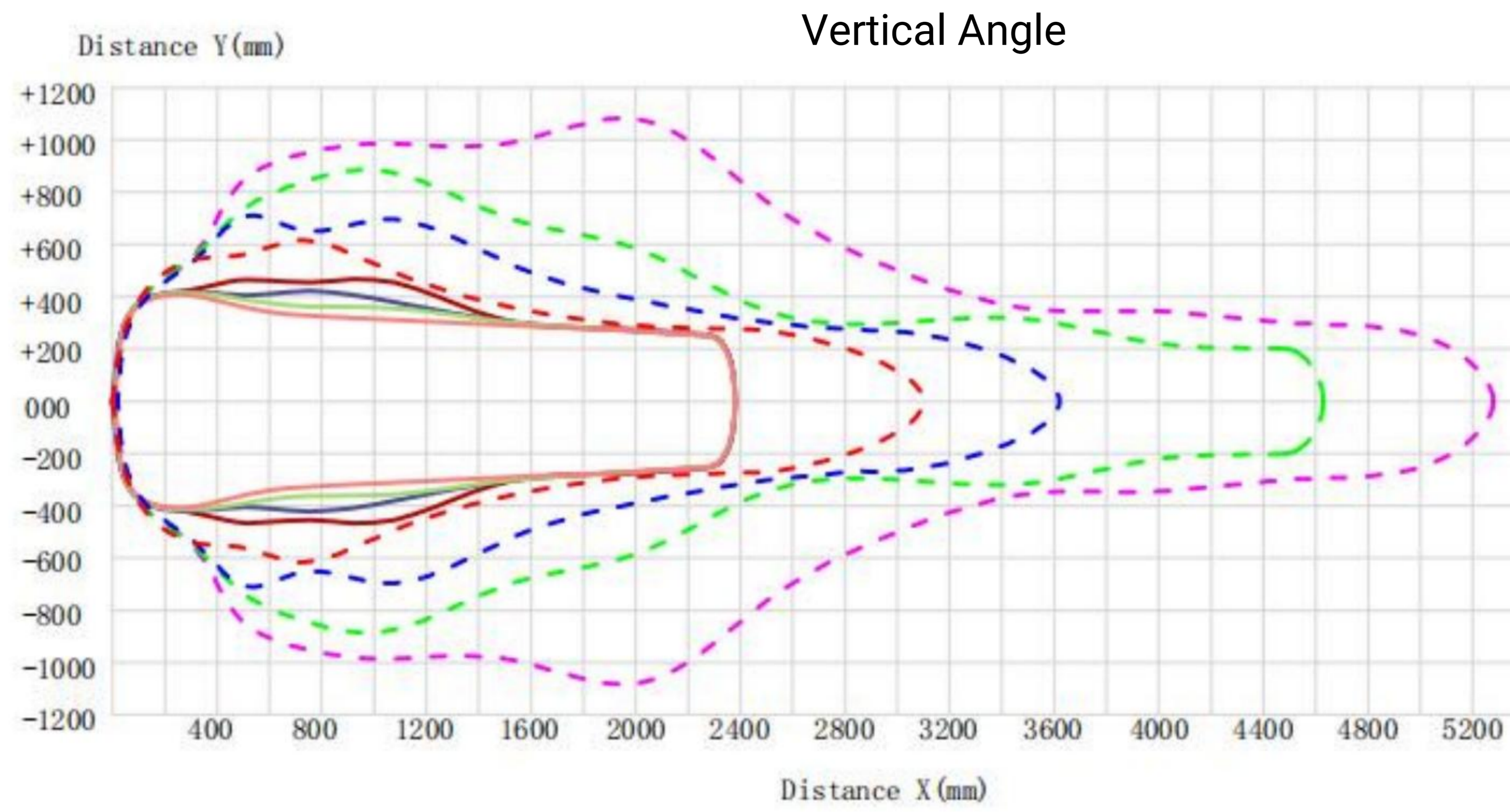
Angle explanation: When the line connecting the centers of the two probes is perpendicular to the ground, it is called the vertical angle; when the line connecting the centers of the two probes is horizontal to the ground, it is called the horizontal angle.

(1) The tested object is a white cylindrical tube made of PVC, with a height of 100cm and a diameter of 7.5cm.

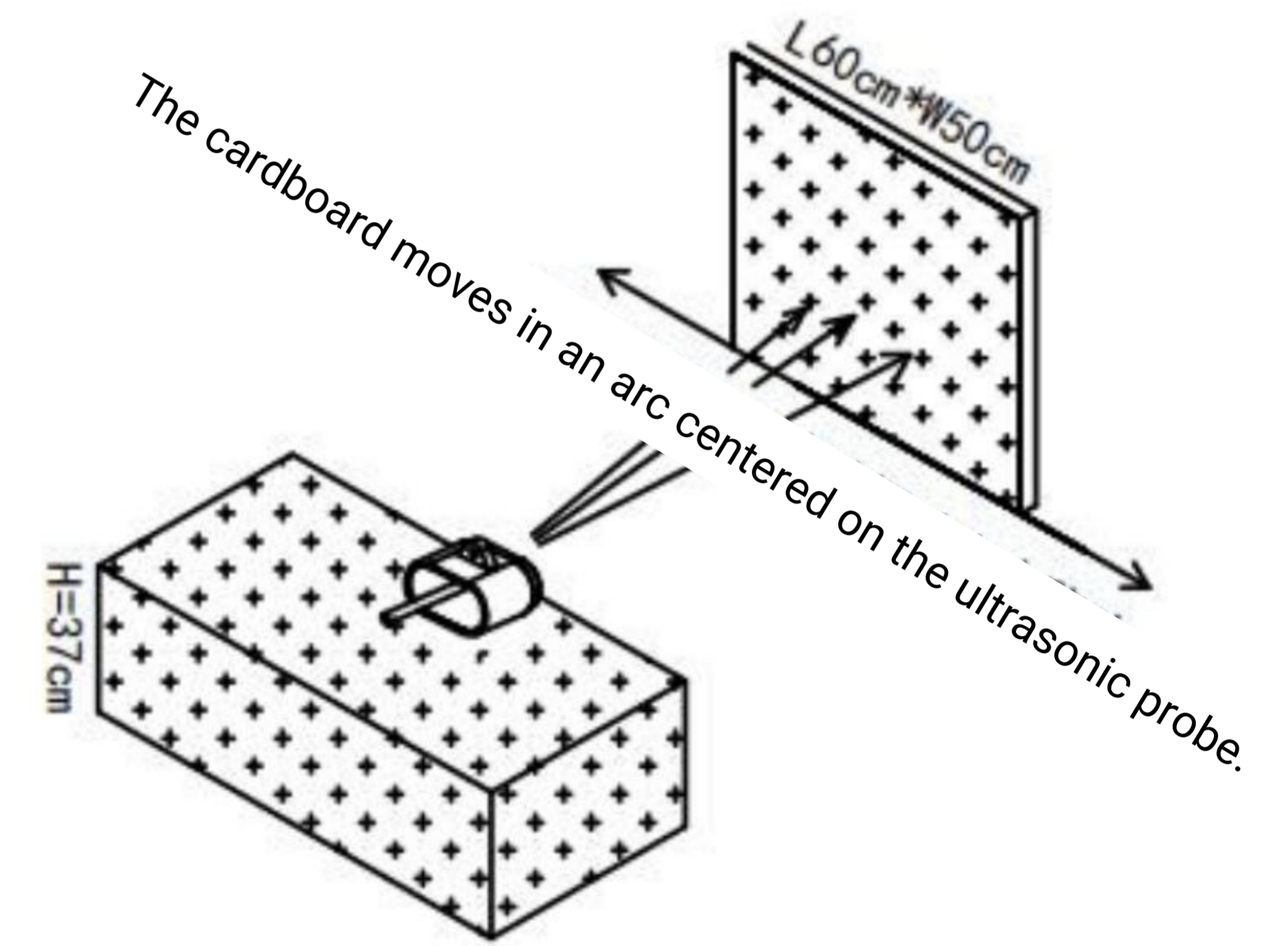
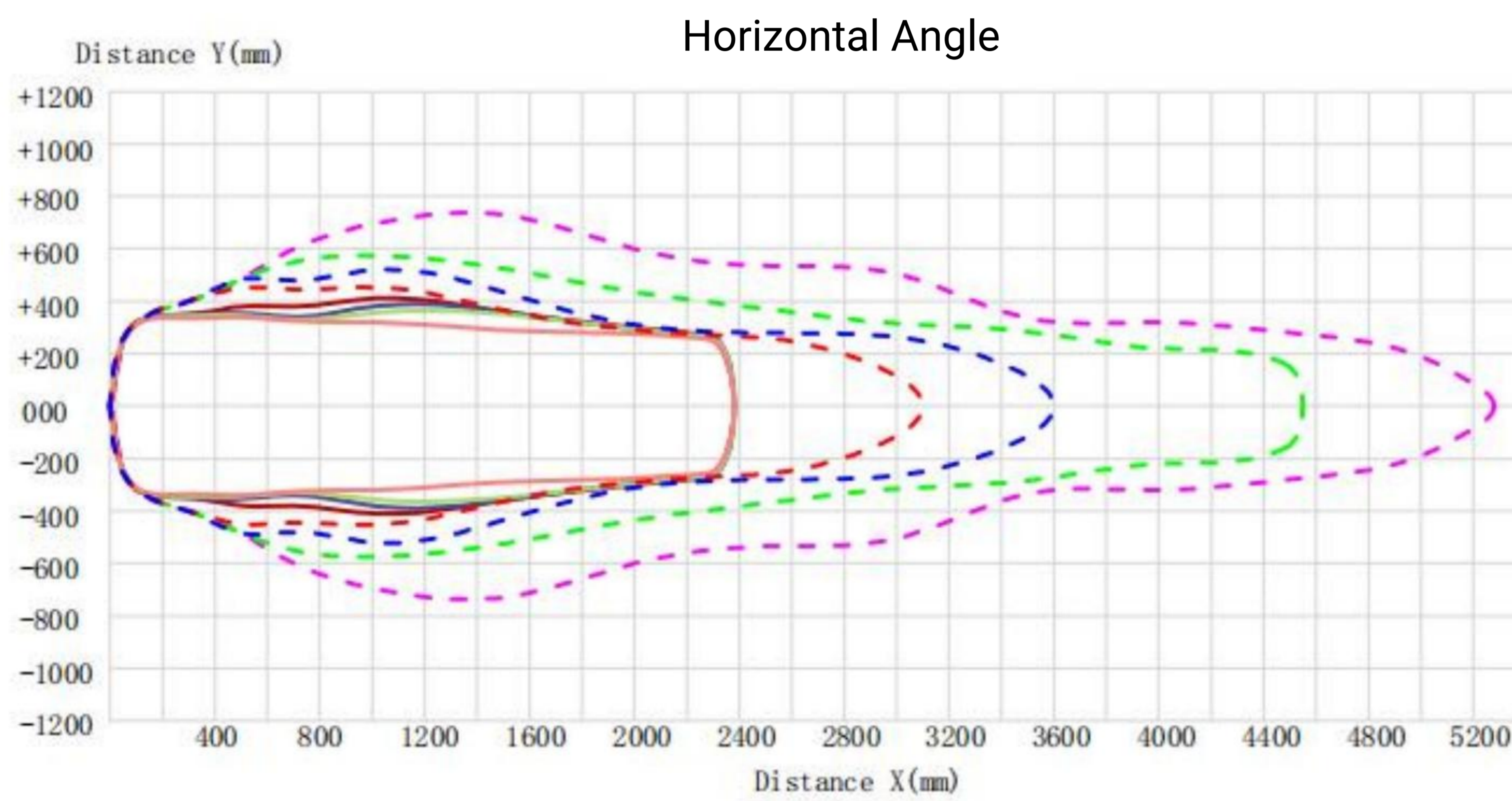


(2) The test object is a “corrugated cardboard” with perpendicular to the 0° centerline, with a length and width of 60cm and 50cm. The test data is obtained.

- A25A Angle Level 1
- A25A Angle Level 2
- A25A Angle Level 3
- A25A Angle Level 4
- A25B Angle Level 1
- A25B Angle Level 2
- A25B Angle Level 3
- A25B Angle Level 4

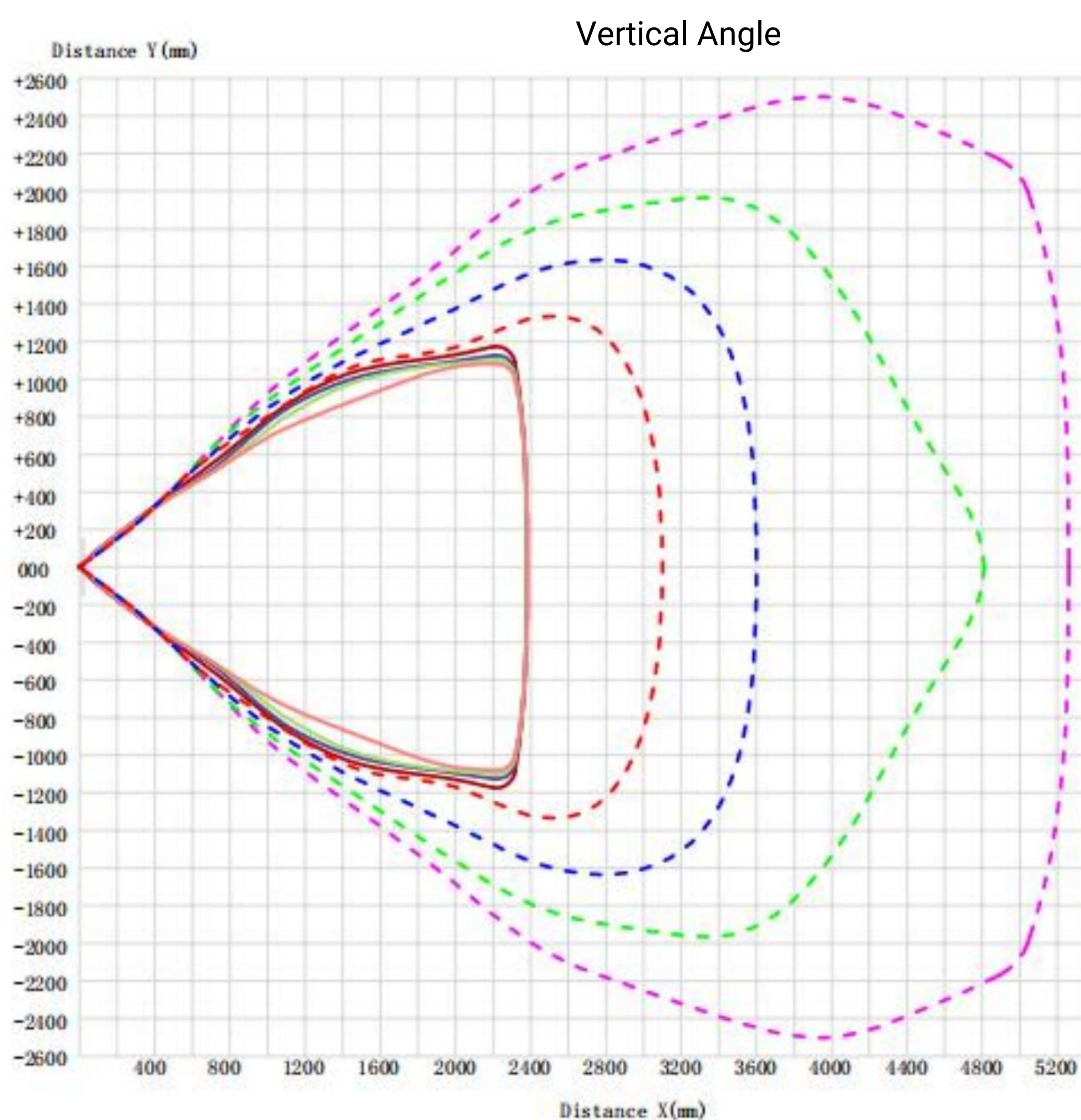


- A25A Angle Level 1
- A25A Angle Level 2
- A25A Angle Level 3
- A25A Angle Level 4
- A25B Angle Level 1
- A25B Angle Level 2
- A25B Angle Level 3
- A25B Angle Level 4

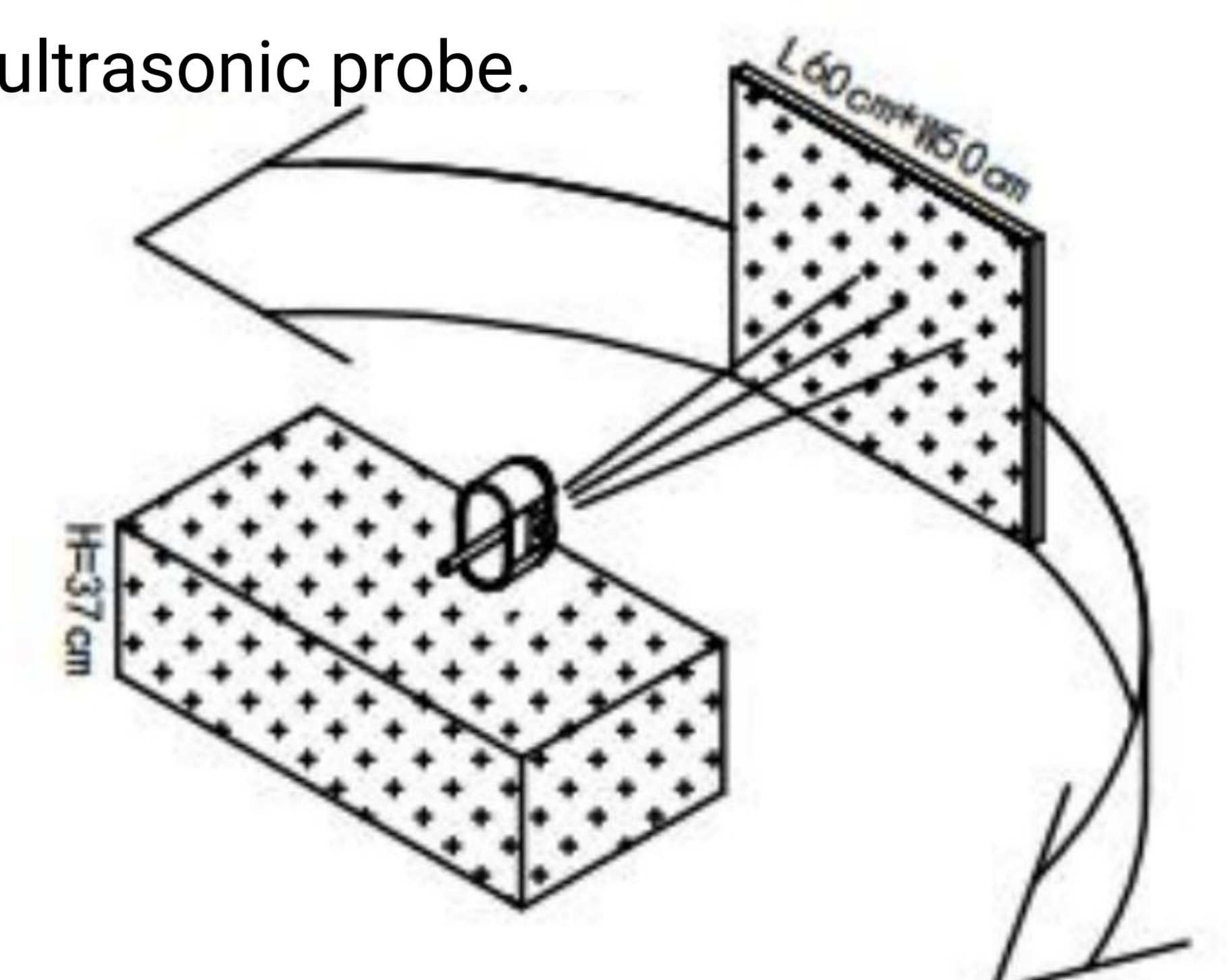


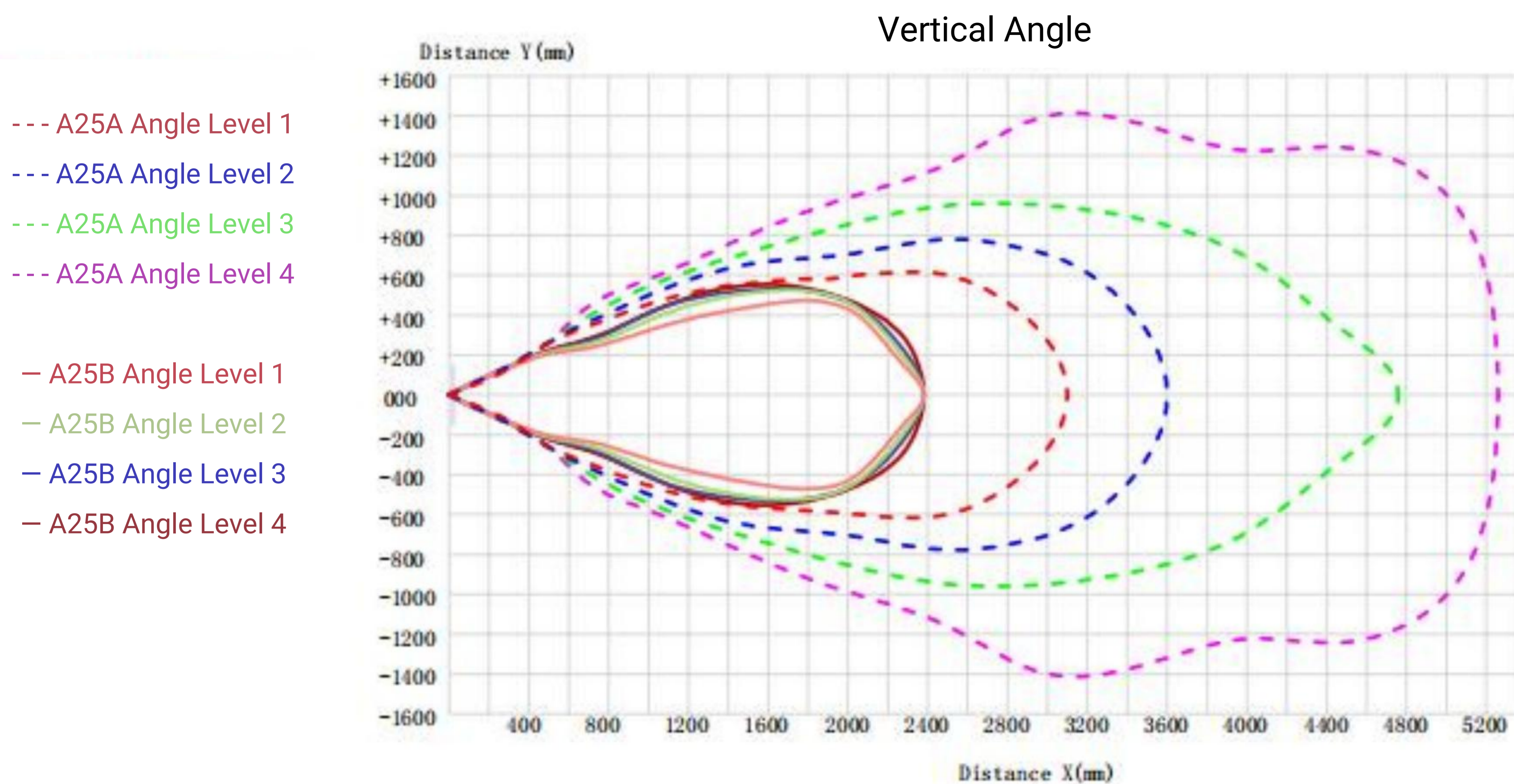
(3) The test object is a “corrugated cardboard” tangent to the arc, with a length and width of 60cm and 50cm. The test data is obtained.

- A25A Angle Level 1
- A25A Angle Level 2
- A25A Angle Level 3
- A25A Angle Level 4
- A25B Angle Level 1
- A25B Angle Level 2
- A25B Angle Level 3
- A25B Angle Level 4

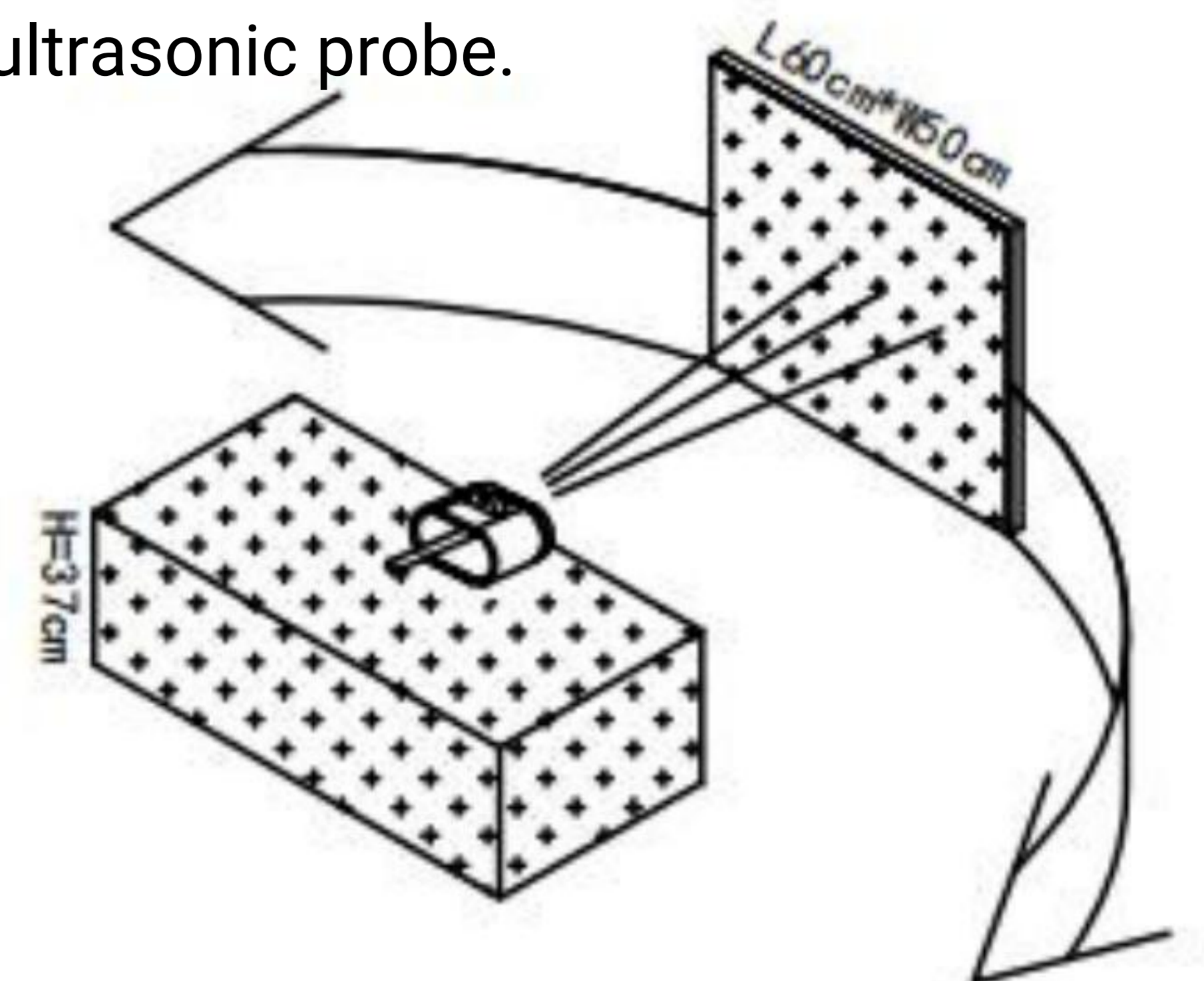


The cardboard moves in an arc centered on the ultrasonic probe.





The cardboard moves in an arc centered on the ultrasonic probe.

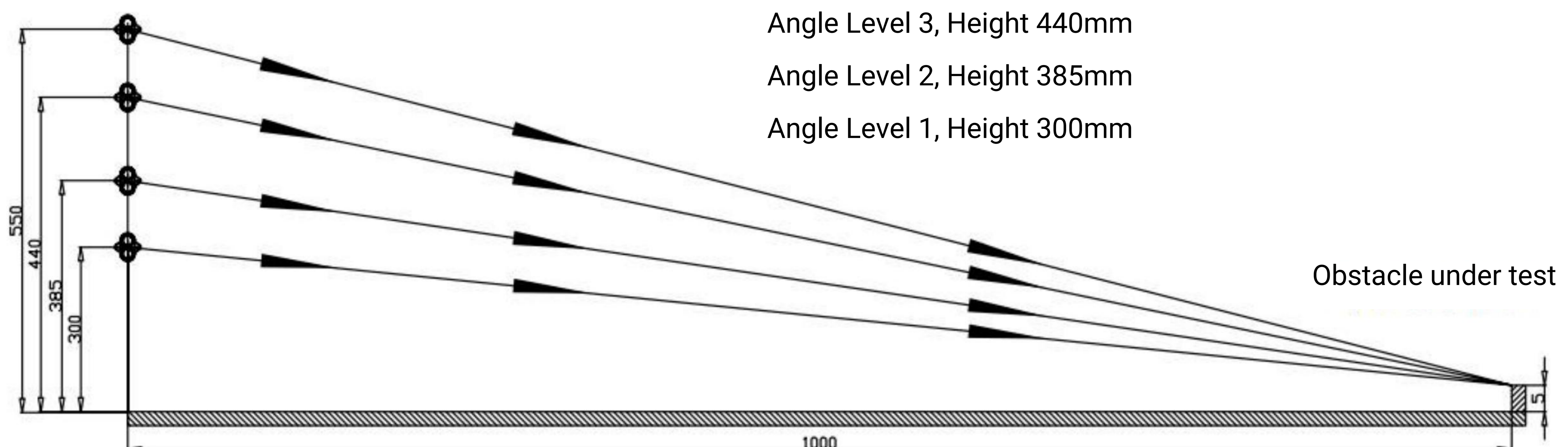


Note: The above data is from the laboratory test data of Dianyingpu Technology. In actual application, various factors such as product installation method and usage environment may cause differences from the laboratory data. Please refer to the test data in the actual application environment.

6. Installation Recommendations

- (1) When installing the module, ensure the transducer's emitting surface is parallel to the plane being measured. This guarantees that the sound waves emitted perpendicularly to the surface of the object return with maximum energy, ensuring maximum range stability and reliability.
- (2) Ensure that objects other than the object being measured are kept out of the module's testing range.
- (3) In areas with steam or water droplets, minimize the impact of condensation on the probe surface.
- (4) Module installation should avoid structural deformation, resonance of metal or other components, and avoid obstructive elements such as elbows, valves, and diameter changes.
- (5) Recommended installation height for the module relative to ground obstacles or obstacles. Refer to the above effective detection range reference diagram for the actual module installation height. Select an appropriate installation height based on different angle requirements. (Below are reference diagrams for different angle levels regarding ground obstacles and module installation height.)

Probe of A25 sensor height



Vertical installation height in planar model (A25A series), unit: mm

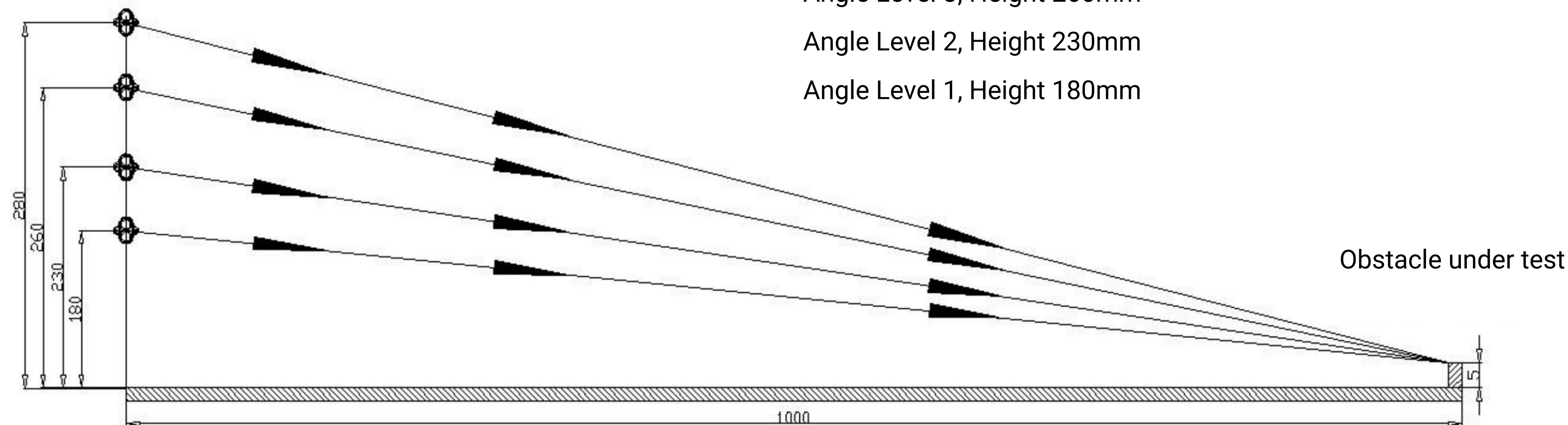
Probe of A25 sensor height

Angle Level 4, Height 280mm

Angle Level 3, Height 260mm

Angle Level 2, Height 230mm

Angle Level 1, Height 180mm



Vertical installation height in lawn mode(A25B series), unit: mm

7. Matters Needing Attention

- 1.The company reserves the right to change this document and update the functions without notice;
- 2.Please pay attention to the structural tolerance when designing, unreasonable structural design may cause transient abnormality of module functions;
- 3.Please pay attention to the electromagnetic compatibility assessment when designing, unreasonable system design may cause abnormal module function;
- 4.Contact our FAE to confirm the relevant precautions when applying to the boundary of product limit parameters;
- 5.The response time and same-frequency interference of this product are configured in common scenarios, and can be improved in special scenarios. You can contact our FAE to communicate with related matters

8. Packaging Specifications

- 1.Defaults to DYP's regular packaging method;
- 2.Packaging materials can be customized according to customer IQC related standards;
- 3.The container transport mode should adopt staggered consolidation mode, and at the same time, it should use film wrapping with reinforced corner boards at the outer edge of a single stack to provide sufficient support.