



微米科技
HUIMI TECHNOLOGY

Suzhou Huimi Communication Technology Co., Ltd

SAMPLE & SPECIFICATION FOR APPROVAL

Customer: T2 Mobile (Shanghai) Limited

Model NO: X1(Scanner) WIFI Antenna

Customer P/N: (BQA2KB0A12C0)

Version: V1.0

Specification Describe: X1(Scanner) WIFI Antenna (Carrier +LDS)

Frequency: 2400-2500MHz, 5150-7125MHz

Vendor P/N: HM0289-WSA

Date: 2023-08-01

Sample and datasheet must be approved for 6 PCS .

HUIMI Information		
Approved By	Check By	Issued By
WangJinhui	SunQuan	YiQin

No Customer appointed Material				Assign Part
	R&D		QE	Sales
Department	MD	HW	Quality and Eng. Dep.	Sale& Marketing
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Approved By	LIXueQin	WangJinhui	YeLing	YiQin
Final Judgment	LiLinHua	LiLinHua	LiLinHua	LiLinHua
Remark				

Project Name:T2 Mobile _X1(Scanner) WIFI Antenna		Document: T2 Mobile _X1 (Scanner)WIFI Antenna	1
Date :2023-08-01	Version: A		

Antenna Approval Sheet

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1. Summary

This is the WIFI antenna approval sheet.

Working band :

ANT0:WIFI-2.4G Chain0/BT 2400-2500MHz

ANT1:WIFI-2.4G Chain1 2400-2500MHz

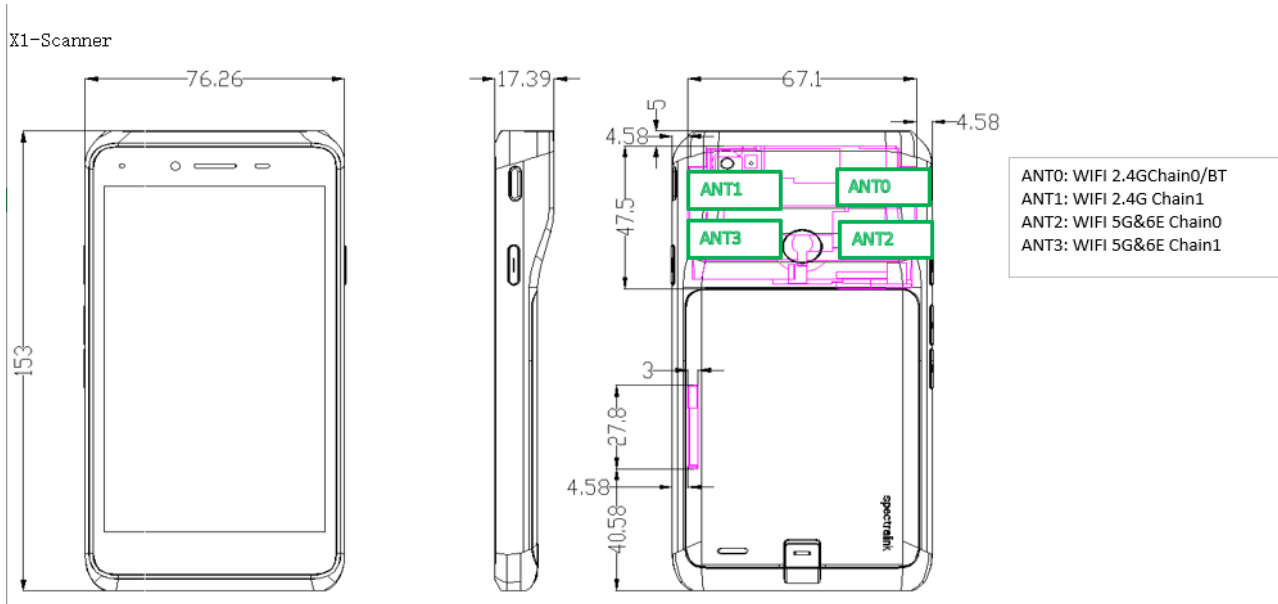
ANT2:WIFI 5G/6E Chain0 5150-7125MHz

ANT3:WIFI 5G/6E Chain1 5150-7125MHz

2. Antenna Structure

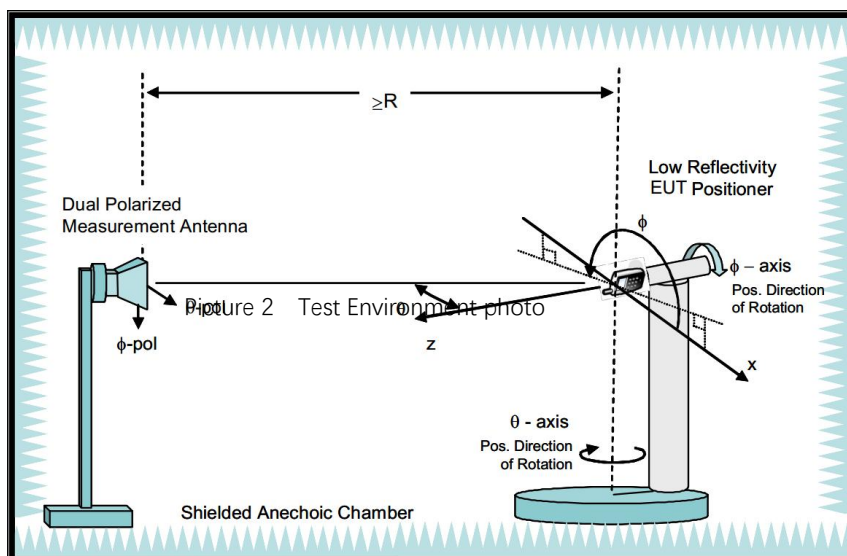
Carrier + LDS

3. Device Conditions



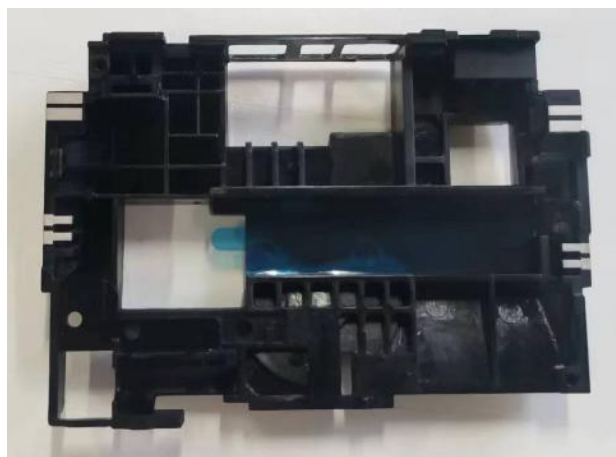
Picture1 X1-scanner Mobile phone photo

4. Test Environment



5. Antenna Test Results

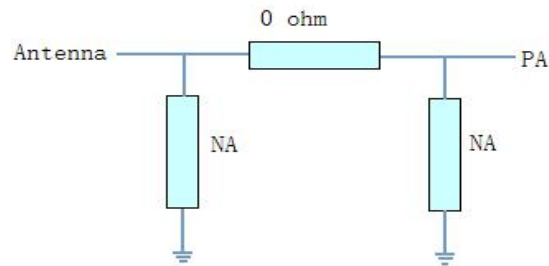
5.1 Antenna Photos



Picture 3 WIFI antenna photo

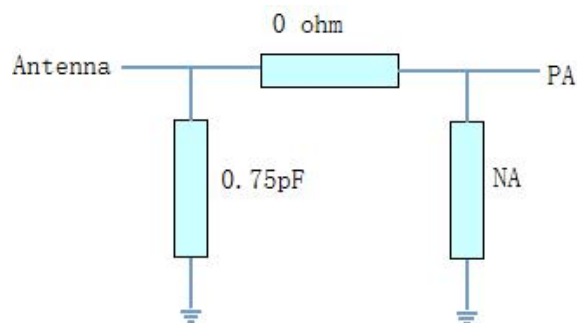
5.2 Matching Network

5.2.1 WIFI-ANT0 Antenna matching network



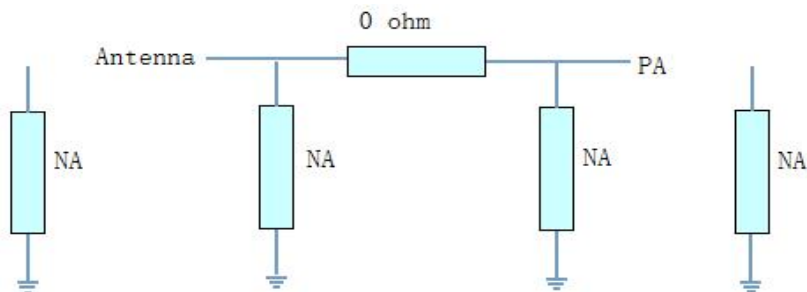
Picture 4 Matching network of WIFI-ANT0 antenna

5.2.2 WIFI-ANT1 Antenna matching network



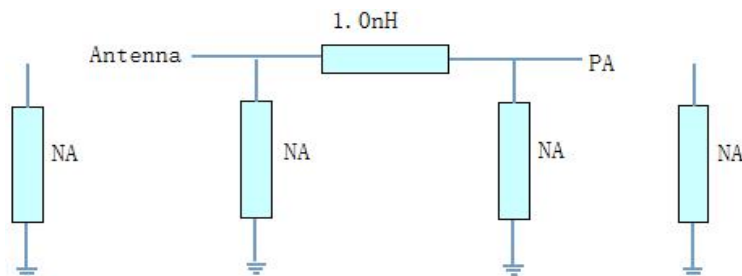
Picture 5 Matching network of WIFI-ANT1 antenna

5.2.3 WIFI-ANT2 Antenna matching network



Picture 6 Matching network of WIFI-ANT2 antenna

5.2.4 WIFI-ANT3 Antenna matching network

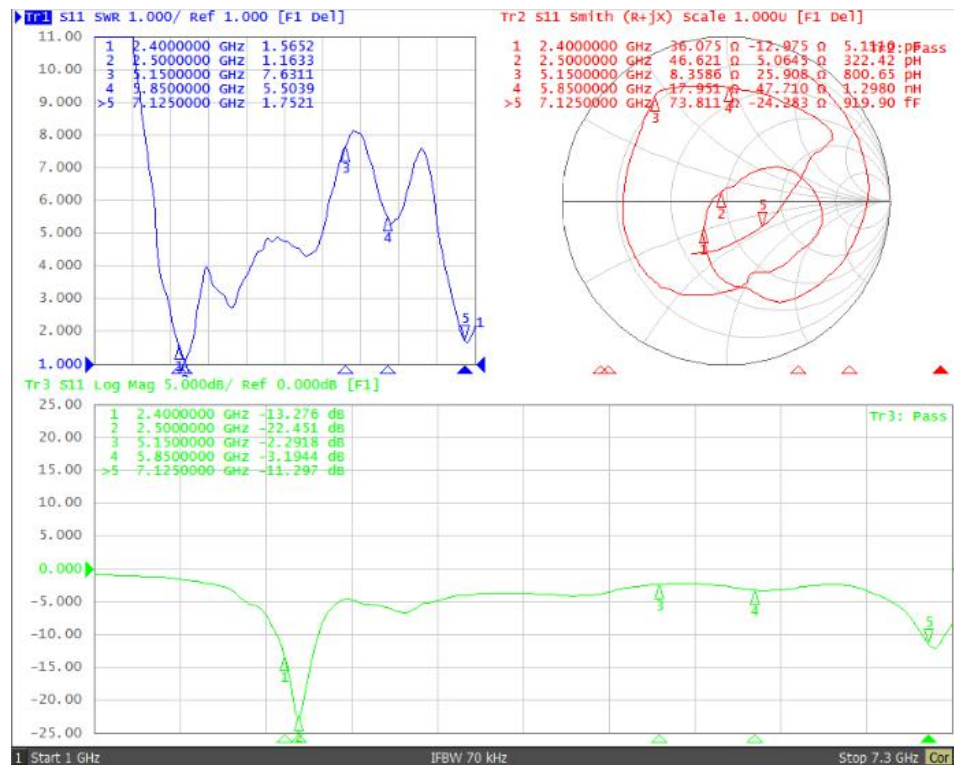


Picture 7 Matching network of WIFI-ANT3 antenna

5.3 Return Loss (S11)

5.3.1 WIFI-ANT0 Antenna Return Loss

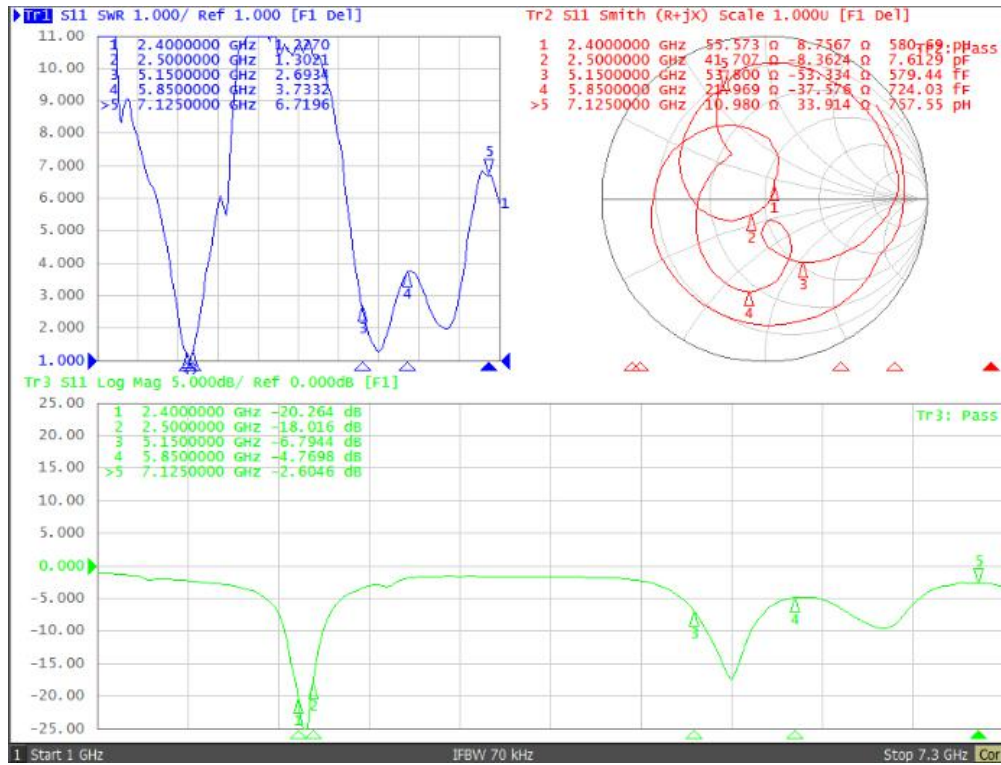
Frequency(MHz)	RL
2400	-13.27
2500	-22.45



Picture 8 Return Loss of WIFI-ANT0 antenna

5.3.2 WIFI-ANT1 Antenna Return Loss

Frequency(MHz)	RL
2400	-20.26
2500	-18.02

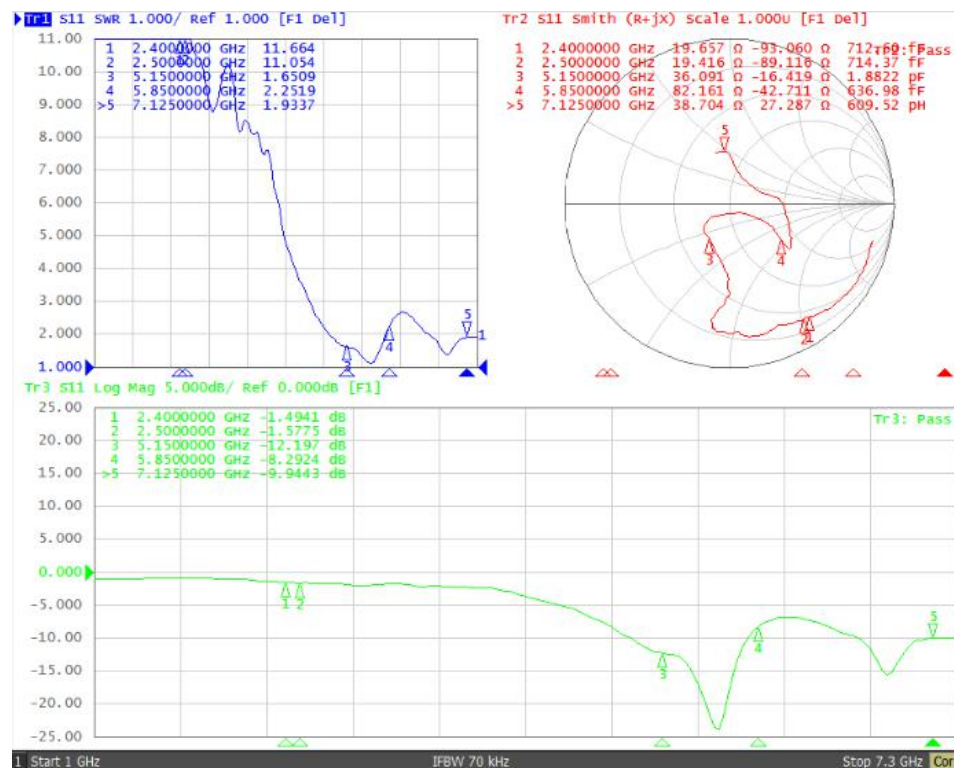


Picture 9 Return Loss of WIFI-ANT1 antenna



5.3.3 WIFI-ANT2 Antenna Return Loss

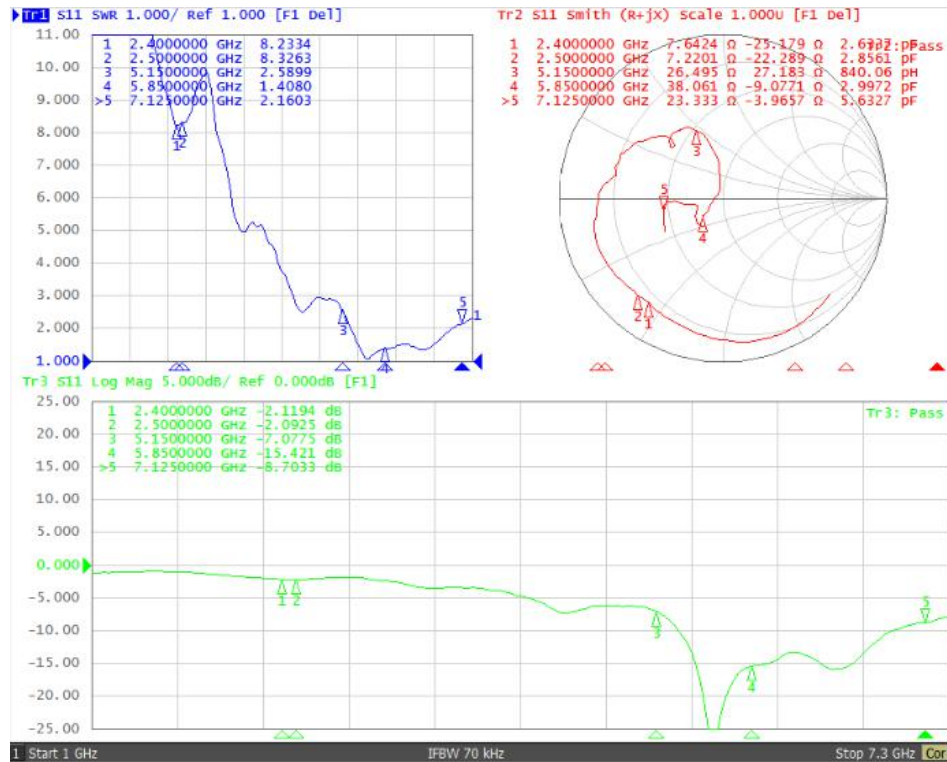
Frequency(MHz)	RL
5150	-12.19
5850	-8.29
7125	-9.94



Picture 10 Return Loss of WIFI-ANT2 antenna

5.3.4 WIFI-ANT3 Antenna Return Loss

Frequency(MHz)	RL
5150	-7.07
5850	-15.42
7125	-8.7



Picture 11 Return Loss of WIFI-ANT3 antenna

5.4 Efficiency & Gain

5.4.1 SISO – Antenna Max Gain

Antenna	Band	Max Gain
ANT0	WIFI2.4G Chain0/BT	0.27
ANT1	WIFI2.4G Chain1	0.27
ANT2	WIFI5G Chain0	0.68
	WIFI6E Chain0	1.35
ANT3	WIFI5G Chain1	0.76
	WIFI6E Chain1	1.2

5.4.2 MIMO – Antenna Max Gain

Scanner

Antenna	Band	Max Gain
ANT0+ANT1	WIFI2.4G MIMO	0.27
ANT2+QNT3	WIFI5G MIMO	0.72
ANT2+ANT3	WIFI6E MIMO	4.29

Wifi 2.4/5G MIMO

$$\text{Directional gain} = 10 \log \left[\frac{(10^{G_1/10} + 10^{G_2/10} + \dots + 10^{G_N/10})}{N_{\text{ANT}}} \right] \text{ dBi}$$

WIFI 6E MIMO

:

$$\text{Directional gain} = 10 \log \left[\frac{(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2}{N_{\text{ANT}}} \right] \text{ dBi}$$

5.4.3 WIFI-ANT0 Antenna Efficiency & Gain

Freq (MHz)	Avg. Gain	Peak. Gain
2400	-3.62	0.18
2410	-3.05	0.11
2420	-3.25	0.12
2430	-3.36	0.02
2440	-3.23	0.26
2450	-3.46	0.09
2460	-3.58	0.21
2470	-3.38	0.20
2480	-3.31	0.18
2490	-3.20	0.27
2500	-3.42	0.16

5.4.4 WIFI-ANT1 Antenna Efficiency & Gain

Freq (MHz)	Avg. Gain	Peak. Gain
2400	-3.42	0.27
2410	-3.59	-0.15
2420	-3.67	-0.36
2430	-3.27	0.04
2440	-3.55	0.13
2450	-3.57	0.07
2460	-3.46	0.25
2470	-3.79	-0.28
2480	-3.90	-0.39
2490	-3.61	-0.33
2500	-3.56	0.15

5.4.5 WIFI-ANT2 Antenna Efficiency & Gain

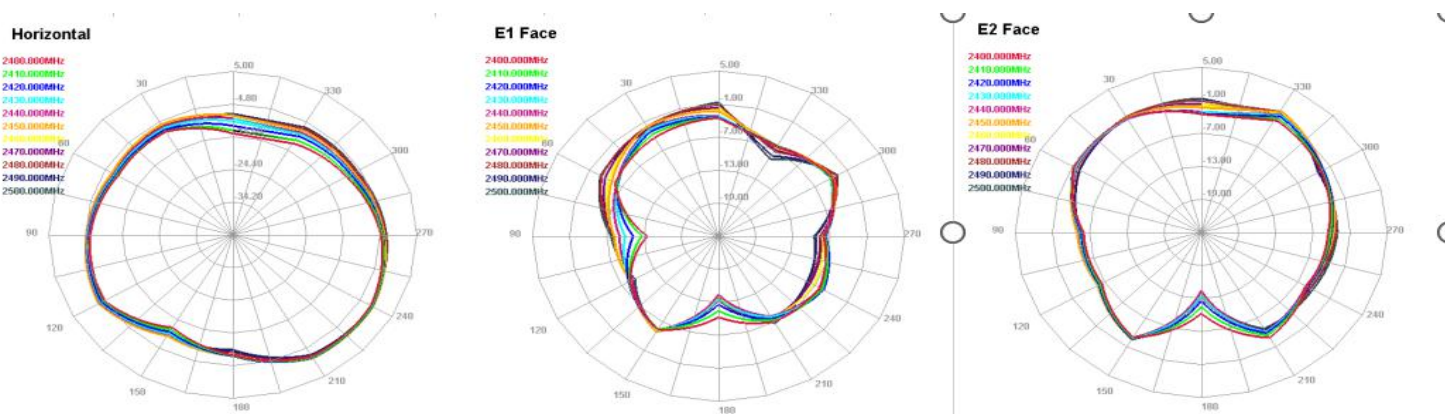
Freq (MHz)	Avg. Gain	Peak. Gain	Freq (MHz)	Avg. Gain	Peak. Gain
5100	-3.31	0.64	5900	-3.91	0.73
5150	-3.38	0.59	5950	-3.74	0.77
5200	-3.10	0.57	6000	-3.88	0.69
5250	-3.44	0.67	6050	-3.78	0.96
5300	-3.49	0.64	6100	-3.90	1.12
5350	-3.59	0.61	6150	-4.01	0.89
5400	-3.65	0.65	6200	-3.75	1.28
5450	-3.78	0.67	6250	-3.64	1.00
5500	-3.59	0.58	6300	-3.66	0.95
5550	-3.71	0.67	6350	-3.64	1.35
5600	-4.09	0.59	6400	-3.72	1.31
5650	-3.73	0.66	6450	-3.70	1.21
5700	-4.01	0.60	6500	-3.62	0.96
5750	-3.93	0.68	6550	-3.53	1.07
5800	-4.05	0.63	6600	-3.61	1.09
5850	-3.59	0.59	6650	-3.69	0.93
			6700	-3.74	1.07
			6750	-3.68	0.98
			6800	-3.61	1.08
			6850	-3.48	1.04
			6900	-3.40	1.30
			6950	-3.70	1.12
			7000	-4.02	1.21
			7050	-4.19	1.11
			7100	-4.09	1.09
			7150	-4.09	1.16

5.4.6 WIFI-ANT3 Antenna Efficiency & Gain

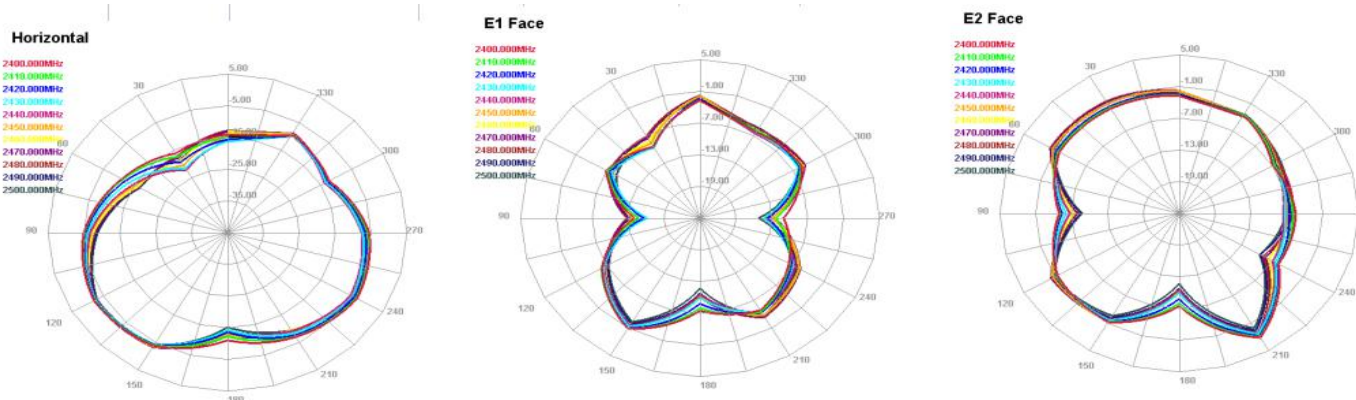
Freq (MHz)	Avg. Gain	Peak. Gain	Freq (MHz)	Avg. Gain	Peak. Gain
5100	-3.73	0.68	5900	-3.89	0.87
5150	-3.46	0.70	5950	-3.85	0.77
5200	-3.36	0.70	6000	-3.59	0.80
5250	-3.50	0.63	6050	-3.99	0.83
5300	-3.53	0.64	6100	-3.89	0.87
5350	-3.45	0.69	6150	-3.85	0.80
5400	-3.67	0.66	6200	-3.99	0.95
5450	-3.64	0.71	6250	-4.09	0.95
5500	-3.58	0.65	6300	-3.79	1.12
5550	-3.38	0.67	6350	-3.64	0.99
5600	-3.65	0.76	6400	-3.80	0.86
5650	-3.61	0.71	6450	-3.96	0.78
5700	-3.70	0.64	6500	-3.88	1.12
5750	-3.48	0.76	6550	-3.59	1.05
5800	-3.48	0.63	6600	-3.68	0.99
5850	-3.58	0.72	6650	-3.26	1.07
			6700	-3.48	1.18
			6750	-3.62	1.13
			6800	-3.88	1.19
			6850	-3.53	0.88
			6900	-3.59	0.78
			6950	-3.91	1.18
			7000	-3.73	1.02
			7050	-4.22	1.20
			7100	-4.23	1.07
			7150	-3.88	0.82

5.5 2D Radiation Pattern

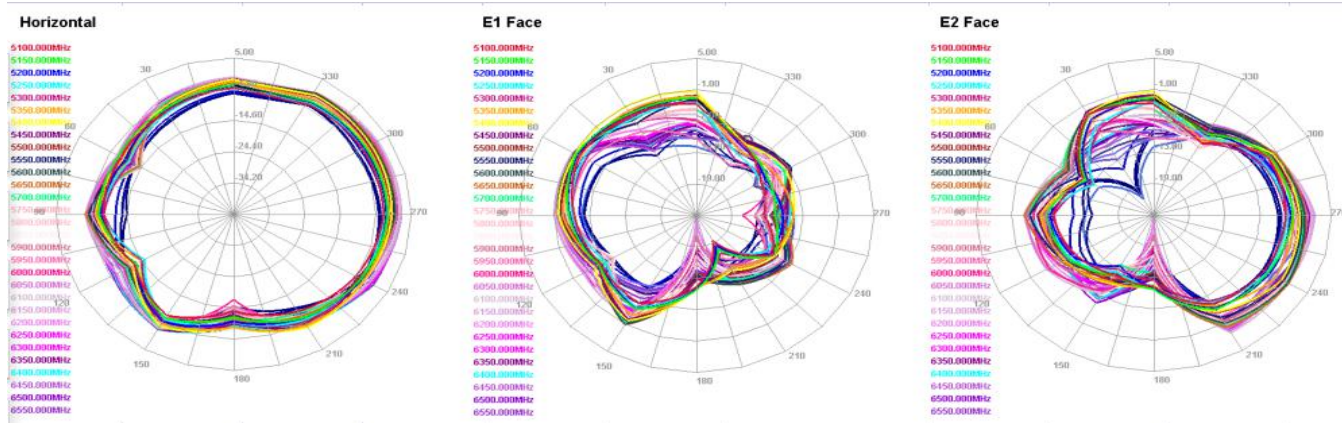
5.5.1 WIFI-ANT0 radiation pattern



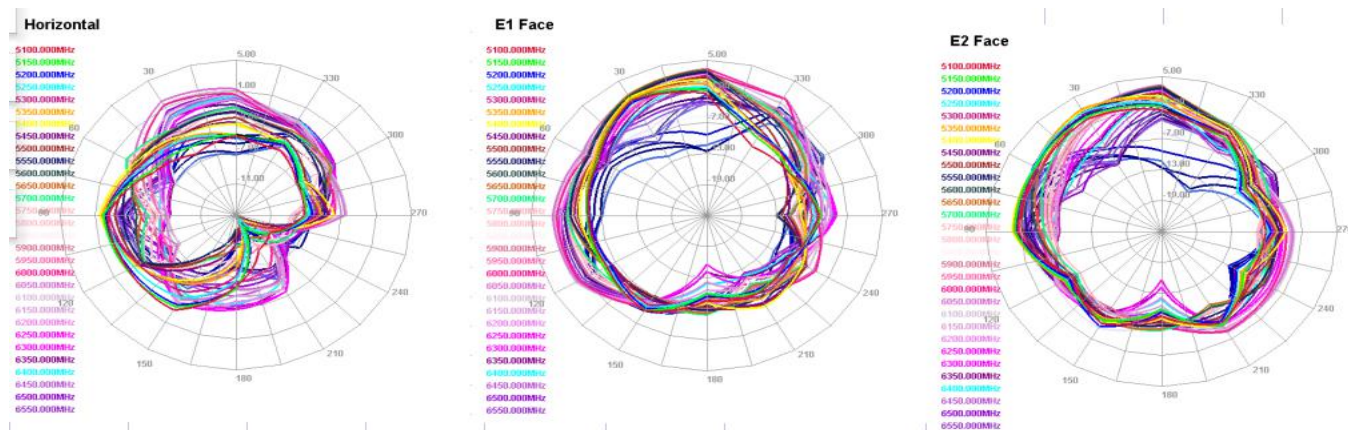
5.5.2 WIFI-ANT1 radiation pattern



5.5.3 WIFI-ANT2 radiation pattern



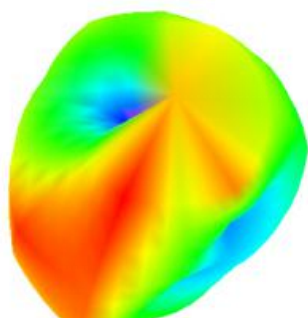
5.5.4 WIFI-ANT3 radiation pattern



5.6 3D Radiation Pattern

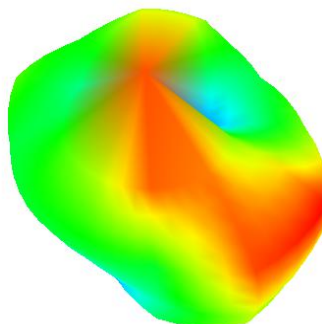
5.6.1 WIFI-ANT0 radiation pattern

2450.000MHz



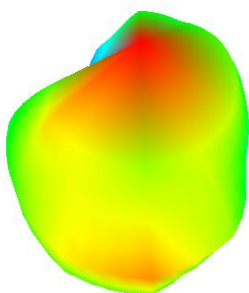
5.6.2 WIFI-ANT1 radiation pattern

2450.000MHz

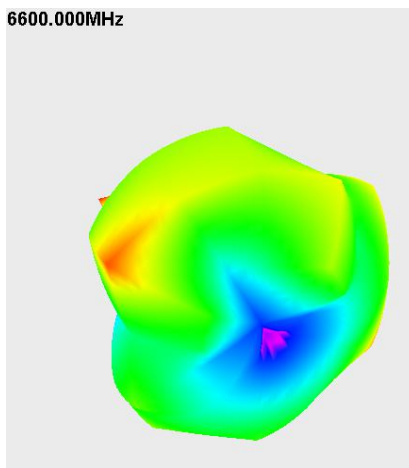


5.6.3 WIFI-ANT2 radiation pattern

5500.000MHz

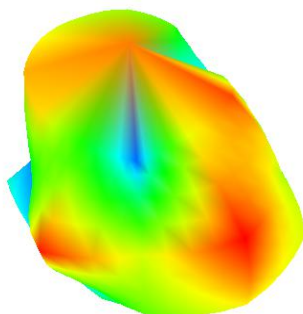


6600.000MHz

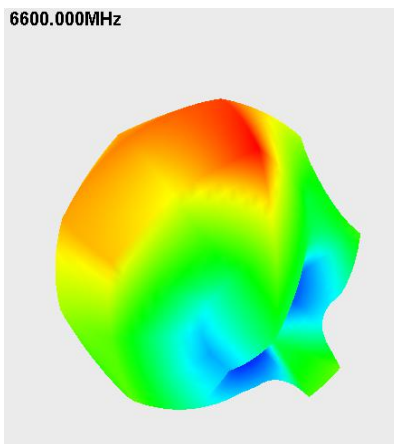


5.6.4 WIFI-ANT3 radiation pattern

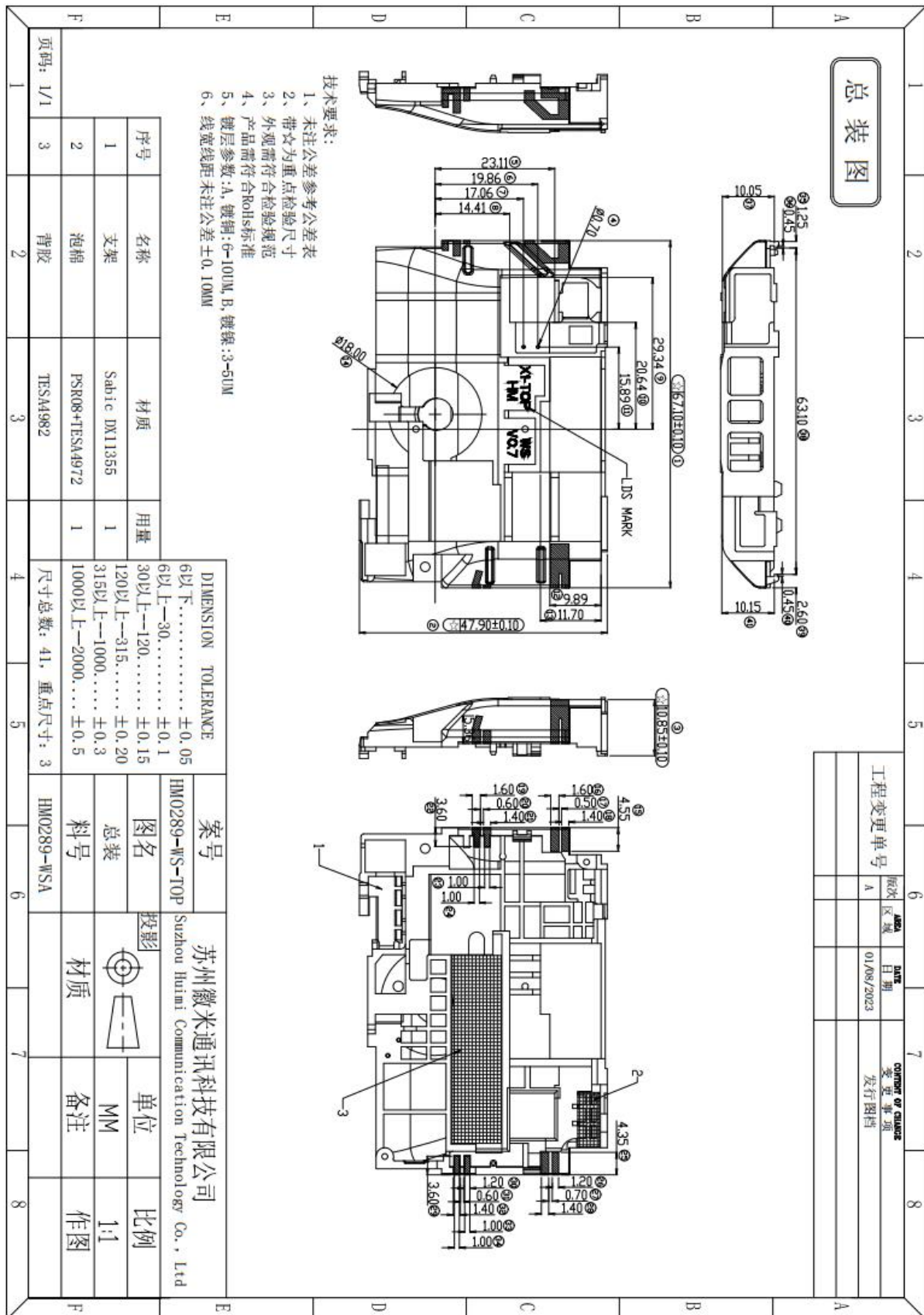
5550.000MHz



6600.000MHz



6. Mechanical Drawings



7. Dimension Report

苏州微米通讯科技有限公司 尺寸检验报告													
客户			T2			产品名称		X1 with Scanner		图纸版本号		A	
我司案号			HMM0289-W5			天线名称		TOP天线		测量日期		2023/8/2	
序号	尺寸性质	尺寸	公差		测量工具							OK/NG	备注
			上限	下限		1	2	3	4	5			
1	★	67.10	0.10	0.10	2.5D	67.09	67.08	67.10	67.13	67.10		OK	
2	★	47.90	0.10	0.10	2.5D	47.88	47.90	47.90	47.93	47.90		OK	
3	★	10.85	0.10	0.10	2.5D	10.81	10.83	10.85	10.89	10.83		OK	
4		0.70	0.05	0.05	2.5D	0.70	0.69	0.70	0.70	0.68		OK	
		0.70	0.05	0.05	2.5D	0.70	0.71	0.69	0.71	0.69		OK	
5		23.11	0.10	0.10	2.5D	23.07	23.11	23.13	23.14	23.10		OK	
6		19.86	0.10	0.10	2.5D	19.82	19.84	19.87	19.88	19.85		OK	
7		17.06	0.10	0.10	2.5D	17.02	17.06	17.06	17.09	17.06		OK	
8		14.41	0.10	0.10	2.5D	14.37	14.41	14.41	14.45	14.40		OK	
9		29.34	0.10	0.10	2.5D	29.30	29.33	29.35	29.37	29.32		OK	
10		20.64	0.10	0.10	2.5D	20.60	20.63	20.64	20.68	20.63		OK	
11		15.89	0.10	0.10	2.5D	15.85	15.89	15.91	15.92	15.87		OK	
12		9.89	0.10	0.10	2.5D	9.85	9.89	9.91	9.91	9.88		OK	
13		11.70	0.10	0.10	2.5D	11.66	11.68	11.70	11.73	11.69		OK	
14		18.00	0.10	0.10	2.5D	17.96	17.99	18.00	18.04	18.00		OK	
15		4.55	0.10	0.10	2.5D	4.51	4.55	4.56	4.57	4.53		OK	
16		1.60	0.10	0.10	2.5D	1.56	1.60	1.60	1.63	1.59		OK	
17		0.50	0.10	0.10	2.5D	0.49	0.49	0.52	0.53	0.50		OK	
18		1.40	0.10	0.10	2.5D	1.41	1.38	1.40	1.44	1.39		OK	
19		1.60	0.10	0.10	2.5D	1.60	1.58	1.62	1.62	1.60		OK	
20		0.60	0.10	0.10	2.5D	0.61	0.59	0.61	0.62	0.60		OK	
21		1.40	0.10	0.10	2.5D	1.37	1.39	1.42	1.44	1.38		OK	
22		3.60	0.10	0.10	2.5D	3.59	3.60	3.61	3.63	3.58		OK	
23		1.00	0.10	0.10	2.5D	0.99	1.00	1.00	1.04	1.00		OK	
24		1.00	0.10	0.10	2.5D	1.01	0.99	1.02	1.03	0.99		OK	
25		4.35	0.10	0.10	2.5D	4.31	4.34	4.37	4.38	4.35		OK	
26		1.20	0.10	0.10	2.5D	1.16	1.19	1.22	1.22	1.20		OK	
27		0.70	0.10	0.10	2.5D	0.68	0.69	0.71	0.72	0.70		OK	
28		1.40	0.10	0.10	2.5D	1.41	1.39	1.41	1.42	1.40		OK	
29		3.60	0.10	0.10	2.5D	3.61	3.60	3.61	3.63	3.58		OK	
30		1.20	0.10	0.10	2.5D	1.20	1.19	1.21	1.23	1.19		OK	
31		0.60	0.10	0.10	2.5D	0.60	0.59	0.62	0.63	0.59		OK	
32		1.40	0.10	0.10	2.5D	1.38	1.39	1.40	1.42	1.40		OK	
33		1.00	0.10	0.10	2.5D	1.01	1.02	0.99	1.01	0.99		OK	
34		1.00	0.10	0.10	2.5D	0.98	1.01	0.98	1.02	0.99		OK	
35		1.25	0.05	0.05	2.5D	1.24	1.27	1.25	1.26	1.23		OK	
36		0.45	0.05	0.05	2.5D	0.45	0.45	0.45	0.43	0.44		OK	
37		10.05	0.05	0.05	2.5D	10.04	10.06	10.05	10.05	10.05		OK	
38		63.10	0.10	0.10	2.5D	63.12	63.10	63.11	63.08	63.06		OK	
39		2.60	0.05	0.05	2.5D	2.60	2.61	2.60	2.58	2.60		OK	
40		0.45	0.05	0.05	2.5D	0.46	0.47	0.45	0.45	0.45		OK	
41		10.15	0.05	0.05	2.5D	10.16	10.14	10.14	10.13	10.15		OK	

8. CPK Report



CPK Report

Customer(客户)	T2		Vendor(供应商)	苏州微米通讯科技有限公司		
Part Number(料号)	HM0289-WS-TOP		Inspected(确认者)	孙泉		
Description(零件名称)	X1-with scanner		Inches/MM(英寸/毫米)	MM		
Revision(版本)	A		Date(日期)	2023/8/2		
Dim. Designator(尺寸序号)	1	2	3			
Nominal(公称尺寸)	67.10	47.90	10.85			
+ Tolerance(正公差)	0.10	0.10	0.10			
- Tolerance(负公差)	-0.10	-0.10	-0.10			
Upper Limit(规格上限)	67.20	48.00	10.95			
Lower Limit(规格下限)	67.00	47.80	10.75			
1	67.09	47.90	10.81			
2	67.12	47.92	10.84			
3	67.14	47.92	10.86			
4	67.09	47.95	10.88			
5	67.11	47.90	10.84			
6	67.08	47.88	10.87			
7	67.10	47.92	10.83			
8	67.09	47.88	10.86			
9	67.09	47.86	10.83			
10	67.09	47.88	10.81			
11	67.12	47.90	10.84			
12	67.13	47.93	10.86			
13	67.10	47.89	10.88			
14	67.11	47.93	10.84			
15	67.08	47.90	10.86			
16	67.13	47.91	10.84			
17	67.08	47.89	10.86			
18	67.11	47.91	10.85			
19	67.11	47.88	10.80			
20	67.12	47.91	10.84			
21	67.13	47.94	10.85			
22	67.10	47.88	10.87			
23	67.01	47.91	10.84			
24	67.09	47.90	10.81			
25	67.09	47.89	10.84			
26	67.06	47.86	10.84			
27	67.10	47.91	10.81			
28	67.12	47.90	10.82			
29	67.11	47.92	10.85			
30	67.10	47.88	10.90			
31	67.11	47.84	10.84			
32	67.09	47.90	10.87			
MAX	67.12	47.90	10.83			
MIN	67.01	47.84	10.80			
AVERAGE	67.10	47.90	10.85			
STDEV	0.02	0.02	0.02			
CP	1.42	1.44	1.45			
Cpk	1.41	1.44	1.38			
TOOLING(测量工具)	投影仪	投影仪	投影仪	投影仪	投影仪	投影仪

9. Reliability Test Report

 Suzhou Huimi Communication Technology Co., Ltd									
Reliability test report									
盐雾实验报告 Salt fog test Report									
客户名称	T2 Mobile			客户项目名称	X1-SCANNER WIFI天线				
报告日期	2023. 7. 31			微米项目名称	HM0289-WSA				
实验设备	Salt fog test machine 盐雾测试机								
试品种类	成品finished								
样品数量	4PCS								
检测项目	盐雾试验(判定标准:产品金属表面生锈面积小于0.5%) FPC/弹片/LDS等表面经擦拭后霉变. 锈蚀. 氧化. 发黑等异常消失则符合要求, 但不允许镀层脱落。。								
测试条件	1. 试验室温湿度: $35 \pm 2^{\circ}\text{C}$; >85%RH; 2. 压力桶温度: $47 \pm 1^{\circ}\text{C}$; 3. 盐水桶温度: $35 \pm 1^{\circ}\text{C}$; 4. 压力: $1 \pm 0.1 \text{ kgf}/\text{cm}^2$; 5. 喷雾量: $1-2 \text{ ml}/80 \text{ cm}^2/\text{hr}$; 6. PH值: 6.5-7.2 ml; 7. 盐水的浓度: $5 \pm 1\%$; 8. FPC/LDS等试验时间: 48H; 9. 弹片金属试验时间: 24H; 10. 样品不能射到烟雾直接喷射, 样品放置与垂直方向成 $15^{\circ}-30^{\circ}$, 并尽可能成 20° ; 11. 试验完成后将样品用清水冲洗干净, 立即用吹风机将样品吹干, 在常温干燥环境下放置2h以上后检查产品的外观。								
检测内容	1: 外观		依据《天线机构测试规范》进行测试/判定.						
	样品编号	01	02	03	04	备注			
	实验前	OK	OK	OK	OK	产品表面无异常现象			
	实验后	OK	OK	OK	OK	产品表面经擦拭后无异常现象			
	2: 机构		依据《天线机构测试规范》进行测试/判定.						
	项 目	规格	公差	实测值		检测工具	判定	备注	
	拉力(kgf)	N/A							
	扭力(kgf)	N/A							
	跌 落	N/A							
	3: 尺寸		依据《天线机构测试规范》进行测试/判定.						
A尺寸	规格	公差	实 测 值		检测工具	判定	备注		
N/A									
图片对比					实验后				
测试结果	检测结果/说明: 经盐雾试验后, 产品表面无镀层脱落现象, 测试符合要求								

 Suzhou Huimi Communication Technology Co., Ltd									
Reliability test									
高温高湿实验报告 High Temperature and Humidity test Report									
客户名称	T2 Mobile			客户项目名称	X1-SCANNER WIFI天线				
报告日期	2023. 7. 31			微米项目名称	HM0289-WSA				
实验设备	Temperature&humidity machine 恒温恒湿机								
试品种类	成品finished								
样品数量	4PCS								
检测项目	高温高湿(判定标准: 产品表面无变色、起泡、油漆脱落等异常, 附着力测试达3B以上时为合格。(3B:脱落占总面积5%-15%之间)								
测试条件	温度: $60^{\circ}\text{C} \pm 2^{\circ}\text{C}$; 湿度: $93\% \pm 2\% \text{RH}$; 时间: 48H ; 试验完成后在常温环境下放置2 h以上后检查产品外观, 并测试油漆的附着力。								
检测内容	1: 外观	依据《天线机构测试规范》进行测试/判定.							
	样品编号	01	02	03	04				备注
	实验前	OK	OK	OK	OK				
	实验后	OK	OK	OK	OK				
	2: 机构	依据《天线机构测试规范》进行测试/判定.							
	项 目	规格	公差	实 测 值			检测工具	判定	备注
	拉力(kgf)	N/A							
	扭力(kgf)	N/A							
	跌 落	N/A							
	3: 尺寸	依据《天线机构测试规范》进行测试/判定.							
A尺寸	规格	公差	实 测 值			检测工具	判定	备注	
N/A									
图片对比	实验前 				实验后 				
测试结果	检测结果/说明: 经高温高湿试验后, 产品按照测试标准判定OK。								

10. Packing Method

苏州微米通讯科技有限公司									
包装作业规范									
客户	T2	产品名称	HM0289-W5-TOP	料号	HM0289-W5A	修订	0	制定日期	2023/8/2
包装材料明细			图示说明						
编号	品名	规格							
1	泡壳	410*310							
2	纸箱	430*300							