Acknowledgment Letter

Customer Name: Shenzhen Hongyi Automation Technology Co., Ltd

Customer part number:

Kexin Part Number: KX-4G-6513-FPC

Specification description: FPC: 65 * 13mm L: 12CM-IPEX-RG1.13

Production date: March 14, 2023

Factory confirmation:

Department	Review	Approval
Radio frequency department	Liu Jingxiong	Li Bin
Structure Department	Liu Jingxiong	Li Bin
Quality Department	Wang Fei	Li Bin

Customer confirmation:

Inspection	Review	Approval

Company address: Building H, Hongyongli Industrial Zone, Shabeili, Baolong Street, Longgang District, Shenzhen

TEL: 0755-28700870

FAX: 0755-28483275

△ Record of document development, modification, and abolishment

File Name	Date	Control Revision	Related content	Develop	Approval
Sample Acknowledgment Letter	March 14th, 2023	V1	First production	Liu Jingxiong	Li Bin

Company address: Building H, Hongyongli Industrial Zone, Shabeili, Baolong Street, Longgang District, Shenzhen

TEL: 0755-28700870

FAX: 0755-28483275

catalogue

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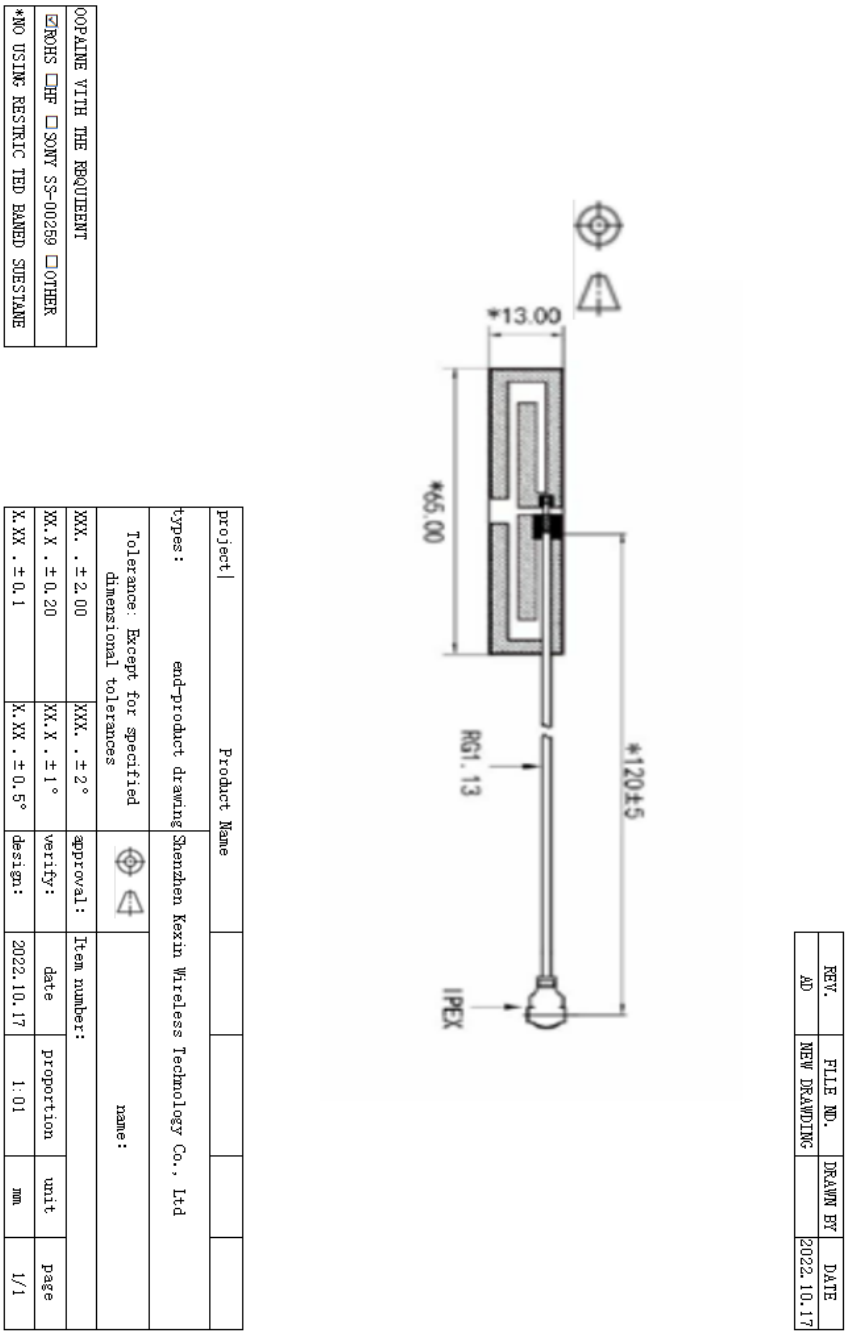
4. Product performance parameters

Electrical specifications	
Frequency Range (MHz)	700-960/1700-2700
Input Impedance (Ω)	fifty
Voltage standing wave ratio V.S.W.R	≤ 3.0
Polarization Type	Linear
Maximum power (W)	10W
Vertical lobe angle (E)	28~50 °
Water plane lobe angle (H)	360 °
Mechanical Specifications	
Antenna Material	FPC
Connector Type	IPEX Generation 1 (RG1.13 cable)
Antenna size	65 * 13 * mm
Operating Temperature	-20~+75 ˚ C
Storage Temperature	-30~+75 ˚ C

5. Product structure drawings



REV.	FILE NO.	DRAWN BY	DATE
AD	NEW DRAWDING		2022.10.17

project	Product Name				
types: end-product drawing	Shenzhen Kexin Wireless Technology Co., Ltd				
Tolerance: Except for specified dimensional tolerances		name:			
XXX. ±2.00	XXX. ±2°	approval:	Item number:		
XX.X ±0.20	XX.X ±1°	verify:	date	proportion	unit	page
X.XX ±0.1	X.XX ±0.5°	design:	2022.10.17	1:01	mm	1/1

OOPALNE VITH THE REQUIEENT
☑ROHS □HF □SONY SS-00259 □OTHER
*NO USING RESTRIC TED BANED SUESTANE

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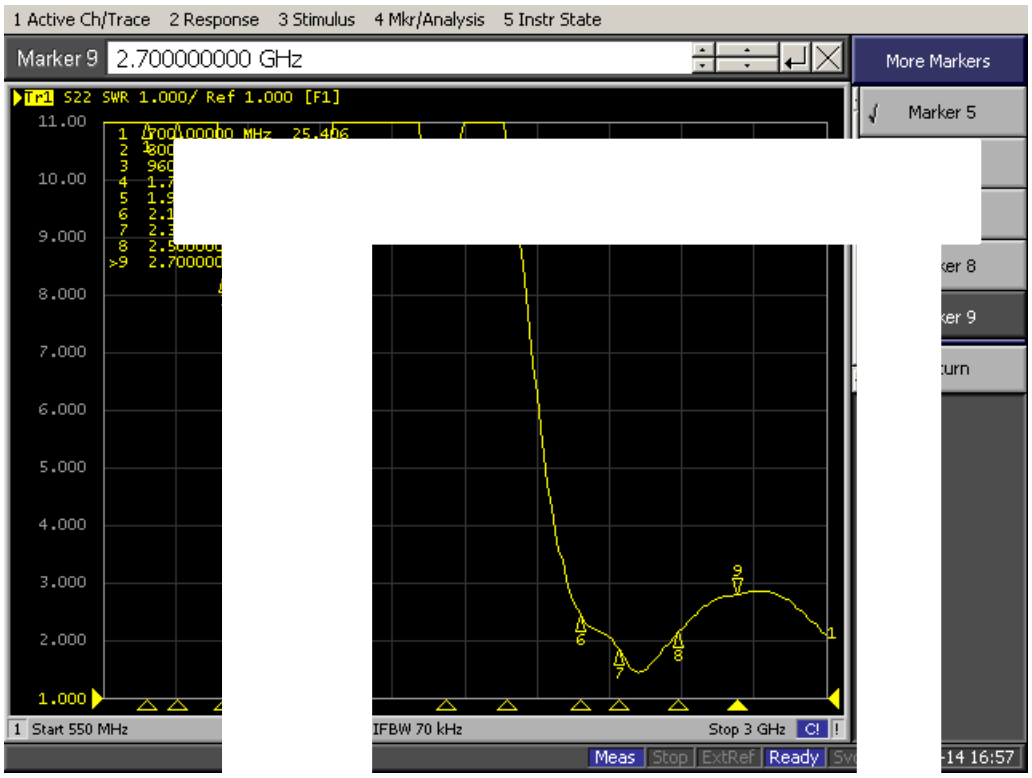
6. Electrical performance test report

VSWR:



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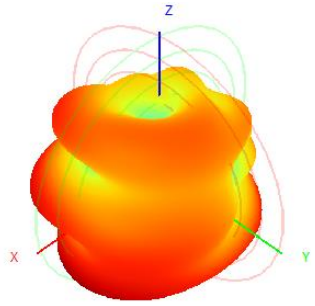
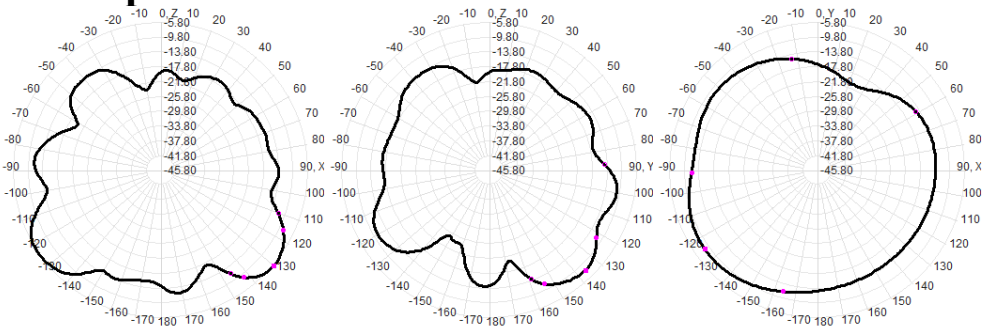
7. Efficiency&Gain

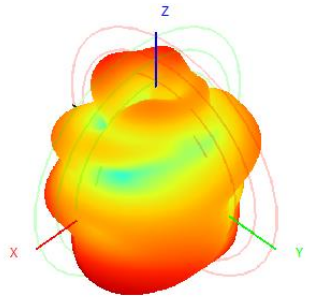
Frequency (MHz) (Operating frequency band)	Efficiency (%) (Efficiency)	Peak Gain (dBi) (Gain)
seven hundred	five point five five	-5.56
eight hundred	six point zero seven	-4.56
nine hundred	nine point nine one	-2.62
nine hundred and sixty	twelve point two one	-2.12
one thousand and seven hundred	eight point eight five	-4.25
one thousand and eight hundred	six point four seven	-4.59
one thousand and nine hundred	eight point four zero	-3.90
two thousand	sixteen point two five	-1.39
two thousand and one hundred	thirty-four point three six	0.68
two thousand and two hundred	forty-four point five seven	1.02
two thousand and three hundred	fifty-two point nine four	0.77
two thousand and four hundred	seventy-four point seven one	2.07
two thousand and five hundred	seventy-two point four five	1.80
two thousand and six hundred	fifty-eight point eight five	1.09
two thousand and seven hundred	sixty-two point five two	1.26

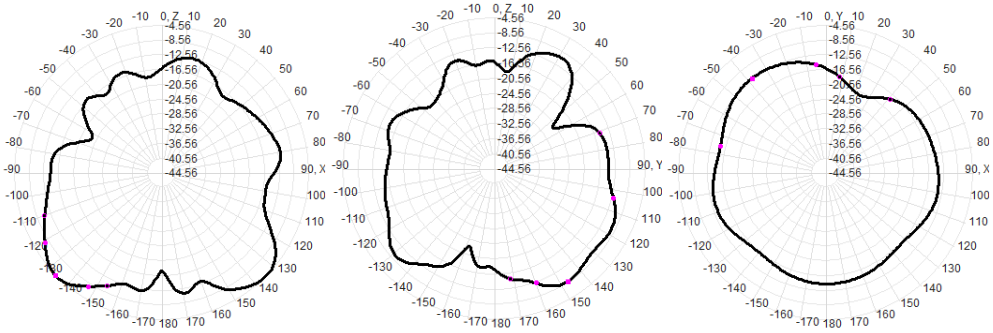
8. 3D&2D directional map



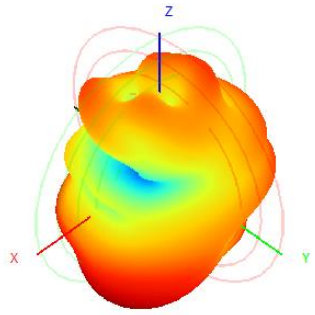


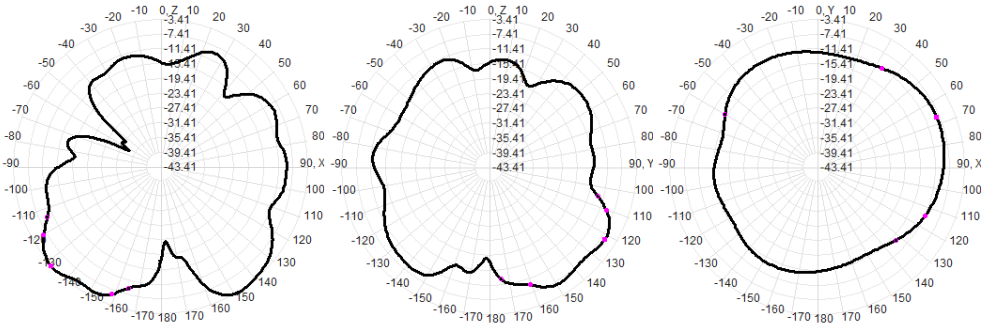
700MHz E1 E2 H



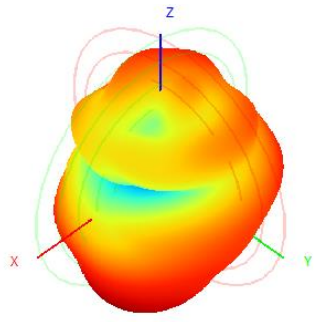


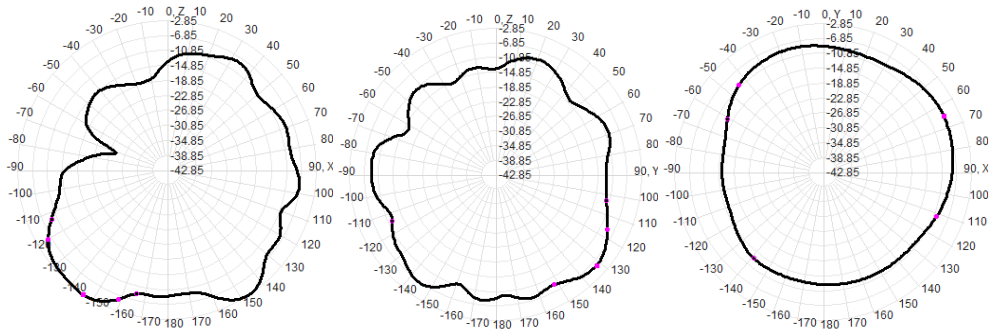
800MHz E1 E2 H



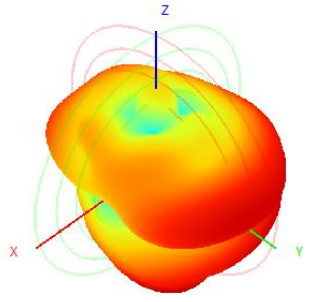


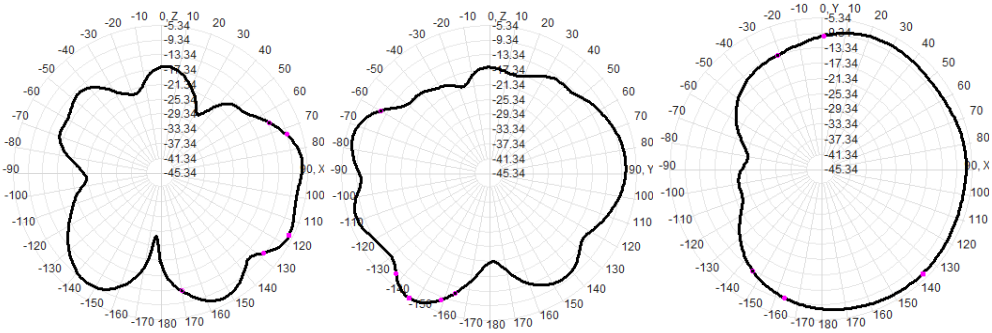
900MHz E1 E2 H





960MHz E1 E2 H





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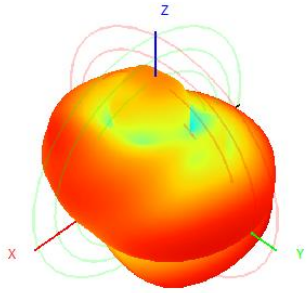
1700MHz



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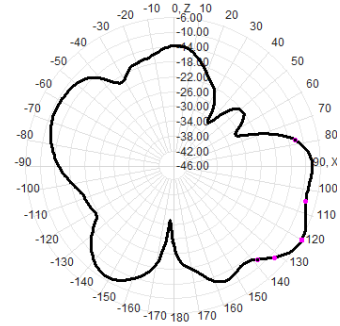

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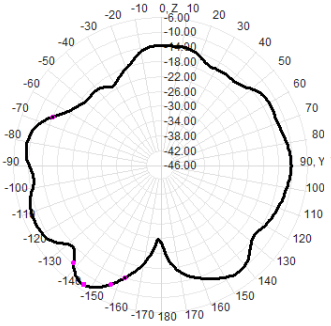

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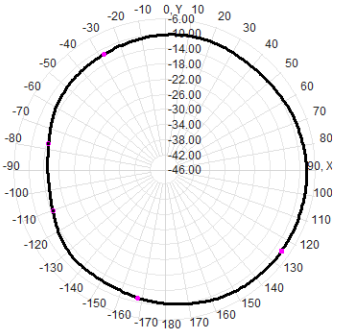
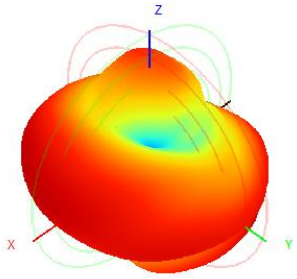


1800MHz



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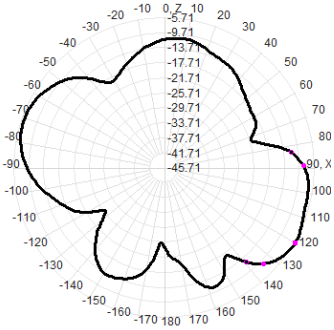

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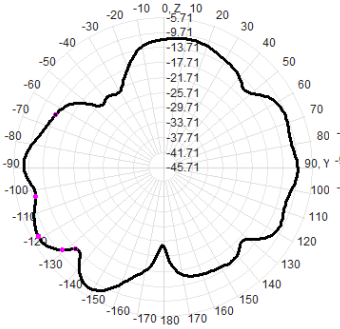

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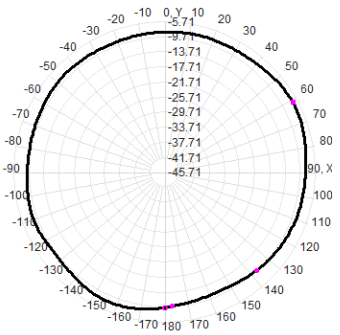

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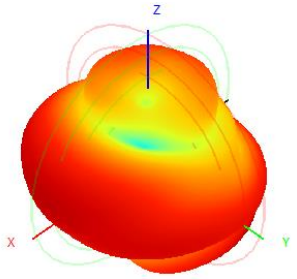

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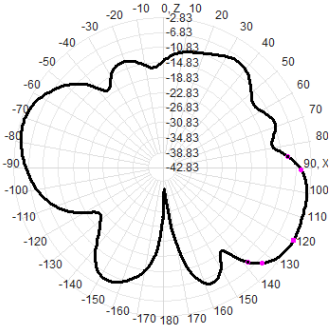

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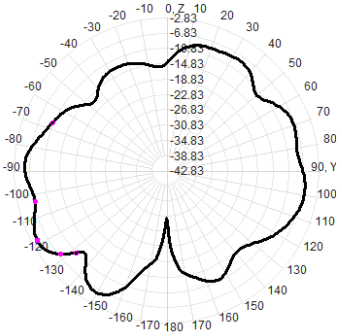

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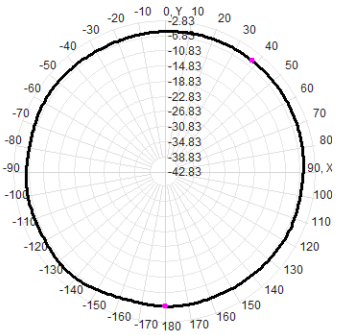

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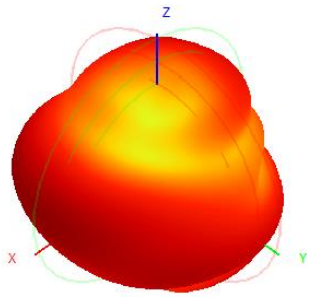

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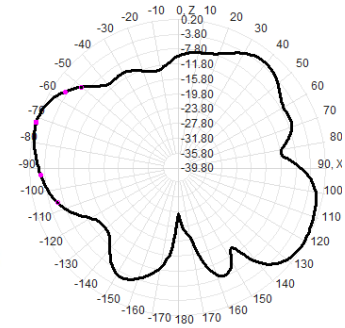

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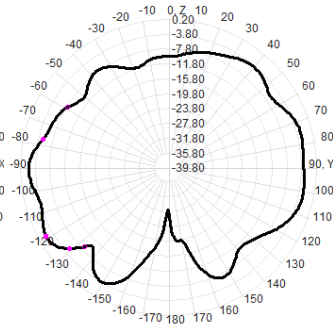

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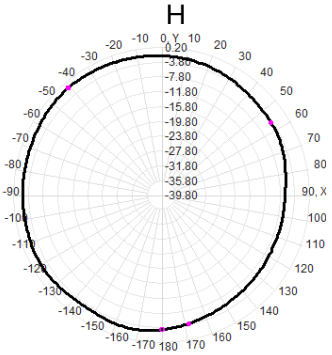
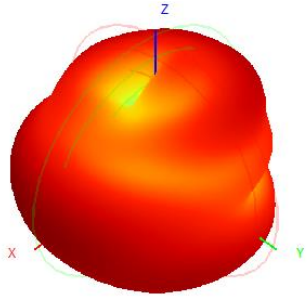


2100MHz



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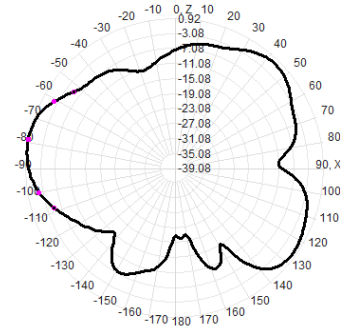

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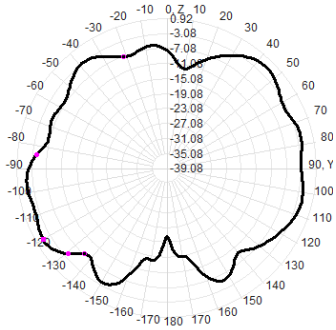

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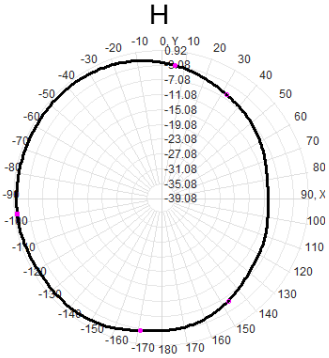

2200MHz

E1

E2

H

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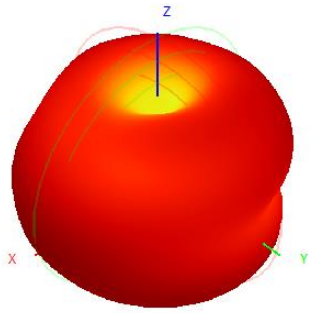

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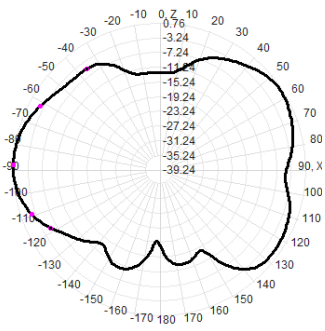

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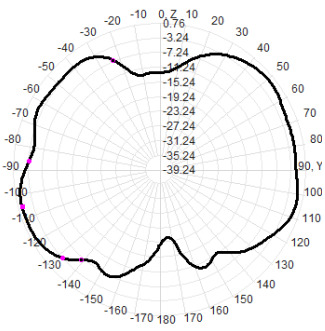

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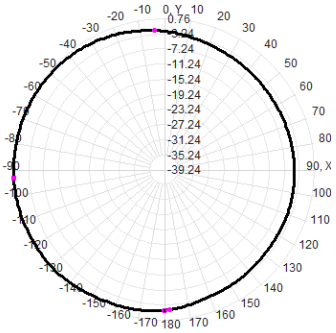

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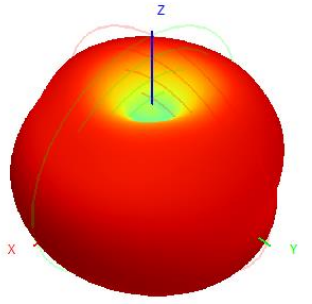

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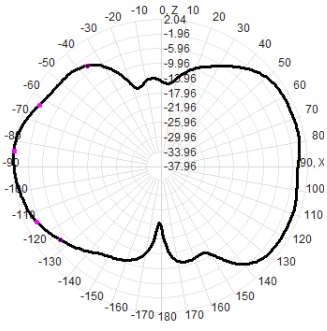

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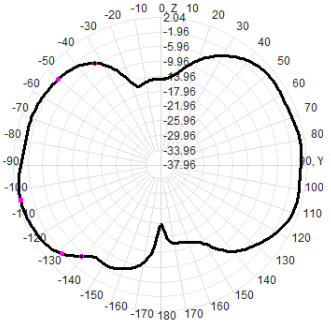

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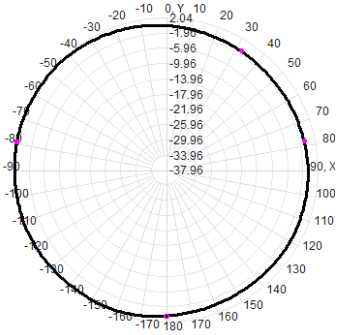

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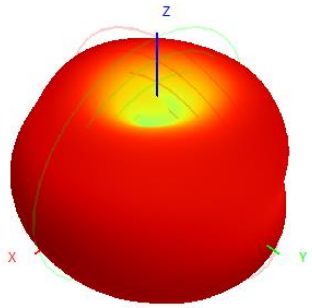

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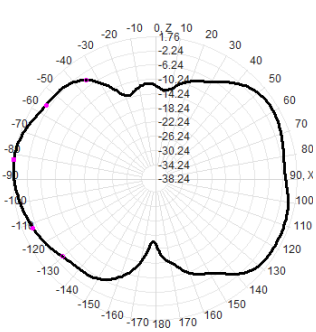

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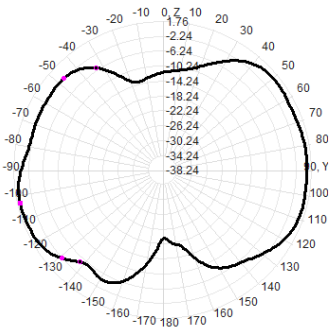

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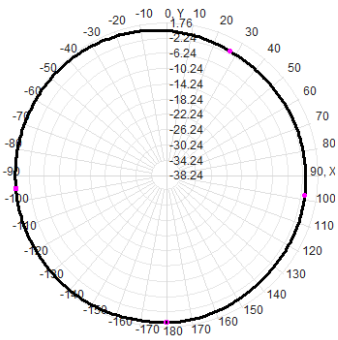

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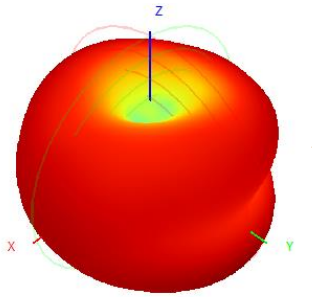
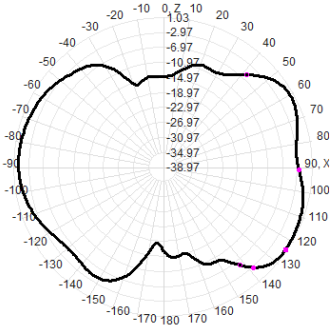


2600MHz



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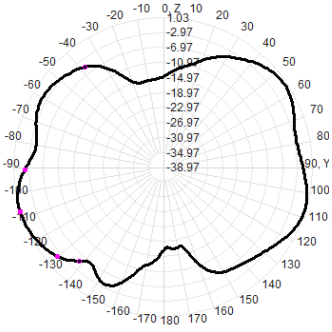

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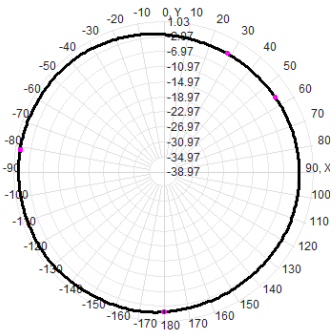

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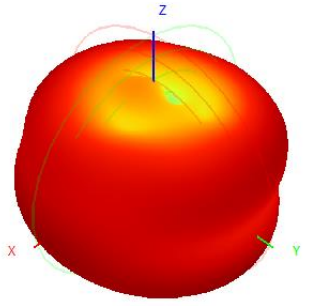
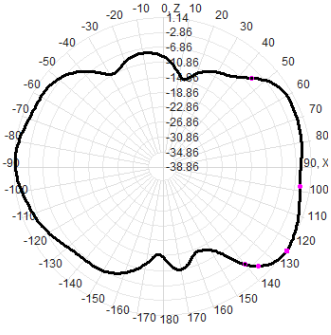


2700MHz



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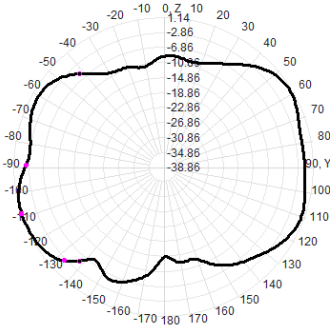
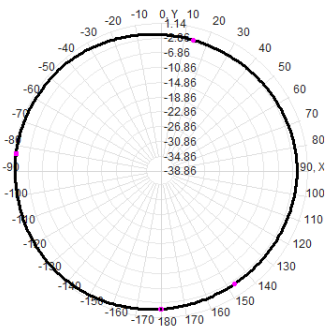


E2



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Company address: Building H, Hongyongli Industrial Zone, Shabeili, Baolong Street, Longgang District, Shenzhen

TEL: 0755-28700870

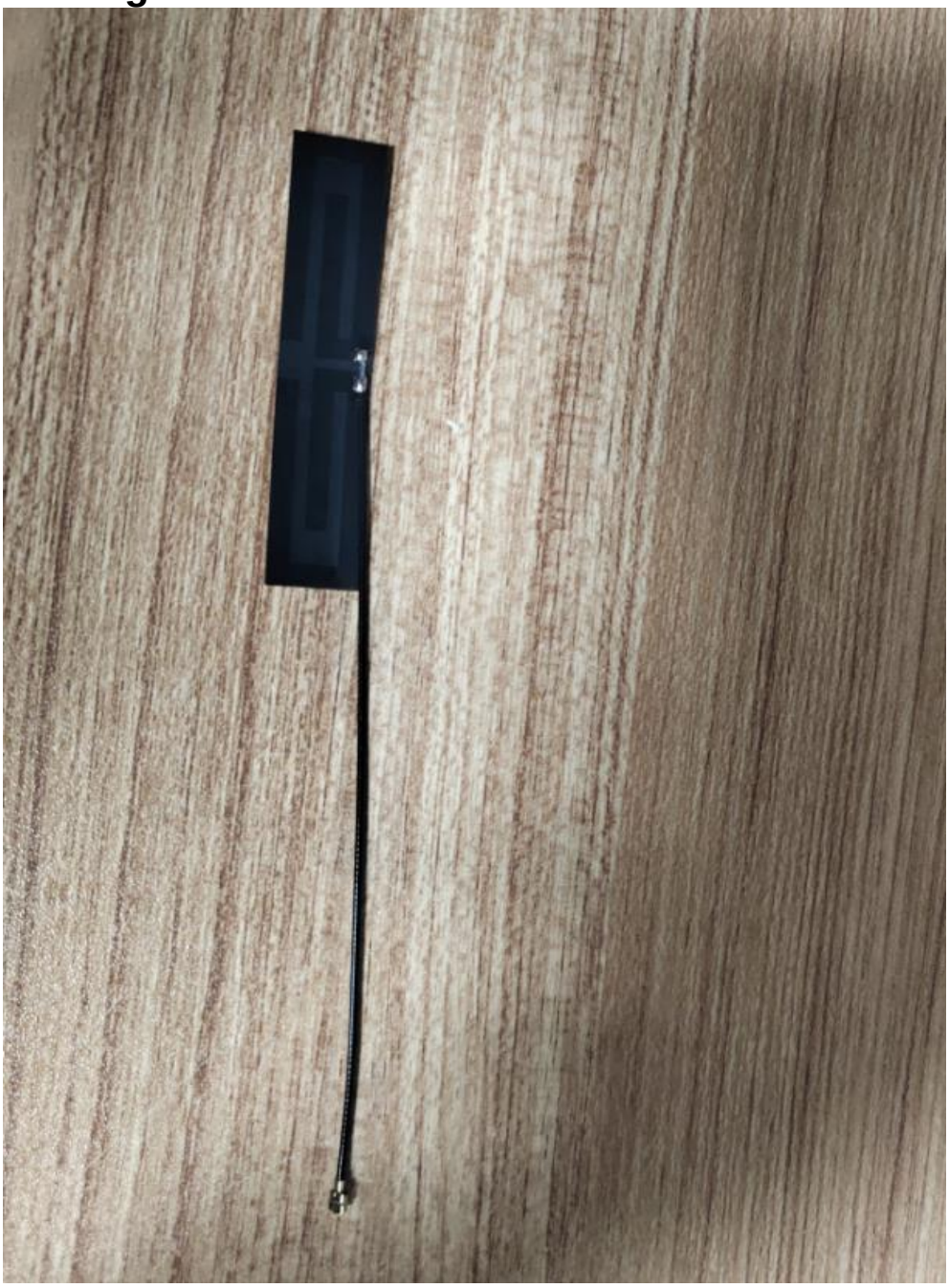
FAX: 0755-28483275

Company address: Building H, Hongyongli Industrial Zone, Shabeili, Baolong Street, Longgang District, Shenzhen

TEL: 0755-28700870

FAX: 0755-28483275

9. Product image



Company address: Building H, Hongyongli Industrial Zone, Shabeili, Baolong Street, Longgang District, Shenzhen

TEL: 0755-28700870

FAX: 0755-28483275

10. Reliability experiment

	Test items	Specific instructions
1.	Bending durability test	Test purpose: To verify that the antenna elbow with bending function can meet the durability of long-term use; Pre set conditions: 1) The electrical performance of the test sample meets the requirements, and the appearance of the sample is free from defects such as cracking and wear; 2) Minimum sample quantity: 3pcs. Testing process: 1. Before testing, check whether the antenna's mechanical and electrical functions are normal; Place the entire antenna horizontally and secure the antenna connector; 2. Rotate the antenna base manually or mechanically to a position 90 degrees from the connector, and then rotate to the original position. Count back and forth once, with a testing frequency of 30-40 times per minute and a total of 500 bends, with a 5-minute interval between every 100 bends; 3. After testing, check the appearance and mechanical performance of the antenna. Criteria: 1. After the test is completed, there should be no obvious physical damage to the antenna, and the antenna should not slide when folded at 30 degrees from the vertical direction. 2. There is no change in electrical performance before and after the test;
2.	Antenna side pressure test	Test purpose: To verify the anti lateral pressure ability of the integrated external antenna of the product, and to test the strength of the antenna itself and the strength of the contact parts between the product and the equipment, such as the strength of the shell and the strength of the stop and limit ribs. Pre set conditions: 1） The electrical performance of the test sample meets the requirements, and the appearance of the sample is free from defects such as cracking and wear. 2） Install the antenna on the product in its normal state and secure the product. 3) Each test sample should be at least 3 pieces; Test steps: 1. Before testing, check the appearance and function of the sample to be tested; 2. Perform the following two tests using two sets of materials: Test 1: Place the antenna in an open and straight state, apply a force of 20N inward, outward, upward, and downward at the 5mm position at the end of the antenna, and maintain it for 5S. Repeat this operation 10 times in each direction. Test 2: Place the antenna in a 90 degree bending state, twist the antenna until the stop stop rib is in effect, apply a force of 20N at the 5mm position at the end of the antenna, and maintain it for 5S. Repeat this operation 10 times. Complete the testing of both positive and negative limit positions. 3. In the above two sets of tests, if it is found that after the antenna is subjected to force, the deformation angle of the antenna has exceeded 30 °, and the external force is still less than 20N, the deformation angle should be maintained at 30 °. After 5 seconds, the external force should be withdrawn and the above operation should be repeated 10 times; Complete a total of 40 tests in 4 directions; 4. After the test is completed, check the mechanical and electrical properties of the sample. 5. If there are multiple antennas on the same product, each antenna installation position on the product needs to be tested. Criteria: 1. After the test is completed, the mechanical and electrical functions of the antenna are normal; 2. The antenna can exhibit manually recoverable bending, and the shell and core are not allowed to break. 3. The limiting rib of the main equipment is cracked, and the shell buckle cannot be loose or broken; 4. There is no change in the electrical performance of the antenna before and after the test;
3.	Antenna rotation durability test	Test purpose: To verify that the antenna with free rotation function between the antenna fixed head and the antenna body can meet the durability performance requirements for long-term use; Pre set conditions: The electrical performance of the test sample meets the requirements, and the appearance of the sample is free from defects such as cracking and wear; Testing process: 180 degree rotatable antenna: 1. Before testing, ensure that the antenna's mechanical and electrical functions are normal and there is no physical damage; 2. Bend the antenna base in a direction perpendicular to the connector 3. Install the antenna on the fixed platform of the corresponding model and bend the antenna base to make it perpendicular to the connecting head. 4. Manually or mechanically rotate the antenna base to the left to a horizontal position (90 degrees), then rotate to the original position, then rotate the antenna base to the right to a horizontal position (90 degrees), and then rotate to the original position, counting the entire cycle once. 5. The testing frequency is 30-40 times per minute, with a total of 1000 rotations; 6. After testing, check the mechanical and electrical performance of the antenna. 360 degree rotatable antenna: 1. Before testing, ensure that the antenna's mechanical and electrical functions are normal and there is no physical

		damage; 2. Bend the antenna base in a direction perpendicular to the connector 2. Install the antenna on the fixed platform of the corresponding model and bend the antenna base to make it perpendicular to the connecting head 3. Manually or mechanically rotate the antenna base 360 degrees to the left to return to its original position, then rotate the antenna base 360 degrees to the right to return to its original position, and count the entire cycle twice. 4. The testing frequency is 30-40 times per minute, with a total of 1000 rotations; 5. After testing, check the mechanical and electrical performance of the antenna. Criteria: 1. After the test is completed, there must be no obvious physical damage to the antenna, and the antenna rotating head also has the function of fixing the antenna rotating position. The limiting structure of the main equipment is not damaged; 2. There is no change in electrical performance before and after the test.
4.	Complete machine free fall test	Verify whether the drop strength of desktop and handheld terminals meets the requirements during use/handling. Test Procedure: 1. Test conditions: (1) The open state of the antenna and the drop height of the entire machine are 0.8 meters, with 6 sides and 1 cycle, recorded 6 times in total, on a marble platform for controlled drop; (2) Minimum sample quantity: 3pcs 2. Program (1) Ensure that the mechanical and electrical functions of the sample are normal; (2) Each sample is subjected to a controlled drop corresponding to the required height and number of drops; (3) During the testing process, it is required to inspect the appearance and function of each surface tested. When conducting the next surface test, if any faults are caused, they can be manually restored and then tested. Criteria: After completing one cycle of testing, the mechanical and electrical functions of the sample are normal, allowing for the occurrence of manually recoverable mechanical failures. Allow minor mechanical malfunctions that do not affect the normal use and safety of users.
5.	Antenna tensile test	Test purpose: To verify whether the strength of the antenna connection meets the requirements; Pre set conditions: The electrical performance of the test sample meets the requirements, and the appearance of the sample is free from defects such as cracking and wear; Testing process: 1. Conduct preliminary inspection before testing to ensure that the prototype accessories function normally before testing; 2. Fix the fixed head and apply a pulling force of 1kgf to the antenna shaft. When the force reaches 1kgf, maintain it for 2S; 3. Repeat step (2) 20 times; 4. Fix the antenna shaft and apply a 1kgf tensile force to the antenna end. When the force reaches 1kgf, maintain it for 2S; 5. Repeat step (4) 20 times. Criteria: 1. After the test is completed, there must be no obvious physical damage to the antenna. 2. There is no change in electrical performance before and after the test.
6.	Antenna installation force	Test purpose: To verify whether the installation force of the antenna during production assembly meets the requirements for human comfort; Pre set conditions: ONT and antenna must be brand new samples for initial installation; Due to wear and tear of structural components during the second installation, the installation force will significantly decrease, resulting in invalid test data; Testing process: 1. Preliminary inspection before testing to ensure that the ONT shell and antenna are brand new prototypes and have not undergone antenna installation; 2. Fix the ONT shell and press the antenna into the installation hole of the ONT shell antenna; A press can be used to record the installation force of the antenna. 3. Number of prototypes: 3pcs Checkpoints, requirements to be met, indicators, and expected results: 1. The installation force of the antenna is less than 30N;
7.	Antenna abnormal noise test	Test purpose: To verify that there is no abnormal noise during the shaking process of the antenna; Test criteria: Manually shaking the single antenna without abnormal noise;

11. Environmental requirements

	Environmental parameters	index	Referenced standards
one	Storage temperature range (℃)	-30~+75	Reference standards: IEC 60068-2-1/2/6/14/30/31/78 ETSI EN 300 019-2-1/2/3 GR-63-CORE
two	Working temperature range (℃)	-20~+65	
three	Storage humidity range	40 ℃, 95% humidity, 96 hours	
four	Operating humidity range	5% to 95%	
five	Alternating damp heat	1) Maintain the temperature at+25 ℃ and increase the humidity to 95% RH within 1 hour 2) Maintain a humidity of 95% RH; Raise the temperature to+55 ℃ within 3 hours; 3) Maintain+55 ℃, 95% RH for 9 hours 4) Maintain a humidity of 95% RH; Cool down to+25 ℃ within 3 hours; 5) Maintain+25 ℃, 95% RH for 9 hours 6) Repeat steps 2) to 5) 5 times (a total of 6 cycles); 7) Maintain the temperature at+25 ℃ and reduce the humidity to 50% within 1 hour; 8) Maintain+25 ℃, 50% RH for 2 hours The required indicators and expected results that the checkpoint should achieve: 1. The antenna should not undergo discoloration, cracking, debonding, warping, deformation, loss of function, etc. 2. There is no significant change in the damping force between the antenna and ONT, and the damping force between the antenna and the product can keep the antenna stable at any angle;	
six	Temperature cycling	1) High temperature limit value: 1) 75 ℃; 2) Low temperature limit value: -30 ℃; 3) Temperature change and holding time: Maintain at least 4 hours at high and low temperature extremes, and do not exceed 4 hours from high to low temperature or from low to high temperature; 4) Number of cycles: 9 cycles in total 5) Recovery time: 24 hours 6) Minimum sample quantity: 3pcs The required indicators and expected results that the checkpoint should achieve: 1. The antenna should not undergo discoloration, cracking, debonding, warping, deformation, loss of function, etc. 2. There is no significant change in the damping force between the antenna and ONT, and the damping force between the antenna and the product can keep the antenna stable at any angle;	
seven	High temperature storage	Raise the temperature to 75 ℃ at a rate of 1 ℃/min and maintain at 75 ℃ for 24 hours; Cool at a rate of 1 ℃/min to+25 ℃ and maintain for 2 hours. Minimum sample quantity: 3pcs The required indicators and expected results that the checkpoint should achieve: 1. The antenna should not undergo discoloration, cracking, debonding, warping, deformation, loss of function, etc. 2. There is no significant change in the damping force between the antenna and ONT, and the damping force between the antenna and the product can keep the antenna stable at any angle;	
eight	Low temperature storage	Cool down to -30 ℃ at a rate of 1 ℃/min and maintain at -30 ℃ for 24 hours; Raise the temperature at a rate of 1 ℃/min to+25 ℃ and hold for 2 hours. The required indicators and expected results that the checkpoint should achieve: 1. The antenna should not undergo discoloration, cracking, debonding, warping, deformation, loss of function, etc. 2. There is no significant change in the damping force between the antenna and ONT, and the damping force between the antenna and the product can keep the antenna stable at any angle;	

nine	Constant salt mist		After 48 hours of salt spray test, the product indicators, functions, and mechanical properties were all normal at room temperature.	
ten	Illumination		/	
eleven	Bare metal vibration		Requirements; 1. Frequency: 10-30Hz, placement distance: 0.38mm, 3 cycles, each cycle for 5 minutes; 2. Frequency: 30-60Hz, placement distance: 0.38mm, 3 cycles, each cycle for 5 minutes; 3. Repeat once in three axis directions; After testing, the product indicators, functions, and mechanical properties were all normal.	
twelve	Vibration with packaging		No testing is required, but it is required to go to Huawei's warehouse. The antenna performance and appearance are both OK	
thirteen	Static pressure with packaging			
fourteen	Dumping with packaging			
fifteen	Collision impact with packaging			
sixteen	Free drop with packaging			
seventeen	Appearance and quality requirements for antenna injection molded parts		/	Chapter 1, 2, 3, 5, and 6 of DKBA04000193 General Quality Requirements for Plastic and Rubber Parts
eighteen	Spraying quality requirements		/	Quality Requirements for ATOM Antenna Painting
nineteen	Environmental requirements	Compliance with European RHOS/REACH requirements	Yes	
twenty		Meet China's RHOS/REACH requirements	Yes	
twen		Lead free requirement	Yes	

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