

Shanghai Sunnyway Communication Technology Limited Company

Temporary antenna specification

Customer: GUANGYI		The project: FH09	
Operating frequency band: GSM850/900/1800/1900/WCDMA1/2/5/8/ FDD B1/B2/B3/B4/B5/B7/B8/B17/B20/B28/B71 TDD B38/B39/B40/B41/ 5G N1/N2/N3/N5/N28/N41/N71/N77/N78/N79/			
Motherboard version:			
Shangyuan material specifications			
Specifications and models		Shangyuan material number	Customer part number
antenna 1		SH22098IB87-1	
antenna 2		SH22098IB87-2	

The record of project changes			
Date of preparation/change	Changes	Change of person	version

Sunnyway counter-signature bar				
Research and development	ME:	Auditor:	QE:	Approver:
	RF:	Auditor:		
Client Counter-signature bar				
EE	PM		RF	QE

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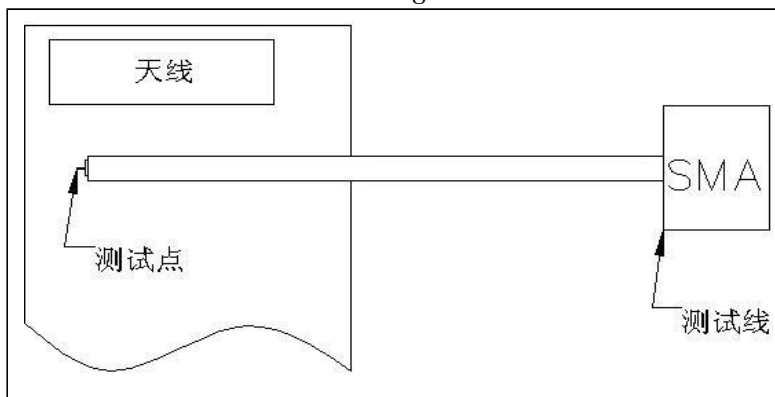
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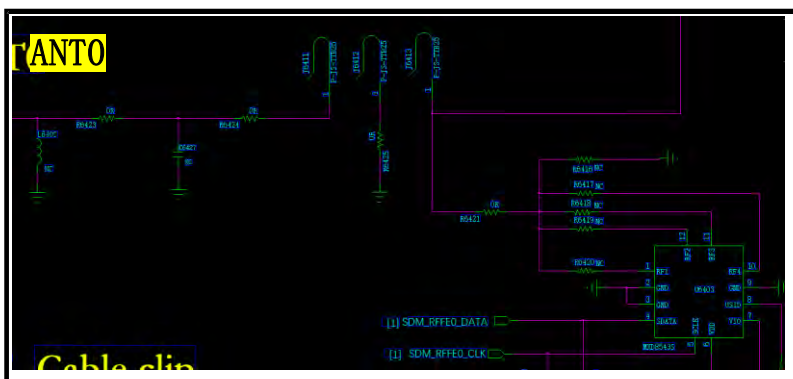
2. Test fixtures

Purpose: To test the passive parameters of the antenna as accurately as possible.

How to make: The prototyping mechanism is made of a 50 ohm coaxial cable, one end is connected to the test point at the back of the matching circuit of the prototype motherboard (the front of the RF test hole), and the other end is connected to the SMA connector. The schematic diagram is as follows:

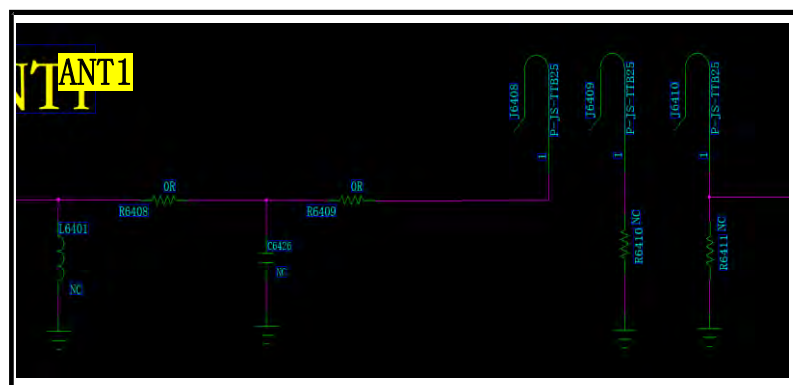


3. Matching circuits

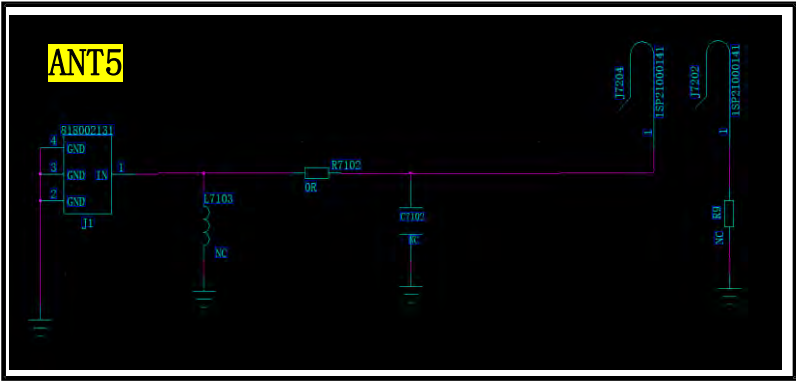


Element	Value	Specification
R6424	0Ω	
C6427	9.1nH	村田
R6423	0Ω	
L6402	N/A	

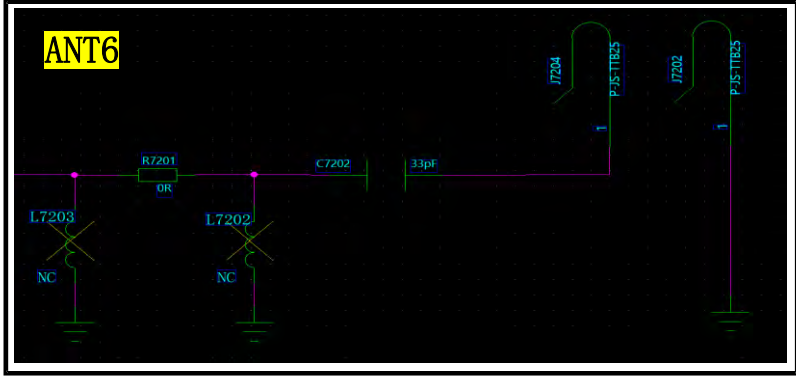
	Value	位号	频率 (MHz)
	N/A	R6416	
RF1	0Ω	R4620	880~960 1710~2690
RF2	4.3nH	R6419	800~880
RF3	18nH	R6418	700~800
RF4	27nH	R6417	600~700



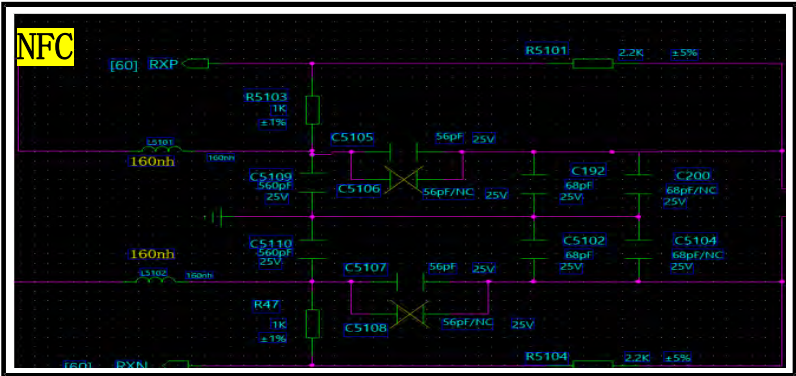
Element	Value	Specification
R6409	0Ω	
C6426	NC	
R6408	1.5nH	村田
L6401	NC	



Element	Value	Specification
R9	0欧姆	
C7102	NC	
R7102	0欧姆	
L7103	NC	



Element	Value	Specification
C7202	0欧姆	
L7202	NC	
R7201	0欧姆	
L7203	NC	



位号	原始匹配	更改后匹配	Specification
L5101/L5102	160nH	160nH	村田
C5109/C5110	560pF	560pF	村田
C5105/C5107	56pF	56pF	村田
C192/C5102	68pF	68pF	村田
C200/C5104	68pF	56pF	村田

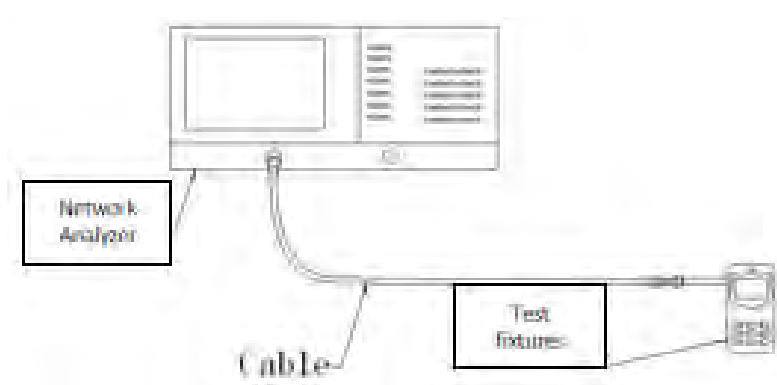
注：天线匹配电路有改动。

4. S11 test

5. 4. 1 S11 Test Method Description

6. Test Equipment: Network Analyzer (E5071C)
7. Test method: A 50 ohm CABLE cable is derived from the instrument test port, and the SMA connector of the prototype is connected after calibration using the calibrator to record the return loss and standing wave ratio corresponding to the relevant frequency point.

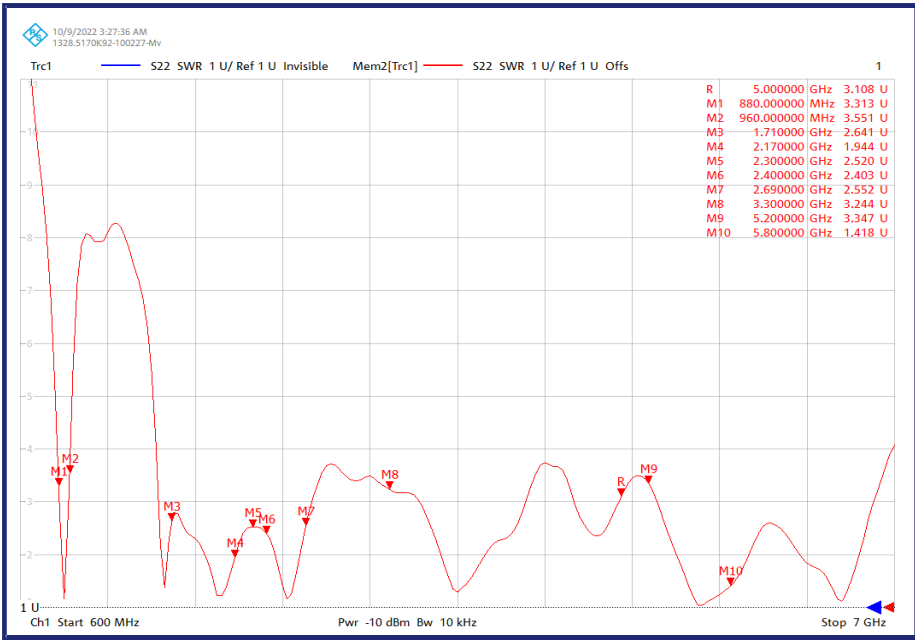
The test diagram is as follows:



Test the schematic

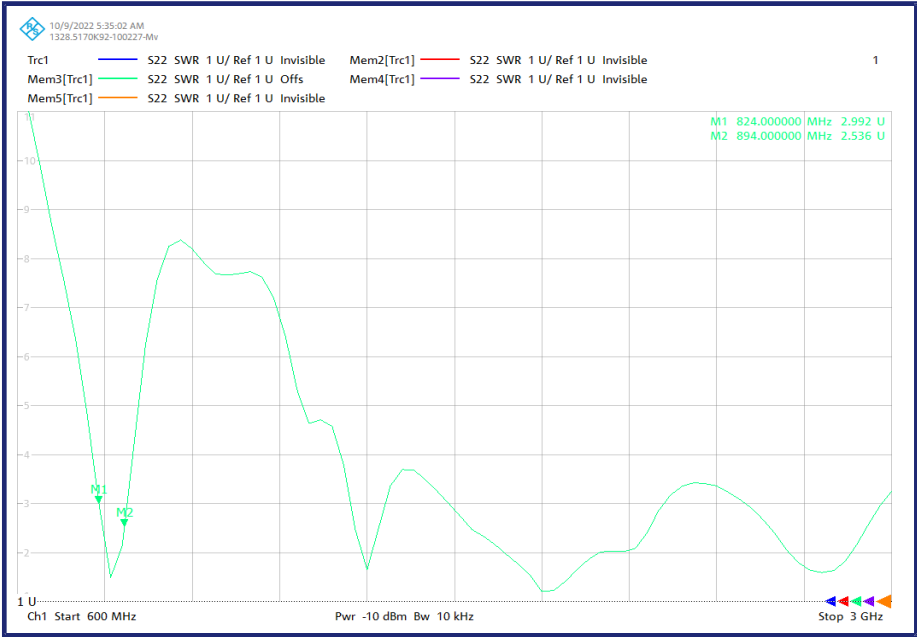
4.2 S11 parameter

ANT0/RF1天线



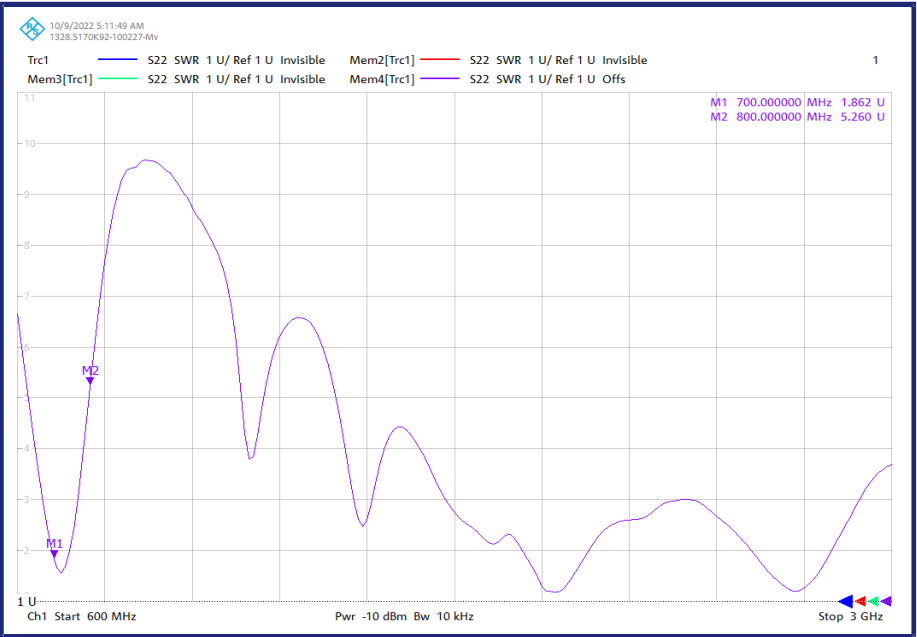
	main
frequency (MHz)	SWR
880	3.3
960	3.5
1710	1.9
2170	1.9
2300	2.5
2400	2.4
2690	2.5
3300	3.2
5000	3.1

ANT0/RF2天线



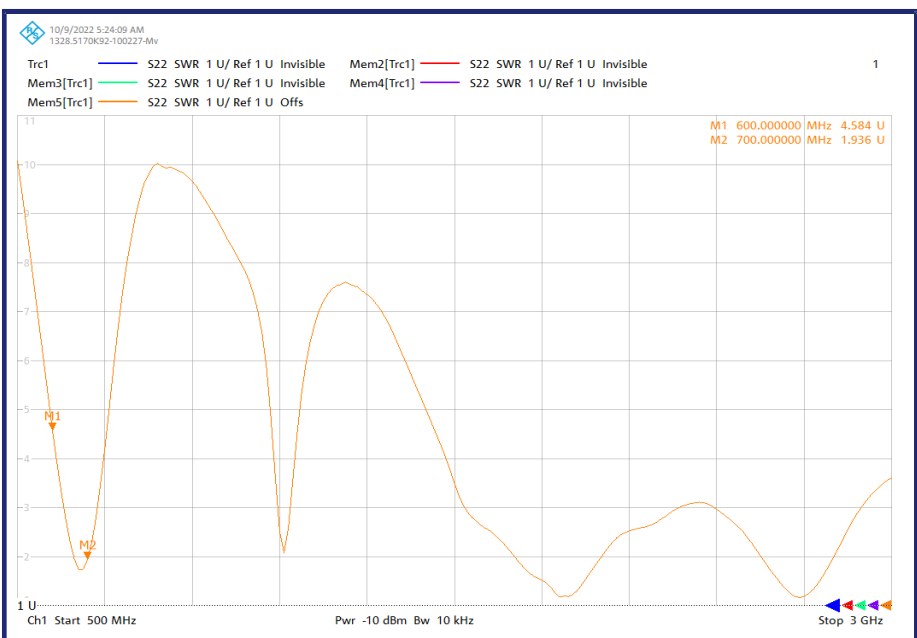
	main
frequency (MHz)	SWR
824	2.992
894	2.536

ANT0/RF3天线



	main
frequency (MHz)	SWR
700	1.862
800	5.260

ANT0/RF4天线



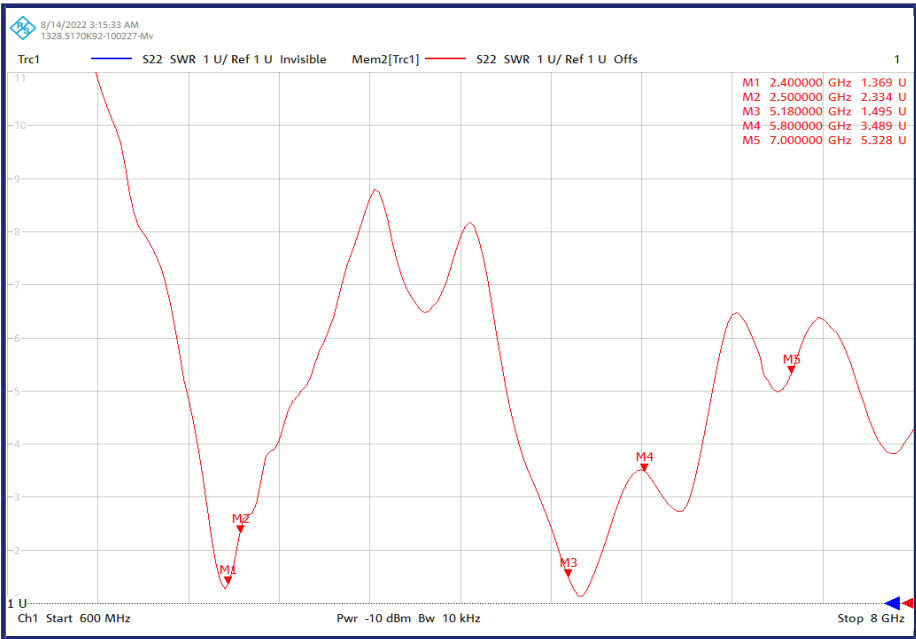
	main
frequency (MHz)	SWR
600	4.584
700	1.936

ANT1天线



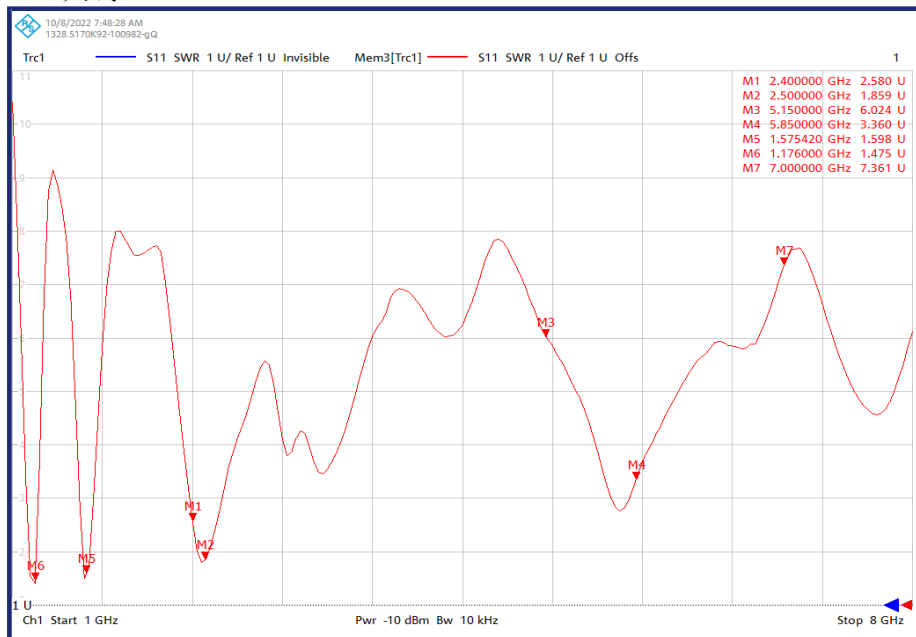
	main
frequency (MHz)	SWR
3300	1.7
3800	1.5
4400	1.5
5000	1.7

ANT2天线



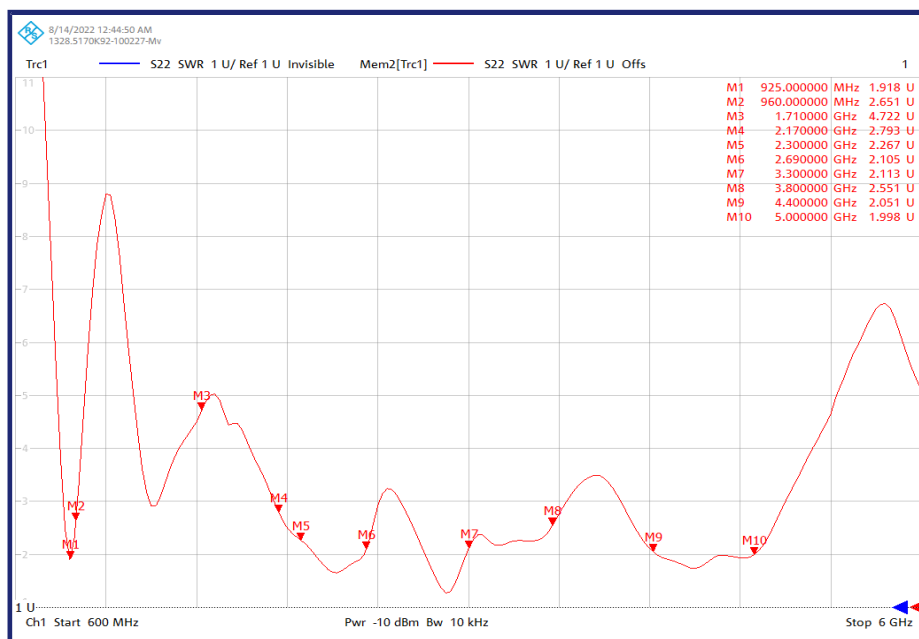
	main
frequency (MHz)	SWR
2400	1.3
2500	2.3
5180	1.4
5800	3.4
7000	5.32

ANT3天线



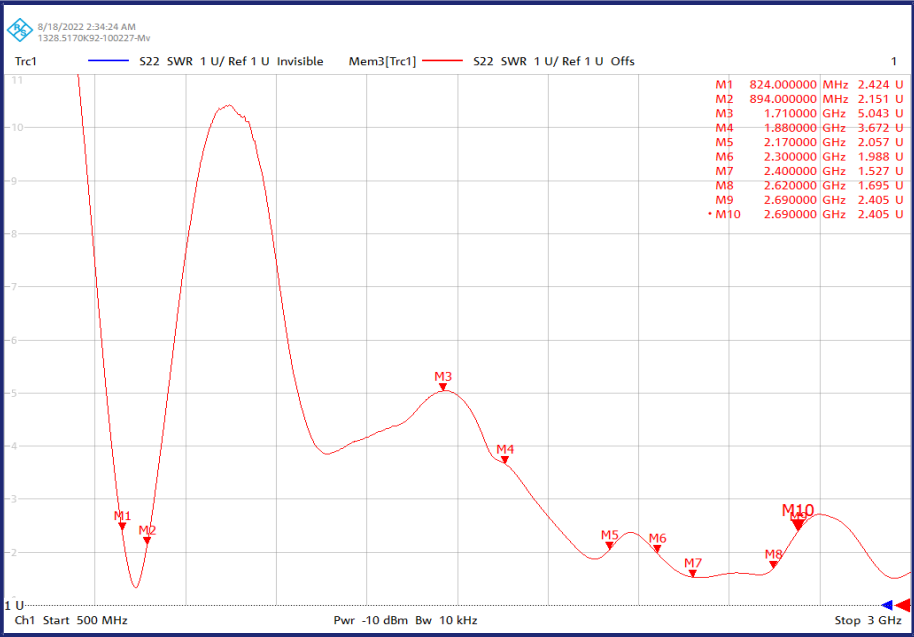
	main
frequency (MHz)	SWR
1176	1.4
1575.42	1.5
2400	2.5
2500	1.8
5150	6
5850	3.3
7000	3.3

ANT4天线/RF1



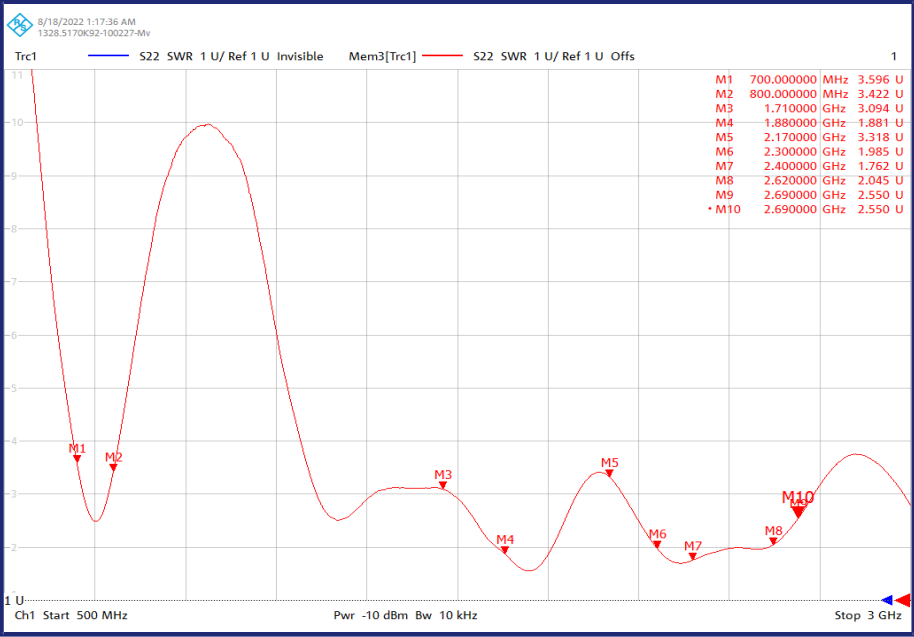
	main
frequency (MHz)	SWR
925	1.9
960	2.6
1710	4.7
2170	2.7
2300	2.2
2690	2.1
3300	2.1
3800	2.5
4400	2.0
5000	1.9

ANT4天线/RF2



	main
frequency (MHz)	SWR
824	2.4
894	2.1

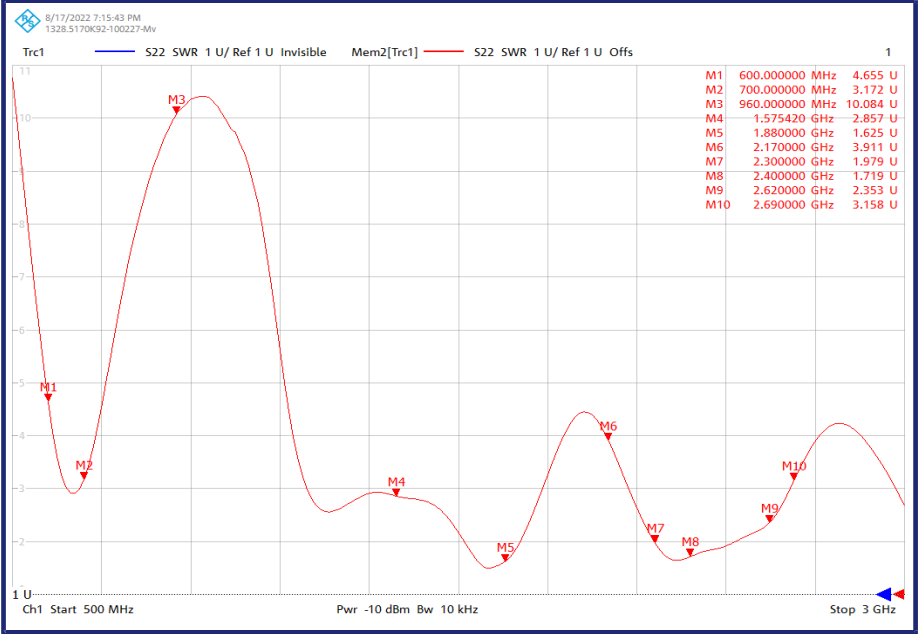
ANT4天线/RF3



	main
frequency (MHz)	SWR
700	3.5
800	3.4

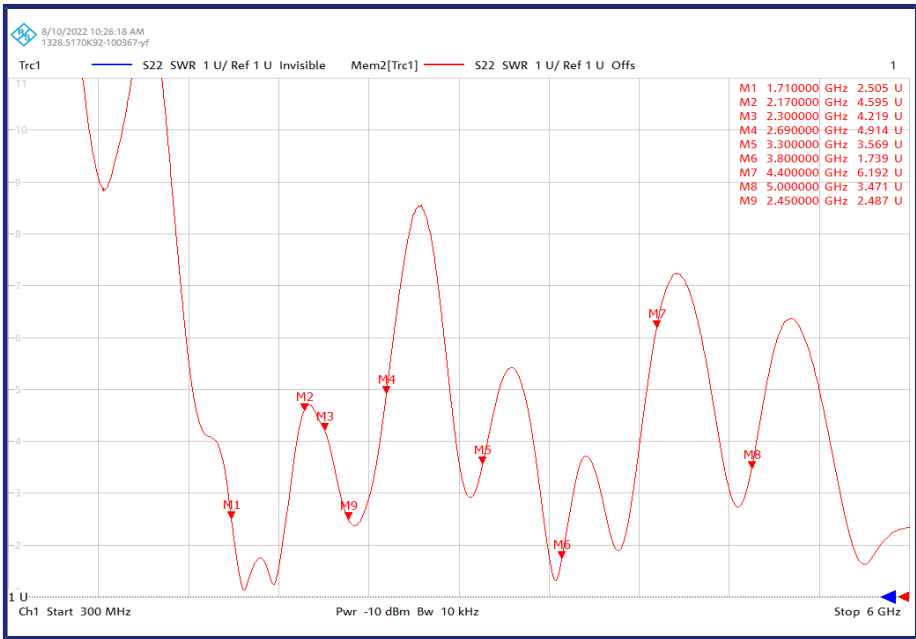
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition

ANT4天线/RF4



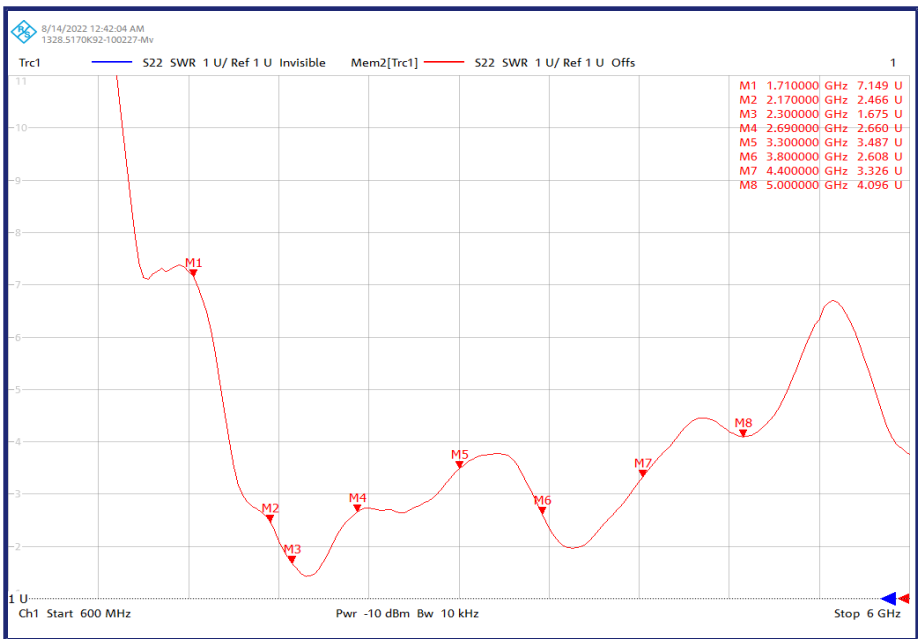
	main
frequency (MHz)	SWR
600	4.6
700	3.1

ANT5天线



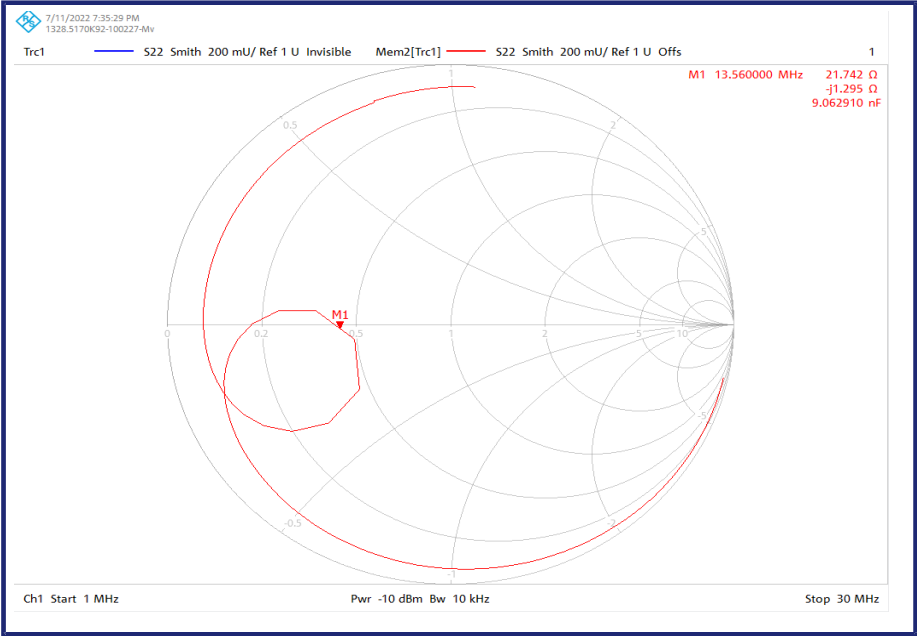
	main
frequency (MHz)	SWR
1710	2.5
2170	4.5
2300	4.2
2690	4.9
3300	3.5
3800	1.7
4400	6.1
5000	3.4

ANT6天线



	main
frequency (MHz)	SWR
1710	7.1
2170	2.4
2300	1.6
2690	2.6
3300	3.4
3800	2.6
4400	3.3
5000	4.0

NFC天线



	main
frequency (MHz)	SWR
13.56	21.74

5 Darkroom test data

Test system: Shielded darkroom

Test environment: temperature $22^{\circ}\text{C}\pm 3^{\circ}\text{C}$, humidity
 $50\%\pm 15\%$

Test equipment: When testing passive data, use the
Network Analyzer Agilent E5062C When testing
active data, the Comprehensive Tester Agilent 8960
/CMW500/E4438C is used

5.1 Passive test data

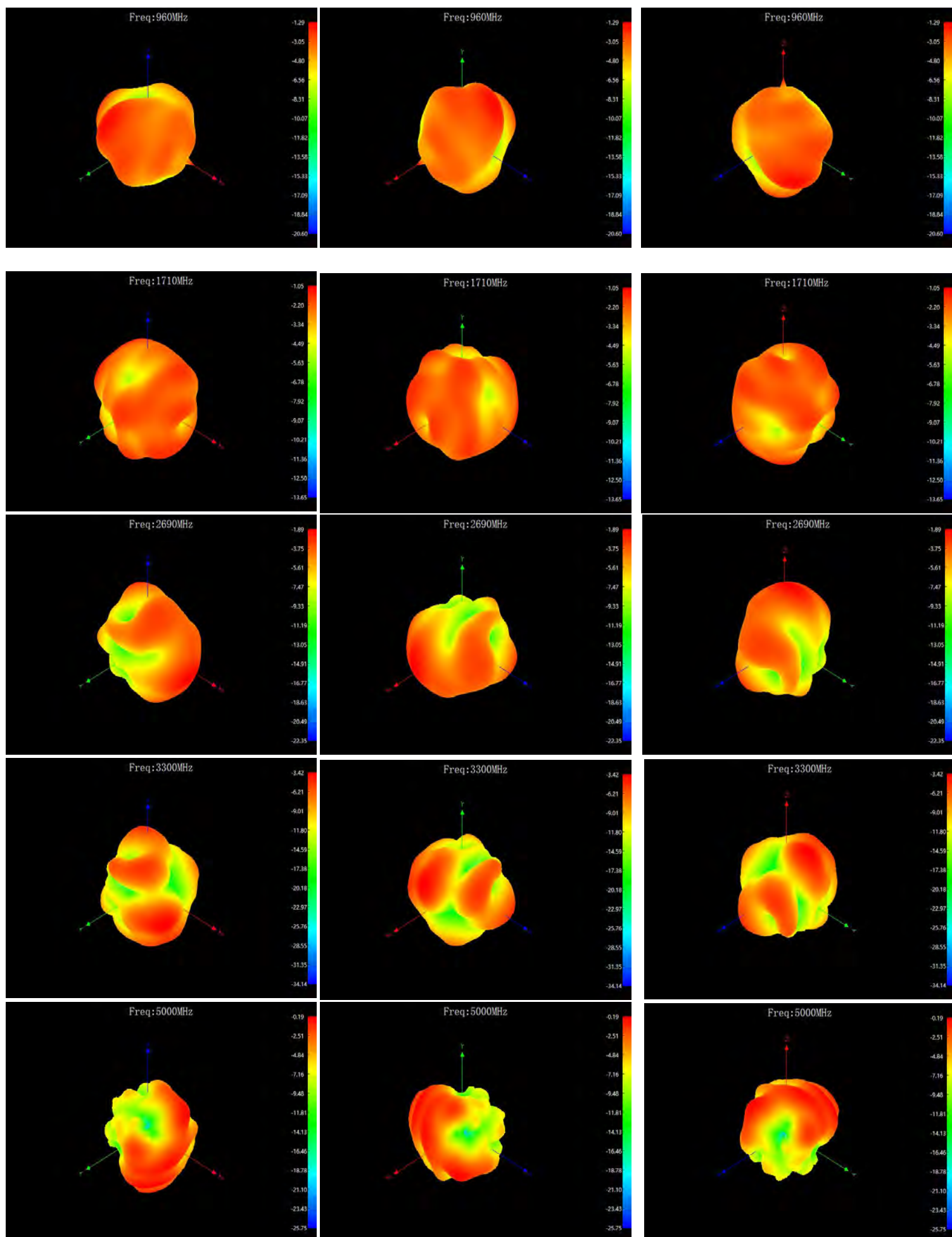
Antenna ANT0/RF1 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
880	21.99	-6.58	-3.34	1710	31.26	-5.05	-0.79	1930	39.63	-4.02	-0.02	2300	32.14	-4.93	0.25	2510	38.55	-4.14	0
890	24.89	-6.04	-2.25	1720	31.12	-5.07	-1.04	1940	39.81	-4	0.08	2310	30.97	-5.09	0.19	2520	38.19	-4.18	-0.2
900	27.86	-5.55	-1.4	1730	31.12	-5.07	-1.17	1950	39.72	-4.01	0.13	2320	31.92	-4.96	0.5	2530	39.17	-4.07	-0.3
910	30.42	-5.17	0	1740	30.9	-5.1	-1.25	1960	39.72	-4.01	0.25	2330	31.62	-5	0.6	2540	39.17	-4.07	-0.1
920	32.59	-4.87	-0.03	1750	30.48	-5.16	-1.32	1970	39.99	-3.98	0.31	2340	31.62	-5	0.43	2550	38.64	-4.13	-0.47
930	33.71	-4.72	0.3	1760	30.76	-5.12	-1.04	1980	40.09	-3.97	0.32	2350	32.73	-4.85	0.13	2560	39.9	-3.99	0.04
940	32.86	-4.83	0.23	1770	31.48	-5.02	-0.63	1990	40.09	-3.97	0.22	2360	33.88	-4.7	0.08	2570	38.64	-4.13	-0.48
950	30.32	-5.18	-0.3	1780	32.14	-4.93	0.3	2000	40.18	-3.96	0.14	2370	33.34	-4.77	-0.39	2580	39.08	-4.08	-0.53
960	27.26	-5.64	-1.38	1790	32.36	-4.9	0.37	2010	37.84	-4.22	-0.22	2380	33.81	-4.71	-0.48	2590	37.67	-4.24	-0.41
				1800	32.89	-4.83	0.38	2020	38.64	-4.13	-0.21	2390	35.24	-4.53	0.37	2600	35.48	-4.5	-0.53
				1810	33.42	-4.76	0.17	2030	36.06	-4.43	-0.16	2400	34.04	-4.68	0.25	2610	33.34	-4.77	-0.65
				1820	33.65	-4.73	-0.19	2040	33.73	-4.72	-0.12	2410	35.08	-4.55	-0.45	2620	30.41	-5.17	-0.86
				1830	33.81	-4.71	-0.1	2050	34.04	-4.68	-0.37	2420	36.48	-4.38	0.31	2630	28.97	-5.38	-1.09
				1840	34.67	-4.6	0.09	2060	36.06	-4.43	0.32	2430	35.32	-4.52	0.65	2640	26.98	-5.69	-1.18
				1850	36.14	-4.42	0.26	2070	36.98	-4.32	0.31	2440	36.14	-4.42	0.11	2650	25.7	-5.9	-1.32
				1860	37.24	-4.29	0.3	2080	37.84	-4.22	0.35	2450	37.41	-4.27	0.93	2660	24.38	-6.13	-1.56
				1870	37.58	-4.25	0.26	2090	37.41	-4.27	0.15	2460	34.28	-4.65	0.65	2670	22.65	-6.45	-1.76
				1880	38.11	-4.19	0.22	2100	38.64	-4.13	0.53	2470	36.56	-4.37	0.34	2680	20.8	-6.82	-1.74
				1890	38.46	-4.15	0.19	2110	37.67	-4.24	0.41	2480	37.58	-4.25	0.76	2690	20.42	-6.9	-2
				1900	38.73	-4.12	0.06	2120	37.58	-4.25	0.32	2490	36.22	-4.41	-0.06				
				1910	38.82	-4.11	-0.08	2130	36.22	-4.41	0.56	2500	38.64	-4.13	-0.07				
				1920	39.17	-4.07	-0.1	2140	36.73	-4.35	0.43								
								2150	37.41	-4.27	0.45								
								2160	36.73	-4.35	0.89								
								2170	36.22	-4.41	0.42								

Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT0/RF1 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
3300	16.87	-7.73	-3.42	3560	26.3	-5.8	-2.32	4400	17.7	-7.52	-3.04	4660	22.28	-6.52	-0.95	4920	26.73	-5.73	-0.11
3310	17.02	-7.69	-3.41	3570	26.73	-5.73	-2.28	4410	17.34	-7.61	-3.31	4670	23.33	-6.32	-0.64	4930	27.35	-5.63	0.02
3320	17.14	-7.66	-3.17	3580	26.98	-5.69	-2.05	4420	16.29	-7.88	-3.25	4680	23.66	-6.26	-0.23	4940	26.92	-5.7	0.07
3330	17.14	-7.66	-3.38	3590	27.93	-5.54	-2.01	4430	16.79	-7.75	-3.07	4690	24.83	-6.05	-0.35	4950	26.67	-5.74	-0.16
3340	17.7	-7.52	-3.36	3600	27.54	-5.6	-1.98	4440	17.42	-7.59	-2.93	4700	25.53	-5.93	-0.16	4960	25.88	-5.87	-0.34
3350	17.74	-7.51	-3.24	3610	29.31	-5.33	-1.53	4450	17.66	-7.53	-2.59	4710	25	-6.02	-0.2	4970	26.24	-5.81	-0.14
3360	17.99	-7.45	-3.4	3620	29.51	-5.3	-1.58	4460	18.45	-7.34	-2.47	4720	23.71	-6.25	-0.7	4980	26.61	-5.75	-0.02
3370	18.2	-7.4	-3.05	3630	30.48	-5.16	-1.63	4470	19.01	-7.21	-2.29	4730	24.77	-6.06	-0.46	4990	26.49	-5.77	-0.2
3380	18.84	-7.25	-3.13	3640	30.55	-5.15	-1.22	4480	18.58	-7.31	-2.44	4740	24.32	-6.14	-0.36	5000	26.3	-5.8	-0.19
3390	19.28	-7.15	-2.88	3650	30.97	-5.09	-1.27	4490	19.23	-7.16	-2.39	4750	25.7	-5.9	-0.36				
3400	19.45	-7.11	-2.58	3660	31.99	-4.95	-1.15	4500	20.28	-6.93	-2.22	4760	25.94	-5.86	-0.09				
3410	20.75	-6.83	-2.95	3670	32.51	-4.88	-0.73	4510	19.86	-7.02	-2.25	4770	25.35	-5.96	0.19				
3420	21.13	-6.75	-2.68	3680	32.73	-4.85	-1.08	4520	20.32	-6.92	-2.15	4780	25.76	-5.89	0.13				
3430	20.84	-6.81	-2.66	3690	32.89	-4.83	-1.01	4530	20.7	-6.84	-1.92	4790	26.24	-5.81	0.02				
3440	20.99	-6.78	-3.4	3700	33.81	-4.71	-0.89	4540	20.14	-6.96	-1.72	4800	27.54	-5.6	0.57				
3450	20.51	-6.88	-2.94	3710	35.89	-4.45	-1.1	4550	20.65	-6.85	-1.68	4810	28.38	-5.47	1.52				
3460	20.89	-6.8	-3.16	3720	35.97	-4.44	-0.91	4560	20.89	-6.8	-1.5	4820	28.12	-5.51	2.6				
3470	21.04	-6.77	-3.29	3730	37.33	-4.28	0.99	4570	21.33	-6.71	-1.33	4830	27.73	-5.57	3.7				
3480	22.18	-6.54	-2.57	3740	38.37	-4.16	-1.2	4580	20.99	-6.78	-1.33	4840	26.61	-5.75	4.4				
3490	23.28	-6.33	-2.51	3750	39.63	-4.02	-1.08	4590	21.09	-6.76	-1.29	4850	26.79	-5.72	3.07				
3500	24.32	-6.14	-2.61	3760	38.37	-4.16	-1.36	4600	21.33	-6.71	-1.21	4860	27.23	-5.65	2.23				
3510	24.49	-6.11	-2.37	3770	37.58	-4.25	-1.88	4610	21.04	-6.77	-1.27	4870	27.67	-5.58	1.38				
3520	24.95	-6.03	-2.63	3780	37.84	-4.22	-1.92	4620	22.23	-6.53	-0.98	4880	27.29	-5.64	0.14				
3530	25.18	-5.99	-2.64	3790	38.02	-4.2	-1.77	4630	22.54	-6.47	-0.9	4890	26.98	-5.69	0.21				
3540	25.64	-5.91	-2.5	3800	37.76	-4.23	-2.01	4640	22.28	-6.52	-1.02	4900	26.06	-5.84	0				
3550	26	-5.85	-2.43					4650	22.44	-6.49	-0.83	4910	25.53	-5.93	-0.18				

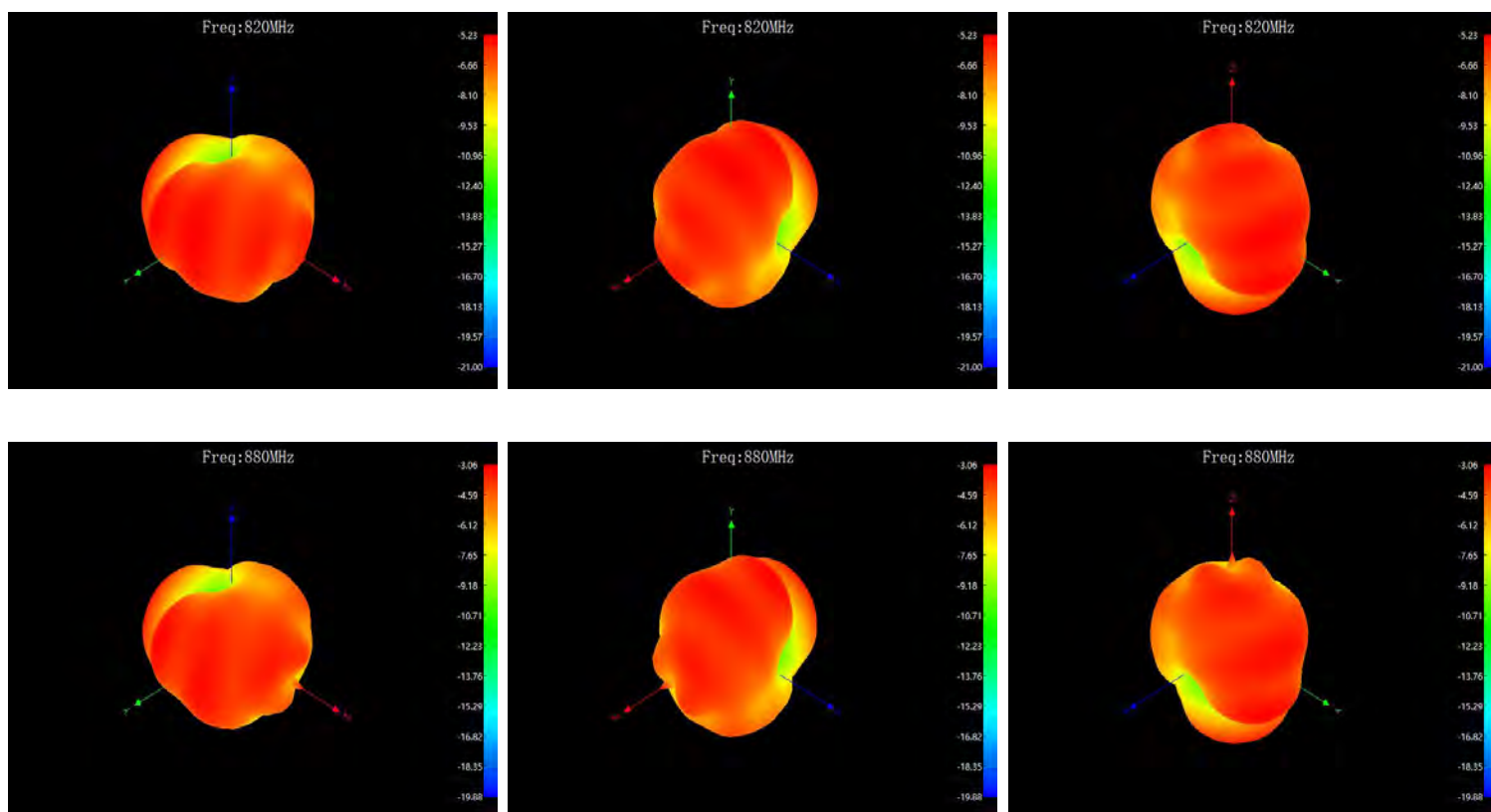
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT0/RF1 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT0/RF2 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
820	16.97	-7.7	-4.18
830	18.87	-7.24	-3.69
840	20.85	-6.81	-3.05
850	22.95	-6.39	-2.2
860	24.36	-6.13	-1.58
870	24.82	-6.05	-1.33
880	24.45	-6.12	-1.25
890	23.16	-6.35	-1.45

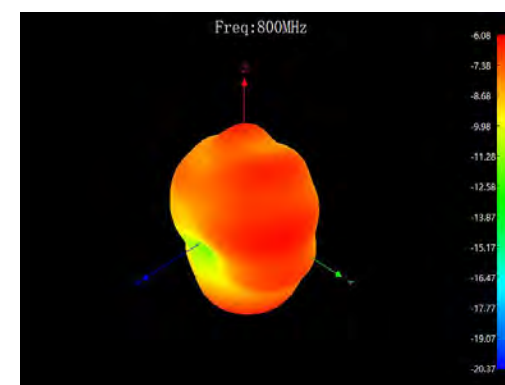
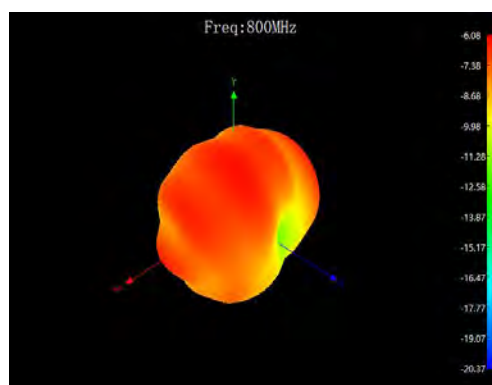
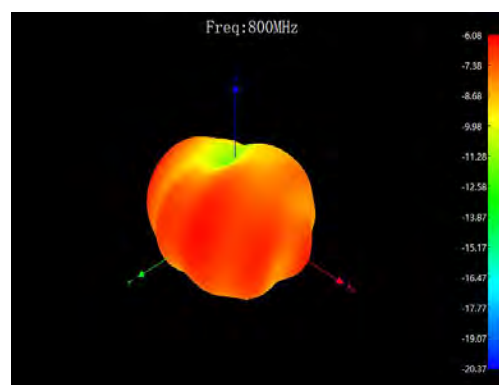
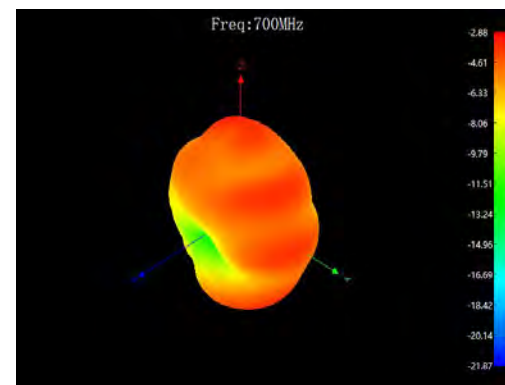
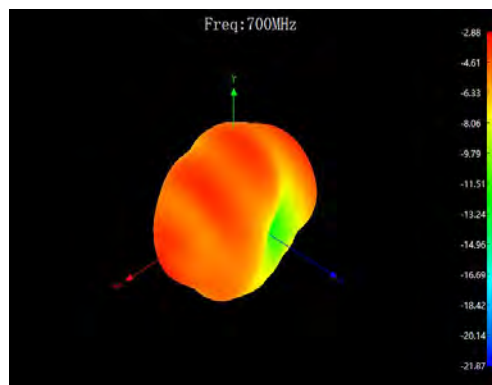
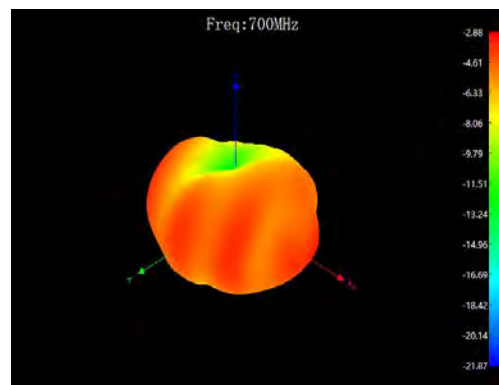
ANT0/RF2 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT0/RF3 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
700	18.61	-7.3	-3.38
710	19.76	-7.04	-1.57
720	20.63	-6.86	-1.5
730	20.89	-6.8	-1.34
740	20.45	-6.89	-1.82
750	19.79	-7.04	-2.46
760	18.71	-7.28	-3.15
770	17.36	-7.6	-3.79
780	18.61	-7.3	-3.38
790	19.76	-7.04	-1.57
800	20.63	-6.86	-1.5

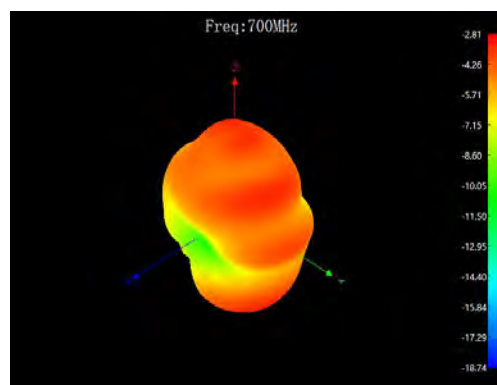
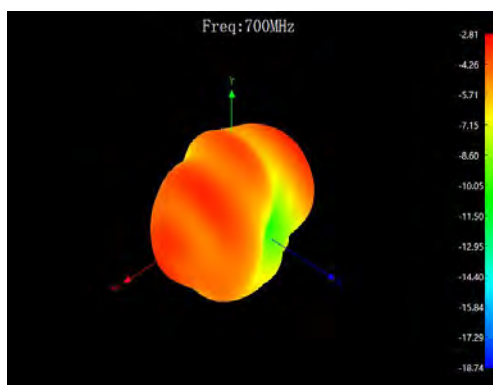
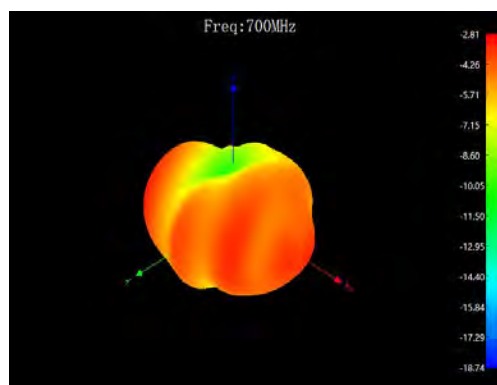
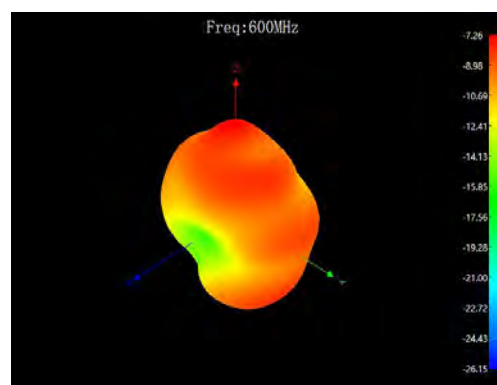
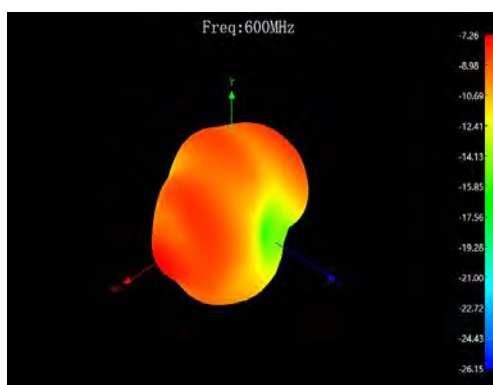
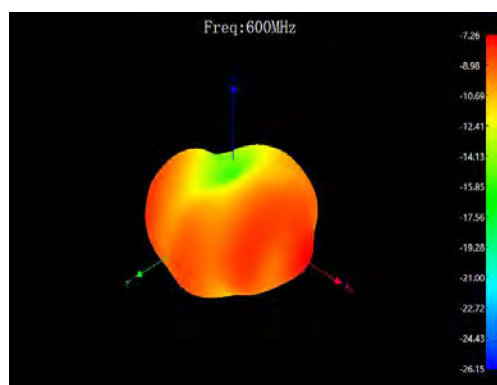
ANT0/RF3 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT0/RF4 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
600	10.5	-9.79	-7.26
610	11.37	-9.44	-7.17
620	12.66	-8.98	-5.74
630	14.12	-8.5	-4.62
640	15.69	-8.04	-4.21
650	17.27	-7.63	-3.63
660	18.49	-7.33	-2.73
670	19	-7.21	-2.45
680	19.06	-7.2	-2.81
690	19.09	-7.19	-2.93
700	18.74	-7.27	-2.81

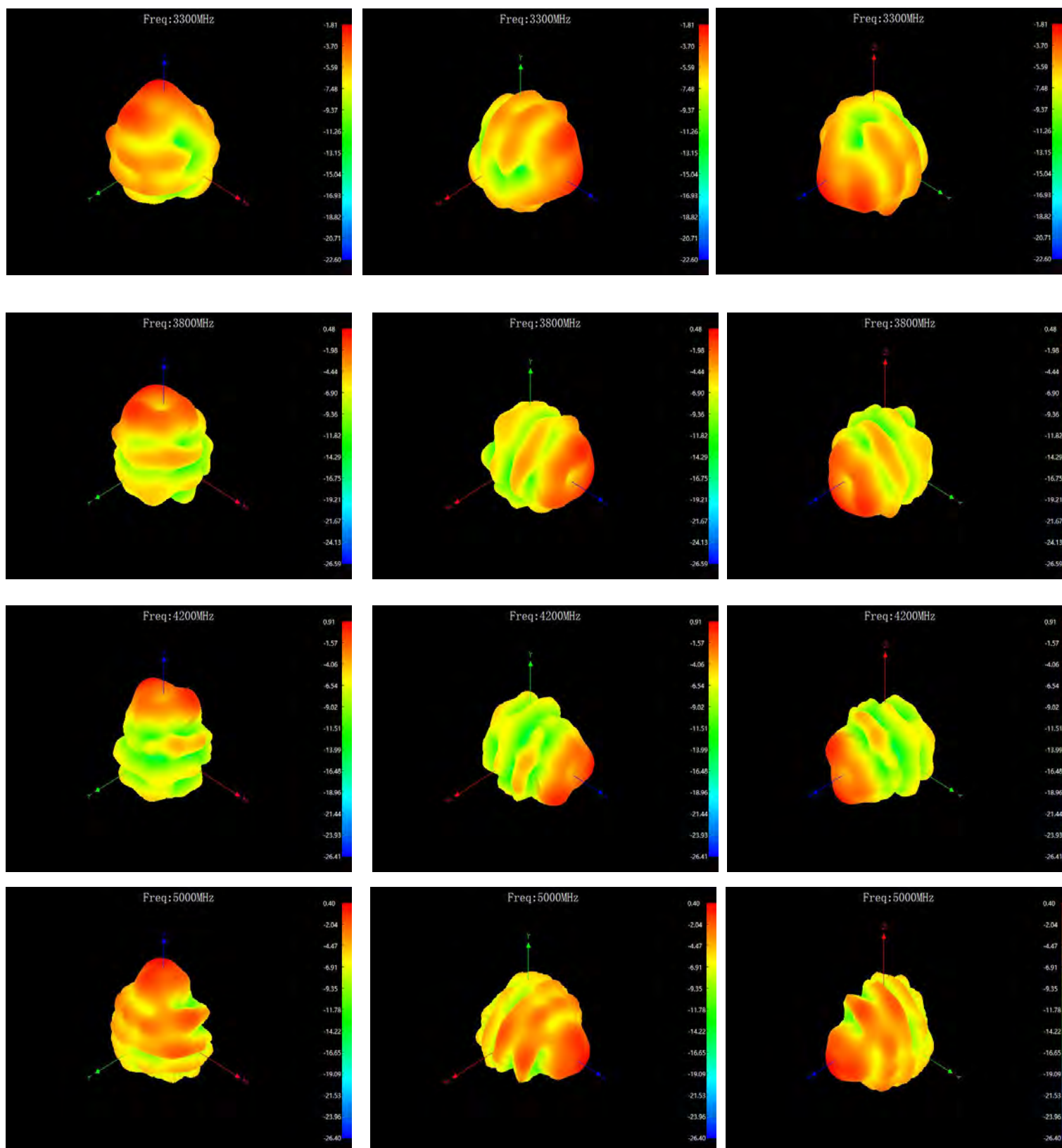
ANT0/RF4 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT1 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
3300	30.62	-5.14	-1.16	3560	27.29	-5.64	-1.48	4400	28.84	-5.4	-1.2	4660	34.59	-4.61	-1.44	4920	32.81	-4.84	-1.96
3310	31.05	-5.08	-1.14	3570	26.92	-5.7	-1.4	4410	29.24	-5.34	-1.25	4670	36.64	-4.36	-2.12	4930	32.21	-4.92	-1.74
3320	31.12	-5.07	-1.16	3580	26.73	-5.73	-1.53	4420	28.31	-5.48	-1.29	4680	36.22	-4.41	-1.94	4940	31.26	-5.05	-1.7
3330	31.05	-5.08	-1.16	3590	28.38	-5.47	-1.25	4430	30.2	-5.2	-2.7	4690	37.58	-4.25	-2.04	4950	30.34	-5.18	-2.34
3340	31.7	-4.99	-1.19	3600	28.12	-5.51	-1.71	4440	31.19	-5.06	-2.77	4700	37.67	-4.24	-2.13	4960	29.51	-5.3	-2.17
3350	31.41	-5.03	-1.23	3610	30.06	-5.22	-1.33	4450	32.51	-4.88	-1.29	4710	37.24	-4.29	-2.06	4970	29.51	-5.3	-2.3
3360	31.84	-4.97	-1.27	3620	30.2	-5.2	-1.64	4460	33.65	-4.73	-1.52	4720	35.24	-4.53	-1.31	4980	29.04	-5.37	-2.13
3370	31.33	-5.04	-1.26	3630	31.7	-4.99	-1.51	4470	34.67	-4.6	-1.69	4730	37.58	-4.25	-1.76	4990	28.71	-5.42	-2.13
3380	32.06	-4.94	-1.6	3640	31.62	-5	-1.39	4480	33.96	-4.69	-1.81	4740	35.89	-4.45	-1.36	5000	28.97	-5.38	-2.31
3390	32.43	-4.89	-1.75	3650	32.06	-4.94	-1.5	4490	34.2	-4.66	-1.89	4750	37.07	-4.31	-1.47				
3400	32.06	-4.94	-1.75	3660	32.51	-4.88	-1.58	4500	35.65	-4.48	-1.94	4760	36.81	-4.34	-1.59				
3410	33.81	-4.71	-1.33	3670	32.73	-4.85	-1.14	4510	34.83	-4.58	-1.94	4770	36.56	-4.37	-1.72				
3420	33.65	-4.73	-1.85	3680	32.89	-4.83	-1.47	4520	35.16	-4.54	-1.84	4780	37.07	-4.31	-1.86				
3430	32.81	-4.84	-1.7	3690	32.89	-4.83	-1.39	4530	35.81	-4.46	-2.02	4790	36.48	-4.38	-1.76				
3440	32.96	-4.82	-1.57	3700	33.19	-4.79	-1.31	4540	35.08	-4.55	-1.86	4800	37.84	-4.22	-1.2				
3450	31.62	-5	-1.32	3710	34.75	-4.59	-1.21	4550	36.9	-4.33	-2.14	4810	37.84	-4.22	-1.87				
3460	31.84	-4.97	-1.28	3720	34.36	-4.64	-1.35	4560	36.9	-4.33	-2.3	4820	37.24	-4.29	-1.75				
3470	31.12	-5.07	-1.33	3730	35.32	-4.52	-1.32	4570	36.98	-4.32	-2.29	4830	36.98	-4.32	-1.83				
3480	31.48	-5.02	-1.39	3740	35.81	-4.46	-1.25	4580	36.39	-4.39	-2.32	4840	35.24	-4.53	-1.45				
3490	31.7	-4.99	-1.3	3750	36.56	-4.37	-1.22	4590	36.9	-4.33	-1.4	4850	35.32	-4.52	-1.48				
3500	31.55	-5.01	-1.38	3760	35.65	-4.48	-1.3	4600	36.9	-4.33	-1.52	4860	34.83	-4.58	-1.58				
3510	30.69	-5.13	-1.33	3770	35.4	-4.51	-1.34	4610	36.22	-4.41	-2.05	4870	34.83	-4.58	-1.34				
3520	30.34	-5.18	-1.32	3780	35.73	-4.47	-1.22	4620	36.14	-4.42	-1.88	4880	34.43	-4.63	-1.29				
3530	29.38	-5.32	-1.29	3790	35.89	-4.45	-1.2	4630	35.81	-4.46	-1.68	4890	33.88	-4.7	-1.26				
3540	28.51	-5.45	-1.42	3800	35.65	-4.48	-1.5	4640	35.4	-4.51	-1.79	4900	33.42	-4.76	-2.06				
3550	27.8	-5.56	-1.5					4650	35.89	-4.45	-1.95	4910	32.43	-4.89	-1.97				

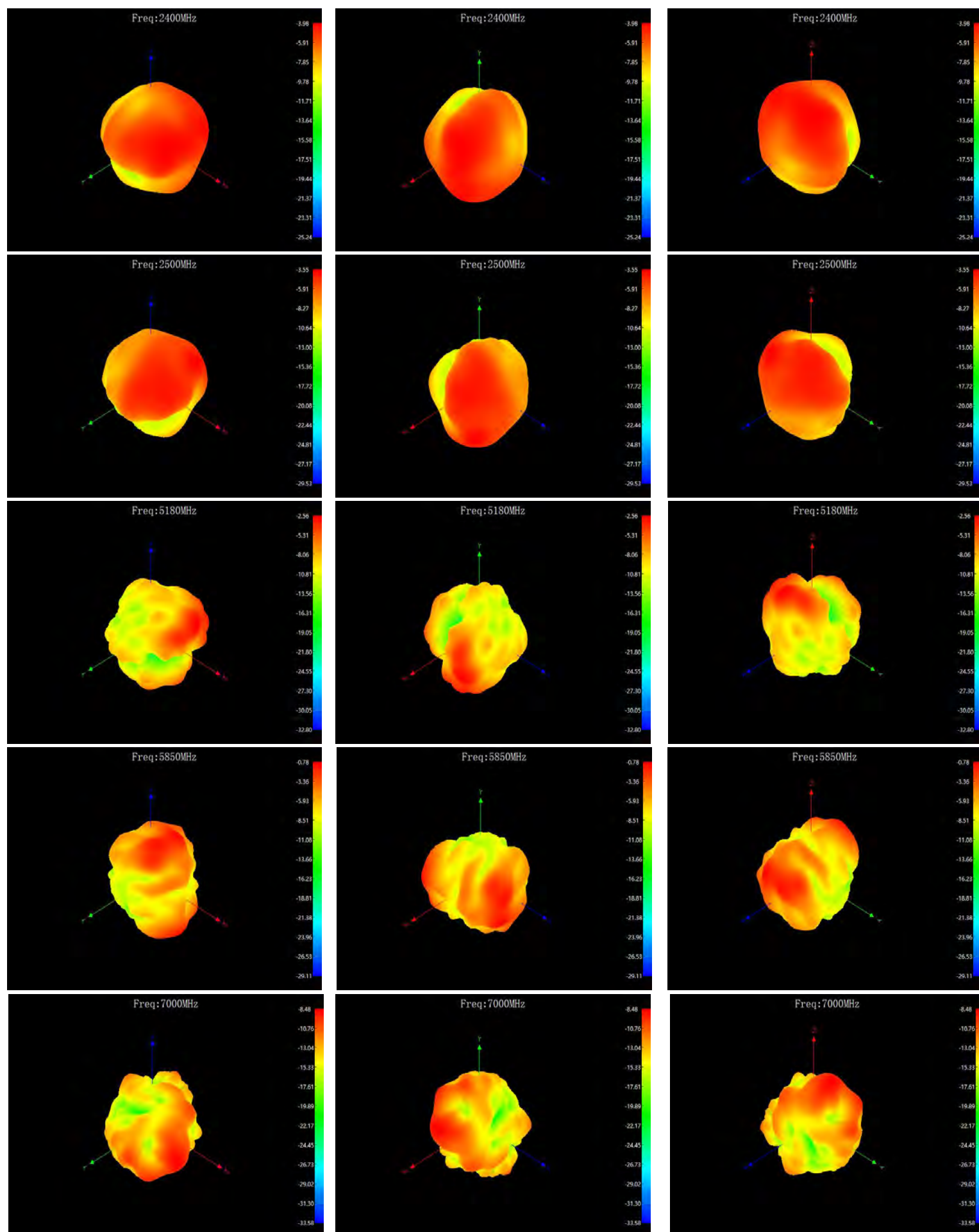
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT1antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT2 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
2400	17.85	-7.48	-3.98	5390	12.62	-8.99	-4.7	5740	13.22	-8.79	-2.43	6230	11.34	-9.45	-2.01	6580	9.75	-10.11	-7.75	6930	7.94	-11	-7.63
2410	18.4	-7.35	-4.1	5400	12.62	-8.99	-4.94	5750	13.25	-8.78	-2.49	6240	11.23	-9.5	-2.68	6590	9.38	-10.28	-7.82	6940	7.9	-11.02	-7.82
2420	19.22	-7.16	-3.55	5410	12.82	-8.92	-4.5	5760	13.3	-8.76	-2.45	6250	11.6	-9.36	-2.48	6600	9.58	-10.19	-7.99	6950	7.87	-11.04	-8.04
2430	18.96	-7.22	-2.1	5420	12.84	-8.91	-4.75	5770	14	-8.54	-2.42	6260	11.73	-9.31	-2.5	6610	9.41	-10.26	-7.64	6960	7.64	-11.17	-8.36
2440	19.29	-7.15	-3.54	5430	12.64	-8.98	-4.63	5780	15.11	-8.21	-2.56	6270	11.29	-9.47	-2.43	6620	9.61	-10.17	-7.38	6970	7.72	-11.12	-8.15
2450	19.76	-7.04	-3.37	5440	11.38	-9.44	-4.96	5790	14.68	-8.33	-2.62	6280	12.66	-8.98	-2.76	6630	9.57	-10.19	-7.91	6980	7.74	-11.11	-8.24
2460	18.84	-7.25	-2.94	5450	11.05	-9.57	-5.31	5800	14.68	-8.33	-2.75	6290	12.39	-9.07	-2.72	6640	9.46	-10.24	-8.05	6990	7.77	-11.1	-8.14
2470	19.72	-7.05	-3.35	5460	10.91	-9.62	-5.13	5810	13.28	-8.77	-2.98	6300	11.67	-9.33	-3.18	6650	9.2	-10.36	-8.05	7000	7.77	-11.1	-8.48
2480	20.24	-6.94	-3.34	5470	11.17	-9.52	-4.83	5820	14.09	-8.51	-2.81	6310	11.26	-9.48	-3.39	6660	8.85	-10.53	-8.5				
2490	19.72	-7.05	-2.9	5480	11.3	-9.47	-4.88	5830	15.08	-8.22	-2.48	6320	11.55	-9.37	-3.64	6670	8.64	-10.63	-8.64				
2500	20.81	-6.82	-3.55	5490	11.78	-9.29	-4.94	5840	14.45	-8.4	-2.49	6330	11.44	-9.42	-3.67	6680	8.51	-10.7	-8.47				
5150	15.96	-7.97	-3.17	5500	11.5	-9.39	-5.21	5850	16.18	-7.91	-2.78	6340	10.81	-9.66	-4.13	6690	8.73	-10.59	-8.13				
5160	16.37	-7.86	-3.1	5510	11.43	-9.42	-5.42	6000	18.03	-7.44	-1.6	6350	10.32	-9.86	-4.7	6700	8.71	-10.6	-8.32				
5170	16.6	-7.8	-2.9	5520	11.35	-9.45	-5.5	6010	17.7	-7.52	-1.9	6360	9.93	-10.03	-4.83	6710	8.62	-10.64	-8.21				
5180	17.78	-7.5	-2.56	5530	11.6	-9.36	-5.38	6020	17.82	-7.49	-1.71	6370	10.17	-9.93	-4.53	6720	8.72	-10.59	-8.44				
5190	16.98	-7.7	-2.91	5540	11.66	-9.33	-5.38	6030	17.95	-7.46	-1.64	6380	10.78	-9.67	-4.7	6730	8.83	-10.54	-7.87				
5200	16.26	-7.89	-3.16	5550	11.73	-9.31	-5.47	6040	16.98	-7.7	-1.83	6390	11.3	-9.47	-4.47	6740	8.91	-10.5	-7.85				
5210	15.14	-8.2	-3.38	5560	11.4	-9.43	-5.55	6050	15.78	-8.02	-2.09	6400	11.32	-9.46	-4.53	6750	9.02	-10.45	-7.54				
5220	15.49	-8.1	-3.45	5570	11.35	-9.45	-5.5	6060	15.7	-8.04	-1.99	6410	10.76	-9.68	-5.22	6760	8.92	-10.5	-7.36				
5230	16.03	-7.95	-3.39	5580	11.76	-9.3	-5.24	6070	15.21	-8.18	-1.96	6420	10.39	-9.83	-5.29	6770	8.66	-10.62	-7.4				
5240	16.29	-7.88	-3.32	5590	12.1	-9.17	-5.07	6080	15.7	-8.04	-1.88	6430	10.12	-9.95	-5.44	6780	8.43	-10.74	-7.73				
5250	15.85	-8	-3.39	5600	12.86	-8.91	-4.53	6090	15.81	-8.01	-1.79	6440	9.97	-10.01	-5.62	6790	8.37	-10.77	-7.21				
5260	14.69	-8.33	-3.67	5610	13.23	-8.78	-4.44	6100	14.96	-8.25	-1.96	6450	10.18	-9.92	-5.66	6800	8.11	-10.91	-7.32				
5270	14.62	-8.35	-3.87	5620	12.61	-8.99	-4.65	6110	13.03	-8.85	-2.23	6460	10.08	-9.97	-5.77	6810	8.19	-10.87	-7.27				
5280	14.86	-8.28	-4.1	5630	12.41	-9.06	-4.73	6120	12.33	-9.09	-2.54	6470	8.96	-10.48	-6.79	6820	8.11	-10.91	-6.71				
5290	15.52	-8.09	-3.79	5640	12.3	-9.1	-4.58	6130	12.33	-9.09	-2.82	6480	8.72	-10.59	-6.92	6830	8.18	-10.87	-7				
5300	15.96	-7.97	-3.65	5650	12.82	-8.92	-4.14	6140	12.53	-9.02	-2.34	6490	8.75	-10.58	-7.22	6840	8.01	-10.96	-7.47				
5310	15.35	-8.14	-3.81	5660	13.17	-8.8	-3.72	6150	13.34	-8.75	-2.53	6500	9.03	-10.44	-7.19	6850	8.09	-10.92	-7.09				
5320	14.35	-8.43	-4.04	5670	13.35	-8.75	-3.59	6160	11.75	-9.3	-2.81	6510	8.9	-10.51	-7.15	6860	8.03	-10.95	-7.37				
5330	13	-8.86	-4.34	5680	13.11	-8.82	-3.68	6170	11.78	-9.29	-2.88	6520	8.92	-10.5	-7.23	6870	8.11	-10.91	-6.95				
5340	12.79	-8.93	-4.34	5690	12.91	-8.89	-3.84	6180	9.93	-10.03	-3.24	6530	8.3	-10.81	-7.53	6880	8.06	-10.94	-7.04				
5350	12.85	-8.91	-4.12	5700	13.29	-8.76	-3.51	6190	10.38	-9.84	-3.25	6540	9.75	-10.11	-7.87	6890	8	-10.97	-7.23				
5360	12.82	-8.92	-3.86	5710	12.66	-8.98	-3.07	6200	10.94	-9.61	-3	6550	9.47	-10.24	-7.73	6900	7.7	-11.14	-7.7				
5370	12.08	-9.18	-4.07	5720	12.26	-9.12	-2.84	6210	10.94	-9.61	-3.2	6560	9.81	-10.08	-7.57	6910	7.75	-11.11	-7.54				
5380	12.67	-8.97	-4.32	5730	13.58	-8.67	-2.3	6220	10.09	-9.96	-3.19	6570	10	-10	-7.39	6920	7.69	-11.14	-8.02				

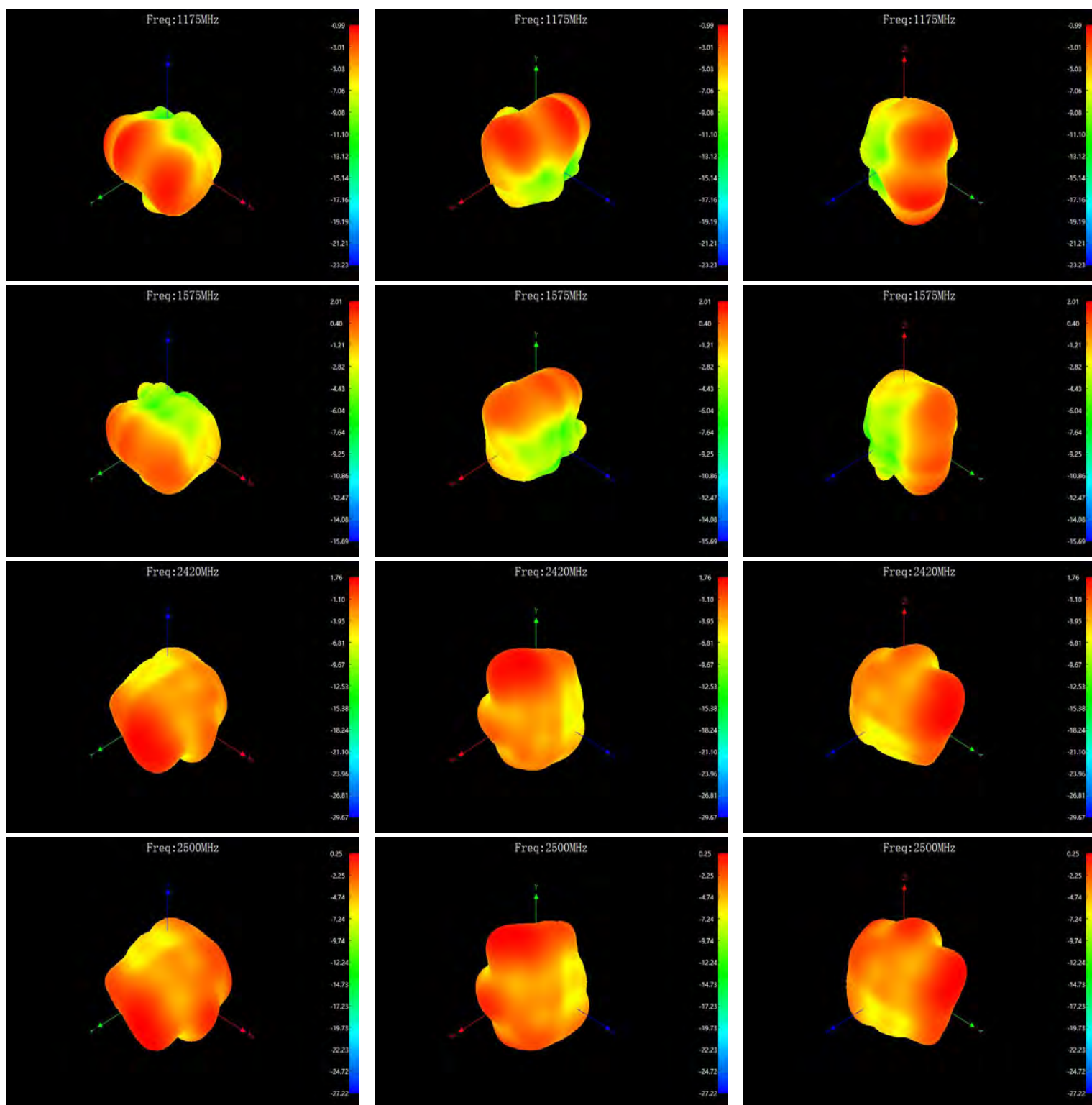
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT2antenna pattern



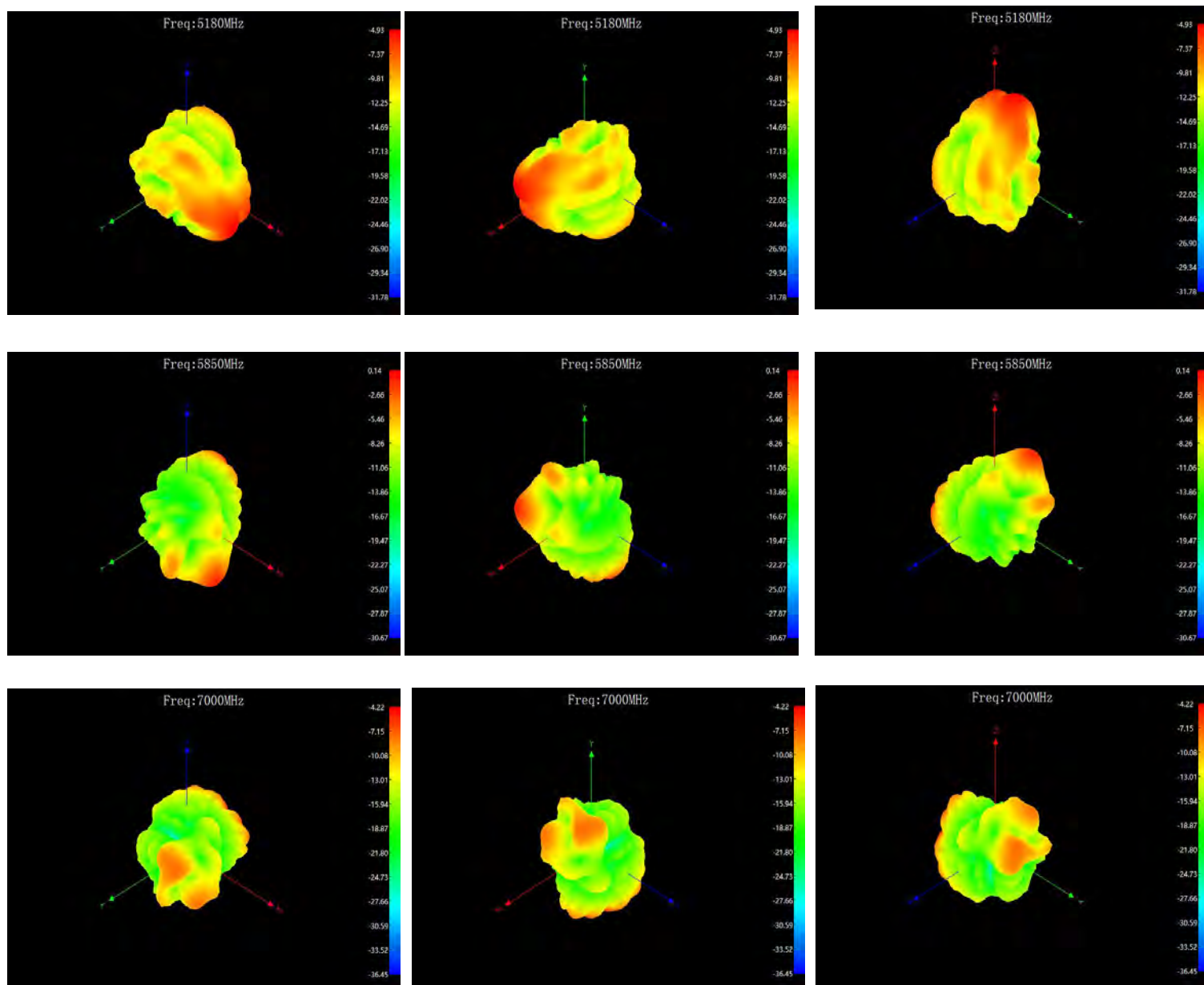
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT3 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
1175	23.56	-6.28	-1.17	5370	16.78	-7.75	-2.27	5720	19.13	-7.18	-0.88	6210	8.98	-10.47	-5.01	6560	7.31	-11.36	-7.3	6910	5.92	-12.28	-3.92
1575	40.28	-3.95	0	5380	15.84	-8	-2.58	5730	19.66	-7.06	-0.53	6220	8.6	-10.66	-5.23	6570	7.33	-11.35	-7.21	6920	5.88	-12.31	-4.19
2400	37.43	-4.27	-1.72	5390	15.23	-8.17	-2.85	5740	18.21	-7.4	-0.88	6230	8.37	-10.77	-5.69	6580	7.19	-11.43	-7.52	6930	6.18	-12.09	-4.34
2410	39.56	-4.03	-1.85	5400	15.59	-8.07	-2.72	5750	17.11	-7.67	-1.27	6240	7.88	-11.03	-6.75	6590	7.09	-11.49	-7.94	6940	6.28	-12.02	-4.01
2420	40.63	-3.91	-1.83	5410	16.35	-7.86	-2.36	5760	16.3	-7.88	-1.4	6250	7.91	-11.02	-6.63	6600	7.24	-11.4	-8.27	6950	6.37	-11.96	-3.93
2430	40.18	-3.96	-1.81	5420	16.83	-7.74	-2.55	5770	16.46	-7.84	-1.33	6260	7.88	-11.03	-7.12	6610	7.24	-11.4	-7.96	6960	6.17	-12.1	-4.58
2440	42.36	-3.73	-1.63	5430	16.8	-7.75	-2.43	5780	17.02	-7.69	-1.03	6270	8.08	-10.93	-7.01	6620	7.51	-11.24	-7.72	6970	6.39	-11.94	-4.31
2450	44.16	-3.55	-1.16	5440	15.72	-8.04	-2.77	5790	16.25	-7.89	-1.3	6280	7.88	-11.03	-7.33	6630	7.61	-11.19	-7.56	6980	6.6	-11.8	-4.01
2460	40.36	-3.94	-0.86	5450	15.64	-8.06	-3.13	5800	16.02	-7.95	-1.05	6290	7.84	-11.06	-7.48	6640	7.61	-11.19	-7.58	6990	6.68	-11.75	-4.25
2470	42.07	-3.76	-1.23	5460	15.76	-8.02	-2.88	5810	14.55	-8.37	-1.69	6300	7.72	-11.12	-7.52	6650	7.65	-11.16	-7.58	7000	6.76	-11.7	-4.22
2480	42.07	-3.76	-1.22	5470	16.72	-7.77	-2.34	5820	15.07	-8.22	-1.21	6310	7.7	-11.14	-7.44	6660	7.56	-11.21	-7.98				
2490	39.89	-3.99	-1.2	5480	17.5	-7.57	-2.35	5830	15.59	-8.07	-0.92	6320	7.88	-11.03	-6.94	6670	7.6	-11.19	-7.67				
2500	39.72	-4.01	0.02	5490	17.19	-7.65	-2.33	5840	15.86	-8	-0.46	6330	7.77	-11.1	-7.11	6680	7.59	-11.2	-7.65				
5150	11.21	-9.5	-5.48	5500	17.3	-7.62	-2.15	5850	16.94	-7.71	0.6	6340	7.67	-11.15	-7	6690	7.81	-11.07	-7.11				
5160	11.46	-9.41	-5.44	5510	16.89	-7.72	-2.15	6000	13.53	-8.69	-1	6350	7.53	-11.23	-7.61	6700	7.91	-11.02	-6.5				
5170	11.82	-9.27	-5.1	5520	16.99	-7.7	-2.18	6010	13.15	-8.81	-2.69	6360	7.43	-11.29	-7.74	6710	7.82	-11.07	-7.24				
5180	12.35	-9.08	-4.93	5530	17.62	-7.54	-1.84	6020	13	-8.86	-2.85	6370	7.51	-11.24	-7.5	6720	7.93	-11.01	-6.72				
5190	12.21	-9.13	-5.17	5540	17.91	-7.47	-1.73	6030	12.73	-8.95	-2.85	6380	7.62	-11.18	-7.31	6730	8.03	-10.95	-7.2				
5200	12.01	-9.2	-5.25	5550	18.09	-7.43	-1.72	6040	12.13	-9.16	-3.25	6390	7.81	-11.07	-6.83	6740	8.21	-10.86	-6.9				
5210	11.62	-9.35	-5.57	5560	17.47	-7.58	-1.85	6050	11.31	-9.47	-3.76	6400	7.82	-11.07	-7.03	6750	8.49	-10.71	-6.21				
5220	11.85	-9.26	-5.32	5570	17.25	-7.63	-1.83	6060	11.07	-9.56	-3.92	6410	7.59	-11.2	-7.32	6760	7.05	-11.52	-6.18				
5230	12.28	-9.11	-5	5580	17.53	-7.56	-1.81	6070	10.7	-9.71	-4.04	6420	7.44	-11.28	-7.62	6770	6.94	-11.59	-6.07				
5240	12.69	-8.97	-4.89	5590	18.12	-7.42	-1.63	6080	10.74	-9.69	-3.63	6430	7.35	-11.34	-7.63	6780	6.95	-11.58	-5.56				
5250	12.67	-8.97	-4.89	5600	19.55	-7.09	-1.16	6090	10.53	-9.78	-3.95	6440	7.32	-11.35	-7.71	6790	7.13	-11.47	-4.93				
5260	12.36	-9.08	-4.92	5610	20.14	-6.96	-0.86	6100	10.19	-9.92	-3.99	6450	7.51	-11.24	-7.3	6800	7.11	-11.48	-5.21				
5270	12.6	-9	-4.96	5620	18.84	-7.25	-1.23	6110	9.44	-10.25	-4.72	6460	7.56	-11.21	-7.05	6810	7.38	-11.32	-4.47				
5280	13.13	-8.82	-4.54	5630	18.58	-7.31	-1.22	6120	9.08	-10.42	-5.02	6470	7.16	-11.45	-7.45	6820	7.53	-11.23	-4.01				
5290	14.06	-8.52	-4.1	5640	18.52	-7.32	-1.2	6130	9.27	-10.33	-4.52	6480	7.2	-11.43	-7.7	6830	7.8	-11.08	-3.74				
5300	14.91	-8.27	-3.73	5650	19.52	-7.1	-0.84	6140	9.39	-10.27	-4.39	6490	7.33	-11.35	-7.5	6840	7.71	-11.13	-4.12				
5310	15.12	-8.2	-3.46	5660	20	-6.99	-0.77	6150	9.74	-10.11	-3.95	6500	7.47	-11.27	-7.53	6850	7.99	-10.97	-3.51				
5320	15.07	-8.22	-3.54	5670	19.96	-7	-0.62	6160	9.27	-10.33	-4.66	6510	7.51	-11.24	-7.03	6860	7.86	-11.05	-3.58				
5330	14.95	-8.25	-3.41	5680	19.26	-7.15	-0.89	6170	9.42	-10.26	-4.16	6520	7.56	-11.21	-7.87	6870	8.08	-10.93	-3.34				
5340	15.52	-8.09	-3.23	5690	18.58	-7.31	-1.05	6180	8.85	-10.53	-4.69	6530	7.31	-11.36	-7.29	6880	7.95	-11	-3.21				
5350	16.19	-7.91	-2.71	5700	18.27	-7.38	-0.96	6190	8.94	-10.49	-4.55	6540	7.26	-11.39	-7.82	6890	7.94	-11	-3.29				
5360	16.83	-7.74	-2.41	5710	19.39	-7.12	-0.82	6200	9.15	-10.39	-4.56	6550	7.08	-11.5	-7.54	6900	7.35	-11.34	-4.12				

Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT3antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT3antenna pattern



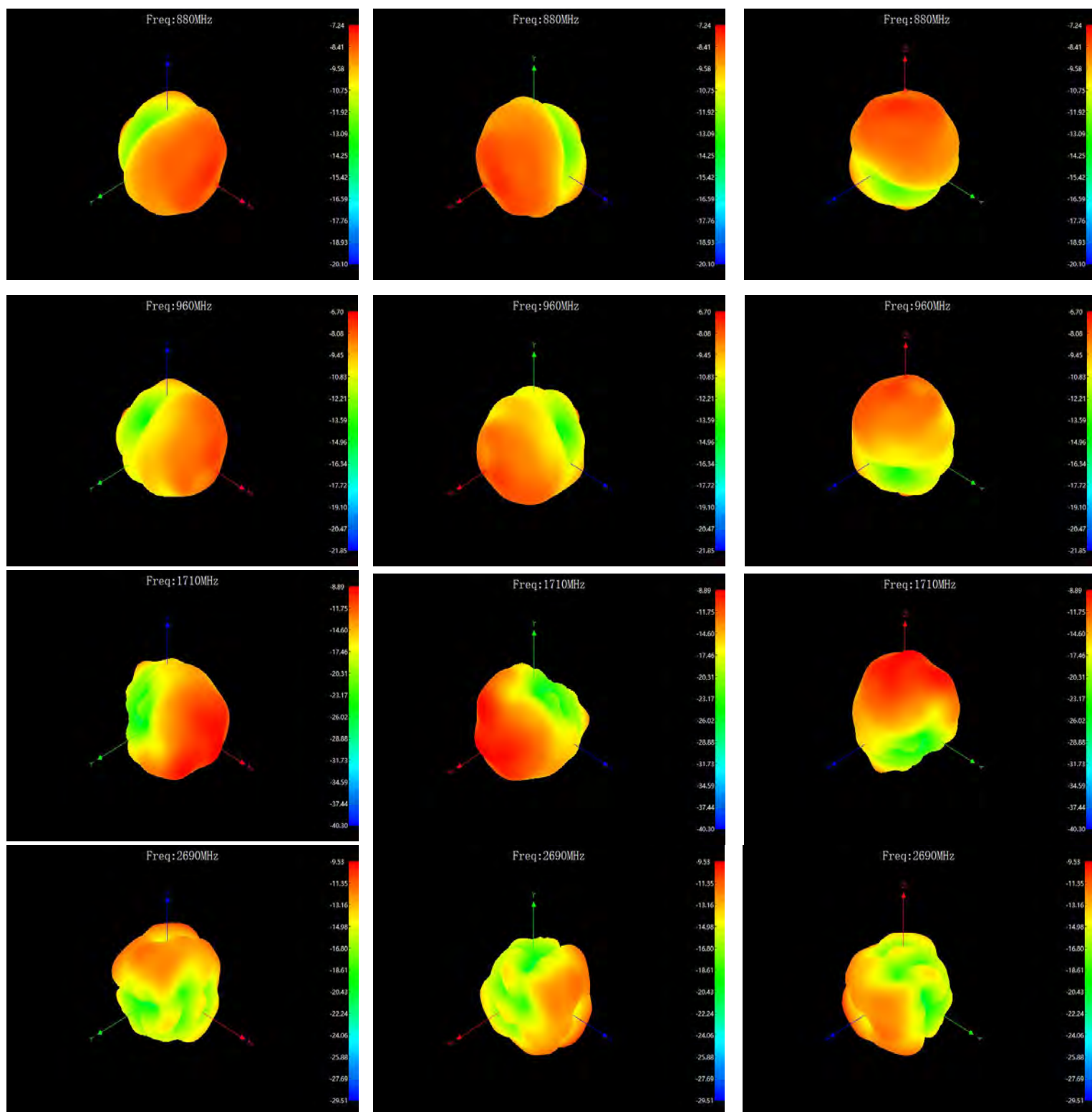
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT4/RF1 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
880	10.31	-9.87	-7.24	1710	7.96	-10.99	-8.89	1930	10.64	-9.73	-10.01	2300	10.07	-9.97	-7.71	2510	9.4	-10.27	-10.68
890	11.71	-9.31	-6.75	1720	8.92	-10.49	-9.44	1940	10.59	-9.75	-10.14	2310	9.98	-10.01	-7.91	2520	9.38	-10.28	-10.79
900	12.82	-8.92	-6.5	1730	10.92	-9.62	-9.58	1950	10.52	-9.78	-10.31	2320	10.01	-10	-7.82	2530	9.38	-10.28	-11.39
910	9.77	-10.1	-6.24	1740	10.9	-9.63	-9.67	1960	10.48	-9.8	-10.1	2330	9.9	-10.04	-7.7	2540	9.38	-10.28	-10.68
920	7.68	-11.15	-5.95	1750	10.88	-9.63	-9.75	1970	10.45	-9.81	-9.77	2340	9.85	-10.07	-7.67	2550	9.37	-10.28	-11.47
930	6.45	-11.9	-5.97	1760	10.85	-9.65	-9.75	1980	10.42	-9.82	-9.6	2350	9.81	-10.08	-8.23	2560	9.46	-10.24	-11.4
940	5.09	-12.93	-6.09	1770	10.86	-9.64	-9.67	1990	10.36	-9.85	-9.65	2360	9.78	-10.1	-8.6	2570	9.43	-10.25	-10.75
950	4.74	-13.24	-6.22	1780	10.85	-9.65	-9.43	2000	10.3	-9.87	-9.79	2370	9.64	-10.16	-8.84	2580	9.61	-10.17	-10.06
960	4.41	-13.56	-6.7	1790	10.79	-9.67	-9.26	2010	10.21	-9.91	-10.16	2380	10.83	-9.65	1.28	2590	9.64	-10.16	-9.88
				1800	10.74	-9.69	-9.39	2020	10.24	-9.9	-10.59	2390	9.54	-10.2	-9	2600	9.65	-10.15	-10.12
				1810	10.67	-9.72	-9.41	2030	10.19	-9.92	-10.33	2400	9.44	-10.25	-8.12	2610	9.7	-10.13	-9.87
				1820	10.61	-9.74	-9.51	2040	10.23	-9.9	-10.18	2410	9.75	-10.11	-7.8	2620	9.67	-10.15	-9.68
				1830	10.55	-9.77	-9.8	2050	10.37	-9.84	-9.56	2420	9.58	-10.19	-9.17	2630	9.72	-10.12	-10.44
				1840	10.53	-9.78	-9.98	2060	10.52	-9.78	-8.46	2430	9.45	-10.25	-8.55	2640	9.74	-10.11	-10.28
				1850	10.55	-9.77	-9.91	2070	10.56	-9.76	-8.28	2440	9.51	-10.22	-9.74	2650	9.86	-10.06	-9.98
				1860	10.59	-9.75	-9.77	2080	10.69	-9.71	-7.6	2450	9.56	-10.2	-10.72	2660	10.01	-10	-10.12
				1870	10.56	-9.76	-9.81	2090	10.74	-9.69	-7.46	2460	9.33	-10.3	-10.33	2670	10.11	-9.95	-9.95
				1880	10.56	-9.76	-9.85	2100	10.9	-9.63	-6.94	2470	9.45	-10.25	-10.81	2680	10.16	-9.93	-10.1
				1890	10.6	-9.75	-9.78	2110	10.91	-9.62	-7.09	2480	9.46	-10.24	-10.21	2690	10.44	-9.81	-9.53
				1900	10.62	-9.74	-9.8	2120	11.01	-9.58	-7.21	2490	9.39	-10.27	-10.05				
				1910	10.62	-9.74	-9.83	2130	10.93	-9.61	-7.6	2500	9.48	-10.23	-10.73				
				1920	10.62	-9.74	-9.89	2140	10.99	-9.59	-7.96								
								2150	11.01	-9.58	-8.85								
								2160	10.96	-9.6	-8.99								
								2170	10.92	-9.62	-9.82								

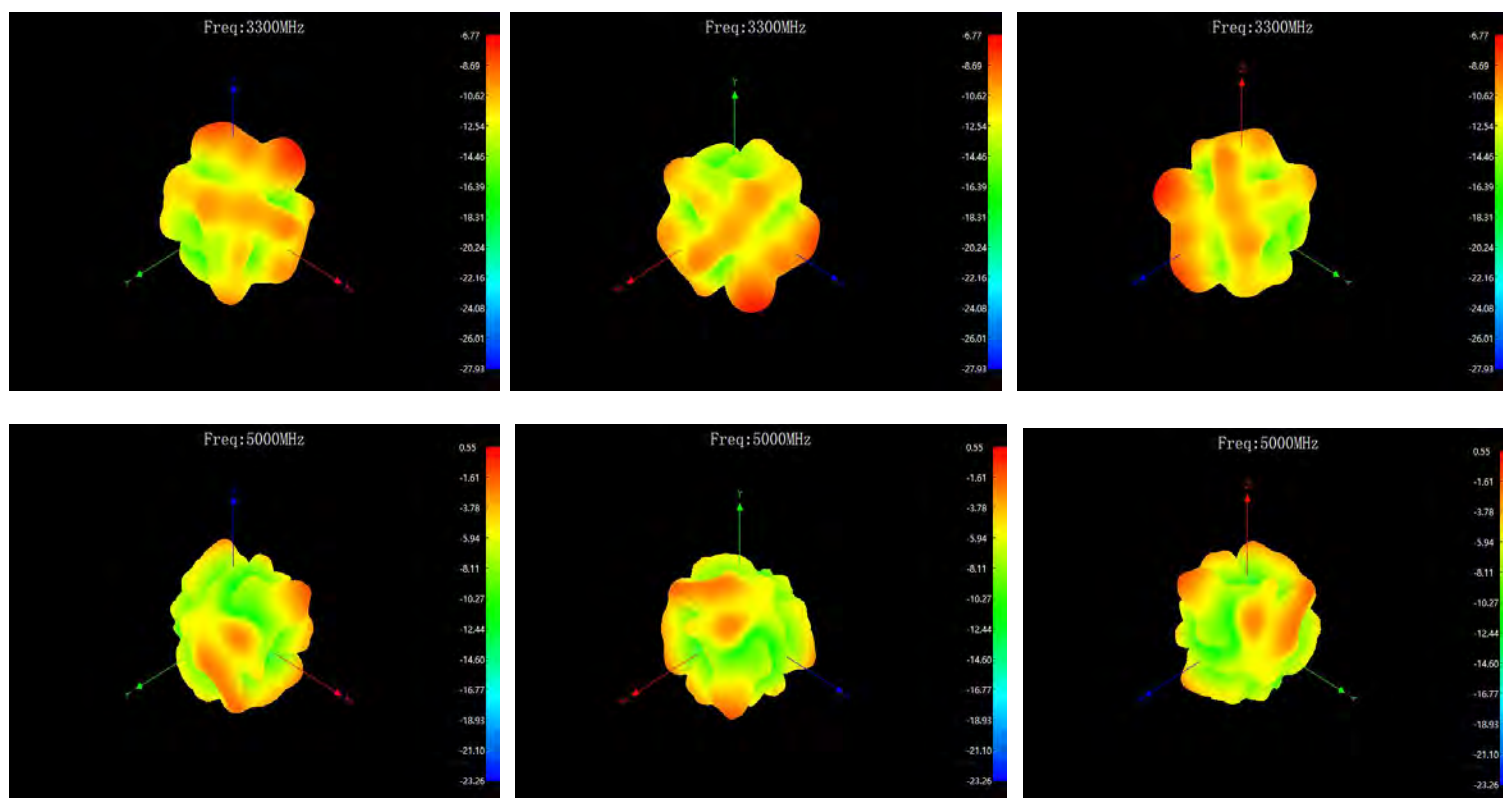
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT4/RF1 passive efficiency

Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)	Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
3300	6.97	-11.57	-6.77	3560	15.56	-8.08	-2.34	4400	28.44	-5.46	1.85	4660	24.95	-6.03	0.65	4920	28.58	-5.44	-0.54
3310	7.33	-11.35	-6.91	3570	15.24	-8.17	-2.67	4410	26.42	-5.78	1.36	4670	27.1	-5.67	1.04	4930	28.25	-5.49	-0.85
3320	7.74	-11.11	-7.04	3580	14.89	-8.27	-3.04	4420	24.04	-6.19	1.42	4680	27.67	-5.58	1.24	4940	27.61	-5.59	-0.95
3330	8.09	-10.92	-7.14	3590	14.83	-8.29	-2.79	4430	25.47	-5.94	1.61	4690	29.58	-5.29	1.84	4950	27.04	-5.68	-0.78
3340	8.51	-10.7	-6.25	3600	14	-8.54	-2.97	4440	26.18	-5.82	1.74	4700	29.31	-5.33	1.63	4960	26.18	-5.82	-0.73
3350	8.61	-10.65	-5.88	3610	14.26	-8.46	-2.09	4450	27.1	-5.67	2.68	4710	28.44	-5.46	1.79	4970	27.04	-5.68	-0.12
3360	8.91	-10.5	-5.25	3620	13.77	-8.61	-2.43	4460	28.05	-5.52	2.74	4720	27.16	-5.66	1.46	4980	27.73	-5.57	0.28
3370	8.93	-10.49	-4.5	3630	13.9	-8.57	-1.73	4470	29.11	-5.36	3.45	4730	29.17	-5.35	1.87	4990	27.42	-5.62	0.18
3380	9.44	-10.25	-4.3	3640	13.27	-8.77	-1.7	4480	27.86	-5.55	3.4	4740	27.99	-5.53	1.71	5000	27.61	-5.59	0.55
3390	9.73	-10.12	-4	3650	13.15	-8.81	-2.51	4490	30.13	-5.21	3.97	4750	29.31	-5.33	2.18				
3400	9.98	-10.01	-3.37	3660	13.46	-8.71	-2.58	4500	32.14	-4.93	4.47	4760	28.25	-5.49	2.08				
3410	10.94	-9.61	-2.93	3670	13.37	-8.74	-2.46	4510	31.33	-5.04	4.47	4770	26.12	-5.83	1.9				
3420	11.27	-9.48	-2.83	3680	13.3	-8.76	-3.1	4520	32.14	-4.93	4.79	4780	26.49	-5.77	2.11				
3430	11.48	-9.4	-2.43	3690	13.27	-8.77	-2.18	4530	30.9	-5.1	4.63	4790	26.73	-5.73	2.12				
3440	11.86	-9.26	-3.3	3700	13.03	-8.85	-1.75	4540	29.17	-5.35	4.41	4800	27.99	-5.53	2.38				
3450	12.08	-9.18	-3.35	3710	13.71	-8.63	-1.56	4550	29.99	-5.23	4.71	4810	28.12	-5.51	1.89				
3460	12.79	-8.93	-2.83	3720	13.61	-8.66	-1.23	4560	29.58	-5.29	4.45	4820	27.67	-5.58	1.65				
3470	13.03	-8.85	-2.59	3730	13.87	-8.58	-1.18	4570	29.11	-5.36	4.55	4830	27.29	-5.64	1.08				
3480	14	-8.54	-1.41	3740	14.29	-8.45	-1.58	4580	27.35	-5.63	4.34	4840	26.85	-5.71	1.26				
3490	14.72	-8.32	-1.14	3750	14.52	-8.38	-1.82	4590	26.36	-5.79	3.7	4850	27.67	-5.58	0.63				
3500	15.38	-8.13	-1.3	3760	13.37	-8.74	-2.8	4600	25.94	-5.86	3.44	4860	33.73	-4.72	7.37				
3510	15.89	-7.99	-0.76	3770	12.91	-8.89	-3.39	4610	25.12	-6	2.7	4870	33.96	-4.69	7.24				
3520	16.14	-7.92	-1.49	3780	13.15	-8.81	-3.6	4620	25.7	-5.9	1.99	4880	28.58	-5.44	1.3				
3530	16.11	-7.93	-2.02	3790	13.46	-8.71	-3.83	4630	25.59	-5.92	1.78	4890	28.38	-5.47	0.76				
3540	16	-7.96	-2.52	3800	14.06	-8.52	-3.93	4640	24.27	-6.15	0.67	4900	28.18	-5.5	0.81				
3550	15.74	-8.03	-2.55					4650	24.38	-6.13	0.51	4910	27.35	-5.63	0.12				

Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT4/RF1antenna pattern



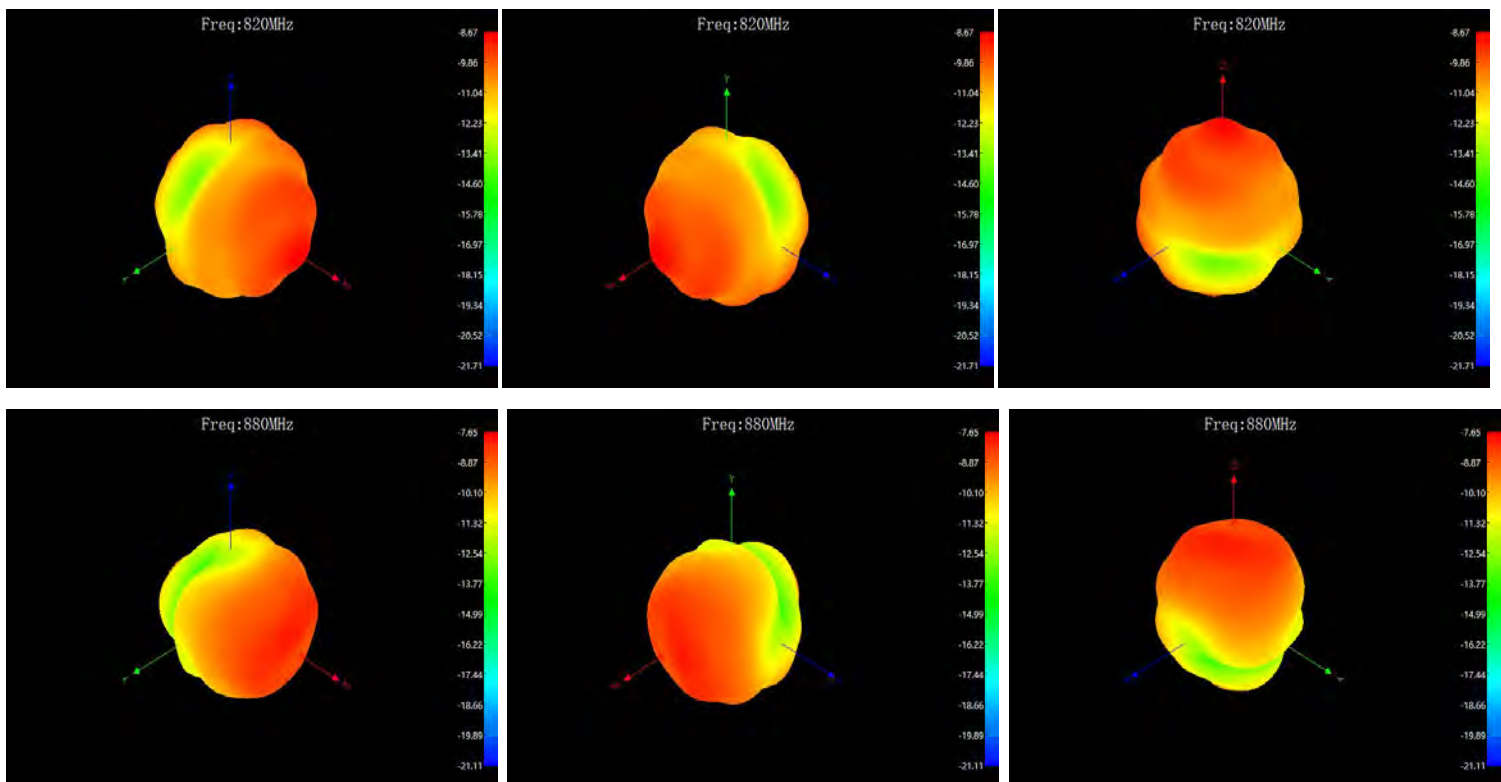
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT4/RF1antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT4/RF2 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
820	10.06	-9.97	-8.67
830	10.39	-9.83	-8.68
840	10.66	-9.72	-8.31
850	10.94	-9.61	-7.99
860	11.14	-9.53	-7.9
870	11.16	-9.52	-7.85
880	11.11	-9.54	-7.65
890	10.94	-9.61	-7.01
900	10.61	-9.74	-7.42

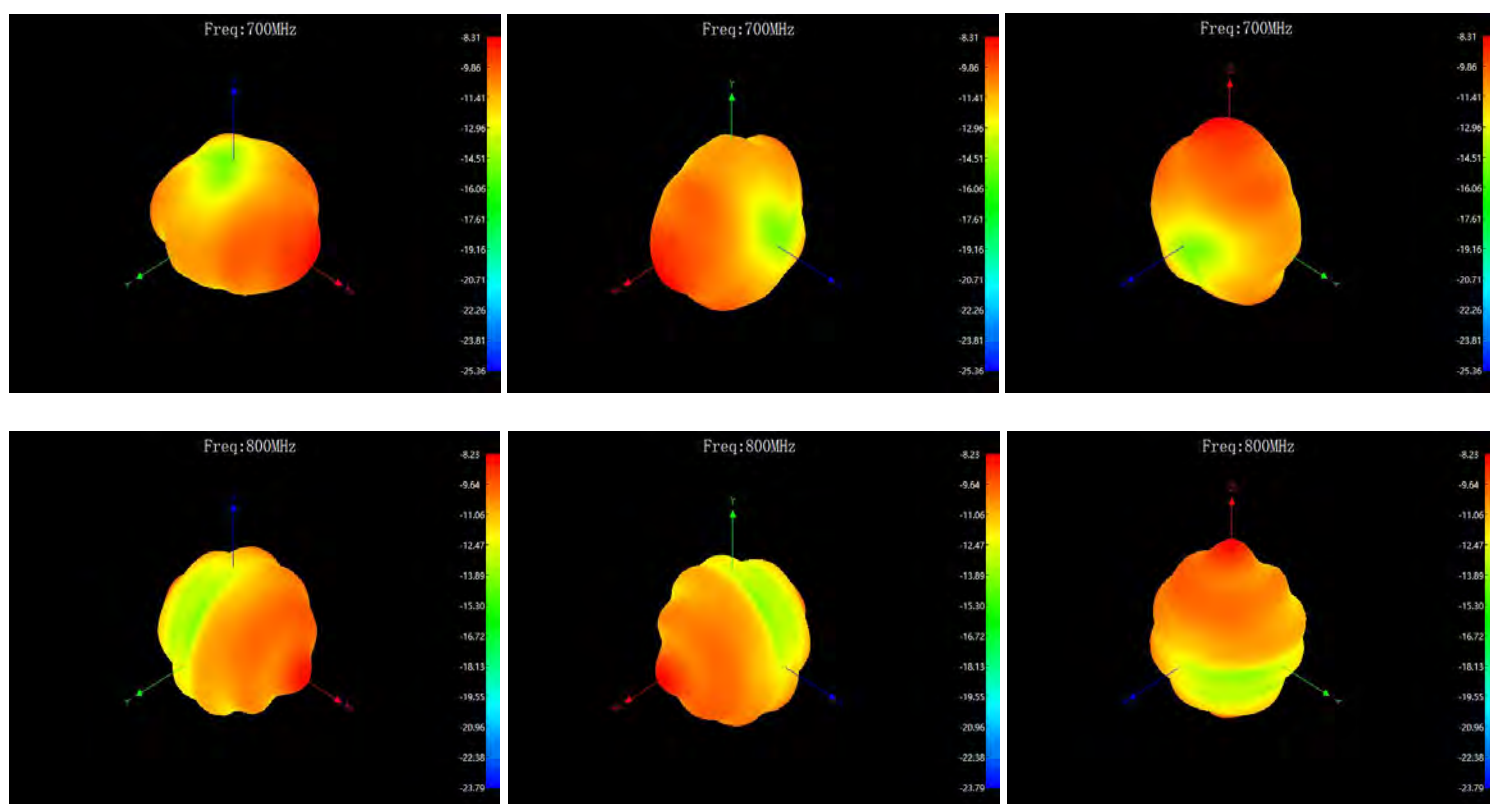
ANT4/RF2 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT4/RF3 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
700	8.41	-10.75	-8.31
710	8.69	-10.61	-8.2
720	8.95	-10.48	-7.66
730	9.47	-10.24	-6.97
740	10.03	-9.99	-6.57
750	10.34	-9.85	-6.7
760	10.19	-9.92	-7.27
770	9.79	-10.09	-7.66
780	9.31	-10.31	-7.74
790	8.8	-10.56	-7.72
800	8.32	-10.8	-8.23

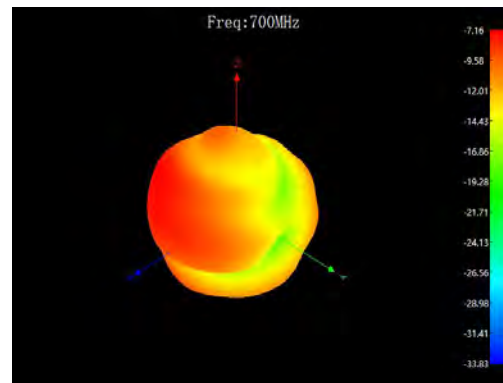
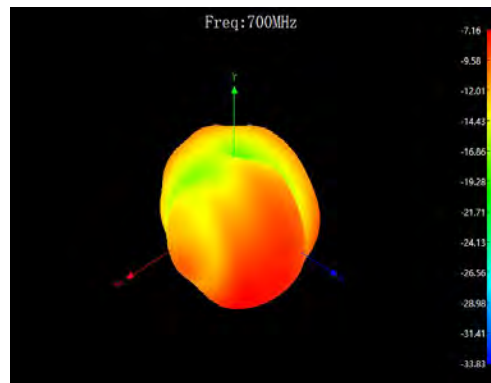
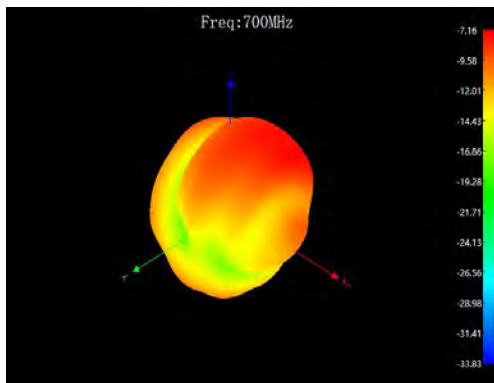
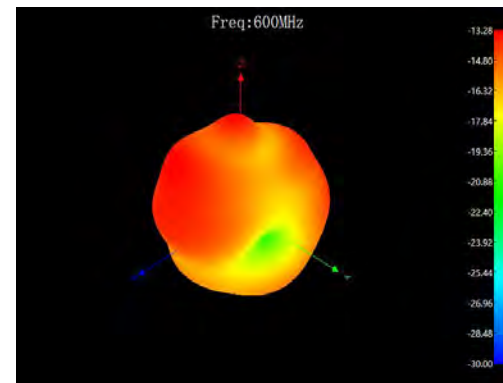
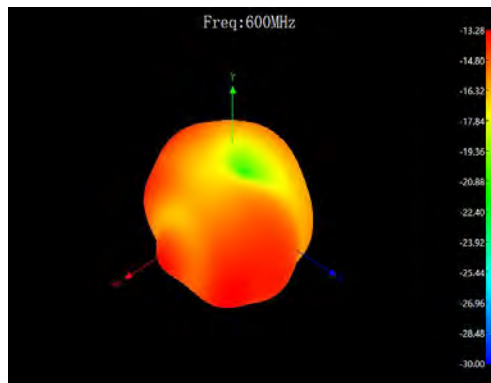
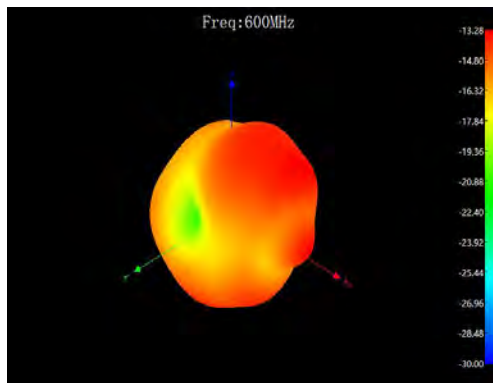
ANT4/RF3 antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT4/RF4 passive efficiency

Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
600	6.6	-11.8	-13.28
610	6.87	-11.63	-12.3
620	7.25	-11.4	-11.13
630	7.74	-11.11	-9.92
640	8.35	-10.78	-8.56
650	9.08	-10.42	-7.74
660	9.76	-10.11	-7.23
670	10.16	-9.93	-6.92
680	10.28	-9.88	-7.14
690	10.37	-9.84	-7.4
700	10.82	-9.66	-7.16

ANT4/RF4 antenna pattern

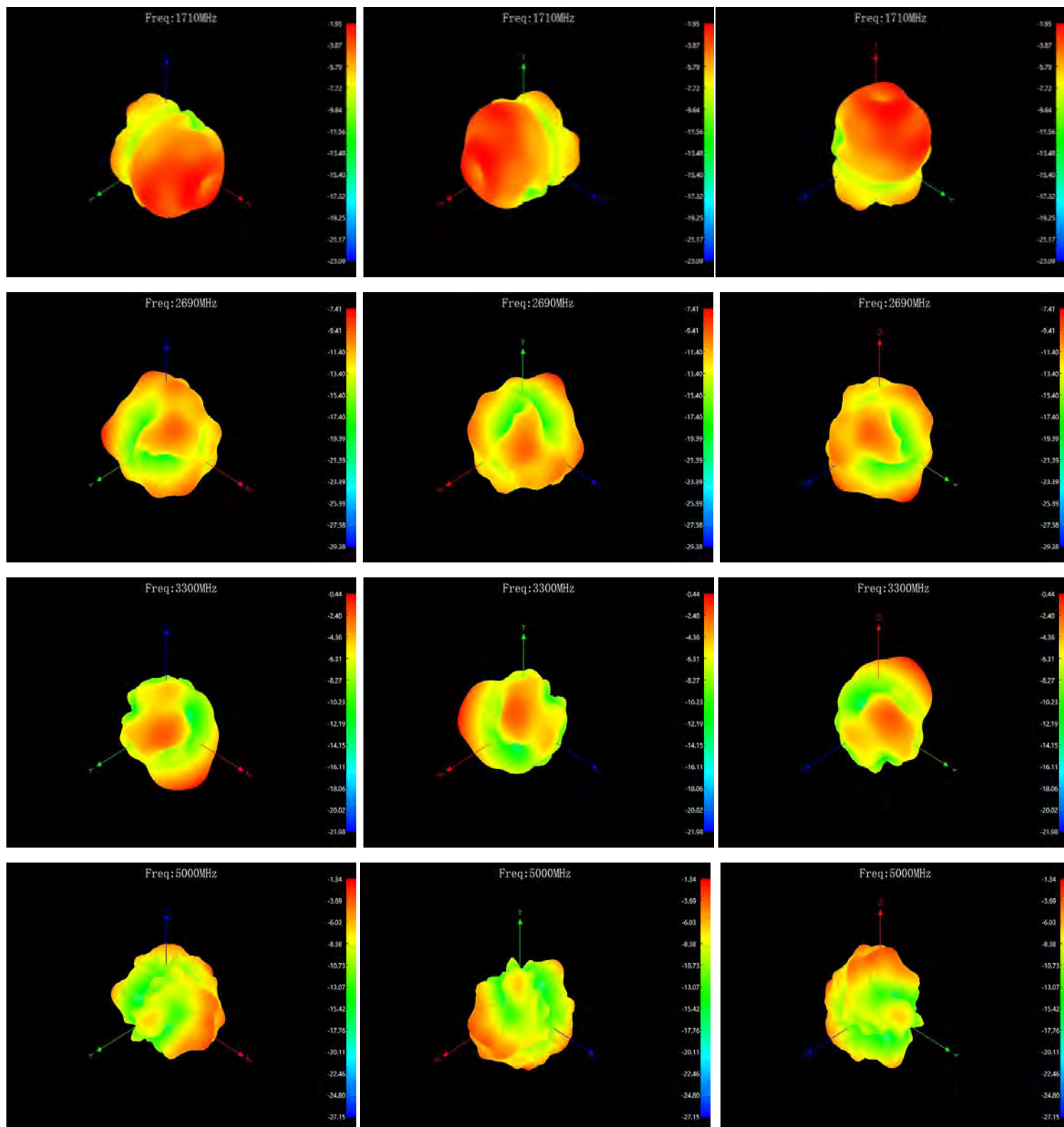


Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition

Antenna ANT5 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
1710	16.63	-7.79	-1.95	2300	13.09	-8.83	-4.09	3370	27.99	-5.53	-0.38	4430	19.85	-7.02	1.16	4900	15.35	-8.14	-1.88
1720	17.91	-7.47	-1.66	2310	14.49	-8.39	-4.57	3380	28.61	-5.43	-0.26	4440	20.42	-6.9	1.28	4910	16.68	-7.78	-1.79
1730	19.05	-7.2	-1.42	2320	14.35	-8.43	-4.36	3390	28.75	-5.41	-0.15	4450	20.79	-6.82	1.75	4920	17.22	-7.64	-1.54
1740	19.68	-7.06	-1.27	2330	13.88	-8.58	-3.88	3400	29.92	-5.24	0.2	4460	21.68	-6.64	1.6	4930	17.29	-7.62	-1.42
1750	20	-6.99	-1.16	2340	13.55	-8.68	-4.07	3410	30.36	-5.18	0.18	4470	20.59	-6.86	1.68	4940	17.38	-7.6	-1.3
1760	20.28	-6.93	-0.95	2350	14.85	-8.28	-4.45	3420	33.42	-4.76	0.35	4480	20.28	-6.93	1.61	4950	17.31	-7.62	-1.38
1770	20.51	-6.88	-0.57	2360	14.67	-8.34	-4.59	3430	33.71	-4.72	0.05	4490	20.61	-6.86	1.53	4960	17.1	-7.67	-1.33
1780	20.61	-6.86	-0.24	2370	14.28	-8.45	-4.86	3440	33.57	-4.74	-0.3	4500	20.8	-6.82	1.33	4970	17.58	-7.55	-1.22
1790	20.37	-6.91	-0.03	2380	14.21	-8.47	-5.62	3450	33.48	-4.75	-0.21	4510	19.98	-6.99	0.82	4980	17.66	-7.53	-1.09
1800	20.37	-6.91	0.06	2390	14.43	-8.41	-5.29	3460	33.65	-4.73	-0.37	4520	18.79	-7.26	0.35	4990	17.73	-7.51	-1.28
1810	20.04	-6.98	-0.07	2400	14.33	-8.44	-4.8	3470	34.26	-4.65	-0.18	4530	17.69	-7.52	0.19	5000	17.78	-7.5	-1.34
1820	19.77	-7.04	-0.34	2410	14.31	-8.44	-5.48	3480	34.59	-4.61	0.1	4540	15.92	-7.98	-0.31				
1830	19.23	-7.16	-0.65	2420	14.36	-8.43	-5.14	3490	35.16	-4.54	-0.04	4550	16.33	-7.87	-0.11				
1840	18.92	-7.23	-0.71	2430	14.03	-8.53	-4.66	3500	35.89	-4.45	0.06	4560	16.29	-7.88	0.13				
1850	18.88	-7.24	-0.58	2440	13.97	-8.55	-5.66	3510	35.28	-4.52	-0.11	4570	16.08	-7.94	0.72				
1860	18.92	-7.23	-0.45	2450	13.73	-8.62	-5.89	3520	35.11	-4.55	-0.17	4580	15.74	-8.03	0.91				
1870	18.66	-7.29	-0.45	2460	13.01	-8.86	-5.62	3530	34.28	-4.65	-0.24	4590	15.63	-8.06	1.19				
1880	18.54	-7.32	-0.56	2470	13.41	-8.73	-6.34	3540	33.27	-4.78	-0.32	4600	15.85	-8	1.1				
1890	18.62	-7.3	-0.76	2480	13.28	-8.77	-6.57	3550	32.75	-4.85	-0.35	4610	15.81	-8.01	0.82				
1900	18.66	-7.29	-0.95	2490	12.83	-8.92	-6.62	3560	31.41	-5.03	-0.39	4620	15.96	-7.97	0.26				
1910	18.62	-7.3	-1.04	2500	13.46	-8.71	-7.04	3570	30.69	-5.13	-0.49	4630	15.16	-8.19	0.11				
1920	18.66	-7.29	-0.94	2510	13.49	-8.7	-6.91	3580	29.99	-5.23	-0.67	4640	14.83	-8.29	-0.52				
1930	18.88	-7.24	-0.73	2520	13.34	-8.75	-7.27	3590	29.05	-5.37	-1.15	4650	14.63	-8.35	-0.75				
1940	18.97	-7.22	-0.61	2530	13.43	-8.72	-7.2	3600	28.71	-5.42	-1.04	4660	14.06	-8.52	-0.89				
1950	19.01	-7.21	-0.63	2540	13.31	-8.76	-6.24	3610	29.11	-5.36	-1.16	4670	14.29	-8.45	-0.63				
1960	19.32	-7.14	-0.64	2550	13.12	-8.82	-6.78	3620	29.24	-5.34	-1.03	4680	14.39	-8.42	-0.34				
1970	19.86	-7.02	-0.65	2560	13.3	-8.76	-6.28	3630	28.71	-5.42	-0.92	4690	14.52	-8.38	-0.19				
1980	20.56	-6.87	-0.53	2570	13.12	-8.82	-6.17	3640	28.25	-5.49	-0.84	4700	14.62	-8.35	-0.22				
1990	21.13	-6.75	-0.34	2580	13.37	-8.74	-6.05	3650	28.09	-5.51	-0.75	4710	14.09	-8.51	-0.38				
2000	21.63	-6.65	-0.24	2590	13.25	-8.78	-5.9	3660	28.12	-5.51	-0.68	4720	13.27	-8.77	-0.76				
2010	21.33	-6.71	-0.89	2600	13.01	-8.86	-6.05	3670	27.98	-5.53	-0.58	4730	13.98	-8.54	-0.43				
2020	22.7	-6.44	-0.98	2610	12.85	-8.91	-6.2	3680	27.61	-5.59	-0.16	4740	14.72	-8.32	-0.3				
2030	22.28	-6.52	-0.55	2620	12.53	-9.02	-6.74	3690	26.93	-5.7	0.49	4750	15.16	-8.19	-0.22				
2040	22.13	-6.55	-0.62	2630	12.41	-9.06	-7.19	3700	26.67	-5.74	0.86	4760	15.6	-8.07	-0.33				
2050	22.49	-6.48	-0.45	2640	12.25	-9.12	-7.19	3710	27.18	-5.66	1.17	4770	15.72	-8.04	-0.58				
2060	22.08	-6.56	-0.38	2650	12.18	-9.14	-7.46	3720	28.12	-5.51	1.27	4780	15.89	-7.99	0.06				
2070	21.28	-6.72	-0.77	2660	12.04	-9.19	-7.63	3730	28.53	-5.45	1.29	4790	16.39	-7.85	0.11				
2080	20.7	-6.84	-0.97	2670	12.9	-8.89	-6.93	3740	29.65	-5.28	1.03	4800	16.87	-7.73	0.65				
2090	19.77	-7.04	-1.09	2680	12.57	-9.01	-8	3750	28.37	-5.47	0.29	4810	16.41	-7.85	-0.12				
2100	19.5	-7.1	-0.86	2690	12.73	-8.95	-7.41	3760	27.23	-5.65	-0.28	4820	16.03	-7.95	-0.03				
2110	18.28	-7.38	-1.17	3300	20.23	-6.94	-0.44	3770	25.45	-5.94	-0.93	4830	15.75	-8.03	-0.37				
2120	17.58	-7.55	-1.57	3310	20.85	-6.81	-0.36	3780	24.89	-6.04	-1.21	4840	14.59	-8.36	-0.62				
2130	16.29	-7.88	-1.49	3320	21.93	-6.59	-0.28	3790	23.91	-6.21	-1.38	4850	14.73	-8.32	-0.82				
2140	15.85	-8	-2.13	3330	22.69	-6.44	-0.48	3800	23.6	-6.27	-1.45	4860	14.86	-8.28	-1.01				
2150	15.52	-8.09	-2.23	3340	23.6	-6.27	-0.52	4400	18.84	-7.25	0.49	4870	15.08	-8.22	-1.34				
2160	14.83	-8.29	-1.78	3350	24.69	-6.07	-0.51	4410	17.91	-7.47	0.28	4880	14.86	-8.28	-1.82				
2170	14.35	-8.43	-2.5	3360	25.53	-5.93	-0.6	4420	17.66	-7.53	0.13	4890	14.71	-8.32	-1.58				

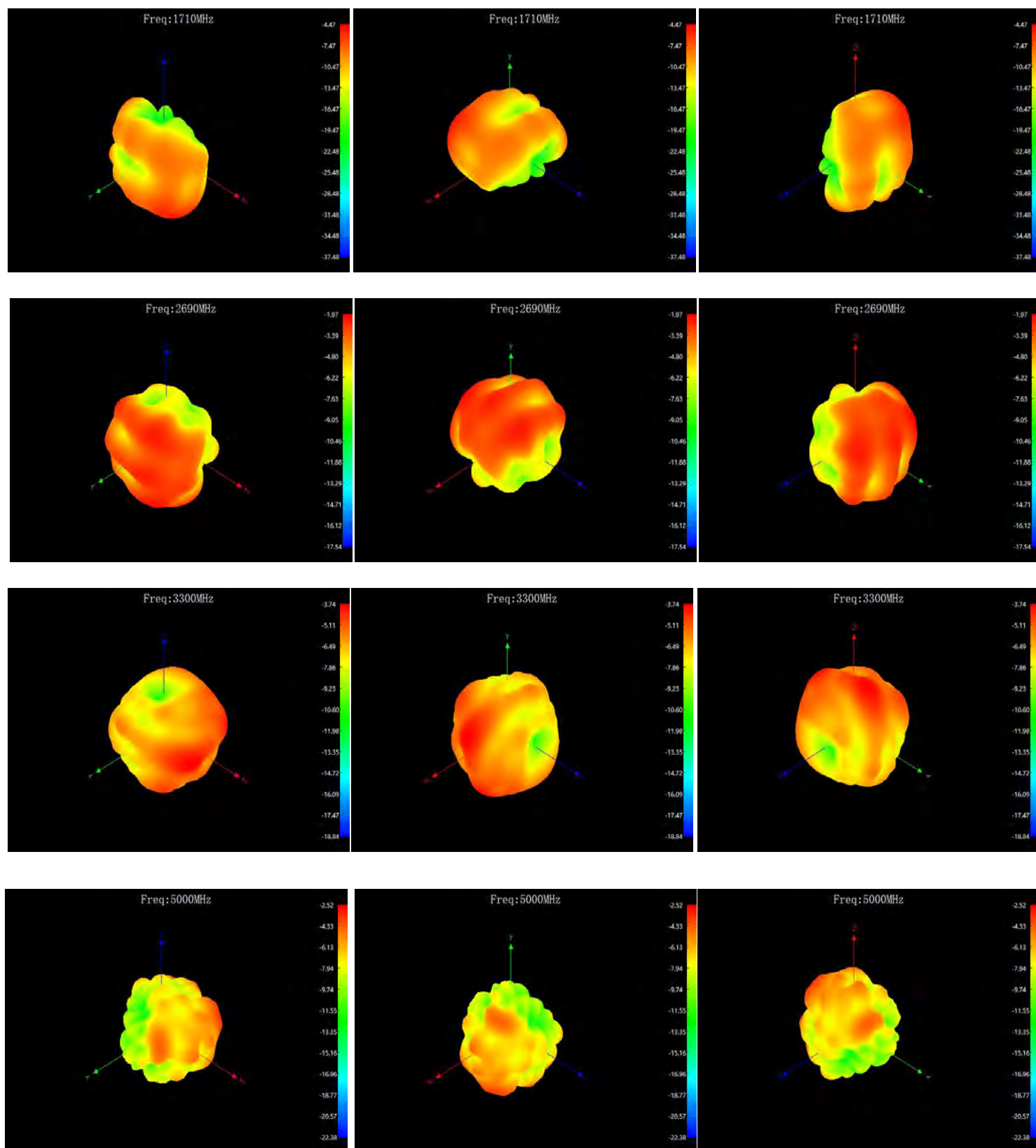
Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT5antenna pattern



Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
Antenna ANT6 passive efficiency

Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain	Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)	(MHz)	(%)	(dB)	(dBi)
1710	9.93	-10.03	-5.49	2300	36.48	-4.38	1.36	3370	22.18	-6.54	-2.96	4430	22.58	-6.46	-2.79	4900	16.37	-7.86	-1.95
1720	10.26	-9.89	-4.7	2310	34.91	-4.57	0.98	3380	22.85	-6.41	-2.83	4440	22.96	-6.39	-2.64	4910	16.52	-7.82	-1.65
1730	10.59	-9.75	-4.43	2320	35.24	-4.53	1.07	3390	23.06	-6.37	-2.61	4450	23.06	-6.37	-2.52	4920	16.87	-7.73	-1.32
1740	10.94	-9.61	-4.55	2330	34.2	-4.66	1.14	3400	23.23	-6.34	-2.25	4460	23.17	-6.35	-2.89	4930	16.79	-7.75	-1.49
1750	11.12	-9.54	-4.87	2340	34.28	-4.65	1.06	3410	24.61	-6.09	-2.09	4470	21.18	-6.74	-3.08	4940	16.75	-7.76	-1.77
1760	11.4	-9.43	-4.9	2350	34.99	-4.56	0.83	3420	26.42	-5.78	-2.16	4480	20.99	-6.78	-3.07	4950	15.89	-7.99	-2.51
1770	11.89	-9.25	-4.82	2360	35.65	-4.48	1.27	3430	27.15	-5.66	-2.11	4490	20.69	-6.84	-3.14	4960	15.07	-8.22	-2.78
1780	12.47	-9.04	-4.6	2370	34.59	-4.61	0.83	3440	28.12	-5.51	-2.19	4500	21.33	-6.71	-3.36	4970	14.92	-8.26	-2.89
1790	13.03	-8.85	-4.26	2380	34.36	-4.64	0.18	3450	29.31	-5.33	-2.15	4510	20.85	-6.81	-3.51	4980	14.76	-8.31	-3.11
1800	13.68	-8.64	-3.74	2390	34.51	-4.62	1.08	3460	29.79	-5.26	-1.92	4520	20.94	-6.79	-3.74	4990	14.87	-8.28	-2.77
1810	14.35	-8.43	-3.37	2400	32.73	-4.85	1.15	3470	30.49	-5.16	-1.78	4530	19.83	-7.03	-3.25	5000	14.83	-8.29	-2.52
1820	15.14	-8.2	-3.41	2410	33.04	-4.81	0.27	3480	31.55	-5.01	-1.53	4540	19.72	-7.05	-3.19				
1830	16	-7.96	-3.55	2420	33.19	-4.79	1.51	3490	32.26	-4.91	-1.21	4550	20.15	-6.96	-3.11				
1840	16.87	-7.73	-3.43	2430	31.92	-4.96	1.85	3500	34.91	-4.57	-0.92	4560	20.94	-6.79	-2.93				
1850	18.03	-7.44	-3.07	2440	31.33	-5.04	0.56	3510	35.39	-4.51	-0.77	4570	20.43	-6.9	-2.81				
1860	19.28	-7.15	-2.61	2450	30.9	-5.1	1.3	3520	36.56	-4.37	-0.79	4580	20.65	-6.85	-2.8				
1870	20.37	-6.91	-2.18	2460	27.73	-5.57	0.39	3530	36.87	-4.33	-0.82	4590	19.91	-7.01	-2.78				
1880	21.48	-6.68	-1.79	2470	28.25	-5.49	-0.17	3540	37.15	-4.3	-0.75	4600	19.59	-7.08	-3.39				
1890	22.39	-6.5	-1.77	2480	27.99	-5.53	0.32	3550	37.22	-4.29	-0.66	4610	18.76	-7.27	-3.53				
1900	23.44	-6.3	-1.49	2490	26.79	-5.72	-0.77	3560	37.58	-4.25	-0.41	4620	18.32	-7.37	-3.52				
1910	24.32	-6.14	-1.36	2500	28.58	-5.44	-0.26	3570	38.51	-4.14	-0.23	4630	17.94	-7.46	-3.6				
1920	25.35	-5.96	-1.25	2510	28.12	-5.51	-0.24	3580	38.99	-4.09	-0.14	4640	17.62	-7.54	-3.64				
1930	26.42	-5.78	-1.16	2520	27.54	-5.6	-1.29	3590	39.36	-4.05	0.13	4650	16.72	-7.77	-3.66				
1940	27.54	-5.6	-1.03	2530	27.35	-5.63	-1.23	3600	39.72	-4.01	0.41	4660	16.03	-7.95	-3.42				
1950	28.58	-5.44	-0.84	2540	27.04	-5.68	-1.18	3610	40.25	-3.95	0.53	4670	16.28	-7.88	-3.31				
1960	29.17	-5.35	-0.65	2550	26.3	-5.8	-1.7	3620	41.98	-3.77	0.68	4680	16.41	-7.85	-3.29				
1970	29.38	-5.32	-0.47	2560	26.73	-5.73	-0.96	3630	42.26	-3.74	0.92	4690	16.85	-7.73	-3.02				
1980	29.44	-5.31	-0.5	2570	25.94	-5.86	-1.31	3640	42.66	-3.7	0.82	4700	17.7	-7.52	-3.17				
1990	29.31	-5.33	-0.72	2580	27.1	-5.67	-1.08	3650	43.35	-3.63	0.61	4710	16.79	-7.75	-3.27				
2000	28.84	-5.4	-0.91	2590	26.55	-5.76	-1.26	3660	44.26	-3.54	0.57	4720	16.48	-7.83	-3.08				
2010	27.23	-5.65	-1.37	2600	25.59	-5.92	-1.91	3670	44.19	-3.55	0.4	4730	16.89	-7.72	-3.03				
2020	27.61	-5.59	-1.58	2610	24.95	-6.03	-2.23	3680	44.77	-3.49	0.63	4740	17.06	-7.68	-2.85				
2030	26.73	-5.73	-0.69	2620	24.27	-6.15	-2.36	3690	45.28	-3.44	0.92	4750	17.33	-7.61	-2.76				
2040	27.73	-5.57	-0.56	2630	24.83	-6.05	-1.97	3700	46.03	-3.37	1.15	4760	17.74	-7.51	-3.02				
2050	30.55	-5.15	0.4	2640	24.83	-6.05	-2.08	3710	46.36	-3.34	1.23	4770	16.62	-7.79	-3.19				
2060	32.14	-4.93	0.69	2650	25.7	-5.9	-1.95	3720	47.28	-3.25	1.08	4780	16.22	-7.9	-3.15				
2070	32.51	-4.88	0.76	2660	26.55	-5.76	-1.7	3730	46.51	-3.32	1.16	4790	16.05	-7.95	-3.04				
2080	33.42	-4.76	0.95	2670	27.35	-5.63	-1.63	3740	45.53	-3.42	1.25	4800	15.92	-7.98	-3.58				
2090	32.96	-4.82	0.96	2680	27.1	-5.67	-2.37	3750	45.82	-3.39	1.21	4810	15.58	-8.07	-3.72				
2100	33.34	-4.77	1.06	2690	28.51	-5.45	-1.83	3760	46.35	-3.34	0.91	4820	15.85	-8	-3.92				
2110	32.28	-4.91	1.03	3300	19.32	-7.14	-3.74	3770	45.08	-3.46	0.95	4830	14.82	-8.29	-4.22				
2120	32.36	-4.9	1.02	3310	19.57	-7.08	-3.71	3780	44.86	-3.48	1.13	4840	14.13	-8.5	-4.05				
2130	31.19	-5.06	0.79	3320	19.68	-7.06	-3.69	3790	44.51	-3.52	0.92	4850	15.02	-8.23	-3.75				
2140	31.05	-5.08	0.42	3330	19.82	-7.03	-3.75	3800	43.27	-3.64	1.02	4860	15.21	-8.18	-3.51				
2150	31.05	-5.08	0.51	3340	19.95	-7	-3.89	4400	23.44	-6.3	-2.44	4870	15.72	-8.04	-2.77				
2160	30.48	-5.16	0.31	3350	20.41	-6.9	-6.72	4410	22.61	-6.46	-2.65	4880	16.18	-7.91	-2.25				
2170	30.55	-5.15	0.15	3360	20.65	-6.85	-3.61	4420	21.93	-6.59	-2.94	4890	16.63	-7.79	-1.95				

Shanghai Shangyuan Communication Technology Co., Ltd. antenna recognition
ANT6antenna pattern



频段	OTA (dB)		频段	OTA (dB)		频段	OTA (dB)	
	TRP	TIS		TRP	TIS		TRP	TIS
GSM850	25.39		LTE B1 (10M)	20.41		LTE B14 (10M)		
	26.62			20.68			14.15	
	26.06	-101.68		20.88	-96.53			-89.48
GSM900	25.23		LTE B2 (10M)	20.26		LTE B17 (10M)	16.38	
	25.46			20.62			16.32	
	25.51	-100.25		21.13	-93.63		16.32	-91.35
DCS1800	23.8		LTE B3 (10M)	18.54		LTE B20 (10M)	16.26	
	24.28			17.85			16.28	
	24.76	-105.16		18.06	-93.83		16	-91.28
PCS1900	24.43		LTE B4 (10M)	20.02		LTE B28 (10M)	16.42	
	24.55			19.85			16.16	
	25.07	-104.88		19.21	-92.1		15.49	-88.31
WCDMA B1	20.02		LTE B5 (10M)	16		LTE B34 (20M)	20.15	
	19.96			16.54			20	
	19.99	-105.41		15.45	-91.03		19.69	-94.89
WCDMA B2	17.77		LTE B7 (10M)	21		LTE B38 (20M)	20.9	
	18.39			21.29			20.52	
	18.64	-104.92		21.09	-91		20.65	-91.02
WCDMA B5	15.63		LTE B8 (10M)	15.53		LTE B39 (20M)	20.03	
	16.32			16.35			20.21	
	16.11	-103.4		16.02	-90.99		20.31	-92.32
WCDMA B8	15		LTE B12 (10M)	17.05		LTE B40 (20M)	19.43	
	15.63			17.25			20.09	
	16.31	-103.81		17.11	-89.49		20.67	-90.93
						LTE B41 (20M)	18.78	
							18.12	
							17.03	-90.02

5.2 Active test data

NSA active test data（free space）

频段	OTA (dB)		频段	OTA (dB)		频段	OTA (dB)	
	TRP	TIS		TRP	TIS		TRP	TIS
N1 (10MHz)	20.31		N28 (10MHz)	15.31		N79 (100MHz)	21.08	
	19.89			15.03			21.37	
	19.97	-94.26		15.12	-82.11		21.06	-87.39
N2 (10MHz)	18.99		N41 (10MHz)	20.57				
	19.3			20.19				
	19.38	-89.21		19.04	-81.61			
N3 (10MHz)	18.44		N77 (100MHz)	15.85				
	17.53			22.02				
	17.89	-86.39		20.62	-87.16			
N5 (10MHz)	15.57		N78 (100MHz)	16.02				
	15.52			19				
	15.38	-82.59		21.45	-88.4			

Triple three in one triad ternion active test data（free space, brigh __ 100%）

频段	OTA (dB)		频段	OTA (dB)	
	TRP	TIS		TRP	TIS
WiFi 2.4G 11b (11M)	14.88		WiFi 2.4G 11n (65M)	15.26	
	12.44			13.06	
	12.56	-79.49		13.28	-66.58
WiFi 2.4G 11G (54M)	15.29		WiFi 5G 11a (54M)	8.32	
	12.7			9.55	
	14.09	-70.82		9.76	-66.65

5.2 Active test data

NFC test card reading distance Type. 1 (Topaz) R/W mode distannccevs. Type 1/2/3/4/5	Type. 1 (Topaz)	13. 83/13. 92MHz	35mm
	Type 2 (MIFARE)	14. 11/. 14. 22MHz	40mm
	Type 3 (Felica)	14. 59MHz	40mm
	Type 4 (DESFIRE)	14. 97/16. 39MHz	25mm
	Type 5 (ISO 15693)	13. 83MHz	65mm



7. Mass production antenna indicators

When the antenna is mass-produced, the standing wave ratio is used as the mass production test standard. According to the differences in the project itself, the following criteria are given:

frequency (MHz)	量产标准
ANT0	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT1	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT2	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT3	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT4	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT5	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
ANT6	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5
	VSWR (Mass production performance) <VSWR(Acknowledge performance)+0.5

8 Drawings

[illegible]

[illegible]

