



深圳市安威无线科技有限公司

行业领先的一站式通信射频天线解决方案制造商

DK087 antenna report

Anwei RF: Lei Yao Bo

Mobile number: 15986728949

Report Version: 2024.11.4 V8

携手共进 共创未来

-  Introduction to Project Debugging
-  Summary of Report Version
-  Project development environment
-  Active test data
-  Environmental treatment methods
-  Passive efficiency
-  Risk warning during debugging process
-  Additional explanation
-  总结

Plate type	complete machine						
Antenna Overview	Main Antenna	Frequency band		Antenna status	antenna form	DESIGN AREA	Match changes
		2G	B2/3/5/8	FPC	PIFA	Bottom of phone	have
		3G	WCDMA B1/2/4/5/8				
		4G	FDD B1/2/3/4/5/7/8/12/13/17/19/20/28A/B/66 TDD 38/40/41				
		5G					
	Other antennas	BT/WIFI	2. 4G/5G/WIFI/BT5. 3 802. 1111a/b/g/n/n/a c	FPC	PIFA	Bottom of phone	not have
		GPS+BEIDOU +Glonass+Galileo	1575				not have
		diversity		FPC	PIFA	Bottom of phone	have

Prototype status

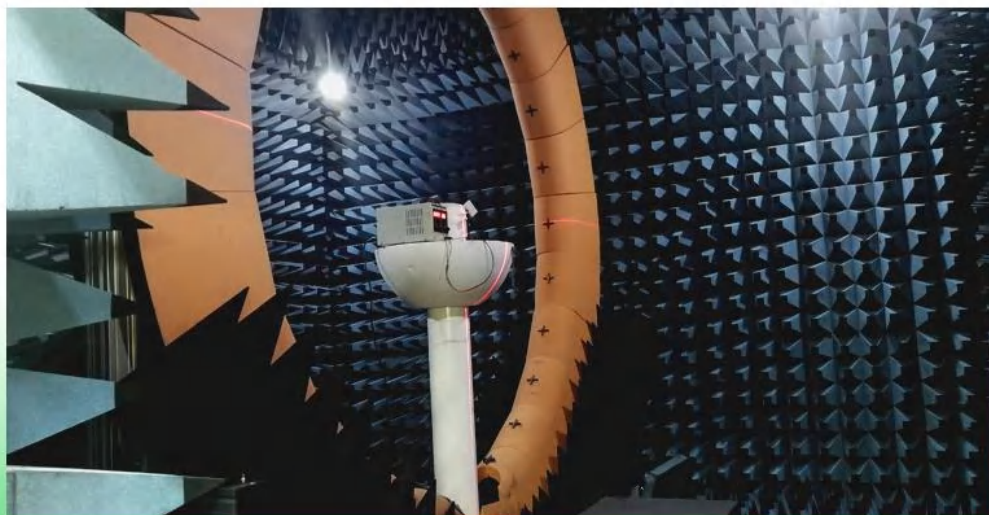
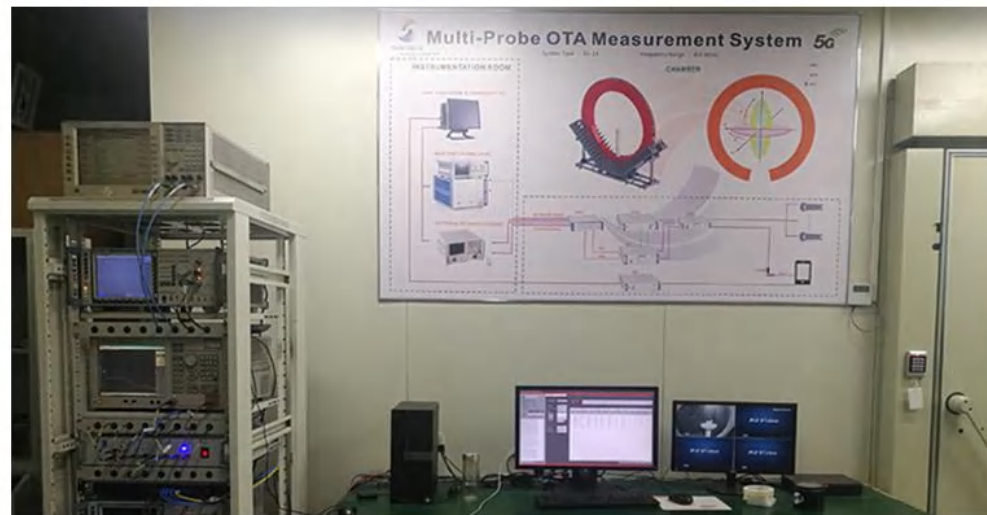
PVT prototype

environmental treatment



Summary of Report Version

version	date	Content Overview
V1	2024.6.15	Preliminary debugging status of antenna
V2	2024.6.19	By switching the logic antenna status
V3	2024.6.20	Optimize B13 segment
V4	2024.7.12	Trial production machine
V5	2024.7.18	Change the RF2 matching and NFC matching of the small board
V6	2024.7.23	Enhance the environment and address the sensitivity issue of the 850 terminal channel
V7	2024.9.6	Replace the CPU with a DVT motherboard
V8	2024.9.27	PVT trial production machine testing



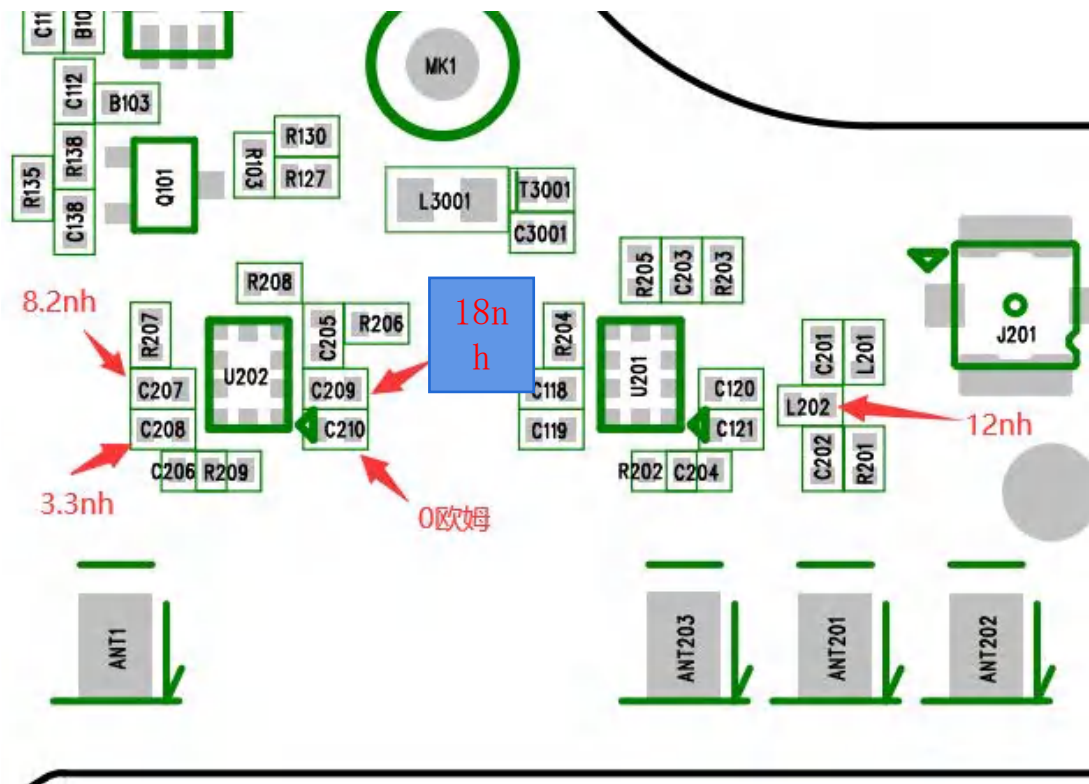
安威无线一直都是您值得信赖且优秀的合作伙伴，我们为您提供全方位一站式的产品以及技术服务！

“质量第一，服务至上”是安威一直以来的发展宗旨

DK087 ANT0 small board bottom switch frequency band division

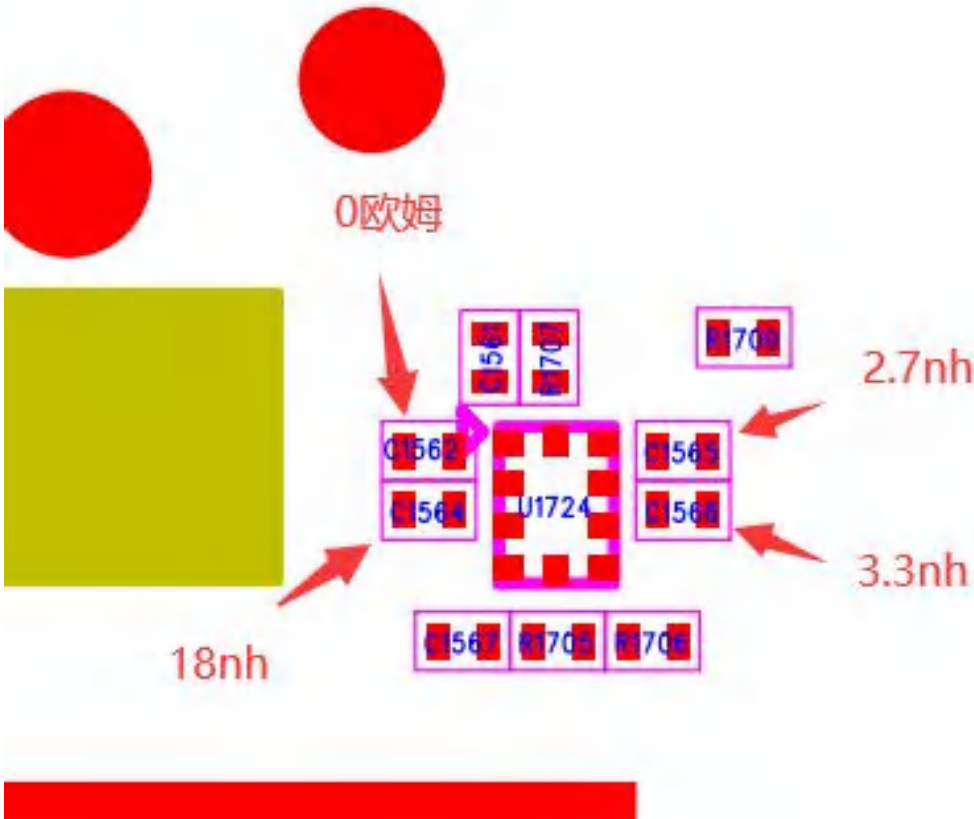
DK087 RF switch frequency band splitting is as follows:			
Frequency band	Switch channel	match	notes
GSM900/1800/1900 W1/2/4/8 LTE B1/2/3/4/7/8/38/ 40/41/66	RF1 (C210)	0ohm	
B12/17/28A/B	RF2 (C209)	18 NH	
GSM850 W5 LTE B5/19/20	RF3 (C208)	3.3 NH	
LTE B13	RF4 (C207)	8.2 NH	
	R209	0ohm	
	C206	NC	

Small board signal path: C202=0ohm;
L202=12NH;C201=0ohm; L201=NC



DK087 ANT1 motherboard switch frequency band division

DK087 RF switch frequency band splitting is as follows :			
Frequency band	Switch channel	match	notes
GSM900/1800/1900 W1/2/4/8 LTE B1/2/3/4/7/8/38/40/41/66	RF1 (C1562)	0ohm	
B12/17/28A/B	RF2 (C1564)	18nh	
GSM850 W5 LTE B5/19/20	RF3 (C1565)	2.7nh	
LTE B13	RF4 (C1566)	3.3nh	
	R1707	0ohm	
	C1561	NC	



	Channel	TRP (dBm)	TIS (dBm)			Channel	TRP (dBm)	TIS (dBm)			Channel	TRP (dBm)	TIS (dBm)
FDD B1	18050	18.65		FDD B13			17.86		TDD (B38)		37850	18.65	
	18300	18.85			23230		17.9				38000	18.73	
	18550	18.81	-93.61				17.7	-91.99			38150	18.54	-91.93
FDD B2	18650	17.96		FDD B17	23790		17.46		TDD (B40)		38750	17.92	
	18900	18.29			23790		17.03				39150	18.52	
	19150	18.46	-93.55		23790		17.33	-91.93			39550	18.6	-92.49
FDD B3	19250	18.08		FDD B19	24050		17.03		TDD (B41)		40340	18.77	
	19575	18.63			24075		17.76				40620	18.88	
	19900	17.89	-93.52		24100		17.71	-92.4			41140	18.64	-92.65
FDD B4	20000	18.52		FDD B20	24200		17.09						
	20175	18.46			24300		17.76						
	20350	18.18	-93.13		24400		17.34	-92.6					
FDD B5	20450	17.58		FDD B26	26740		17.32						
	20525	17.61			26865		17.24						
	20600	17.77	-92.38		26990		17.42	-92.81					
FDD B7	20800	18.77		FDD B28A	27260		17.45						
	21100	18.95			27370		17.22						
	21400	18.86	-94.75		27469		16.78	-91.46					
FDD B8	21500	17.93		FDD B28B	27410		17.9						
	21625	17.51			27510		17.13						
	21750	17.11	-91.64		27600		16.83	-91.39					
FDD B12	23060	16.09		FDD B66	132022		18.04						
	23095	16.23			132322		17.8						
	23130	16.34	-91.91		132622		17.17	-94.19					

	Channel	TRP (dBm)	TIS (dBm)			Channel	TRP (dBm)	TIS (dBm)			Channel	TRP (dBm)	TIS (dBm)
WCDMA B1	10562	18.67		GSM 850	128	25.83							
	10700	18.65			190	26.29							
	10838	18.55	-106		251	26.59	-105.19						
WCDMA B2	9262	17.43		GSM 900	1	26.25							
	9400	17.93			62	26.46							
	9538	18.14	-105.73		124	26.57	-103.27						
WCDMA B4	1312	18.11		DCS1800	512	25.44							
	1413	18.57			698	25.18							
	1513	18.35	-106.84		885	24.86	-105.72						
WCDMA B5	4132	17.26		PCS 1900	512	24.34							
	4183	17.85			661	24.65							
	4233	17.73	-105.29		810	24.76	-105.67						
WCDMA B8	2712	18.32											
	2787	17.51											
	2863	17.22	-103.02										

Conduction test (without adding
line loss)

Frequency band	power		Frequency band	power	
FDD 1	21.2		FDD 66	21	
FDD 2	20.6		TDD 38	22.2	
FDD 3	21		TDD 40	21	
FDD 4	21		TDD 41	22.2	
FDD 5	22.6		GSM850	31.7	
FDD 7	21.7		GSM900	31.7	
FDD 8	22.7		DCS1800	28.6	
FDD 12	22.5		PCS1900	28	
FDD 13	22.7		W1	21.6	
FDD 17	22.7		W2	21.5	
FDD 19	22.7		W4	21.4	
FDD 20	22.8		W5	22.5	
FDD 28	22.5		W8	22.5	

WIFI test results

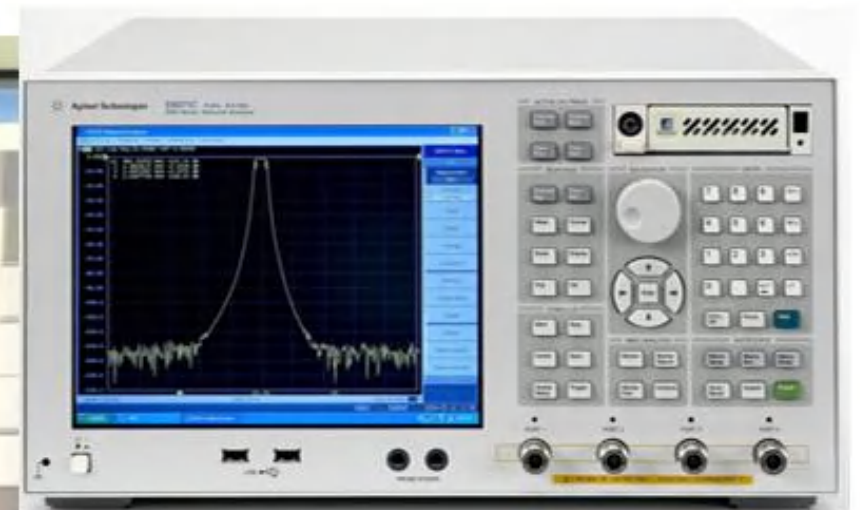
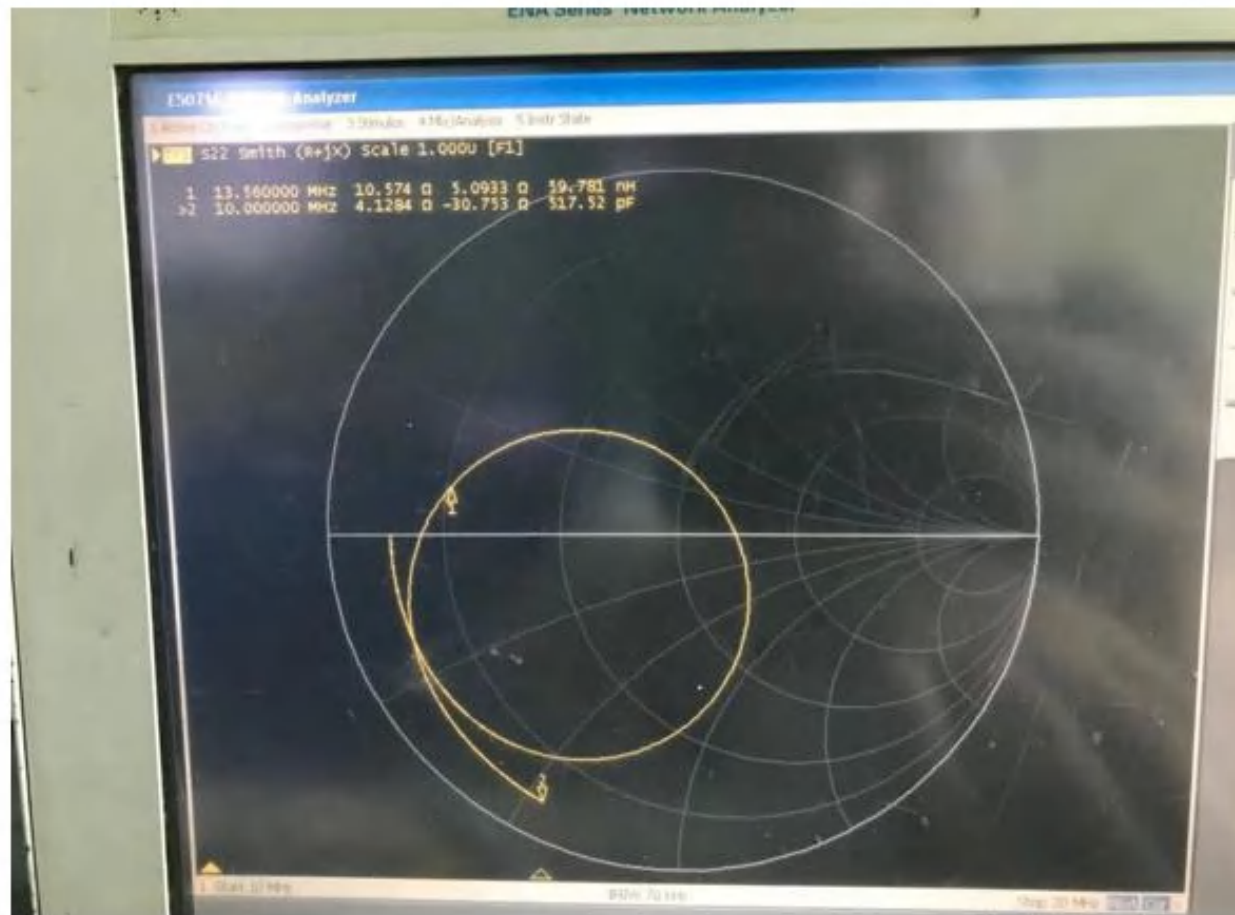
	Channel	TRP (dBm)	TIS (dBm)
2.4G WIFI-B (11M)	L	13.85	-83.82
	M	13.71	-83.46
	H	13.7	-83.21
2.4G WIFI-G (54M)	L	13.64	-73.92
	M	12.34	-73.1
	H	13.38	-73.3
2.4G WIFI-N (MCS7)	L	13.94	-69.7
	M	13.77	-69.0
	H	13.82	-69.1
5G WIFI-A (54M)	L	11.12	-72.42
	M	11.25	-72.38
	H	11.48	-72.54

	Channel	TRP (dBm)	TIS (dBm)
5G WIFI-N (65M)	L	11.35	-66.89
	M	11.24	-66.78
	H	11.44	-66.67
5G WIFI-AC (UNLL)	L	10.89	-66.97
	M	11.3	-66.71
	H	11.32	-66.73

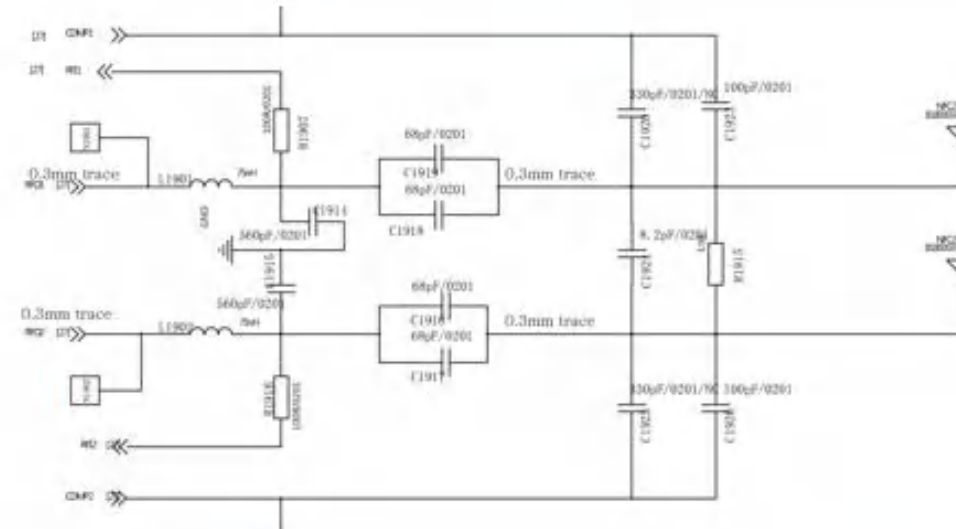
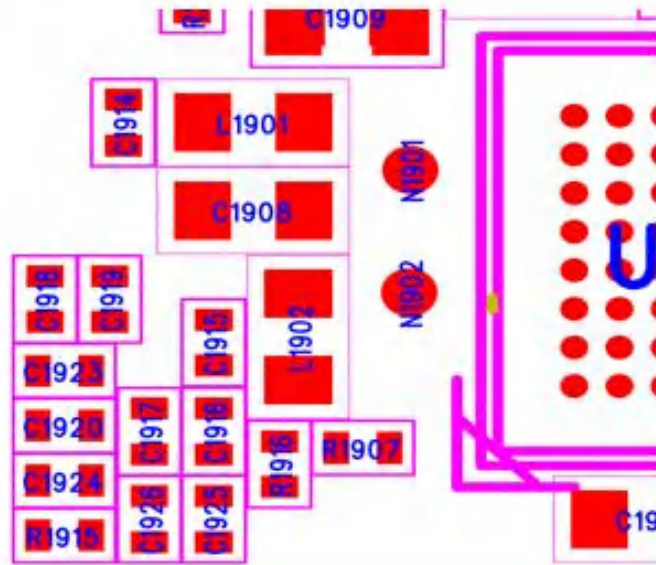
NFC Debugging Report

RF: engineer	SONG	Telephone:	13424355302
Date:	2024-07-15		

— Passive debugging and equipment



II Match debugging (modified based on the first trial production of the machine)



Attention: The matching parameters that need to be modified and optimized are shown in the table below (note: other matching parameters have not been changed, and other matching parameters will be based on the original parameters of the motherboard),

Improved based on the first trial production of the machine

Position Number	After adjustment	notes
C1919, C1917	27 pF	Package: 0201, Brand: Murata, Error 5% 50V
C1923, C1926	56 pF	Package: 0201, Brand: Murata, Error 5% 50V

III Reading distance

Card Type	distance (cm)	Antenna material
Type1 (Topaz-512)	4.0	FPC+ferri te
Type2 (Mifare-Ultralight)	3.8	
Type3 (Sony-Felica)	3.2	
Type4 (Mifare-Desfire)	2.2	
Type5 (ISO15693)	5.3	
Resident ID card	2.0	



4 Product Analysis and Summary

- 4.1. The reading distance is related to the compatibility of the card, and the above distance is only for testing the card
- 4.2. It is recommended to use higher precision capacitors

Actual GPS test results

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SVID	Fq	CNR	Elevation	Azimuth
 5 L1	40.1	39.00	44.00	
 13 L1	43.1	50.00	32.00	
 15 L1	36.9	70.00	324.00	
 18 L1	36.8	33.00	326.00	
 20 L1	26.1	23.00	76.00	
 23 L1	30.4	13.00	292.00	
 29 L1	35.0	45.00	244.00	
 65 L1	19.8	46.00	350.00	
 66 L1	26.6	40.00	275.00	
 67 L1	0.0	2.00	241.00	
 72 L1	0.0	7.00	38.00	
 75 L1	19.6	7.00	98.00	
 81 L1	30.2	19.00	333.00	
 87 L1	25.1	42.00	157.00	
 88 L1	40.4	71.00	318.00	
1 L1	0.0			

G:GPS R:GLN B:BD E:GAL Q:QZS L:L1S I:IRNSS S:SBAS

Average CNR

G:30.4/-/-/-/- R:28.7/-/-/-/- B:24.8/-/-/-/- E:7/-/-/-/-
Q:22.0/-/-/-/- L:-/-/-/-/- I:-/-/-/-/- S:-/-/-/-/-

☐ Show in single page

SVID	Fq	CNR	Elevation	Azimuth
 5 L1	42.8	39.00	46.00	
 11 L1	19.2	26.00	129.00	
 13 L1	42.2	49.00	32.00	
 15 L1	35.0	69.00	330.00	
 18 L1	30.3	34.00	326.00	
 20 L1	20.3	23.00	77.00	
 23 L1	25.6	13.00	294.00	
 29 L1	28.1	0.00	0.00	
 6			352.00	
 6			278.00	
 6			242.00	
 72 L1	0.0	6.00	39.00	
 75 L1	27.0	8.00	96.00	
75 L1	0.0	1.00	149.00	
81 L1	35.0	20.00	332.00	



9.20 欧盟 PVT

A线-BV7300 (0+250) 9-23/9:59

RF ☐ 热成像 ☐

扫描头 ☐ QA外观 ☐



9.20 欧盟 PVT

A线-BV7300 (0+250)

9-23/9:59

RF

热成像

扫描头

QA外观

Actual GPS test results

☐ Show in single page

SVID	Fq	CNR	Elevation	Azimuth
5 L1	42.8	38.00	48.00	
11 L1	16.3	25.00	129.00	
13 L1	41.6	48.00	32.00	
15 L1	19.9	69.00	332.00	
18 L1	38.5	35.00	326.00	
20 L1	24.0	22.00	78.00	
23 L1	29.1	14.00	295.00	
24 L1	17.2	37.00	171.00	
65 L1	0.0	45.00	353.00	
66 L1	36.9	40.00	279.00	
67 L1	0.0	3.00	242.00	
81 L1	0.0	21.00	332.00	
87 L1	19.0	40.00	158.00	
88 L1	3.0	1.00	1.00	
1 L1	0.0	0.00	0.00	
2 L1	33.0	48.00	48.00	

9.20 欧盟 PVT

A线-BV7300 (0+250) 9-23/10:58

RF ☐ 热成像 ☐

扫描头 ☐ QA外观 ☐

SVID	Fq	CNR	Elevation	Azimuth
5 L1	42.7	38.00	48.00	
13 L1	42.4	47.00	32.00	
15 L1	27.2	69.00	333.00	
18 L1	33.9	36.00	326.00	
20 L1	33.1	22.00	79.00	
23 L1	34.1	14.00	295.00	
24 L1	29.6	0.00	0.00	
29 L1	36.7	44.00	241.00	
65 L1	26.4	44.00	354.00	
66 L1	26.0	41.00	281.00	
67 L1	0.0	3.00	244.00	
72 L1	0.0	5.00	40.00	
75 L1	20.7	94.00	94.00	
76 L1		147.00		
81 L1		332.00		

9.20 欧盟 PVT

A线-BV7300 (0+250)

RF ☐

扫描头 ☐

9-23/10:00

热成像 ☐

QA外观 ☐

environmental treatment



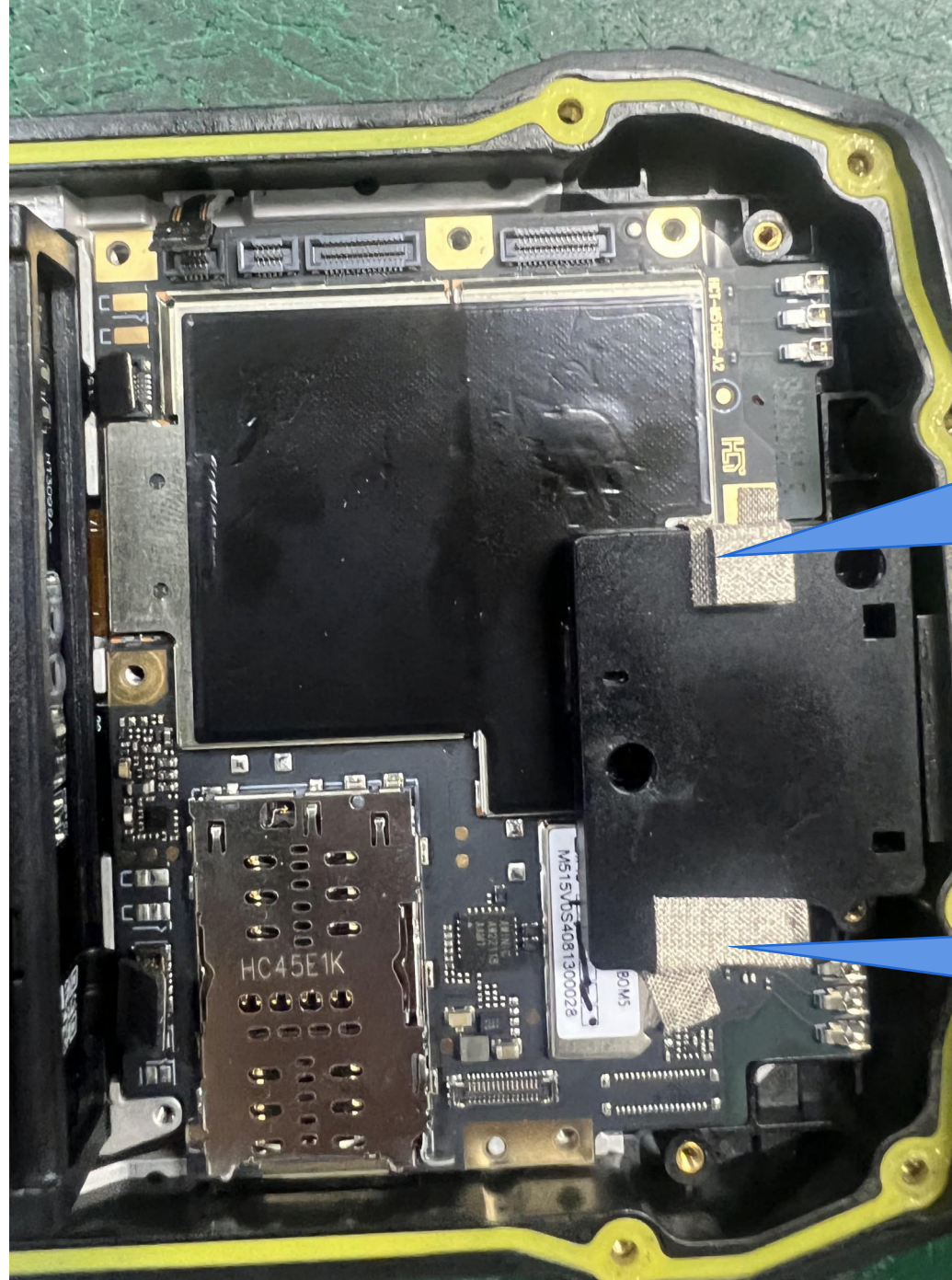
The motherboard is grounded with conductive sponge

environmental treatment



Camera
grounding

environmental treatment



Attach conductive cloth to the copper leakage area of the motherboard, and add conductive foam on the conductive cloth

Attach conductive cloth from the shielding cover to the bracket

environmental treatment

Horn
grounding



environmental treatment

Screen
sticker
conductive
sponge
grounding

The wiring
of the
screen is
wrapped in
conductive
cloth



Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
700	-3.24	-20.1	-7.06	19.66
720	-2.36	-17.07	-6.41	22.87
740	-1.66	-18.43	-6.16	24.22
760	-1.89	-17.25	-6.18	24.10
780	-2.11	-21.43	-6.13	24.40
800	-1.87	-21.32	-5.56	27.77

frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益 (dBi)	efficiency 效率(dBi)	efficiency 效率
820	-0.99	-21.29	-5.71	26.85%
840	-0.67	-21.96	-5.7	26.90%
860	-0.5	-28.45	-5.82	26.20%
880	-0.33	-24.48	-5.91	25.67%
900	-0.61	-21.76	-5.98	25.23%

Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
880	-0.47	-22.62	-5.9	25.73
900	-0.5	-22.54	-6.06	24.79
920	-0.41	-25.77	-5.72	26.81
940	-0.92	-20.29	-6.09	24.61
960	-0.87	-19.58	-5.87	25.89

ANT0 antenna passive efficiency

1700	-0.02	-23.8	-4.95	31.98
1720	0.6	-23.73	-4.42	36.11
1740	0.44	-31.74	-4.59	34.73
1760	0.65	-24.45	-4.65	34.31
1780	0.85	-19.22	-4.45	35.90
1800	0.48	-18.23	-4.92	32.22
1820	0.76	-17.88	-4.66	34.21
1840	0.58	-17.99	-5.02	31.44
1860	0.26	-20.61	-5.34	29.22
1880	0.53	-17.71	-5.25	29.88
1900	0.79	-17.58	-4.84	32.80
1920	0.03	-18.52	-5.51	28.14
1940	0.5	-17.04	-5.02	31.51
1960	0.04	-16.2	-5.22	30.06
1980	-0.34	-16.82	-5.52	28.04
2000	-0.7	-17.55	-5.61	27.50
2020	-0.33	-17.07	-4.7	33.90
2040	-2.14	-17.72	-5.95	25.41
2060	-1.13	-20.04	-5.37	29.02
2080	-1.53	-18.61	-5.49	28.23
2100	-2.03	-19.44	-5.84	26.08
2120	-3.04	-22.38	-6.83	20.73

2220	-1.11	-17.09	-4.8	33.15
2240	-1.33	-16.81	-4.93	32.11
2260	-0.22	-15.5	-4.28	37.36
2280	-0.78	-15.96	-4.59	34.76
2300	-0.79	-17.75	-4.88	32.48
2320	0.25	-17.83	-4.36	36.62
2340	0.55	-17.25	-4.15	38.49
2360	1.27	-18.98	-3.58	43.86
2380	1.61	-18.14	-3.34	46.40
2400	1.97	-19.54	-2.86	51.70
2420	1.99	-18.5	-2.79	52.65
2440	2.16	-17.97	-2.8	52.49
2460	2.32	-18.31	-2.74	53.21
2480	2.42	-20.08	-2.89	51.43
2500	2.9	-17.75	-2.71	53.55
2520	2.74	-19.2	-2.91	51.11
2540	2.57	-21.99	-3.1	49.00
2560	2.66	-22.73	-3.39	45.83
2580	2.63	-19.38	-3.53	44.37
2600	2.47	-16.57	-3.74	42.31
2620	2.75	-17.98	-3.64	43.30
2640	2.16	-20.66	-3.94	40.39
2660	1.96	-22.34	-4.07	39.20

Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
700	-5.43	-21.44	-9.79	10.50
710	-5.49	-21.1	-9.72	10.51
720	-5.13	-22.56	-9.5	11.22
730	-5.39	-21.39	-9.5	10.91
740	-4.32	-22.29	-9.21	12.00
750	-4.42	-20.88	-9.45	11.34
760	-3.64	-19.82	-8.54	14.01
770	-4.84	-20.83	-9.63	10.89
780	-3.16	-18.68	-7.94	16.07
790	-3.02	-18.25	-7.92	16.16
800	-1.67	-16.69	-6.6	21.90
Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
800	-0.56	-16.36	-5.37	29.01
810	-0.51	-15.49	-5.52	28.05
820	-0.93	-14.73	-5.67	27.11
830	-1.76	-14.4	-6.35	23.16
840	-2.88	-13.63	-7.1	19.48
850	-3.9	-13.64	-7.85	16.39
860	-3.42	-14.1	-7.99	15.87
870	-2.78	-14.53	-7.69	17.03
880	-2.68	-14.98	-7.69	17.01
890	-2.67	-14.72	-7.52	17.70

Gain&Efficiency						
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	DO Gain 主极化最	OP Gain 交叉极化	efficiency 效率(dBi)	efficiency 效率(%)
880	0.21	-16.1	-1.67	-0.1	-6.56	27.66%
900	-1.12	-16.74	-3.17	-1.34	-6.28	27.53%
920	-1.62	-17.09	-3.46	-1.87	-6.67	26.51%
940	-3.34	-19.36	-5.03	-2.66	-8.27	24.89%

ANT1 antenna passive efficiency

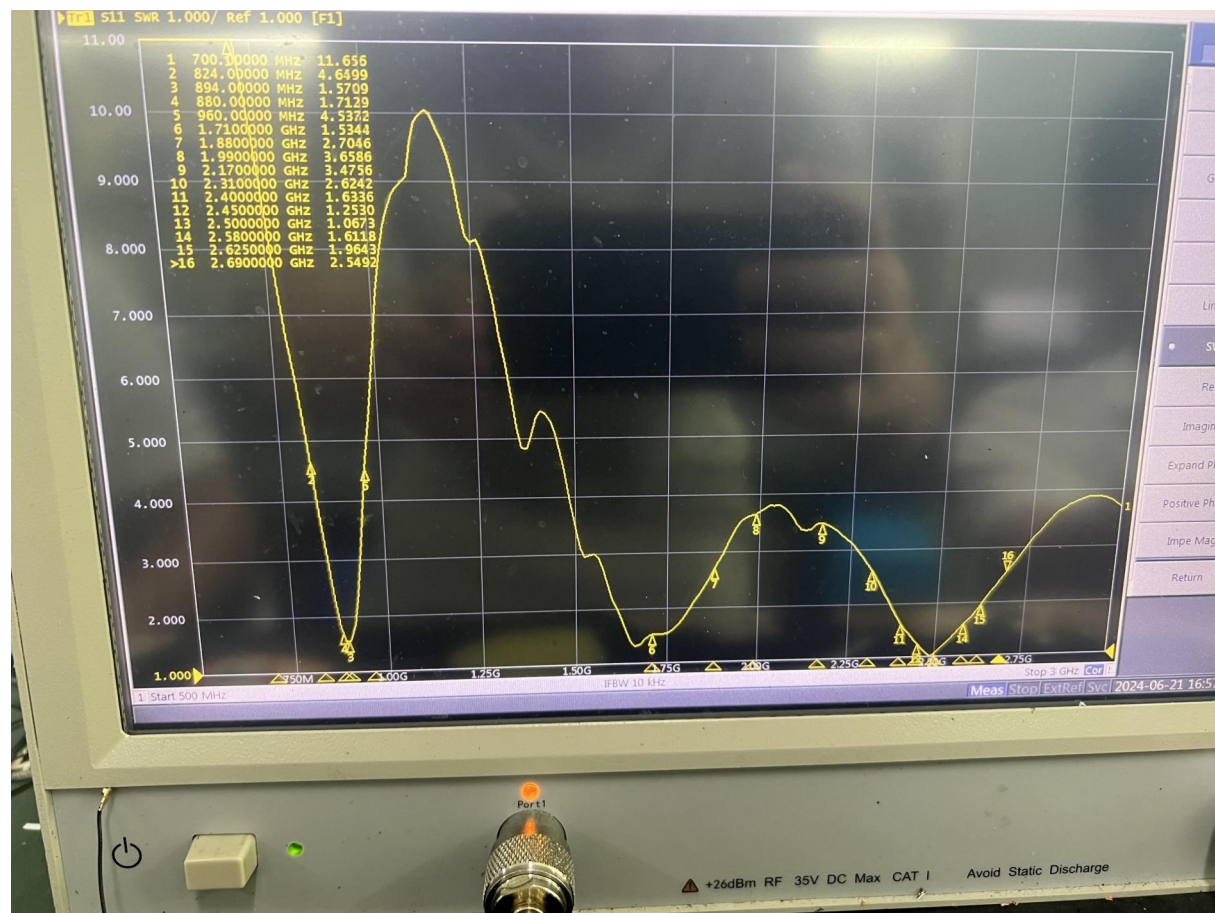
1700	2.91	-14.13	-2.89	51.36	2260	-0.12	-22.18	-5.16	30.49
1720	2.71	-13.01	-2.95	50.71	2280	-1.67	-21.77	-5.84	26.08
1740	2.52	-13.9	-3.08	49.25	2300	-1.68	-19.17	-5.73	26.74
1760	3.72	-10.93	-2.83	52.17	2320	-1.56	-18.2	-5.29	29.59
1780	3.18	-13.42	-3.2	47.89	2340	-1.99	-18.97	-5.04	31.36
1800	3.02	-15.02	-3.09	49.07	2360	-1.49	-16.94	-4.99	31.68
1820	3.42	-17.24	-2.77	52.79	2380	-1.9	-16.95	-4.96	31.92
1840	3.36	-15.2	-3.22	47.63	2400	-1.32	-16.98	-4.58	34.87
1860	3.28	-17.49	-3.29	46.91	2420	-1.61	-17.09	-5.02	31.45
1880	2.71	-18.56	-3.31	46.70	2440	-1.41	-16.59	-4.84	32.78
1900	2.15	-19.17	-3.46	45.07	2460	-1.78	-16.22	-5.15	30.52
1920	1.62	-20.05	-4.11	38.77	2480	-1.49	-16.49	-4.99	31.69
1940	2.26	-19.91	-3.58	43.83	2500	-1.48	-17.3	-5.06	31.20
1960	1.55	-22.73	-4.21	37.94	2520	-0.03	-16.22	-4	39.80
1980	1.07	-23.37	-4.46	35.83	2540	-0.59	-18.23	-4.82	32.96
2000	0.91	-22.35	-4.21	37.94	2560	-0.21	-18.14	-4.49	35.59
2020	1.37	-20.43	-3.78	41.90	2580	-0.25	-18.63	-4.68	34.04
2040	0.55	-21.7	-4.83	32.85	2600	0.13	-24.29	-4.76	33.39
2060	1.51	-19.89	-3.88	40.95	2620	-0.78	-22.39	-5.94	25.46
2080	1.08	-23.85	-4.39	36.38	2640	-0.39	-16.86	-5.36	29.11
2100	0.62	-20.5	-4.63	34.46	2660	-0.75	-15.48	-5.97	25.30
2120	-0.22	-19.56	-5.57	27.76	2680	0.2	-13.81	-5.34	29.26
2140	0.48	-19.2	-4.78	33.30	2700	0.1	-14.31	-5.4	28.85

Passive efficiency of three in one antenna

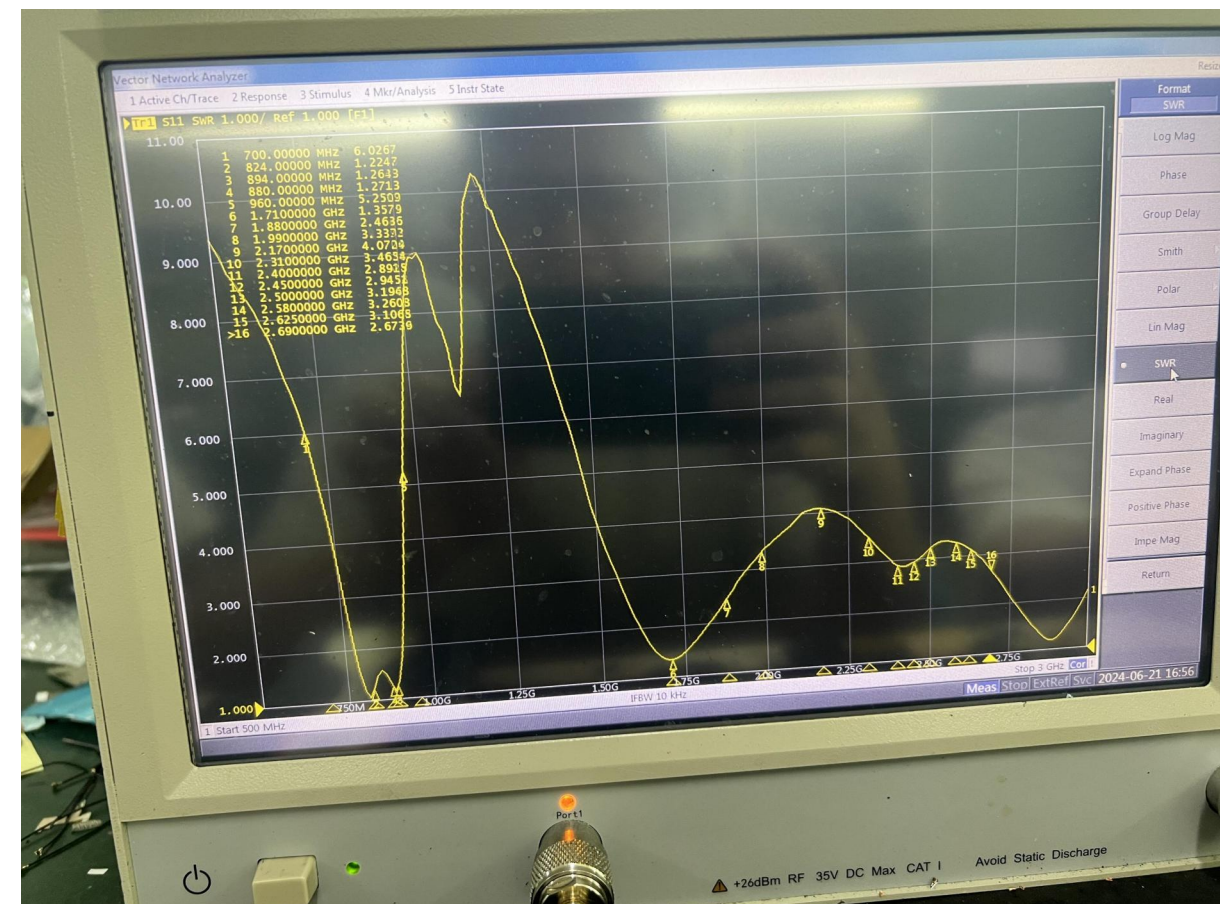
Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
1570	2.65	-20.31	-3.48	44.87
1575	2.23	-20.4	-3.8	41.69
1580	2.17	-19.95	-3.86	41.15
2400	2.27	-26.33	-4.64	34.33
2450	2.48	-21.34	-4.62	34.51
2500	2.74	-21.59	-4.41	36.25
5100	0.68	-31.8	-6.56	22.08
5200	-0.53	-27.16	-6.41	23.15
5300	0.89	-26.31	-5.6	27.56
5400	3.16	-19.29	-4.36	36.67
5500	3.15	-18.38	-3.63	43.36
5600	4.03	-17.96	-3.26	47.18
5700	3.78	-17.31	-3.01	50.02
5800	4.42	-19.44	-2.79	52.62

Passive standing wave diagram

ANTO

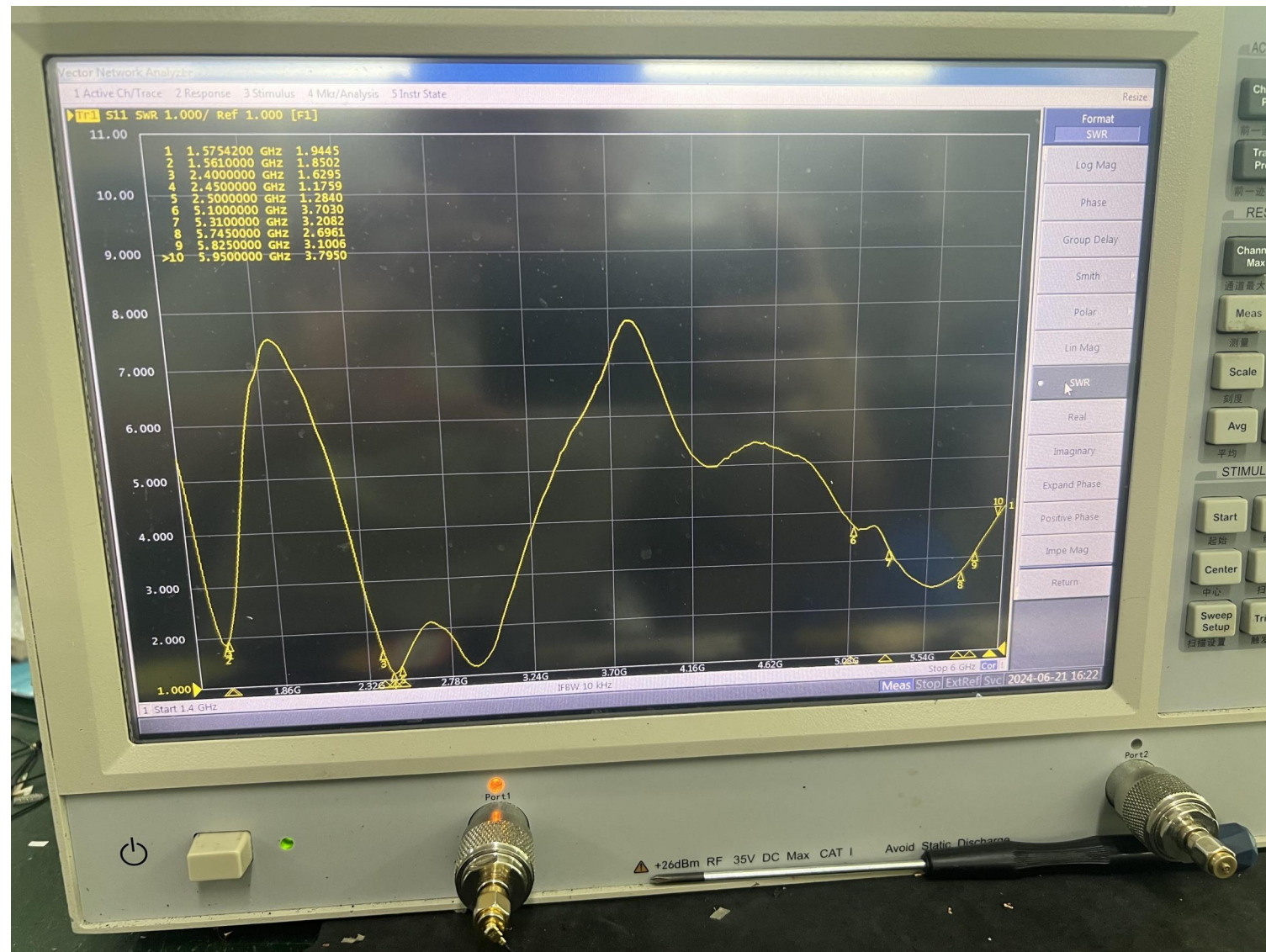


ANT1



Passive standing wave diagram

Three in one



During the debugging process of the project, some abnormal situations were found that may pose certain risks during the mass production phase of the project. The following are listed below:

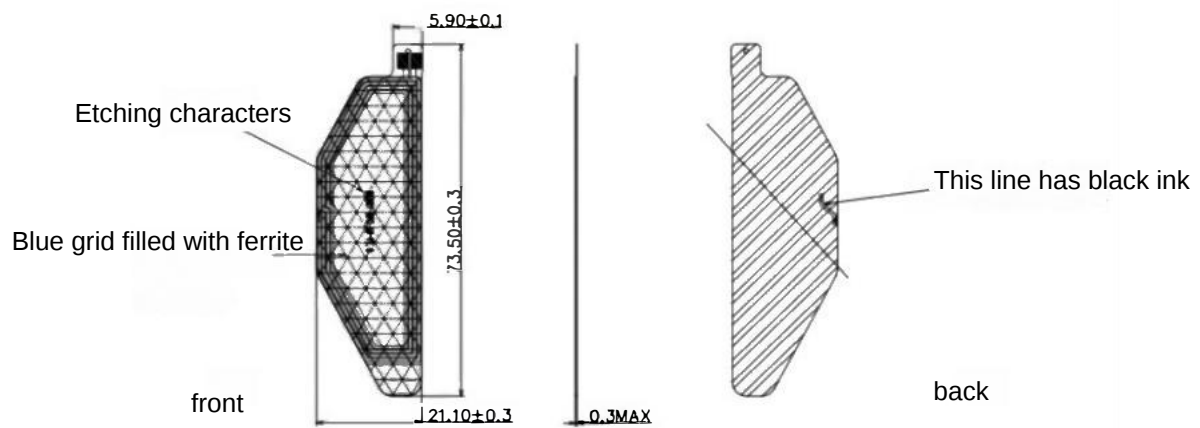
Outlier: Currently
unavailable

Note: The above abnormal phenomena were detected from the perspective of antenna testing, and their causes may not necessarily be on the antenna. If a fundamental solution is needed, your company needs to coordinate relevant resources for support, and we will cooperate to solve these problems.

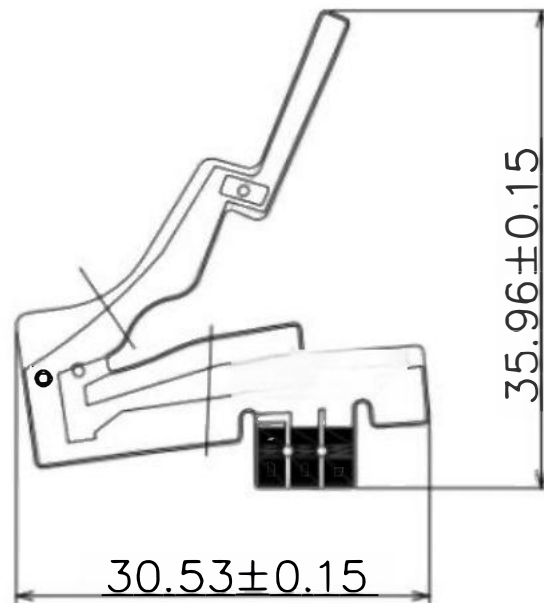
Additional explanation

-  Please carefully confirm whether the matching circuit mentioned in the report has been modified and whether the environmental treatment has been imported, as this will directly affect the antenna performance.
-  The parameters provided in this report are only the parameters provided by the customer to our company for testing the prototype, and do not represent the final mass production status of your company's final project.
-  If your company has the latest prototype for trial production or updated status (replacement of materials, software, environmental treatment, etc.), please submit it to our company for verification as soon as possible to confirm whether the antenna performance is affected.
-  If your company needs to send the machine for third-party retesting or customer testing, please be sure to hand it over to our company for testing and confirmation, as factors such as motherboard consistency, assembly consistency, and differences in antenna assembly may lead to deviations in antenna parameters.

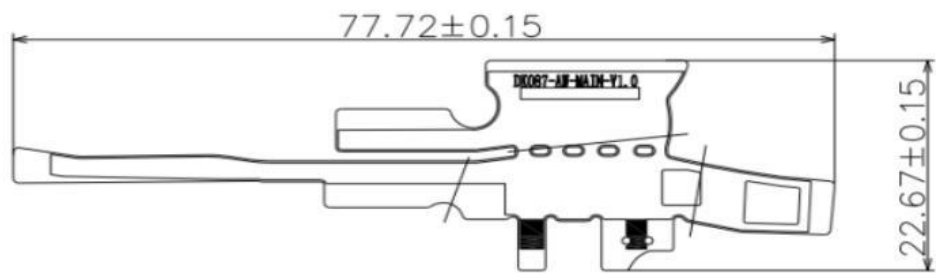
NFC antenna unit:mm



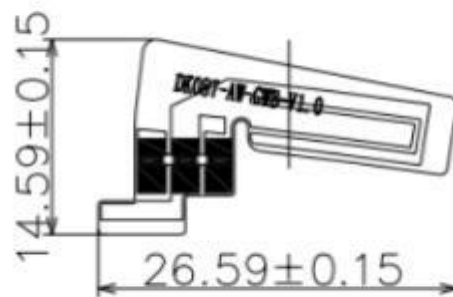
AUX antenna unit:mm



Main antenna unit:mm



GWB antenna unit:mm





深圳市安威无线科技有限公司

行业领先的一站式通信射频天线解决方案制造商

The End

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