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

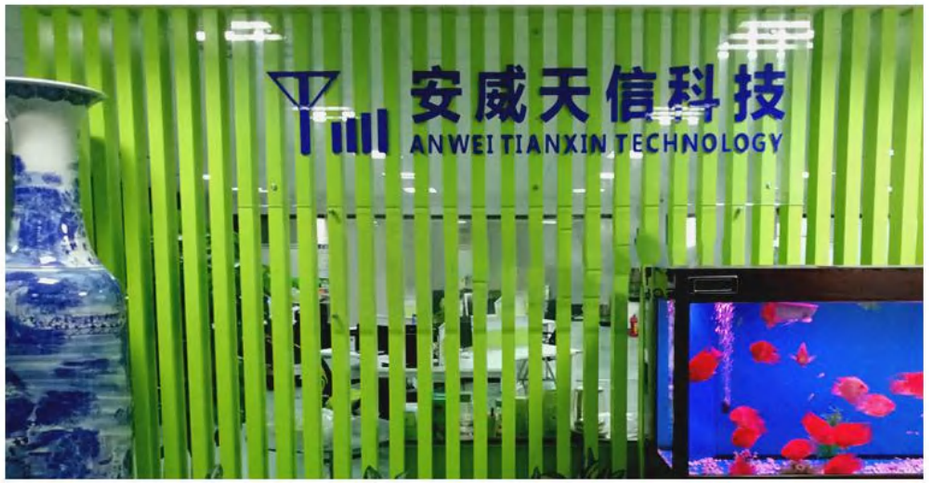
contents

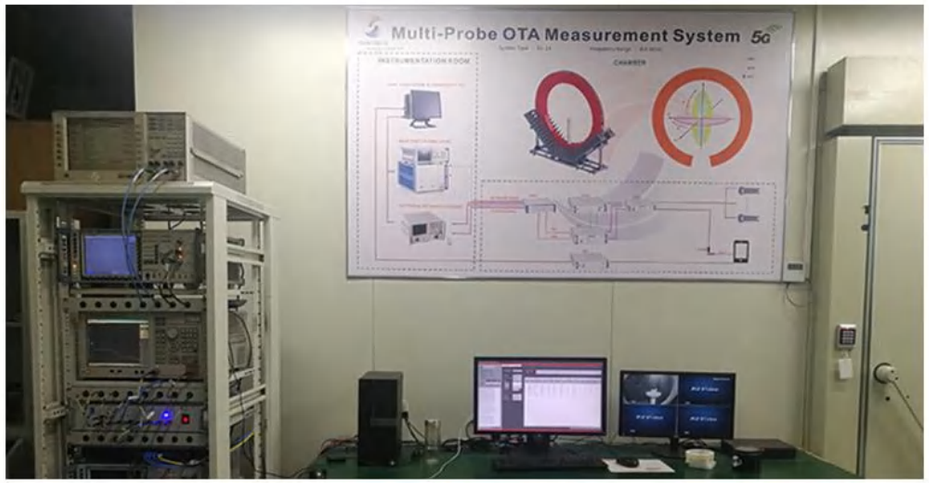
Plate type	complete machine						
Antenna Overview	Main Antenna	Frequency band		Antenna status	antenna form	DESIGN AREA	Match changes
		2G	B2/3/5/8	FPC	PIFA	Bottom of phone	have
		3G	WCDMA B1/2/4/5/8				
		4G	FDD B1/2/3/4/5/7/8/12/13/17/19/20/28A/B/66 TDD 38/40/41				
		5G					
	Other antennas	BT/WIFI	2.4G/5G/WIFI/BT5.3 802.1111a/b/g/n/n/ac	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

Project development environment





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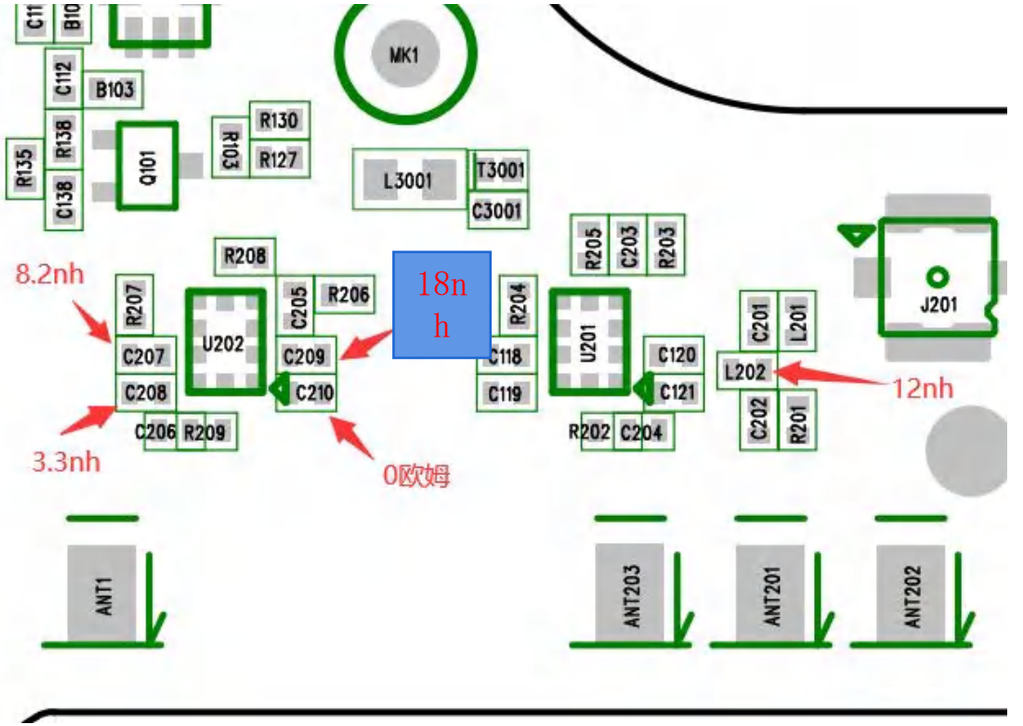
“质量第一，服务至上”是安威一直以来的发展宗旨

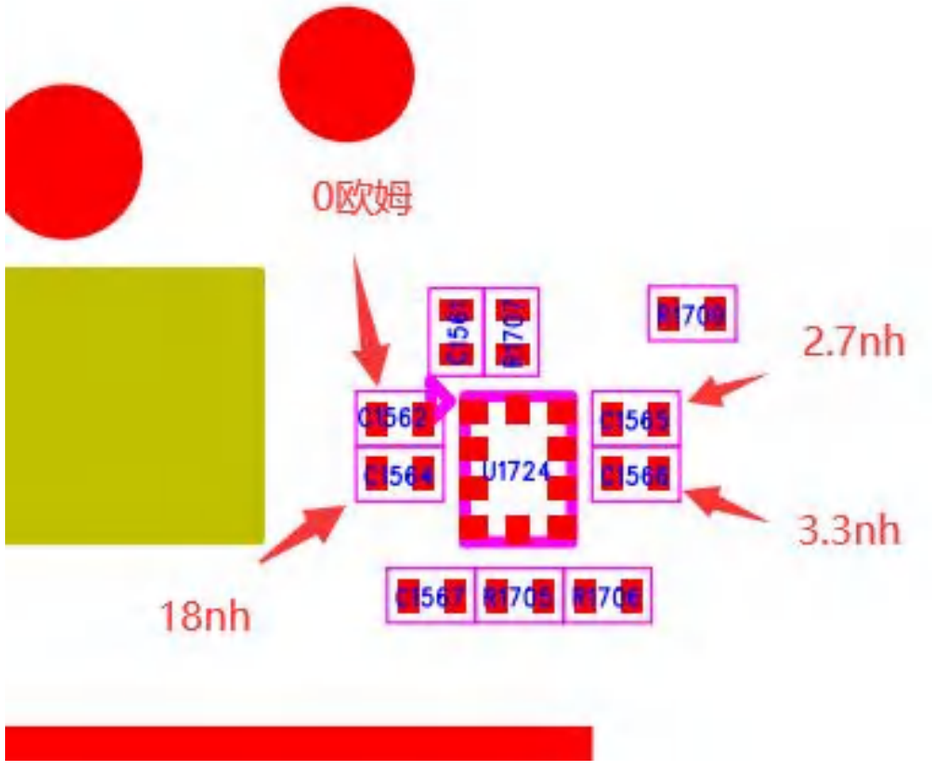
DK087 ANT0 small board bottom switch frequency band division

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	



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	Channel	TRP（dBm）	TIS（dBm）
FDD B1	18050	18.65	
	18300	18.85	
	18550	18.81	-93.61
FDD B2	18650	17.96	
	18900	18.29	
	19150	18.46	-93.55
FDD B3	19250	18.08	
	19575	18.63	
	19900	17.89	-93.52
FDD B4	20000	18.52	
	20175	18.46	
	20350	18.18	-93.13
FDD B5	20450	17.58	
	20525	17.61	
	20600	17.77	-92.38
FDD B7	20800	18.77	
	21100	18.95	
	21400	18.86	-94.75
FDD B8	21500	17.93	
	21625	17.51	
	21750	17.11	-91.64
FDD B12	23060	16.09	
	23095	16.23	
	23130	16.34	-91.91

	Channel	TRP（dBm）	TIS（dBm）
FDD B13		17.86	
	23230	17.9	
		17.7	-91.99
FDD B17	23790	17.46	
	23790	17.03	
	23790	17.33	-91.93
FDD B19	24050	17.03	
	24075	17.76	
	24100	17.71	-92.4
FDD B20	24200	17.09	
	24300	17.76	
	24400	17.34	-92.6
FDD B26	26740	17.32	
	26865	17.24	
	26990	17.42	-92.81
FDD B28A	27260	17.45	
	27370	17.22	
	27469	16.78	-91.46
FDD B28B	27410	17.9	
	27510	17.13	
	27600	16.83	-91.39
FDD B66	132022	18.04	
	132322	17.8	
	132622	17.17	-94.19

	Channel	TRP（dBm）	TIS（dBm）
TDD(B38)	37850	18.65	
	38000	18.73	
	38150	18.54	-91.93
TDD(B40)	38750	17.92	
	39150	18.52	
	39550	18.6	-92.49
TDD(B41)	40340	18.77	
	40620	18.88	
	41140	18.64	-92.65

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	Channel	TRP（dBm）	TIS（dBm）
WCDMA B1	10562	18.67	
	10700	18.65	
	10838	18.55	-106
WCDMA B2	9262	17.43	
	9400	17.93	
	9538	18.14	-105.73
WCDMA B4	1312	18.11	
	1413	18.57	
	1513	18.35	-106.84
WCDMA B5	4132	17.26	
	4183	17.85	
	4233	17.73	-105.29
WCDMA B8	2712	18.32	
	2787	17.51	
	2863	17.22	-103.02

	Channel	TRP（dBm）	TIS（dBm）
GSM 850	128	25.83	
	190	26.29	
	251	26.59	-105.19
GSM 900	1	26.25	
	62	26.46	
	124	26.57	-103.27
DCS1800	512	25.44	
	698	25.18	
	885	24.86	-105.72
PCS 1900	512	24.34	
	661	24.65	
	810	24.76	-105.67

	Channel	TRP（dBm）	TIS（dBm）

携手共进 共创未来

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 I9	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

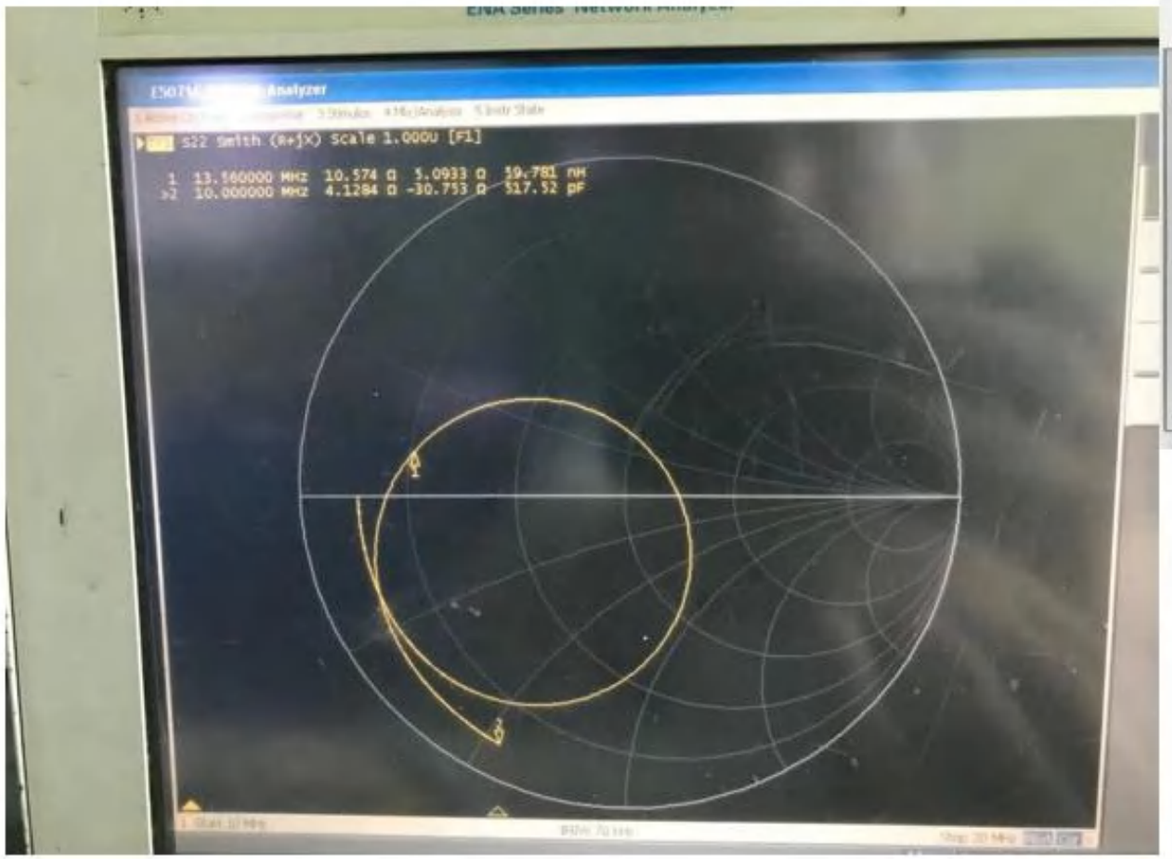
	Channel	TRP (dBm)	TIS (dBm)
5G WIFI-N (65M)	L	11.35	-66.89
	M	11.24	-66.78
	H	11.44	-66.67
5G WIFI-AC (UNLL)	L	10.89	-66.97
	M	11.3	-66.71
	H	11.32	-66.73

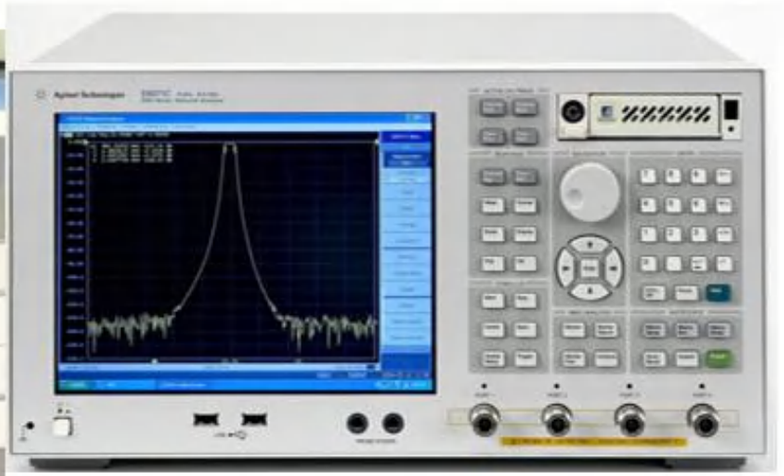
Shenzhen Anwei Wireless Technology Co., Ltd

NFC Debugging Report

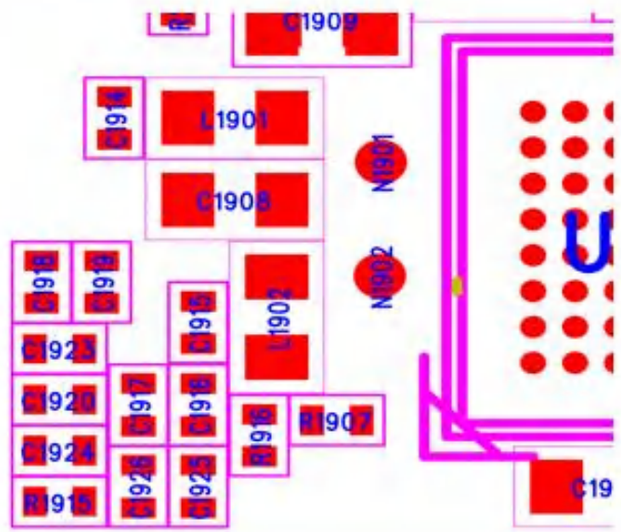
RF: engineer	SONG	Telephone:	13424355302
Date: 2024-07-15			

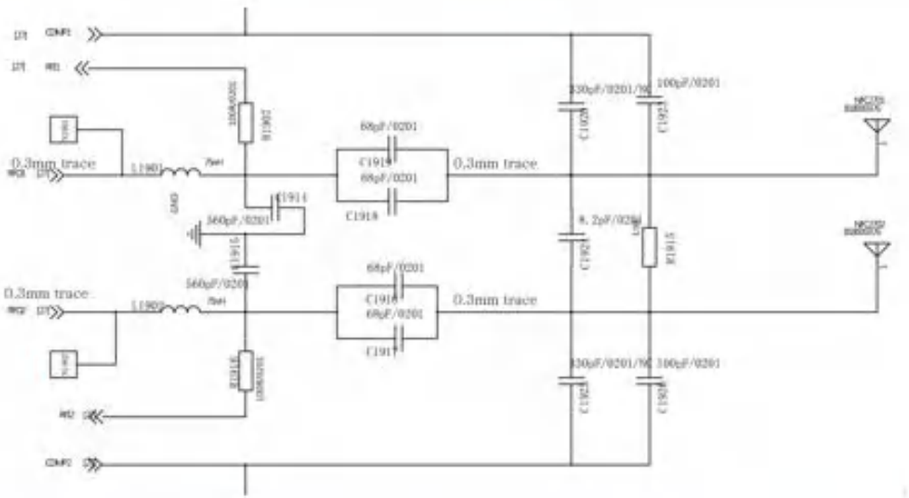
一. Passive debugging and equipment





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



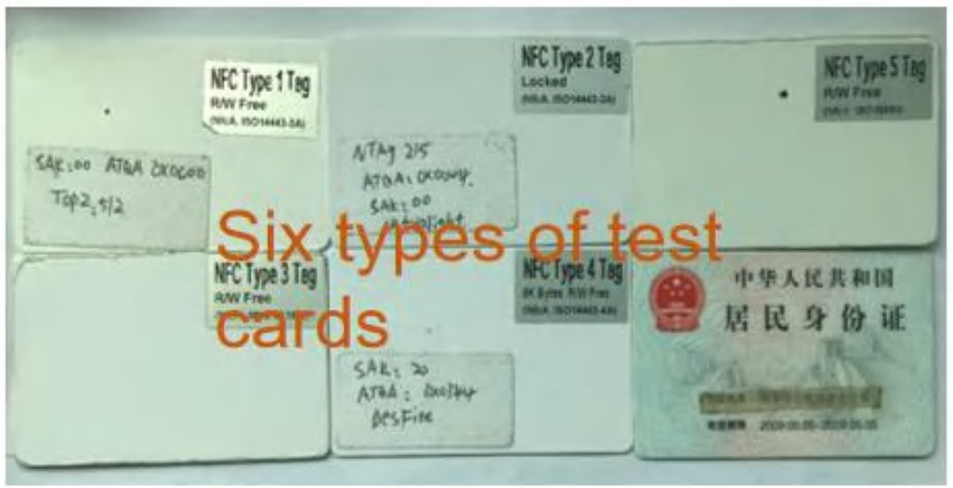


Attention: The matching parameters that need to be modified and optimized are shown in the table below (note: other matching parameters have not been changed, and other matching parameters will be based on the original parameters of the motherboard),
Improved based on the first trial production of the 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+ferrite
Type2 (Mifare-Ultralight)	3.8	
Type3 (Sony-Felica)	3.2	
Type4 (Mifare-Desfire)	2.2	
Type5 (IS015693)	5.3	
Resident ID card	2.0	

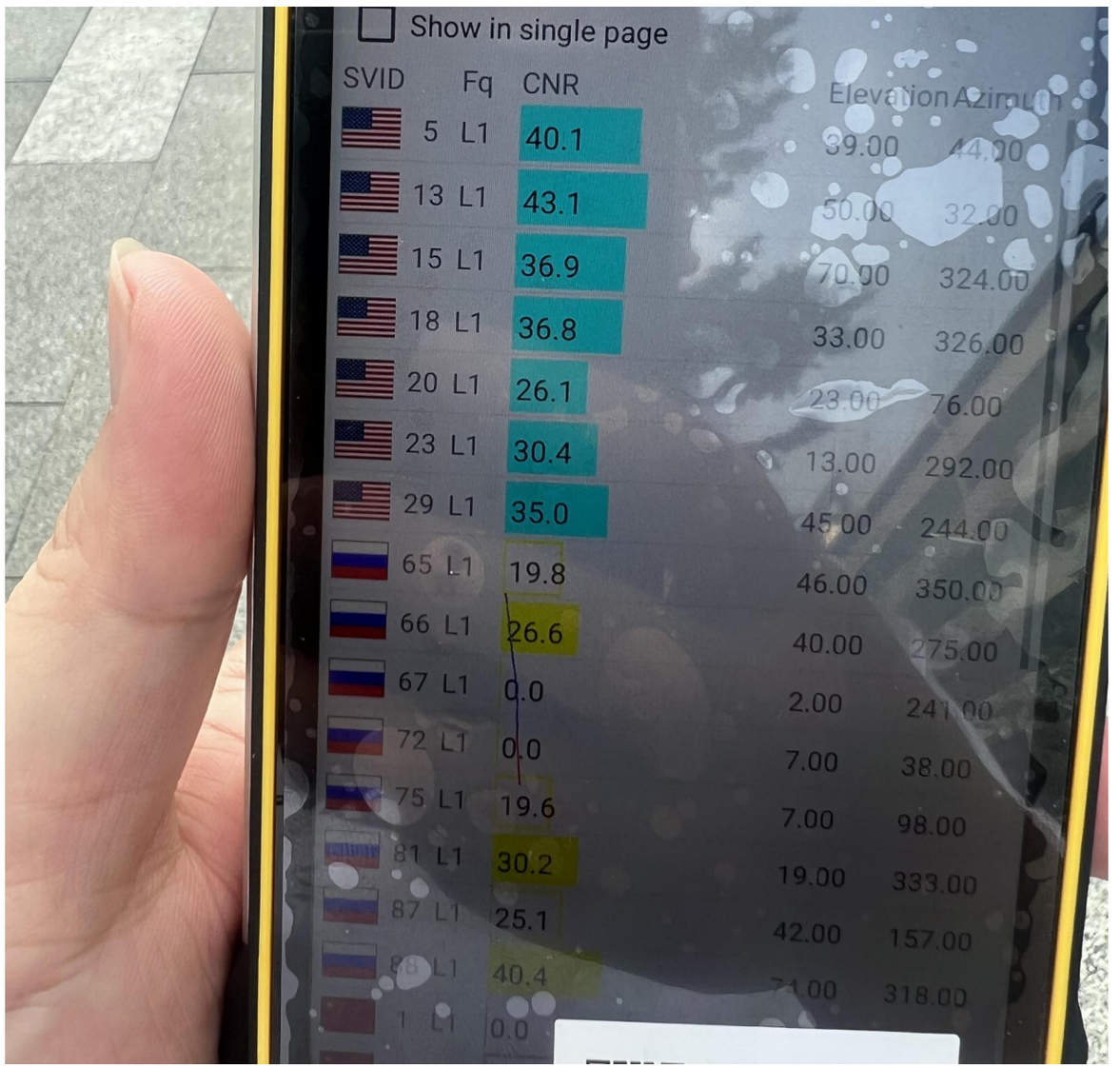


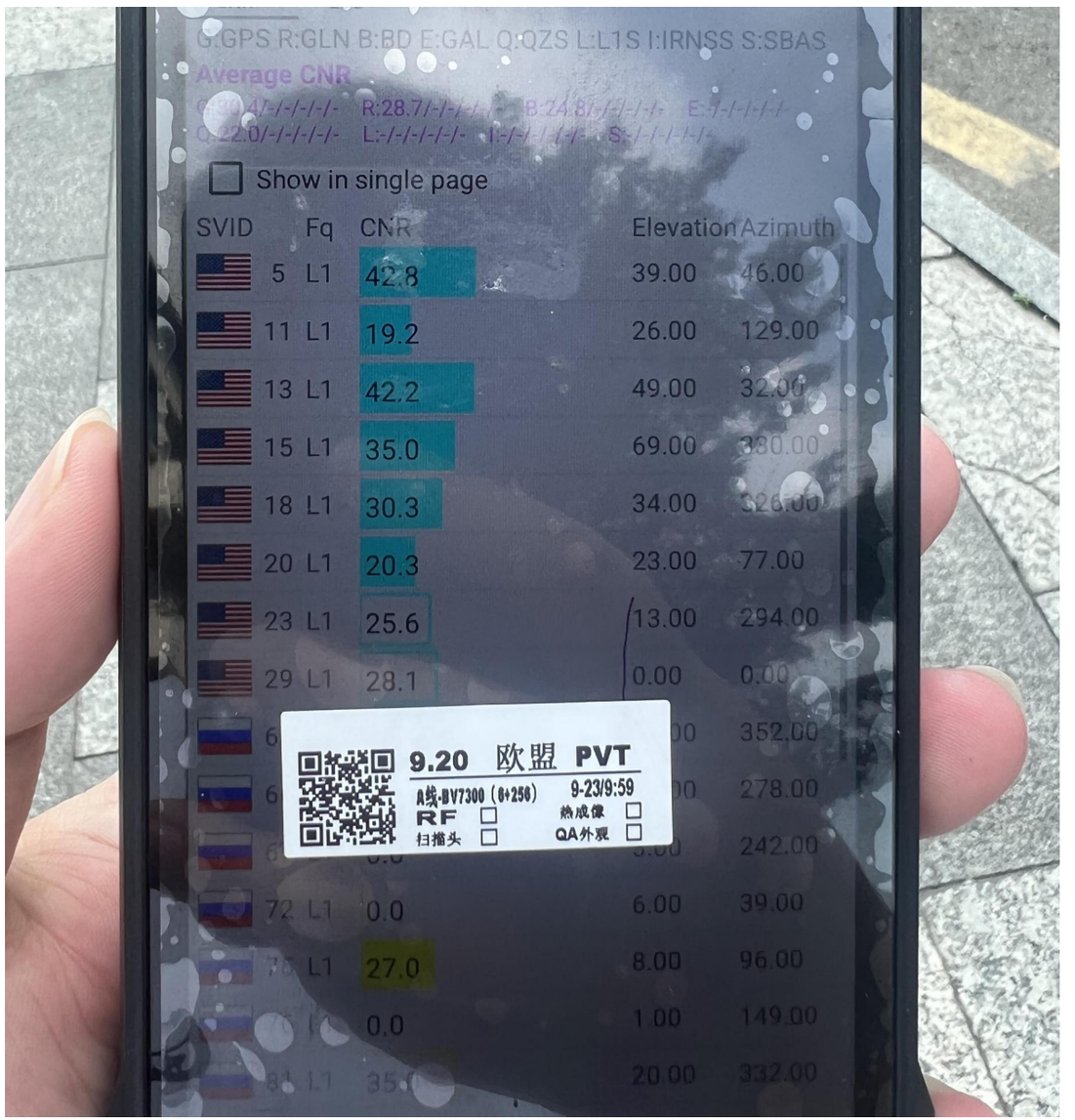
4 Product Analysis and Summary

4.1. The reading distance is related to the compatibility of the card, and the above distance is only for testing the card

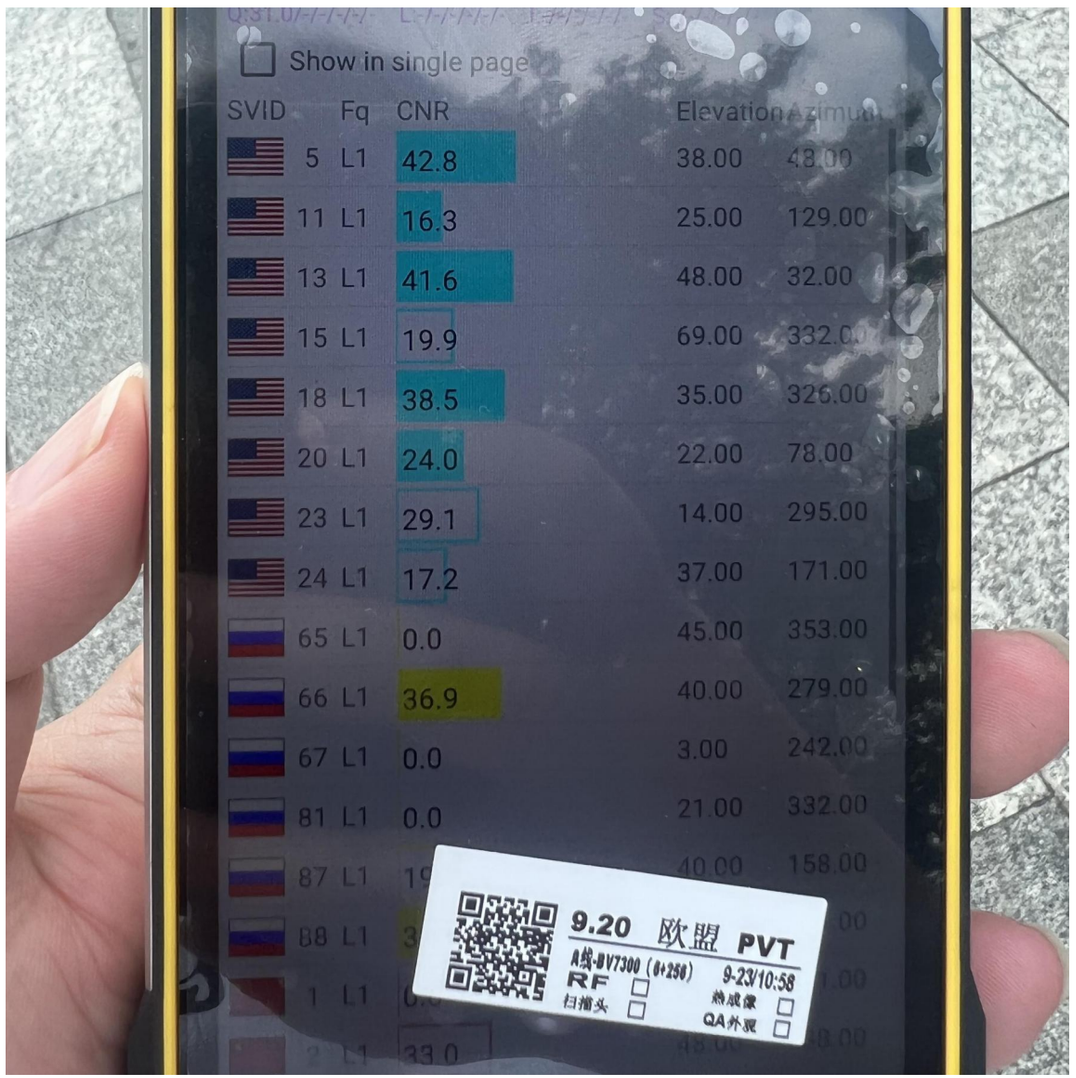
4.2. It is recommended to use higher precision capacitors

Actual GPS test results

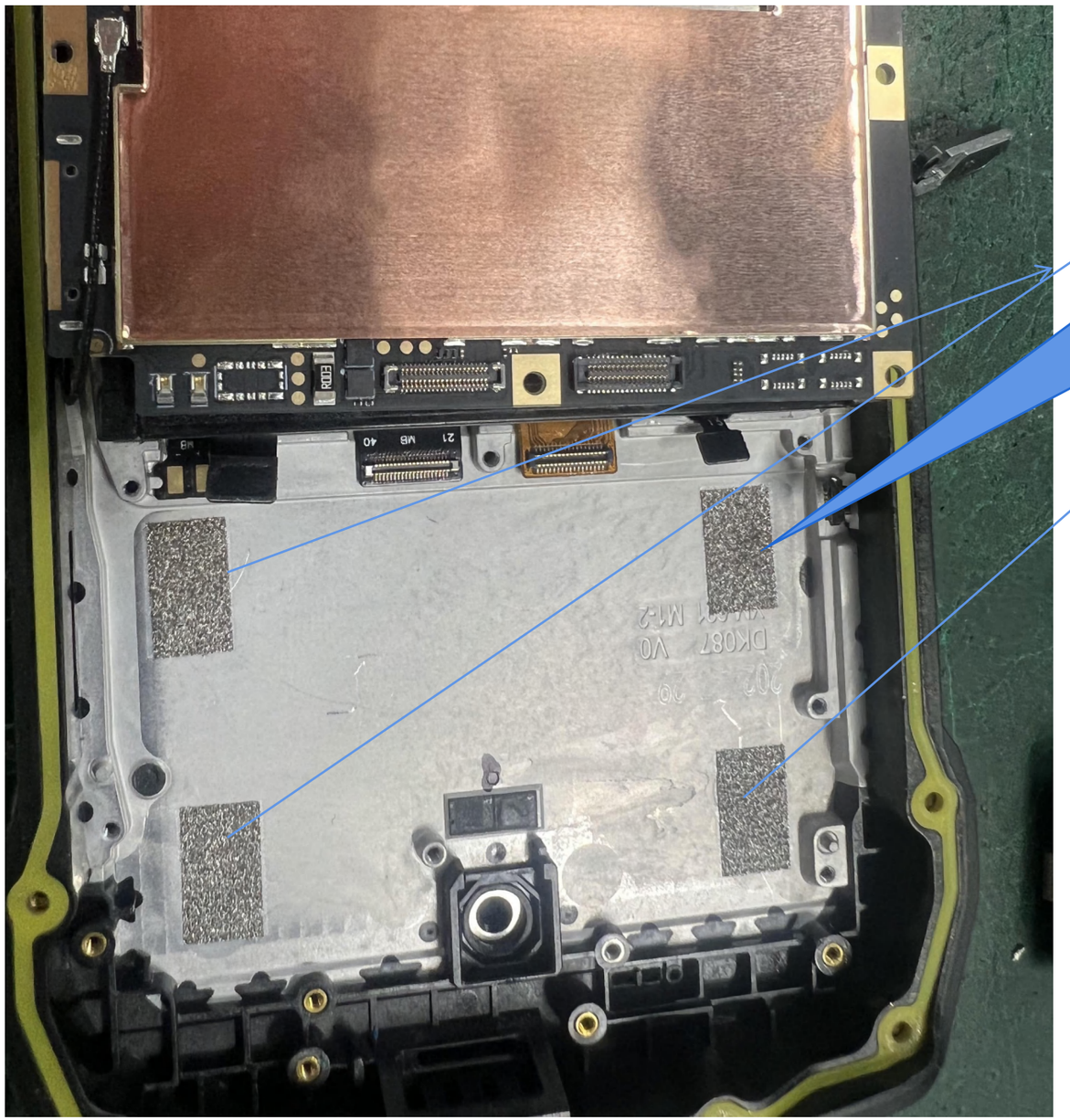




Actual GPS test results



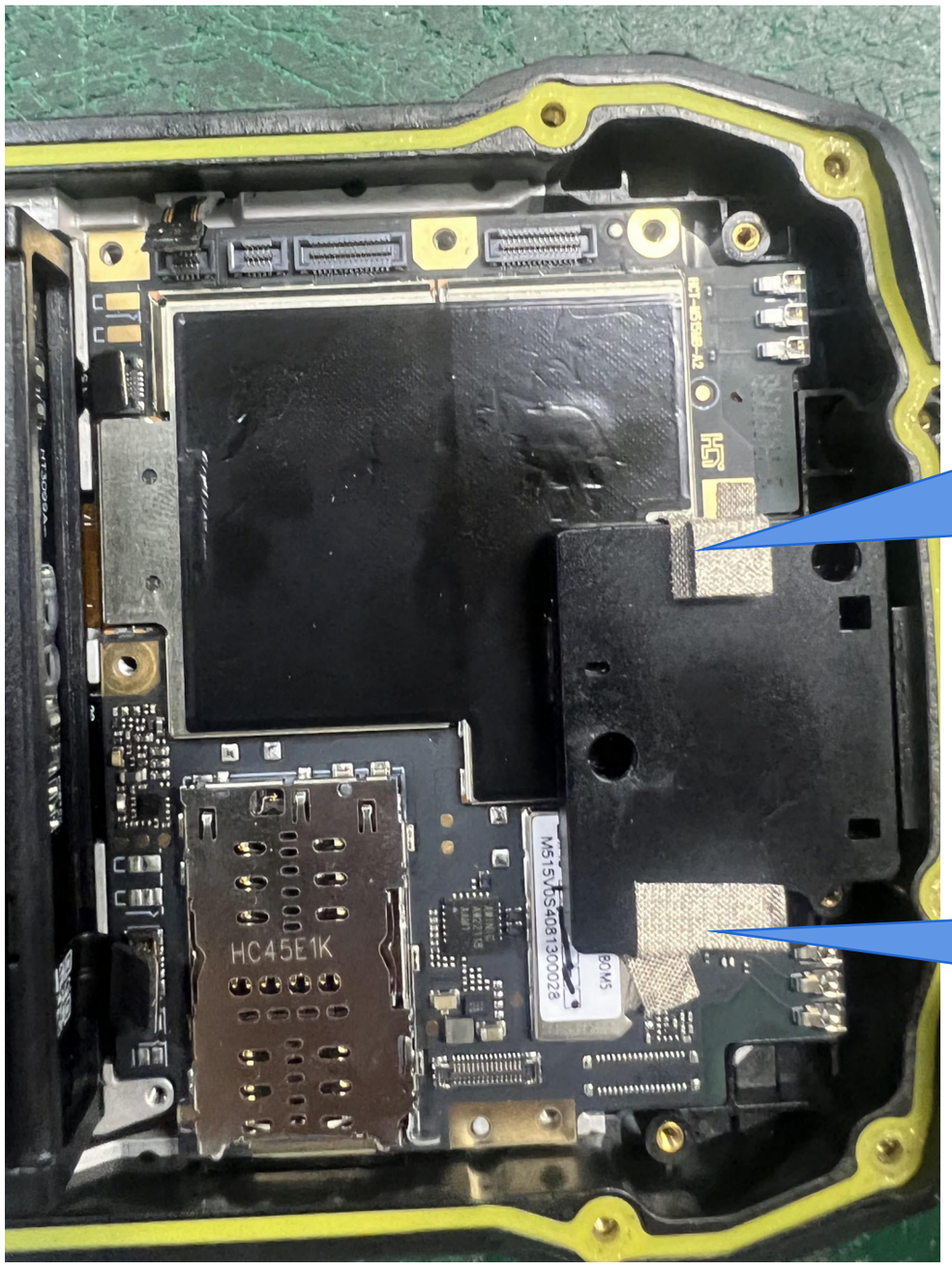
environmental treatment



environmental treatment

Camera grounding

environmental treatment



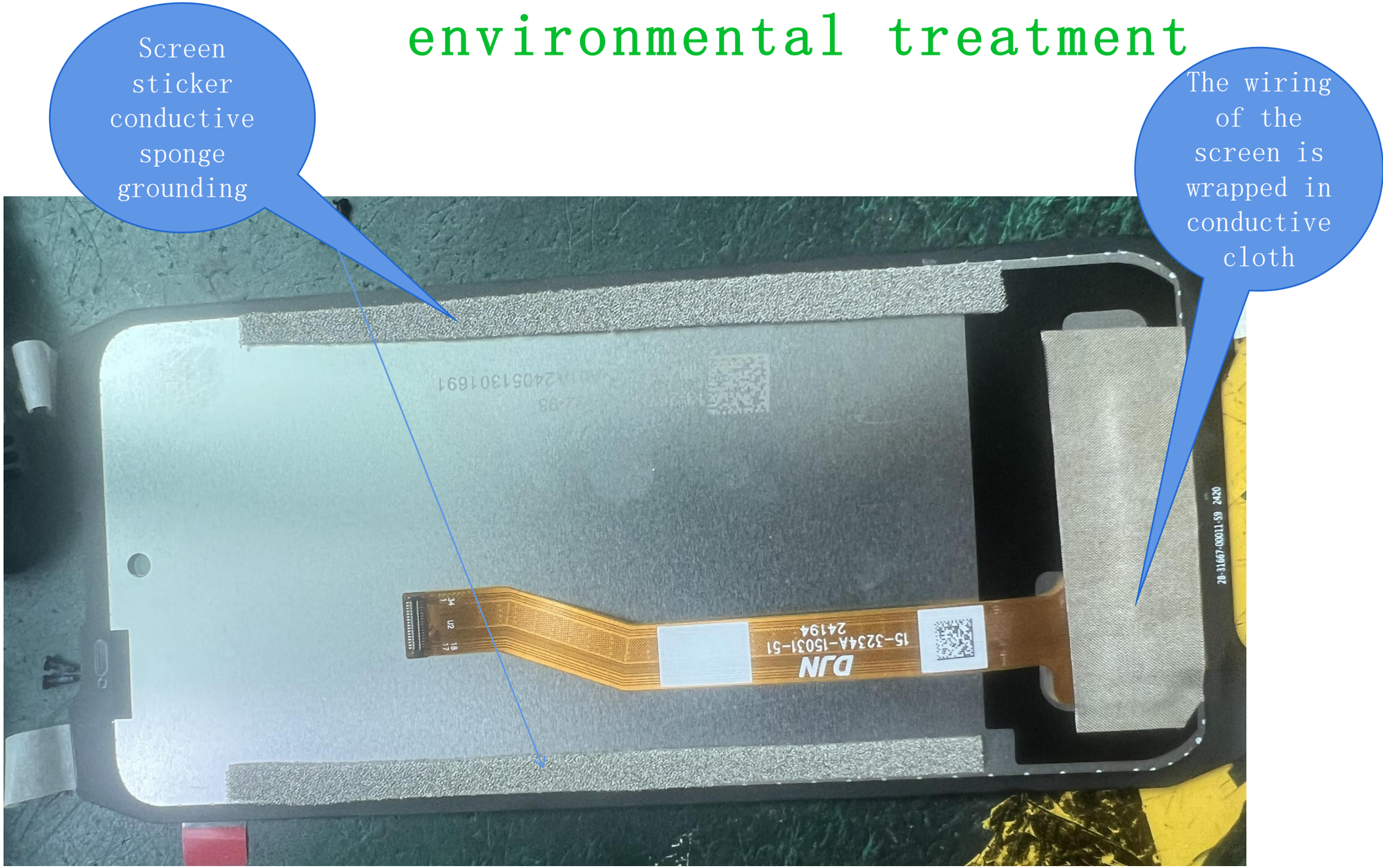
Attach conductive cloth to the copper leakage area of the motherboard, and add conductive foam on the conductive cloth

Attach conductive cloth from the shielding cover to the bracket

environmental treatment

Horn grounding

environmental treatment



ANT0 antenna passive efficiency

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

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

ANT1 antenna passive efficiency

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	CO Gain 主极化最	CP Gain 交叉极化	efficiency 效率(dB)	efficien 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%

1700	2.91	-14.13	-2.89	51.36
1720	2.71	-13.01	-2.95	50.71
1740	2.52	-13.9	-3.08	49.25
1760	3.72	-10.93	-2.83	52.17
1780	3.18	-13.42	-3.2	47.89
1800	3.02	-15.02	-3.09	49.07
1820	3.42	-17.24	-2.77	52.79
1840	3.36	-15.2	-3.22	47.63
1860	3.28	-17.49	-3.29	46.91
1880	2.71	-18.56	-3.31	46.70
1900	2.15	-19.17	-3.46	45.07
1920	1.62	-20.05	-4.11	38.77
1940	2.26	-19.91	-3.58	43.83
1960	1.55	-22.73	-4.21	37.94
1980	1.07	-23.37	-4.46	35.83
2000	0.91	-22.35	-4.21	37.94
2020	1.37	-20.43	-3.78	41.90
2040	0.55	-21.7	-4.83	32.85
2060	1.51	-19.89	-3.88	40.95
2080	1.08	-23.85	-4.39	36.38
2100	0.62	-20.5	-4.63	34.46
2120	-0.22	-19.56	-5.57	27.76
2140	0.48	-19.2	-4.78	33.30

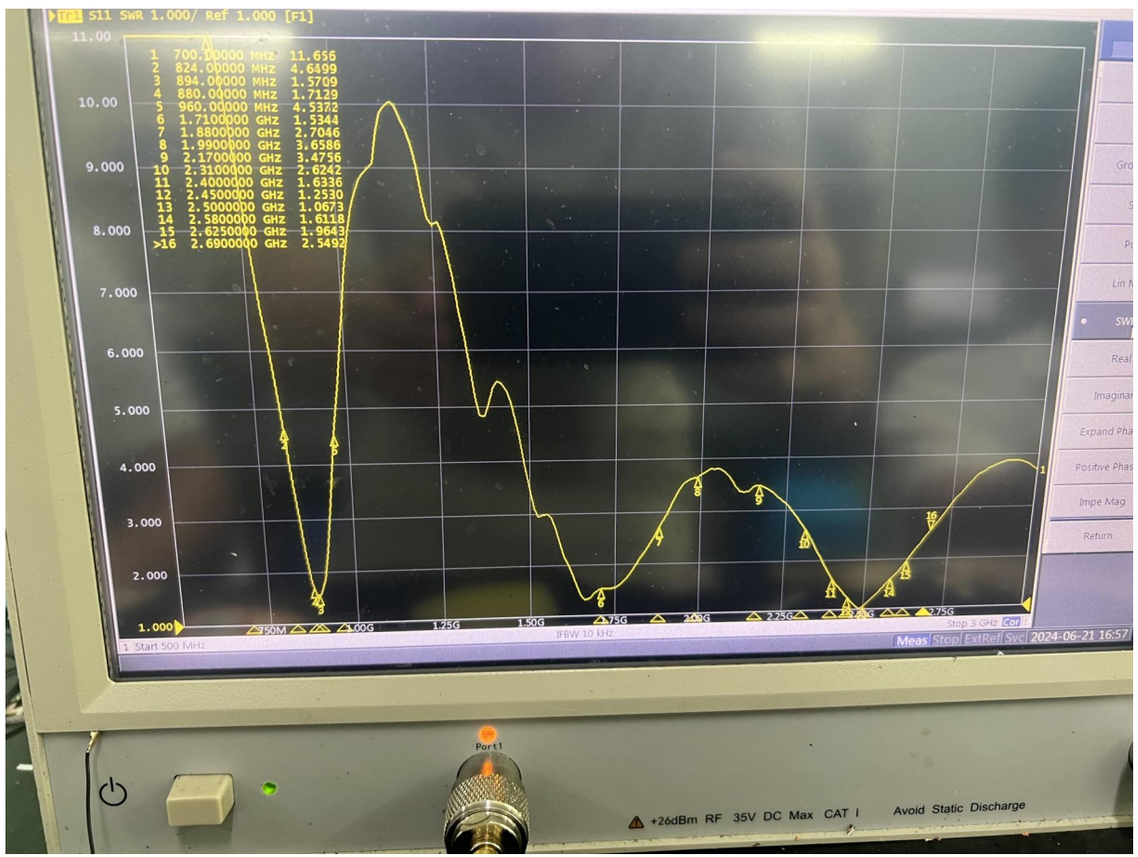
2260	-0.12	-22.18	-5.16	30.49
2280	-1.67	-21.77	-5.84	26.08
2300	-1.68	-19.17	-5.73	26.74
2320	-1.56	-18.2	-5.29	29.59
2340	-1.99	-18.97	-5.04	31.36
2360	-1.49	-16.94	-4.99	31.68
2380	-1.9	-16.95	-4.96	31.92
2400	-1.32	-16.98	-4.58	34.87
2420	-1.61	-17.09	-5.02	31.45
2440	-1.41	-16.59	-4.84	32.78
2460	-1.78	-16.22	-5.15	30.52
2480	-1.49	-16.49	-4.99	31.69
2500	-1.48	-17.3	-5.06	31.20
2520	-0.03	-16.22	-4	39.80
2540	-0.59	-18.23	-4.82	32.96
2560	-0.21	-18.14	-4.49	35.59
2580	-0.25	-18.63	-4.68	34.04
2600	0.13	-24.29	-4.76	33.39
2620	-0.78	-22.39	-5.94	25.46
2640	-0.39	-16.86	-5.36	29.11
2660	-0.75	-15.48	-5.97	25.30
2680	0.2	-13.81	-5.34	29.26
2700	0.1	-14.31	-5.4	28.85

Passive efficiency of three in one antenna

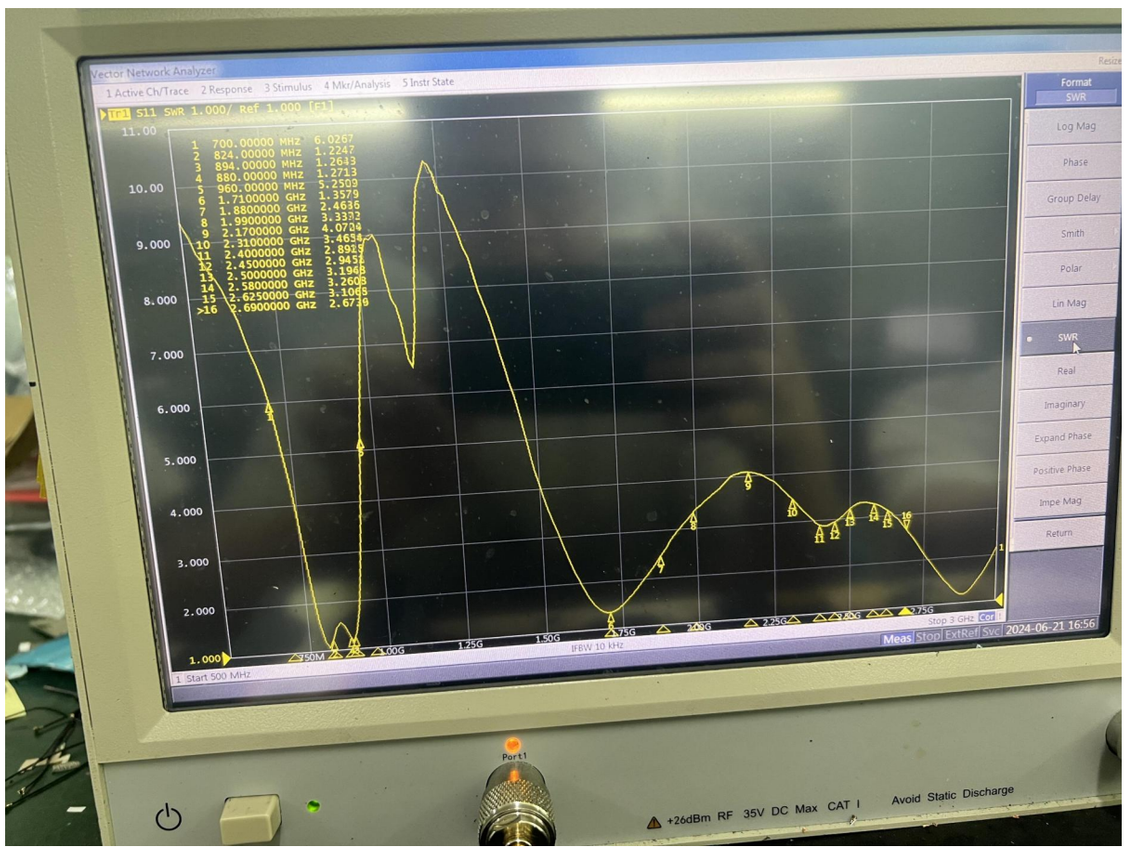
Gain&Efficiency				
frequency 频率(MHz)	gain 增益(dBi)	mingain 最小增益	efficiency 效率(dBi)	efficiency 效率(%)
1570	2.65	-20.31	-3.48	44.87
1575	2.23	-20.4	-3.8	41.69
1580	2.17	-19.95	-3.86	41.15
2400	2.27	-26.33	-4.64	34.33
2450	2.48	-21.34	-4.62	34.51
2500	2.74	-21.59	-4.41	36.25
5100	0.68	-31.8	-6.56	22.08
5200	-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

ANT0

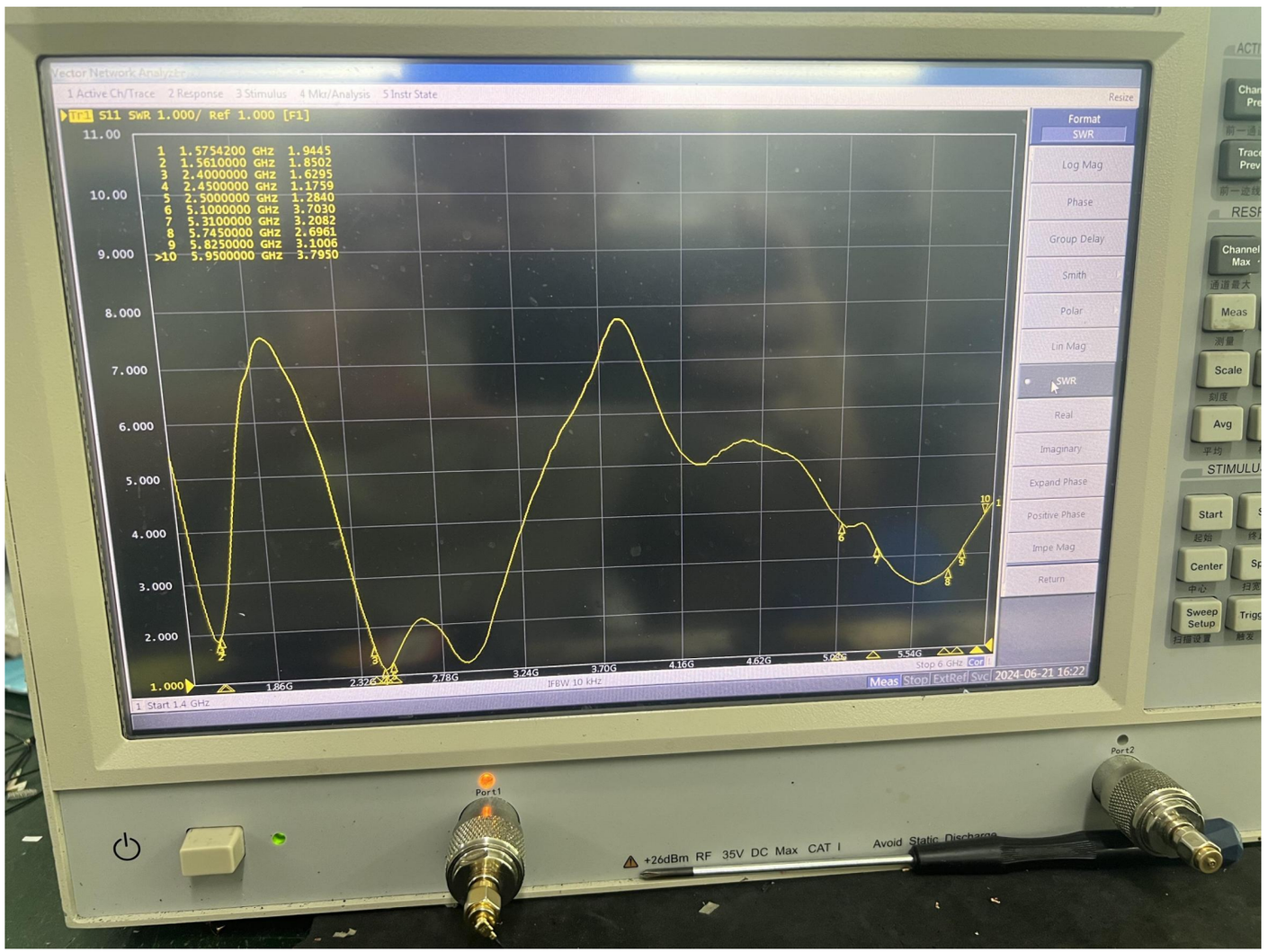


ANT1



Passive standing wave diagram

Three in one



Risk warning during debugging process

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

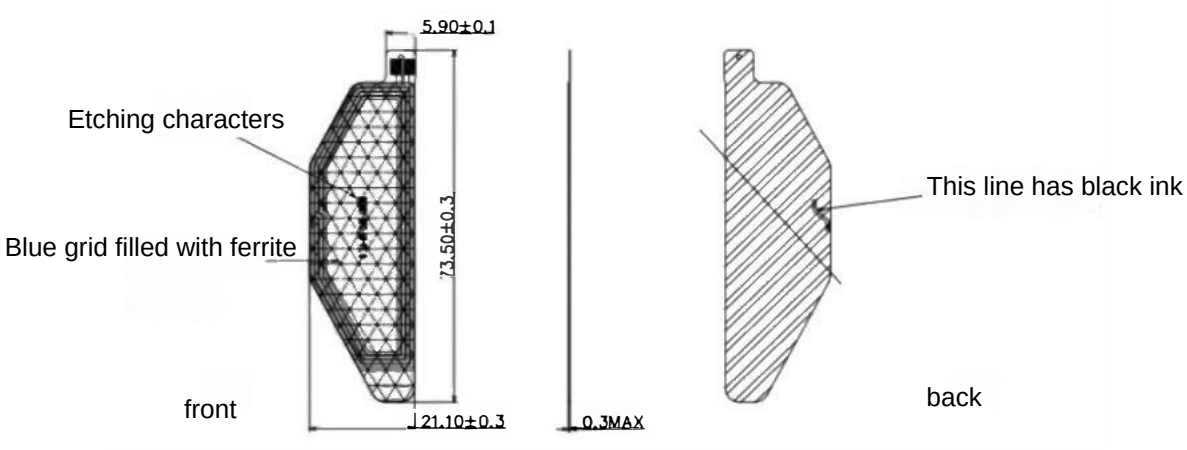
- Please carefully confirm whether the matching circuit mentioned in the report has been modified and whether the environmental treatment has been imported, as this will directly affect the antenna performance。

- 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.

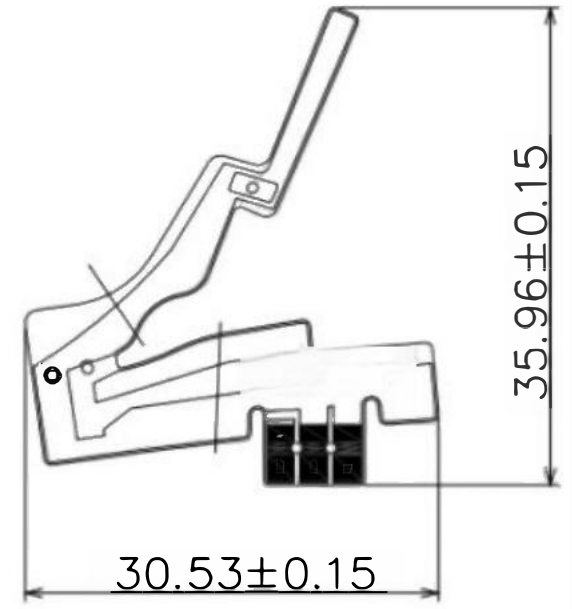
- If your company has the latest prototype for trial production or updated status (replacement of materials, software, environmental treatment, etc.), please submit it to our company for verification as soon as possible to confirm whether the antenna performance is affected。

- 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.

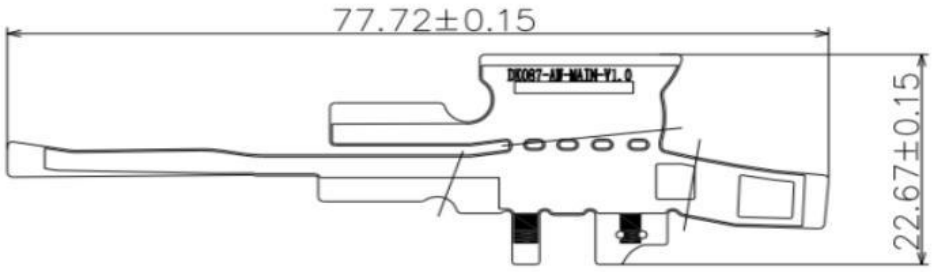
NFC antenna unit:mm



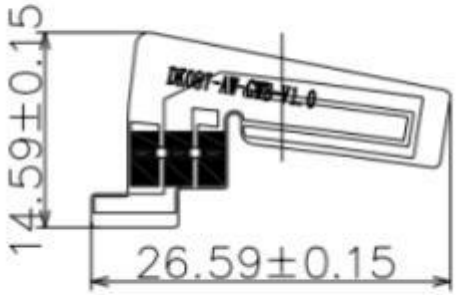
AUX antenna unit:mm



Main antenna unit:mm



GWB antenna unit:mm



ANWEI 深圳市安威无线科技有限公司

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The End

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