Antenna Testing Report

Customer：Shenzhen sangge'er Polytron Technologies Inc

Project Name：MS2

Antenna Manufacturer: Sunnyway Technology(CHINA)

Address：The 6th floor, Building 5, Nantaiyun Innovation Valley Center, Guangming District, Shenzhen City

Report version： Jan 31th, 2024 A0
Research staff： Yang Jie

Record

Version	Report date	Remark
A0	2024.01.31	Antenna test report
A1		
A2		
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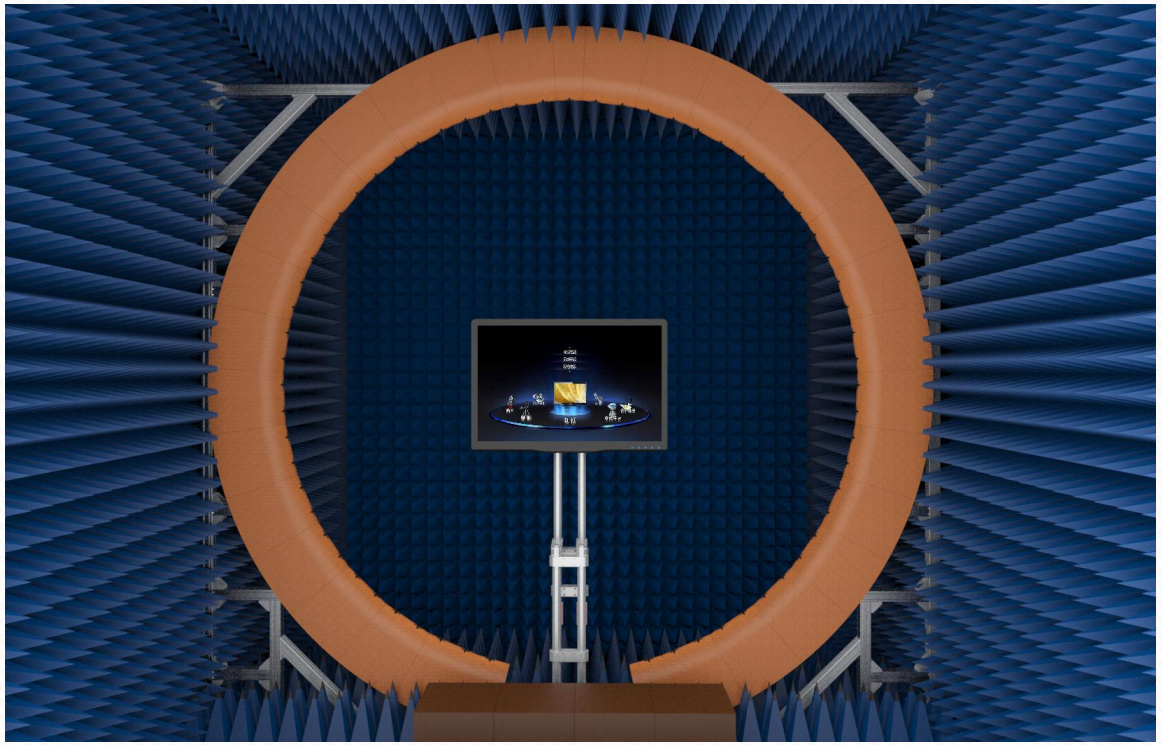
Contents

Project Overview

Prototype status	Debugging machine	Project pictures
Device type	POS machine	
Number of antennas	Main antenna; diversity antenna; three-in-one antenna NFCantenna	
Frequency band	MIAN LTE B1/2/3/4/5/7/8/12/14/17/25/26/38/40/41/66	
	NFC (13.56MHz)	
	WIFI 802.11 a/b/g/n+GPS/BT	
Structural style	FPC	
Environment adjustment	No change	
Matching modification	No change	

Equipment List



The industry's top 64 sensors OTA chamber

Frequency range: 400MHz-11GHz

Device Llimitation: 2M

Load-bearing limitation:100KG

Equipments Items	Total Quantity	Quantity for Shanghai R&D	Quantity for Shenzhen R&D	Quantity for ChongQing R&D
OTA chamber	10	4	5	1
5G Tester（SP9500-CTS）	3	1	1	1
R&S Tester（high configuration CMW500）	6	3	2	1
Japan Anritsu Tester（Dual Channel 8820）	4	2	2	--
NB-IoT Tester (SP8315)	3	1	1	1
Agilent Tester（8960）	9	4	4	--
Agilent Network Analyzer（E5062A）	7	3	3	1
Agilent Network Analyzer（E5071C 8.5GHZ ）	11	5	5	1
Agilent Network Analyzer（E5071B 8.5GHZ ）	7	3	3	1
R&S Network Analyzer（ZND）	9	4	4	1
R&S Network Analyzer（ZVB）	3	1	1	1
OTA head hand / ear hand / arm hand	5	2	2	1
GPS/WIFI active test equipment	5	2	2	1

antenna matching circuitl

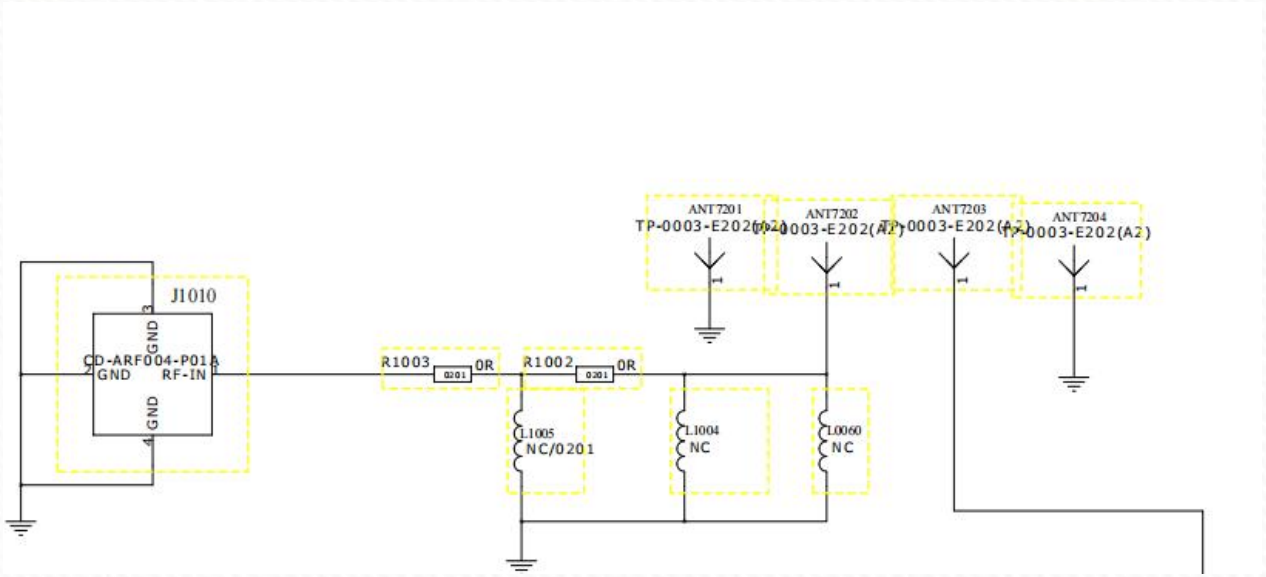
Main antenna ：

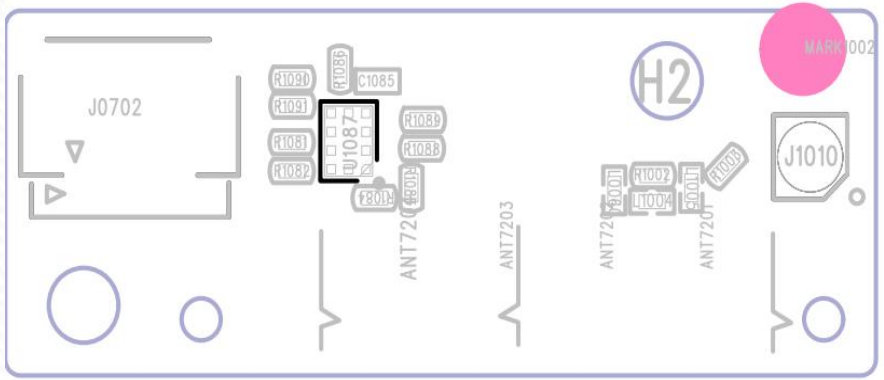
Main feeder

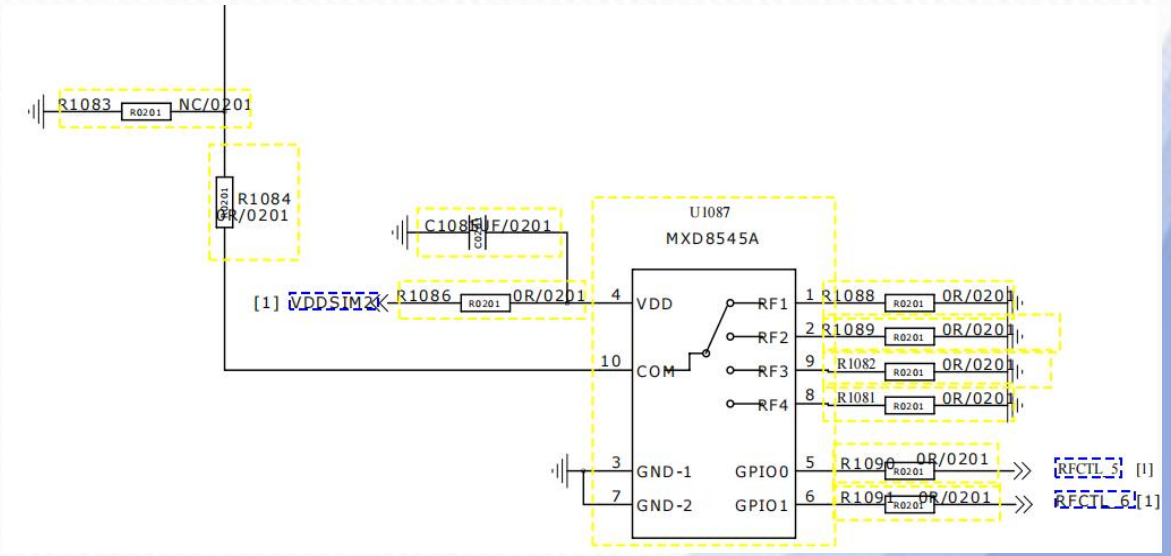
Element	Value
R1002	0 Ω
L1004	N/A
1005	N/A
1006	8.2NH

Switch feeder

Element	Value
R1088	0 Ω
R1089	N/A
R1081	N/A
R1082	N/A



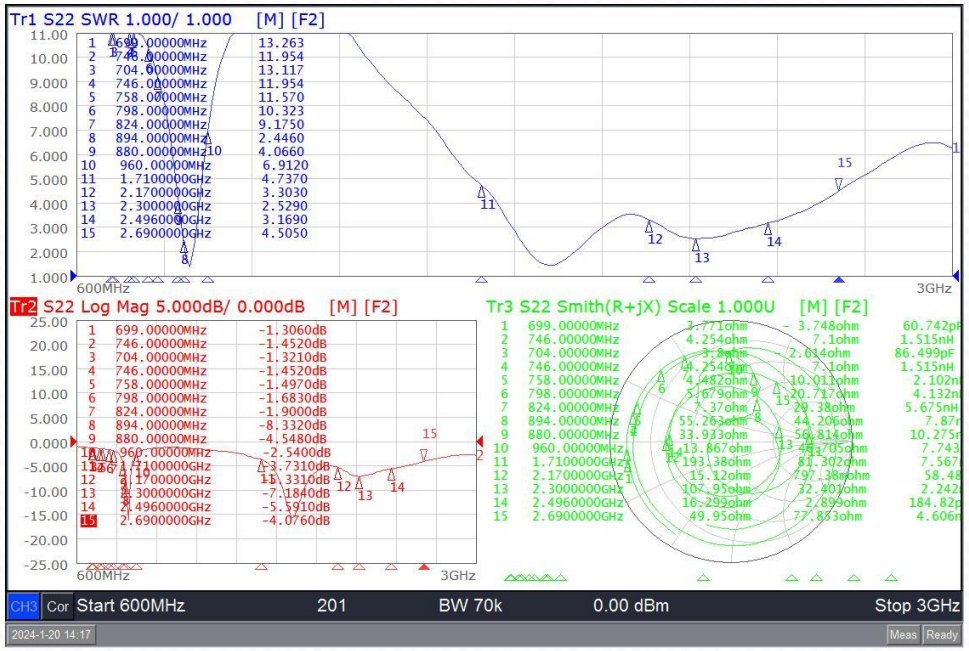




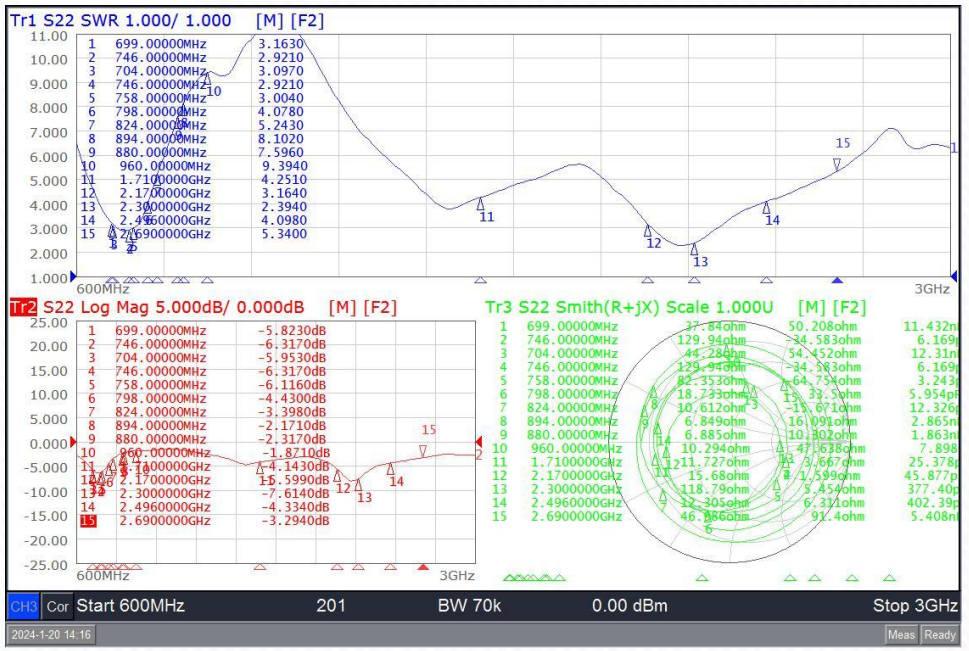
Diversity antenna data

MAIN-ANT

RF1



RF2



switching logic：
RF1:LTE B1/2/3/7/8/25/38/40/41 WCDMA B1/2/8 GSM900/1800/1900
RF2:LTE B4/5/12/14/17/26 WCDMA B5 GSM850

Main antenna efficiency and gain

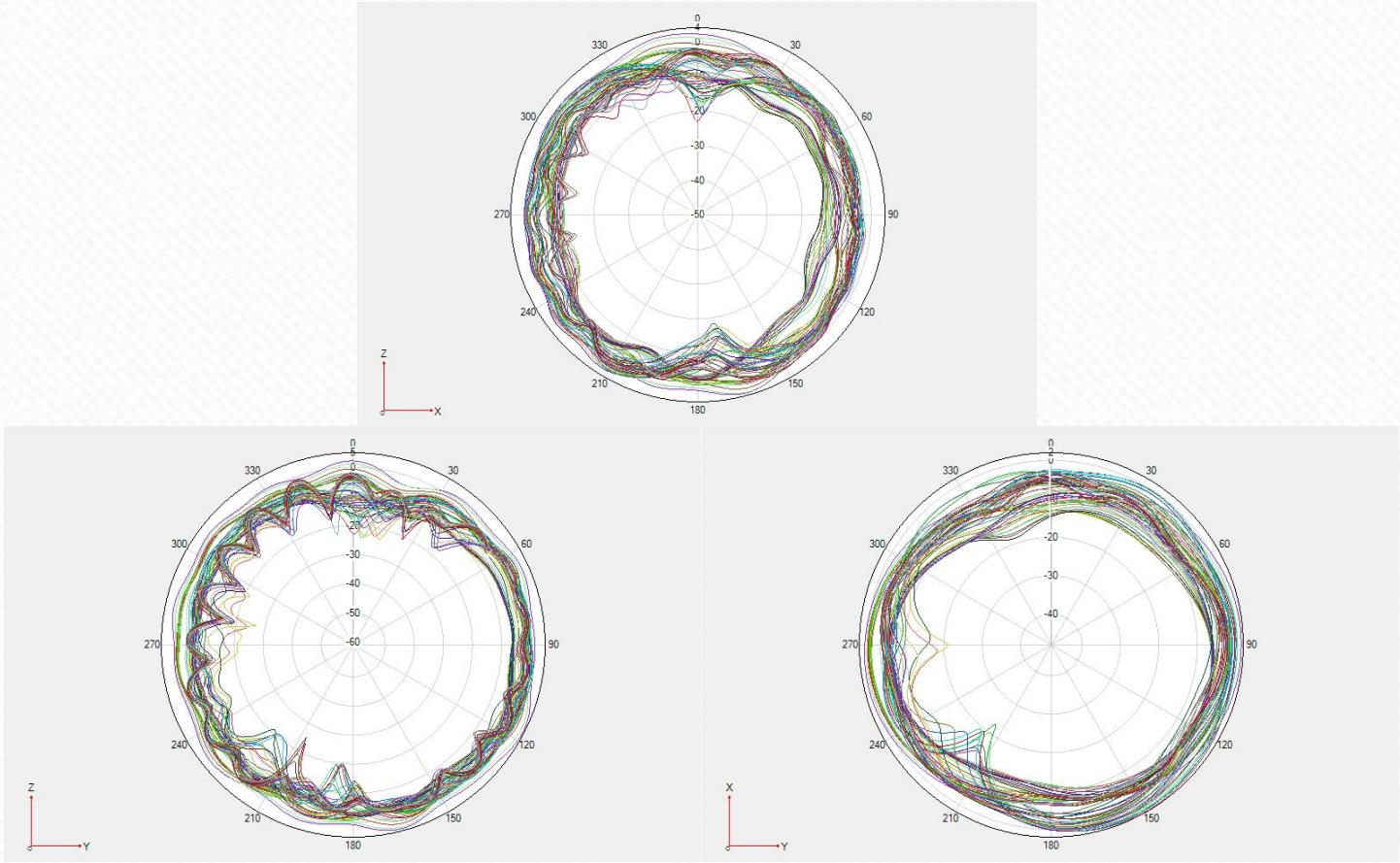
Frequency/Mhz	Efficiency/%	MaxGain/dBi		Frequency/Mhz	Efficiency/%	MaxGain/dBi
700	10.77	-10.57		1710	28.61	-1.77
710	12.35	-9.45		1745	30.26	-1.96
720	14.06	-8.52		1780	32.81	-1.57
730	17.26	-7.63		1815	32.52	-0.65
740	21.98	-6.58		1850	32.23	0.29
750	26.36	-5.79		1885	31.8	0.23
760	31.26	-5.05		1920	29.98	0.6
770	33.19	-4.79		1955	24.57	0.81
780	33.65	-4.73		1990	21.52	0.39
790	34.75	-4.59		2025	19.7	0.23
800	30.06	-5.22		2060	21.29	0.69
810	26.12	-5.83		2095	23.83	1.01
820	24.72	-6.07		2130	24.27	0.31
830	22.96	-6.39		2165	26.37	0.72
840	20	-6.99		2200	23.1	1.02
850	18.45	-7.34		2235	22.95	0.83
860	16.52	-7.82		2270	26.68	0.59
870	14.42	-8.41		2305	23.97	0.93
880	11.91	-9.24		2340	22.37	0.52
				2375	23.24	0.62
				2410	23.68	0.07
884	27.66	-1.33		2445	28.48	-0.43
894	26.38	-1.27		2480	25.59	-0.47
904	25.66	-1.35		2515	23.95	-0.12
914	23.51	-1.42		2550	23.7	0.05
924	21.63	-1.78		2585	23.21	-0.1
934	20.28	-1.89		2620	18.98	0.48
944	18.36	-2.01		2655	18.42	0.64
954	15.55	-2.56		2690	17.1	1.14

Main antenna OTA test data

Item	Measurement	Band	Total
1	TRP	FDD_B1	18.39
2	TRP	FDD_B1	17.89
3	TRP	FDD_B1	17.36
4	TIS	FDD_B1	-93.36
5	TRP	FDD_B2	16.23
6	TRP	FDD_B2	17.65
7	TRP	FDD_B2	17.76
8	TIS	FDD_B2	-90.22
9	TRP	FDD_B3	14.32
10	TRP	FDD_B3	14.51
11	TRP	FDD_B3	14.71
12	TIS	FDD_B3	-94.05
13	TRP	FDD_B4	14.35
14	TRP	FDD_B4	14.09
15	TRP	FDD_B4	13.82
16	TIS	FDD_B4	-88.36
17	TRP	FDD_B5	14.22
18	TRP	FDD_B5	14.28
19	TRP	FDD_B5	14.85
20	TIS	FDD_B5	-89.41
21	TRP	FDD_B7	18.96
22	TRP	FDD_B7	17.98
23	TRP	FDD_B7	17.17
24	TIS	FDD_B7	-90.57
25	TRP	FDD_B8	14.2
26	TRP	FDD_B8	15.3
27	TRP	FDD_B8	14.97
28	TIS	FDD_B8	-88.61
29	TRP	FDD_B12	16.3
30	TRP	FDD_B12	16.56
31	TRP	FDD_B12	16.48
32	TIS	FDD_B12	-90.22

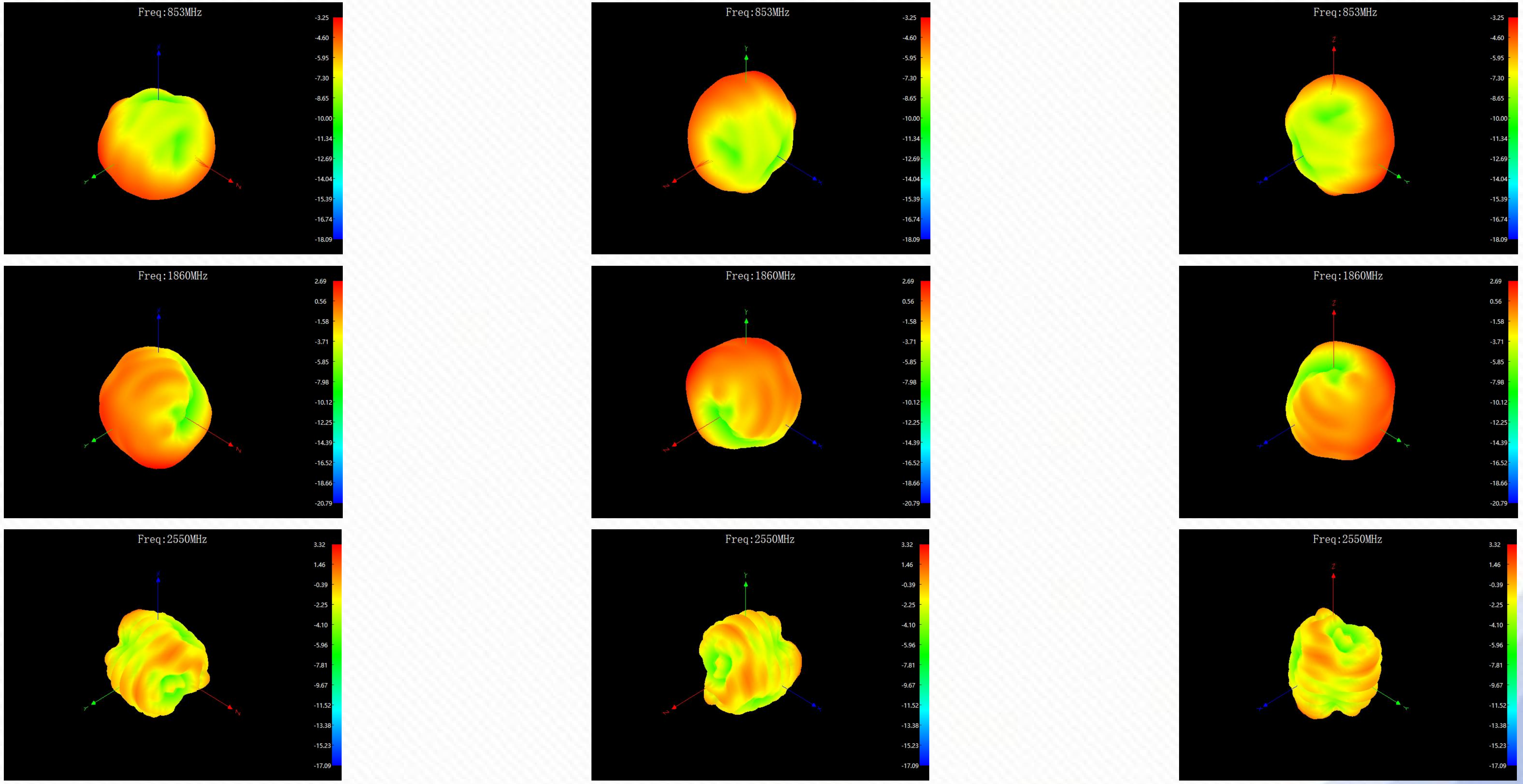
Item	Measurement	Band	Total
29	TRP	FDD_B14	16.54
30	TRP	FDD_B14	16.88
31	TRP	FDD_B14	15.96
32	TIS	FDD_B14	-89.76
33	TRP	FDD_B17	16.35
34	TRP	FDD_B17	16.52
35	TRP	FDD_B17	16.44
36	TIS	FDD_B17	-92.15
37	TRP	FDD_B25	17.12
38	TRP	FDD_B25	17.67
39	TRP	FDD_B25	17.65
40	TIS	FDD_B25	-91.88
41	TRP	FDD_B26	15.05
42	TRP	FDD_B26	14.9
43	TRP	FDD_B26	14.28
44	TIS	FDD_B26	-91.9
45	TRP	TDD_B38	15.98
46	TRP	TDD_B38	16.6
47	TRP	TDD_B38	16.82
48	TIS	TDD_B38	-78.33
49	TRP	TDD_B40	17.72
50	TRP	TDD_B40	18.42
51	TRP	TDD_B40	17.92
52	TIS	TDD_B40	-76.14
53	TRP	TDD_B41	14.57
54	TRP	TDD_B41	14.77
55	TRP	TDD_B41	14.24
56	TIS	TDD_B41	-82.06

Main antenna Directional pattern



Main antenna Directional pattern

SUNNYWAY



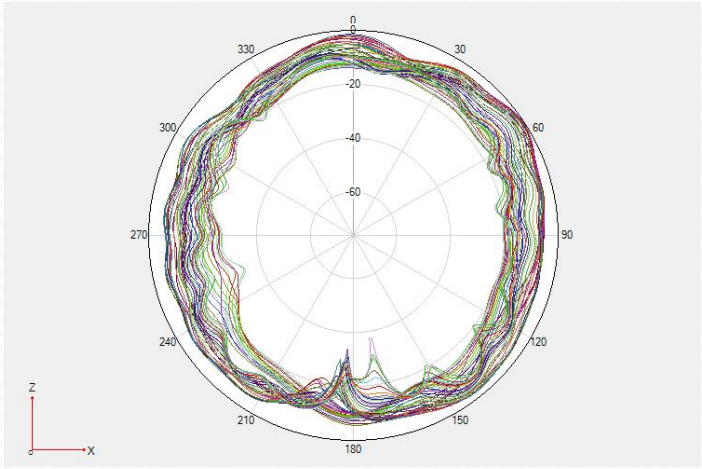
Diversity antenna data

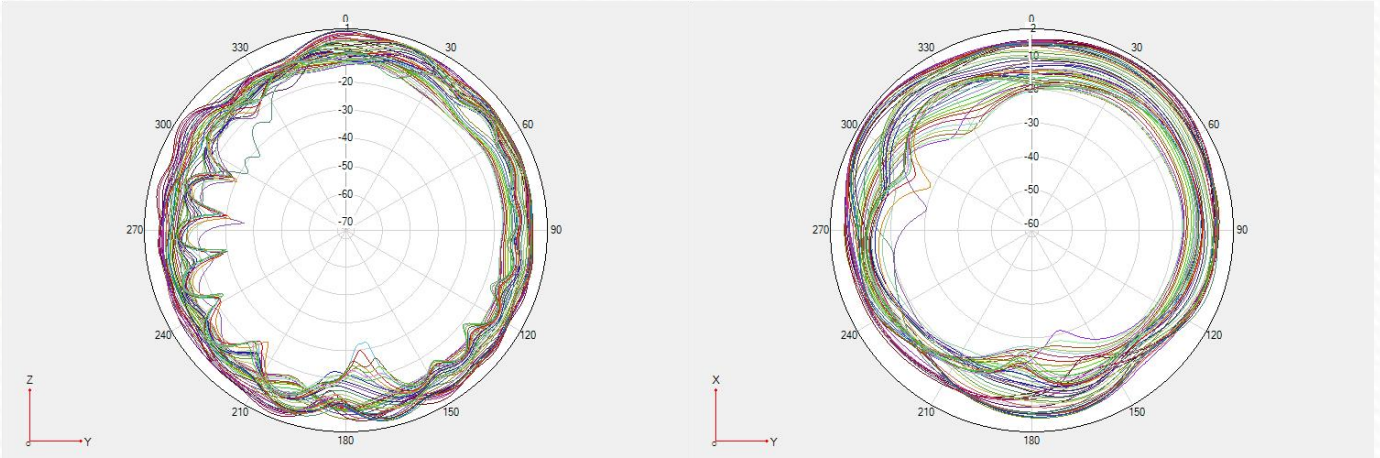
S11-VSWR

Diversity antenna efficiency and gain

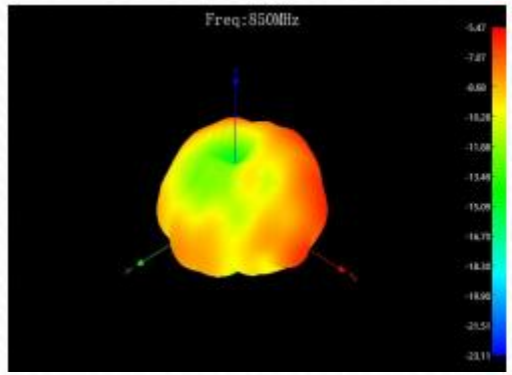
Freq	Effi	Gain	Freq	Effi	Gain	Freq	Effi	Gain
(MHz)	(%)	(dBi)	(MHz)	(%)	(dBi)	(MHz)	(%)	(dBi)
840	5.47	-12.12	1700	22.39	-0.03	2300	23.5	0.88
850	6.29	-11.32	1720	26	0.18	2320	26.24	1.26
860	7.82	-8.56	1740	27.73	0.63	2340	26	1.34
870	10.03	-6.98	1760	28.31	1.11	2360	29.04	2.37
880	12.18	-5.85	1780	29.24	0.96	2380	27.16	2.43
890	13.28	-5.35	1800	27.04	0.46	2400	25.7	2.42
900	13.5	-5.46	1820	25.88	0.44	2420	22.18	1.72
910	11.69	-6.46	1840	25	0.53	2440	22.08	1.37
920	10.1	-7.46	1860	22.08	-0.36	2460	20.18	0.63
930	8.74	-8.24	1880	19.54	-1.22	2480	20.75	0.59
940	8.19	-8.51	1900	18.32	-1.17	2500	19.19	0.39
950	7.55	-9.04	1920	17.66	-1.06	2520	18.2	0.69
960	6.82	-10.16	1940	16.44	-2	2540	15.49	0.35
			1960	15.89	-2.38	2560	13.87	0.06
			1980	14.79	-2.3	2580	10.59	-0.93
			2000	14.13	-2.04	2600	8.55	-1.95
			2020	12.33	-2.41	2620	6.71	-3.29
			2040	11.99	-2.19	2640	5.78	-4.22
			2060	12.22	-1.96	2660	4.46	-5.62
			2080	12.97	-1.9	2680	4.18	-6.08
			2100	11.91	-2.54	2700	3.53	-7.01
			2120	12.94	-2.03			
			2140	13.74	-1.77			
			2160	14.06	-1.53			
			2180	15.14	-1.04			

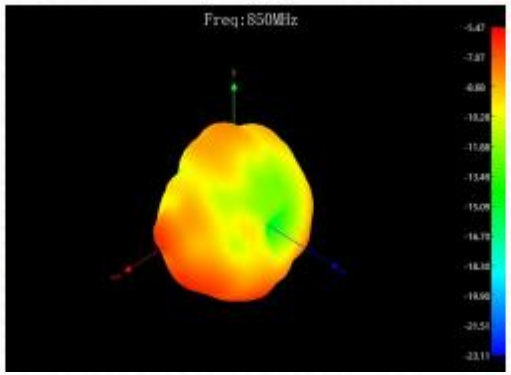
Directional pattern Directional pattern

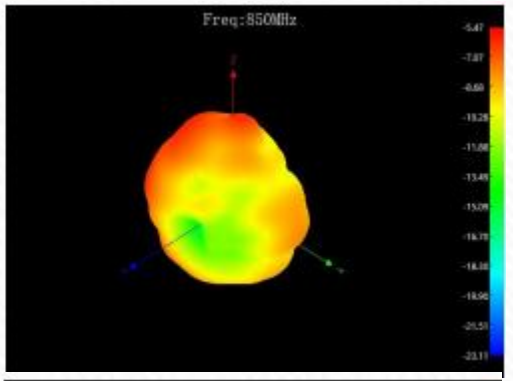


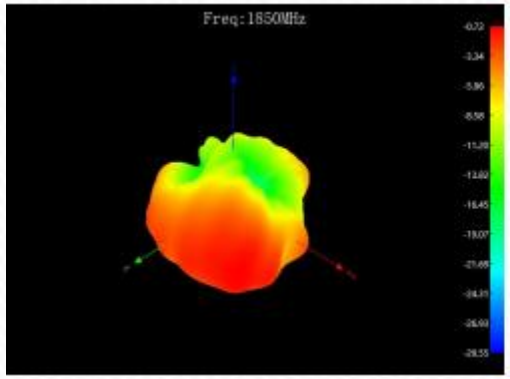


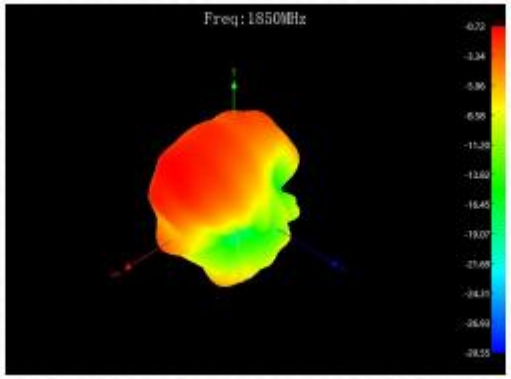
Directional pattern Directional pattern

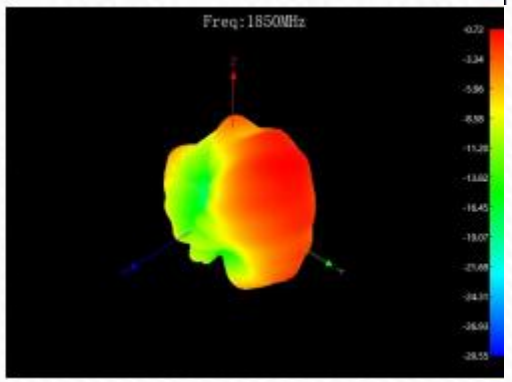


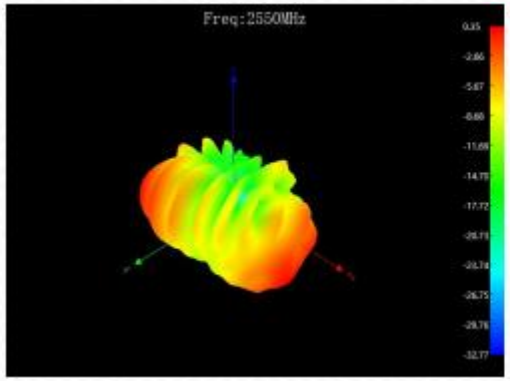


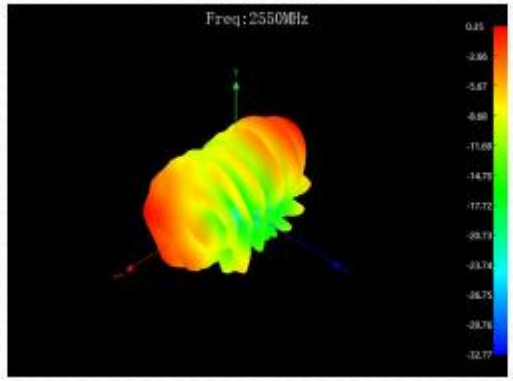


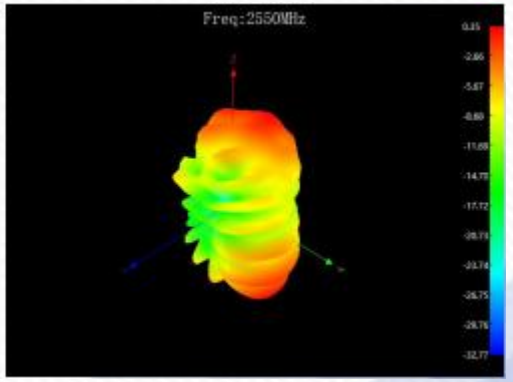






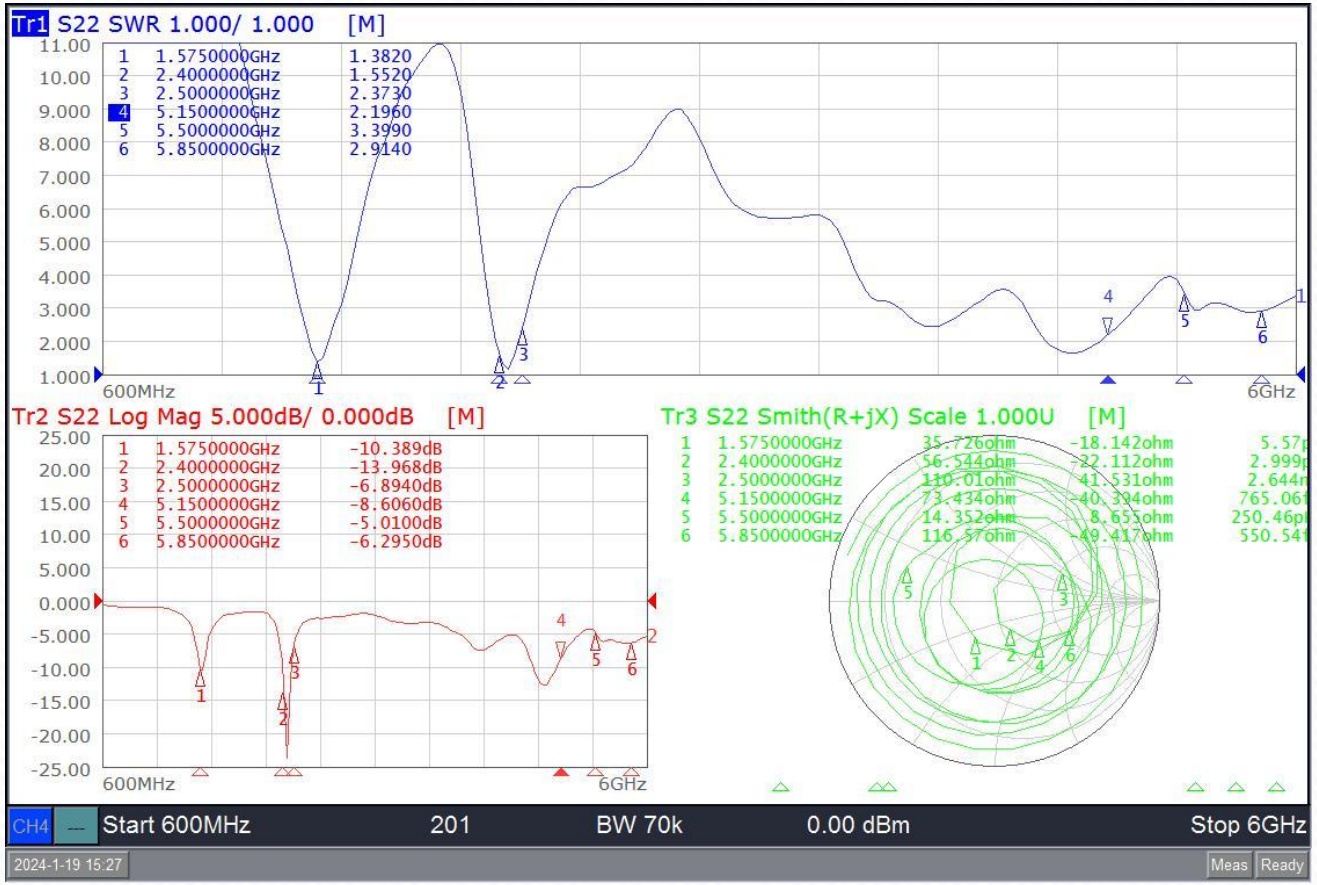






Three-in-one antenna

S11-VSWR



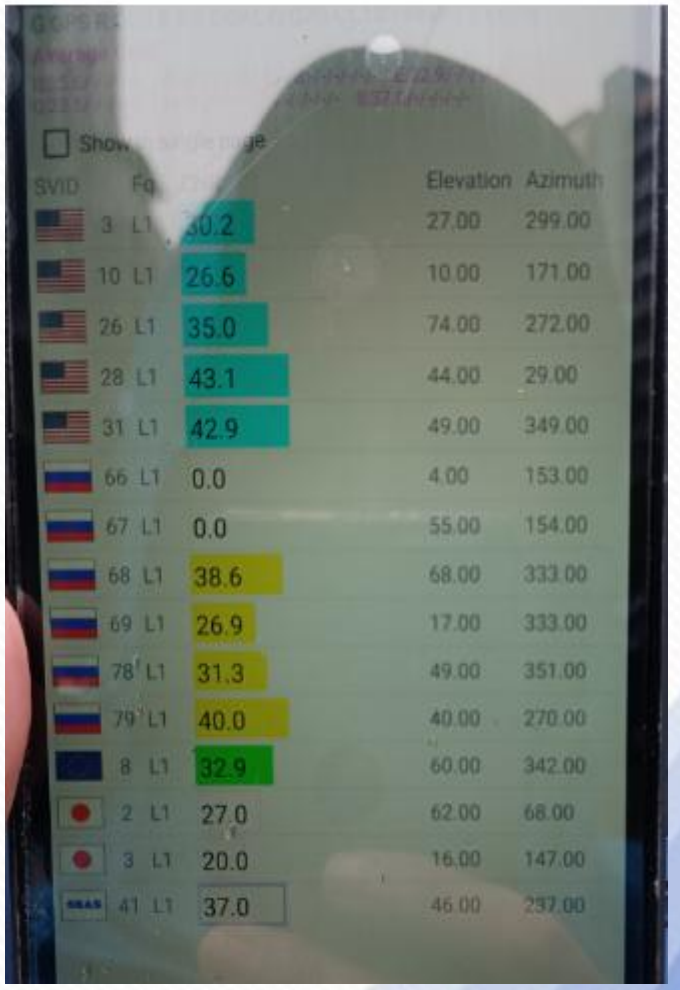
Three-in-one antenna efficiency and gain

Freq (MHz)	Effi (%)	Gain (dBi)	Freq (MHz)	Effi (%)	Gain (dBi)	Freq (MHz)	Effi (%)	Gain (dBi)
1565	36.98	1.55	2400	30.71	1.6	5150	31.18	1.02
1570	36.59	1.57	2410	33.61	-0.19	5200	30.84	0.09
1575	37.07	1.69	2420	35.31	0.64	5250	31.63	0.17
1580	36.02	1.76	2430	36.62	0.57	5300	32.8	0.23
1585	34.9	1.75	2440	36.99	1.24	5350	31.04	0.18
1590	32.93	1.68	2450	38.31	1.4	5400	32.39	0.14
			2460	37.4	1.9	5450	33.77	1.44
			2470	37.73	1.5	5500	31.05	2.01
			2480	37.89	1.78	5550	35.09	1.75
			2490	36.36	1.45	5600	35.27	1.98
			2500	34.06	1.55	5650	36.78	2.04
						5700	37.27	2.65
						5750	35.36	2.75
						5800	32.58	2.87
						5850	33.19	2.66

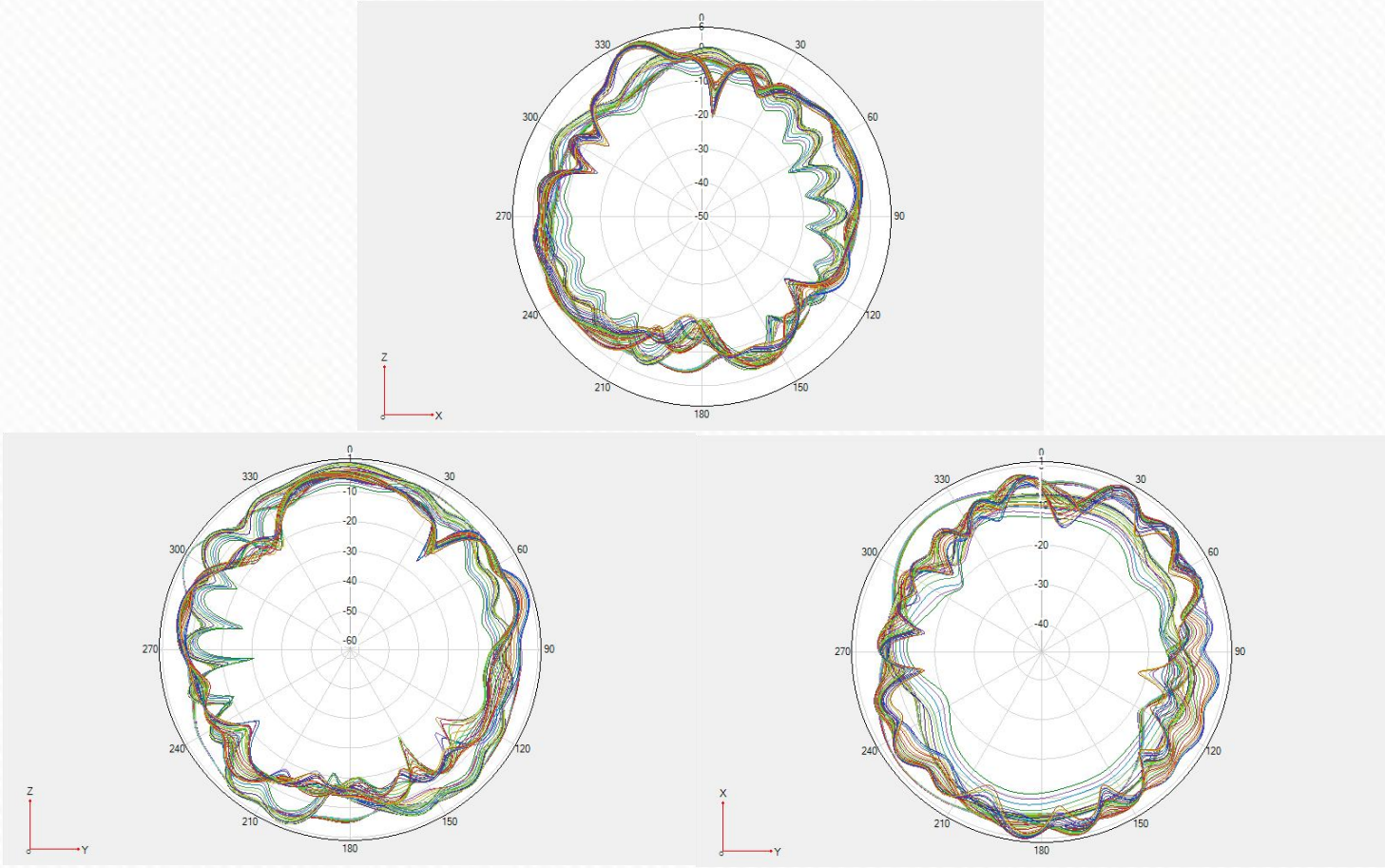
WIFI antenna OTA data

Item	Measurement	Band	Channel	Total
1	TRP	WIFI_B (1M)	1	10.56
2	TRP	WIFI_B (1M)	7	11.53
3	TRP	WIFI_B (1M)	11	10.72
4	TIS(EIRP)	WIFI_B (11M)	11	-80.2
5	TRP	WIFI_A (6M)	36	7.82
6	TRP	WIFI_A (6M)	149	7.86
7	TRP	WIFI_A (6M)	165	7.78
8	TIS(EIRP)	WIFI_A (54M)	165	-71.33

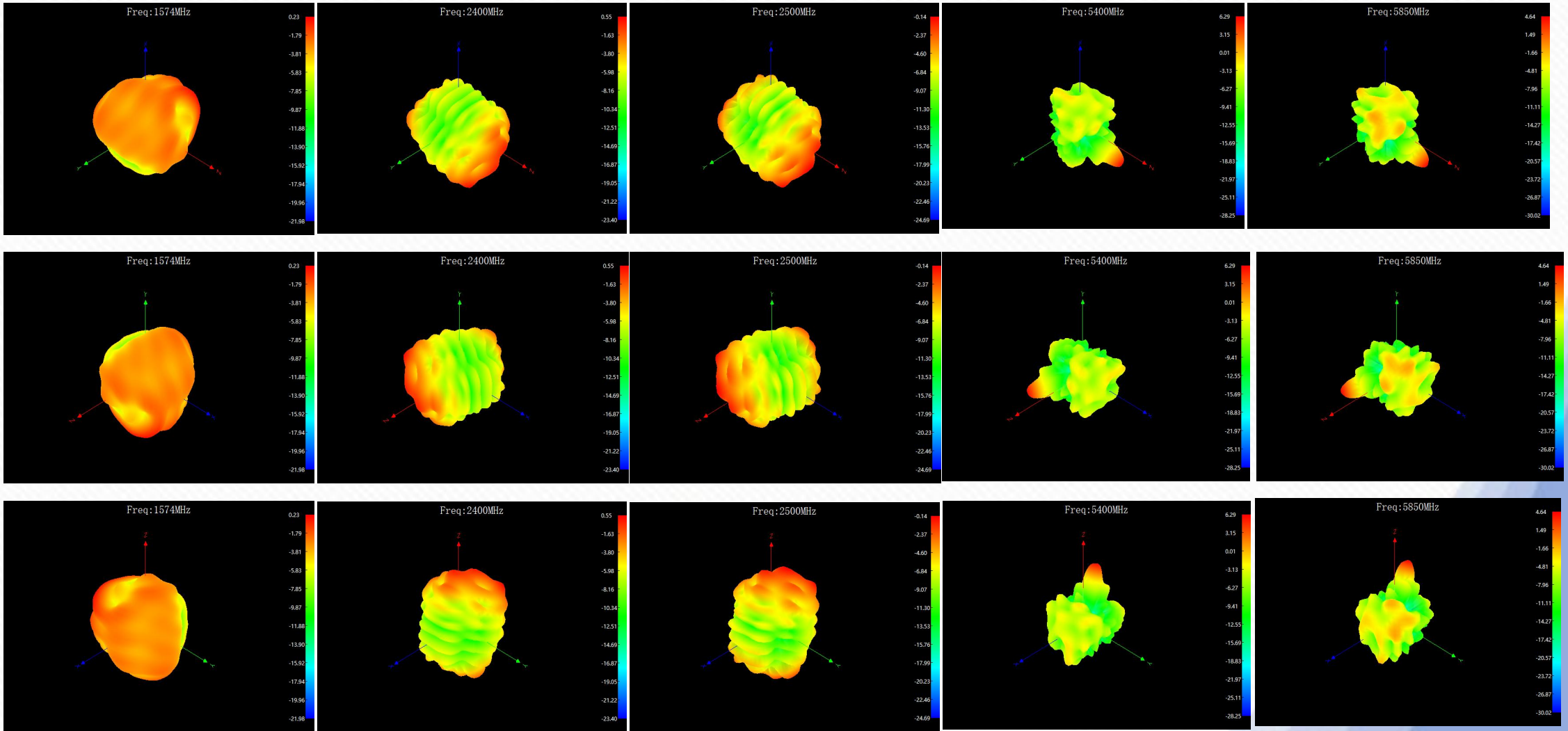
GPS actual measured data



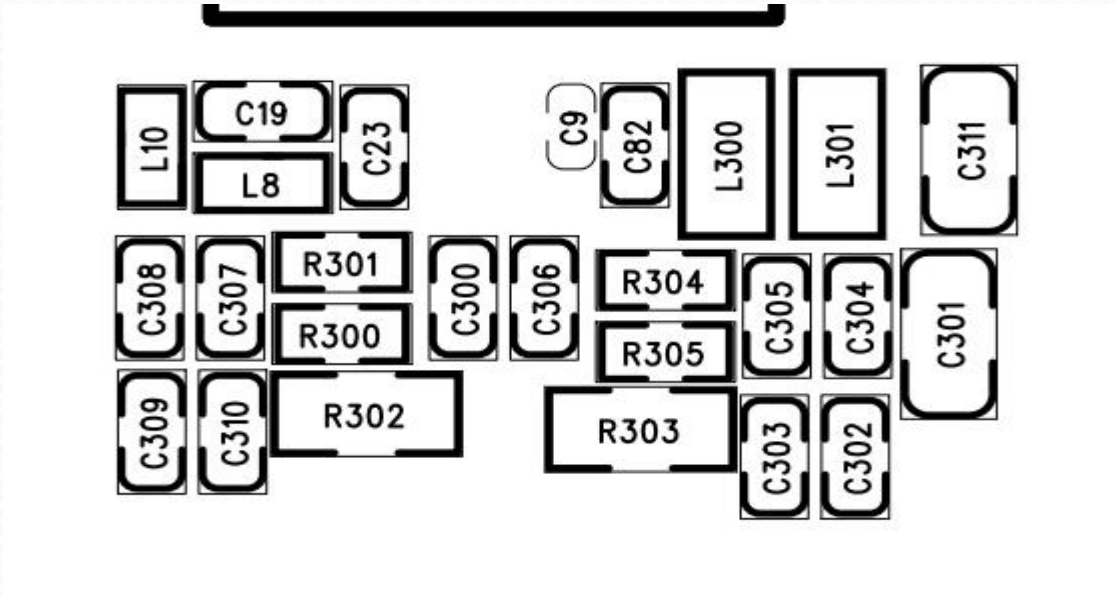
Three-in-one antenna directional pattern



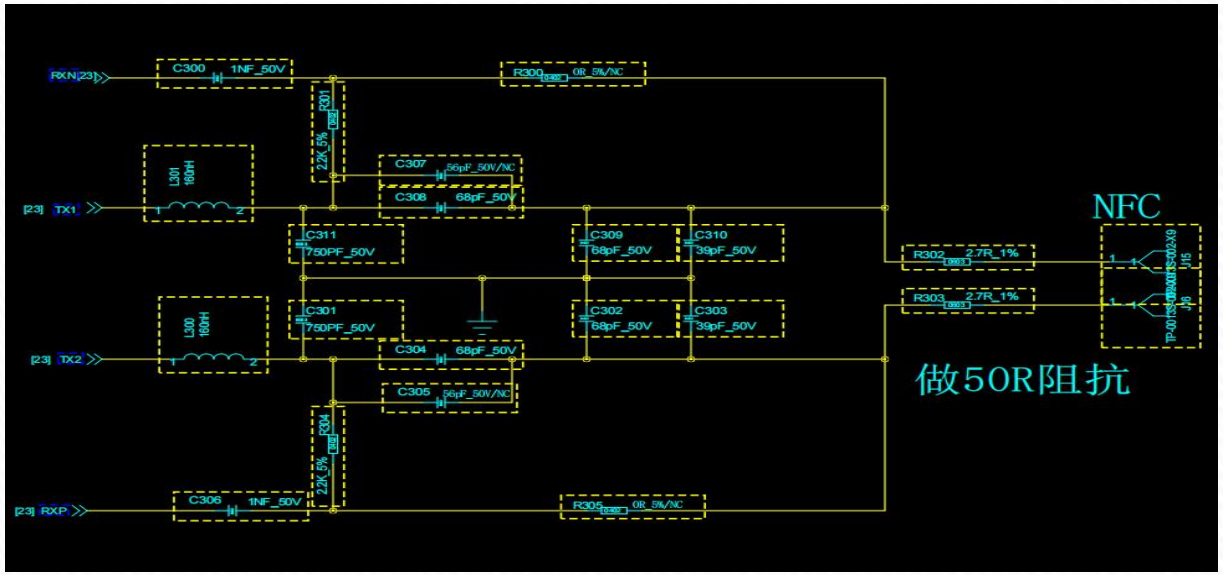
Three-in-one antenna directional pattern



NFC matching circuitl

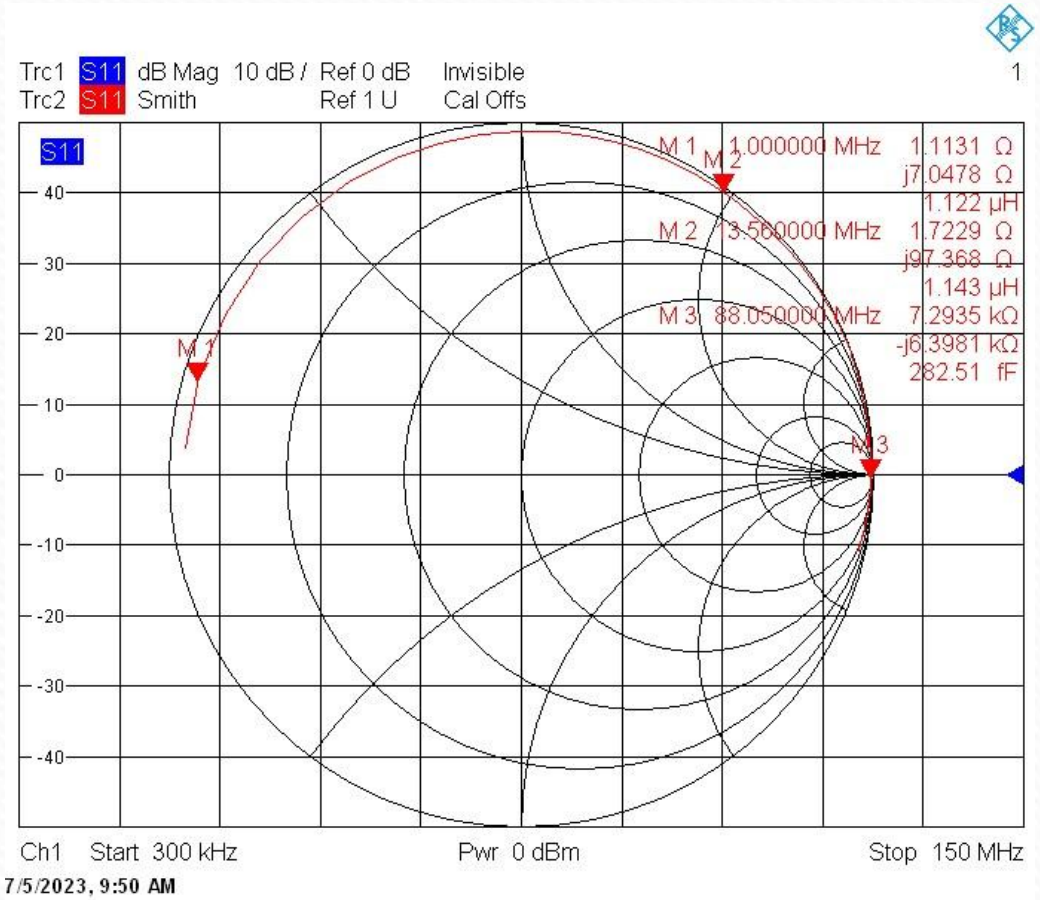


position	specifications and models	
C301/C311	750pF	0603 50V/±5%
C304/C308	68pF	0402 50V/±5%
C305/C307	22PF	0402 50V/±5%
C309/C302	68pF	0402 50V/±5%
C310/C303	47pF	0402 50V/±5%
R301/R304	2.2KΩ	0402±1%
R302/R303	2.7Ω	0603±1%



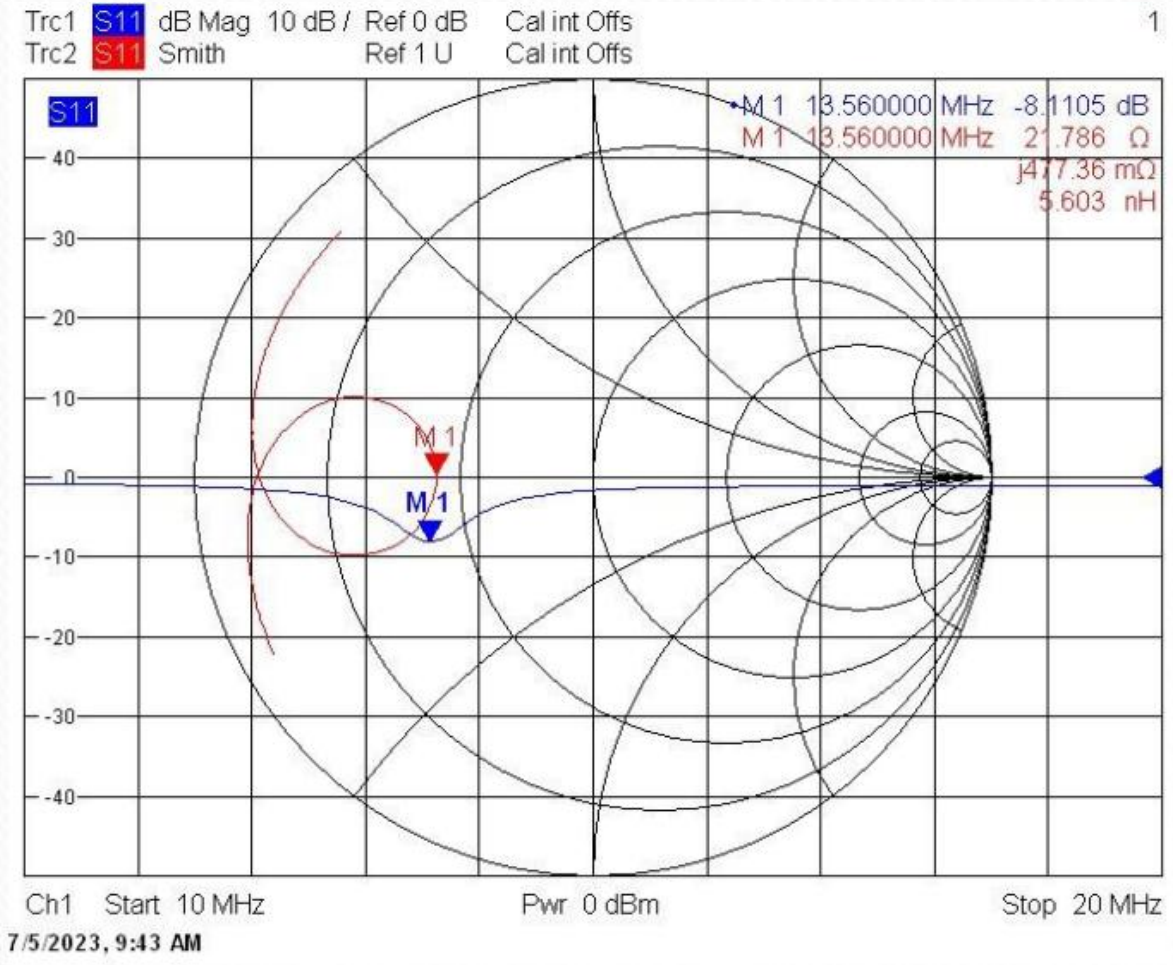
NFC天线数据

Antenna ontology data：



NFC天线数据

Complete machine antenna data：



Antenna environment processing

The antenna environment is not increased

Summary

1. The antenna matching is not changed.

2. The antenna environment is not increased.

3. The antenna performance test is OK.

Thank You

Shanghai R&D Center: 1F, Building 4, No.99, Lane 215, Gaoguang Road, Qingpu District, Shanghai, 201799, PRC

Shenzhen R&D Center: The 6th floor, Building 5, Nantaiyun Innovation Valley Center, Guangming District, Shenzhen City

ChongQing R&D Center: 1F, ARM Ecological Industrial Park, 19 East Datugu Road, Xiantao, Yubei District, Chongqing, 401120, PRC

Huizhou Factory: 4-5F, No.1, Central Village Road, Longhu Industrial Zone, Shuikou Town, Huicheng District, Huizhou, 516255, PRC

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