

Sward Antenna Report

Customer: Epudo

Project: ES510 (13.3-inch plastic
shell BND-N868-V5.0 motherboard)

date: 2025. 12. 08

Project Contact Information

Customer contact person:

Mobile:

Email:

Soward structure:

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Project Introduction

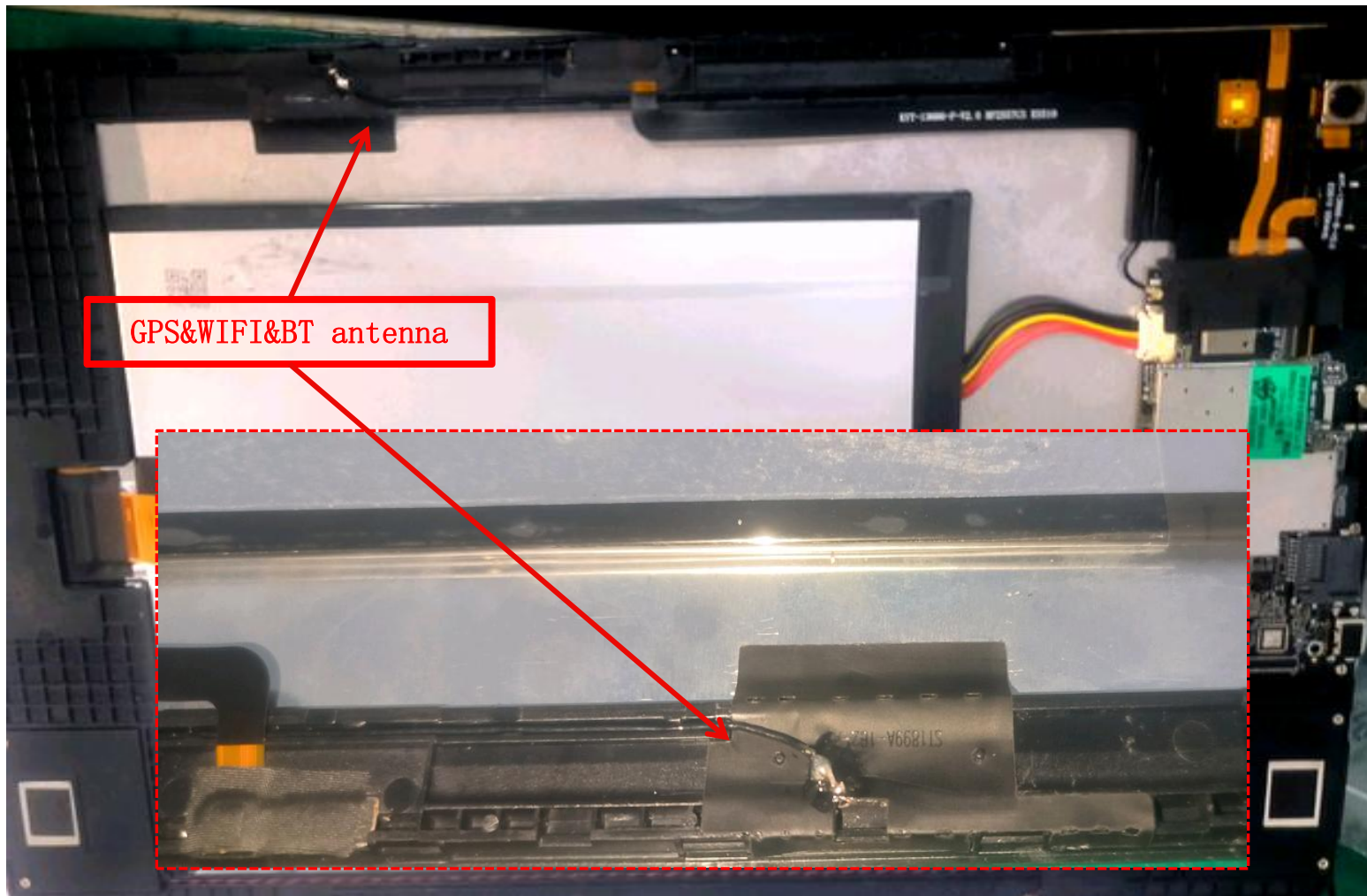
1. Project Overview

Number of project antennas	Machine type
1	Three in one tablet
Material of the whole machine shell: 13.3-inch plastic shell	

2. Antenna Overview

Antenna number	name	Working frequency band/MHz	Material/Structure
1	WIFI&GPS&BT&5Gwifi	2400MHz/2500MHz&1575MHz&5.8GHz	FPC

Antenna layout



WIFI&GPS&BT&5G WiFi antenna



WIFI antenna active data

Model status	channel	B mode (11MHz)		a mode (54MHz)	
		TRP	TIS	TRP	TIS
spot measurement	1	13. 05	—	NA	NA
	7	18. 13	—	NA	NA
	11	15. 66	—	NA	NA
	36	NA	NA	14. 4	—
	64	NA	NA	14. 45	—
	165	NA	NA	9. 98	—
complete machine	1	10. 44	-76. 94	NA	NA
	7	11. 95	-79. 24	NA	NA
	11	9. 58	-77. 72	NA	NA
	36	NA	NA	10. 14	-69. 29
	64	NA	NA	12. 38	-69. 76
	165	NA	NA	8. 62	-69. 83

WiFi throughput

Iperf throughput test						
model	ES510 (BND-N868 -V5.0 motherboard)	module	Accompanying the motherboard	Software version	Iperf2 for Android	
Model number	Frequency band	distance	Test angle	Test data (TX) 1-minute mean	Test data (RX) 1-minute mean	Remarks (number of packet drops)
1	2. 4G	2. 4G WIFI (Research and development testing 15m))	0°	31. 3 Mbps	87. 5 Mbps	0
			90°	33. 2 Mbps	94. 9 Mbps	0
			180°	33. 4 Mbps	87. 7 Mbps	0
			270°	31. 8 Mbps	112 Mbps	0
	5G	5g WIFI (Research and development testing 15m)	0°	184 Mbps	340 Mbps	0
			90°	178 Mbps	338 Mbps	0
			180°	180 Mbps	344 Mbps	0
			270°	184 Mbps	342 Mbps	0

WIFI antenna throughput test (test image)

Test data 2.4Gwifi/5Gwifi upload/download (corresponding to connection speeds of 150/390 Mbps)

iPerf2 for Android

Start

Save

IPv4

Your IP address is: 192.168.1.115

iperf -c 192.168.1.100 -i 1 -w 1m -t 50

[1] 45.00-46.00 sec

4.62 MBytes

38.8 Mbits/sec

[1] 46.00-47.00 sec

3.12 MBytes

26.2 Mbits/sec

[1] 47.00-48.00 sec

4.12 MBytes

34.6 Mbits/sec

[1] 48.00-49.00 sec

2.63 MBytes

22.0 Mbits/sec

[1] 49.00-50.00 sec

4.25 MBytes

35.7 Mbits/sec

[1] 50.00-50.31 sec

128 KBytes

3.33 Mbits/sec

[1] 0.00-50.31 sec

188 MBytes

31.3 Mbits/sec

Client connecting to 192.168.1.100, TCP port 5001

TCP window size: 1.91 MByte (WARNING: requested 977 KByte)

[1] local 192.168.1.115 port 53532 connected with 192.168.1.100 port 5001

[ID] Interval

Transfer

Bandwidth

[1] 0.00-1.00 sec

4.88 MBytes

40.9 Mbits/sec

[1] 1.00-2.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 2.00-3.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 3.00-4.00 sec

3.88 MBytes

32.5 Mbits/sec

[1] 4.00-5.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 5.00-6.00 sec

4.50 MBytes

37.7 Mbits/sec

[1] 6.00-7.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 7.00-8.00 sec

3.12 MBytes

26.2 Mbits/sec

[1] 8.00-9.00 sec

4.62 MBytes

38.8 Mbits/sec

[1] 9.00-10.00 sec

3.88 MBytes

32.5 Mbits/sec

[1] 10.00-11.00 sec

4.50 MBytes

37.7 Mbits/sec

[1] 11.00-12.00 sec

3.50 MBytes

29.4 Mbits/sec

[1] 12.00-13.00 sec

4.25 MBytes

35.7 Mbits/sec

[1] 13.00-14.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 14.00-15.00 sec

4.88 MBytes

40.9 Mbits/sec

[1] 15.00-16.00 sec

4.00 MBytes

33.6 Mbits/sec

[1] 16.00-17.00 sec

4.12 MBytes

34.6 Mbits/sec

[1] 17.00-18.00 sec

3.00 MBytes

25.2 Mbits/sec

[1] 18.00-19.00 sec

5.12 MBytes

43.0 Mbits/sec

[1] 19.00-20.00 sec

5.00 MBytes

41.9 Mbits/sec

[1] 20.00-21.00 sec

4.88 MBytes

40.9 Mbits/sec

[1] 21.00-22.00 sec

4.00 MBytes

33.6 Mbits/sec

[1] 22.00-23.00 sec

3.38 MBytes

28.3 Mbits/sec

[1] 23.00-24.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 24.00-25.00 sec

2.75 MBytes

23.1 Mbits/sec

[1] 25.00-26.00 sec

4.12 MBytes

34.6 Mbits/sec

[1] 26.00-27.00 sec

4.25 MBytes

35.7 Mbits/sec

[1] 27.00-28.00 sec

3.38 MBytes

28.3 Mbits/sec

[1] 28.00-29.00 sec

4.12 MBytes

34.6 Mbits/sec

[1] 29.00-30.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 30.00-31.00 sec

3.75 MBytes

31.5 Mbits/sec

[1] 31.00-32.00 sec

4.12 MBytes

34.6 Mbits/sec

[1] 32.00-33.00 sec

3.50 MBytes

29.4 Mbits/sec

[1] 33.00-34.00 sec

3.25 MBytes

27.3 Mbits/sec

[1] 34.00-35.00 sec

4.25 MBytes

35.7 Mbits/sec

[1] 35.00-36.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 36.00-37.00 sec

2.05 MBytes

17.2 Mbits/sec

[1] 37.00-38.00 sec

5.25 MBytes

44.0 Mbits/sec

[1] 38.00-39.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 39.00-40.00 sec

4.50 MBytes

37.7 Mbits/sec

[1] 40.00-41.00 sec

4.62 MBytes

38.8 Mbits/sec

[1] 41.00-42.00 sec

4.00 MBytes

33.6 Mbits/sec

[1] 42.00-43.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 43.00-44.00 sec

3.62 MBytes

30.4 Mbits/sec

[1] 44.00-45.00 sec

2.88 MBytes

24.1 Mbits/sec

[1] 45.00-46.00 sec

3.00 MBytes

25.2 Mbits/sec

[1] 46.00-47.00 sec

2.79 MBytes

23.4 Mbits/sec

[1] 47.00-48.00 sec

4.38 MBytes

36.7 Mbits/sec

[1] 48.00-49.00 sec

4.50 MBytes

37.7 Mbits/sec

[1] 49.00-50.00 sec

3.50 MBytes

29.4 Mbits/sec

[1] 50.00-50.30 sec

128 KBytes

3.48 Mbits/sec

[1] 0.00-50.30 sec

199 MBytes

33.2 Mbits/sec

iPerf2 for Android

StartSaveIPv4

Your IP address is: 192.168.1.115

iperf -c 192.168.1.100 -i 1 -w 1m -t 50

[1] 43.00-44.00 sec23.0 MBytes193 Mbits/sec

[1] 44.00-45.00 sec23.6 MBytes198 Mbits/sec

[1] 45.00-46.00 sec20.6 MBytes173 Mbits/sec

[1] 46.00-47.00 sec22.8 MBytes191 Mbits/sec

[1] 47.00-48.00 sec25.8 MBytes216 Mbits/sec

[1] 48.00-49.00 sec20.6 MBytes173 Mbits/sec

[1] 49.00-50.00 sec22.6 MBytes190 Mbits/sec

[1] 0.00-50.08 sec1.05 GBytes180 Mbits/sec

Client connecting to 192.168.1.100, TCP port 5001

TCP window size: 1.91 MByte (WARNING: requested 977 KByte)

[1] local 192.168.1.105 port 48478 connected with 192.168.1.100

IDIntervalTransferBandwidth

[1] 0.00-1.00 sec19.0 MBytes159 Mbits/sec

[1] 1.00-2.00 sec22.5 MBytes189 Mbits/sec

[1] 2.00-3.00 sec24.9 MBytes209 Mbits/sec

[1] 3.00-4.00 sec22.0 MBytes185 Mbits/sec

[1] 4.00-5.00 sec24.0 MBytes201 Mbits/sec

[1] 5.00-6.00 sec23.5 MBytes197 Mbits/sec

[1] 6.00-7.00 sec18.6 MBytes156 Mbits/sec

[1] 7.00-8.00 sec25.4 MBytes213 Mbits/sec

[1] 8.00-9.00 sec22.0 MBytes185 Mbits/sec

[1] 9.00-10.00 sec22.0 MBytes185 Mbits/sec

[1] 10.00-11.00 sec21.4 MBytes179 Mbits/sec

[1] 11.00-12.00 sec26.8 MBytes224 Mbits/sec

[1] 12.00-13.00 sec20.9 MBytes175 Mbits/sec

[1] 13.00-14.00 sec24.4 MBytes204 Mbits/sec

[1] 14.00-15.00 sec26.6 MBytes223 Mbits/sec

[1] 15.00-16.00 sec26.1 MBytes219 Mbits/sec

[1] 16.00-17.00 sec21.5 MBytes180 Mbits/sec

[1] 17.00-18.00 sec24.6 MBytes207 Mbits/sec

[1] 18.00-19.00 sec27.2 MBytes229 Mbits/sec

[1] 19.00-20.00 sec29.1 MBytes244 Mbits/sec

[1] 20.00-21.00 sec23.8 MBytes199 Mbits/sec

[1] 21.00-22.00 sec18.4 MBytes154 Mbits/sec

[1] 22.00-23.00 sec21.1 MBytes177 Mbits/sec

[1] 23.00-24.00 sec21.8 MBytes182 Mbits/sec

[1] 24.00-25.00 sec17.5 MBytes147 Mbits/sec

[1] 25.00-26.00 sec24.1 MBytes202 Mbits/sec

[1] 26.00-27.00 sec20.9 MBytes175 Mbits/sec

[1] 27.00-28.00 sec21.4 MBytes179 Mbits/sec

[1] 28.00-29.00 sec21.8 MBytes182 Mbits/sec

[1] 29.00-30.00 sec21.4 MBytes179 Mbits/sec

[1] 30.00-31.00 sec25.0 MBytes210 Mbits/sec

[1] 31.00-32.00 sec18.4 MBytes154 Mbits/sec

[1] 32.00-33.00 sec16.6 MBytes139 Mbits/sec

[1] 33.00-34.00 sec17.4 MBytes146 Mbits/sec

[1] 34.00-35.00 sec12.9 MBytes108 Mbits/sec

[1] 35.00-36.00 sec20.8 MBytes174 Mbits/sec

[1] 36.00-37.00 sec19.1 MBytes160 Mbits/sec

[1] 37.00-38.00 sec24.1 MBytes202 Mbits/sec

[1] 38.00-39.00 sec20.0 MBytes168 Mbits/sec

[1] 39.00-40.00 sec24.0 MBytes201 Mbits/sec

[1] 40.00-41.00 sec23.2 MBytes195 Mbits/sec

[1] 41.00-42.00 sec24.2 MBytes203 Mbits/sec

[1] 42.00-43.00 sec22.4 MBytes188 Mbits/sec

[1] 43.00-44.00 sec23.8 MBytes199 Mbits/sec

[1] 44.00-45.00 sec17.8 MBytes149 Mbits/sec

[1] 45.00-46.00 sec16.4 MBytes137 Mbits/sec

[1] 46.00-47.00 sec18.9 MBytes158 Mbits/sec

[1] 47.00-48.00 sec21.5 MBytes180 Mbits/sec

[1] 48.00-49.00 sec24.8 MBytes208 Mbits/sec

[1] 49.00-50.00 sec23.4 MBytes196 Mbits/sec

[1] 0.00-50.09 sec1.07 GBytes184 Mbits/sec

iPerf2 for Android

Abort

Save

IPv4

Your IP address is: 192.168.1.115

iperf -s -i 10

Server listening on TCP port 5001

TCP window size: 1.00 MByte (default)

[1] local 192.168.1.105 port 5001 connected with 192.168.1.100 port 555

[ID] Interval Transfer Bandwidth

[1] 0.00-10.00 sec 380 MBytes 319 Mbits/sec

[1] 10.00-20.00 sec 413 MBytes 346 Mbits/sec

[1] 20.00-30.00 sec 408 MBytes 342 Mbits/sec

[1] 30.00-40.00 sec 411 MBytes 345 Mbits/sec

[1] 40.00-50.00 sec 414 MBytes 347 Mbits/sec

[1] 0.00-50.02 sec 1.98 GBytes 340 Mbits/sec

[2] local 192.168.1.105 port 5001 connected with 192.168.1.100 port 555

[ID] Interval Transfer Bandwidth

[2] 0.00-10.00 sec 369 MBytes 309 Mbits/sec

[2] 10.00-20.00 sec 408 MBytes 342 Mbits/sec

[2] 20.00-30.00 sec 415 MBytes 348 Mbits/sec

[2] 30.00-40.00 sec 416 MBytes 349 Mbits/sec

[2] 40.00-50.00 sec 404 MBytes 339 Mbits/sec

[2] 0.00-50.01 sec 1.97 GBytes 338 Mbits/sec

[3] local 192.168.1.105 port 5001 connected with 192.168.1.100 port 575

[ID] Interval Transfer Bandwidth

[3] 0.00-10.00 sec 402 MBytes 337 Mbits/sec

[3] 10.00-20.00 sec 400 MBytes 336 Mbits/sec

[3] 20.00-30.00 sec 407 MBytes 342 Mbits/sec

[3] 30.00-40.00 sec 415 MBytes 348 Mbits/sec

[3] 40.00-50.00 sec 412 MBytes 346 Mbits/sec

[3] 0.00-50.00 sec 1.99 GBytes 342 Mbits/sec

Operation aborted.

Server listening on TCP port 5001

TCP window size: 1.00 MByte (default)

[1] local 192.168.1.115 port 5001 connected with 192.168.1.100 port 576

[ID] Interval Transfer Bandwidth

[1] 0.00-10.00 sec 96.5 MBytes 81.0 Mbits/sec

[1] 10.00-20.00 sec 82.5 MBytes 69.2 Mbits/sec

[1] 20.00-30.00 sec 115 MBytes 96.7 Mbits/sec

[1] 30.00-40.00 sec 115 MBytes 96.7 Mbits/sec

[1] 40.00-50.00 sec 112 MBytes 94.1 Mbits/sec

[1] 0.00-50.12 sec 523 MBytes 87.5 Mbits/sec

[2] local 192.168.1.115 port 5001 connected with 192.168.1.100 port 595

[ID] Interval Transfer Bandwidth

[2] 0.00-10.00 sec 104 MBytes 87.1 Mbits/sec

[2] 10.00-20.00 sec 120 MBytes 100 Mbits/sec

[2] 20.00-30.00 sec 107 MBytes 89.6 Mbits/sec

[2] 30.00-40.00 sec 117 MBytes 98.0 Mbits/sec

[2] 40.00-50.00 sec 119 MBytes 99.5 Mbits/sec

[2] 0.00-50.07 sec 567 MBytes 94.9 Mbits/sec

[3] local 192.168.1.115 port 5001 connected with 192.168.1.100 port 595

[ID] Interval Transfer Bandwidth

[3] 0.00-10.00 sec 119 MBytes 100 Mbits/sec

[3] 10.00-20.00 sec 102 MBytes 85.7 Mbits/sec

[3] 20.00-30.00 sec 92.0 MBytes 77.2 Mbits/sec

[3] 30.00-40.00 sec 120 MBytes 100 Mbits/sec

[3] 40.00-50.00 sec 90.0 MBytes 75.5 Mbits/sec

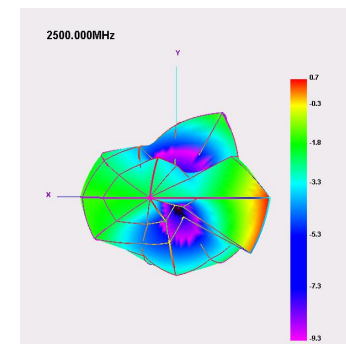
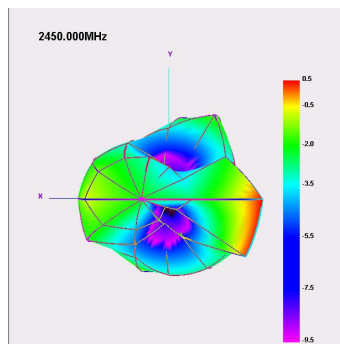
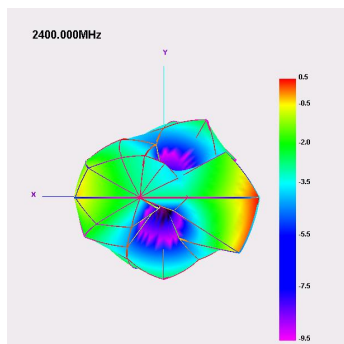
[3] 0.00-50.10 sec 524 MBytes 87.7 Mbits/sec

BT antenna measured distance

Actual test effect	
Model number	1
test environment	Soward R&D Center
test equipment	Huawei AM08
test distance	> 10 meters

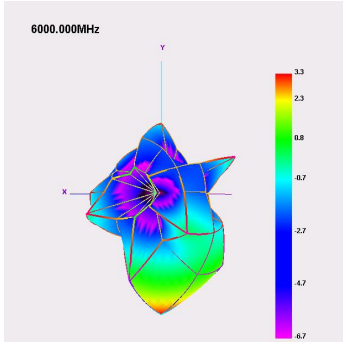
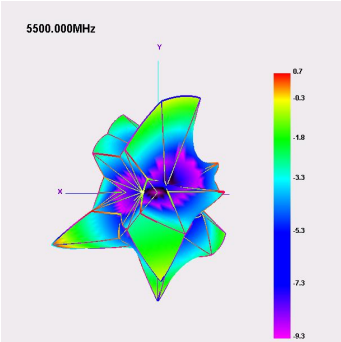
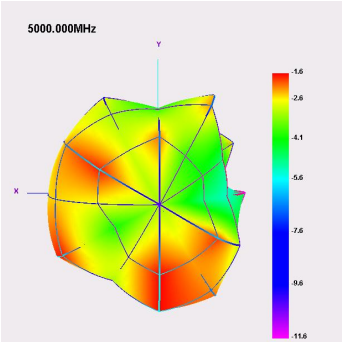
WIFI&BT antenna efficiency

Passive Test For 2.4Gwifi						
Freq	Effi	Effi	Gain	Gain	Max	Min
(MHz)	(%)	(dB)	(dBi)	(dBd)	(dB)	(dB)
2400	34.68	-4.6	0.46	-1.69	0.46	-16.95
2410	34.53	-4.62	0.59	-1.56	0.59	-18.09
2420	34.29	-4.65	0.68	-1.47	0.68	-18.47
2430	34.64	-4.6	0.71	-1.44	0.71	-16.81
2440	32.87	-4.83	0.58	-1.57	0.58	-16.8
2450	32.8	-4.84	0.49	-1.66	0.49	-16.23
2460	34.49	-4.62	0.44	-1.71	0.44	-15.46
2470	36.52	-4.38	0.23	-1.92	0.23	-14.74
2480	39.66	-4.02	0.25	-1.9	0.25	-14.24
2490	42.23	-3.74	0.53	-1.62	0.53	-14.54
2500	41.87	-3.78	0.73	-1.42	0.73	-14.66

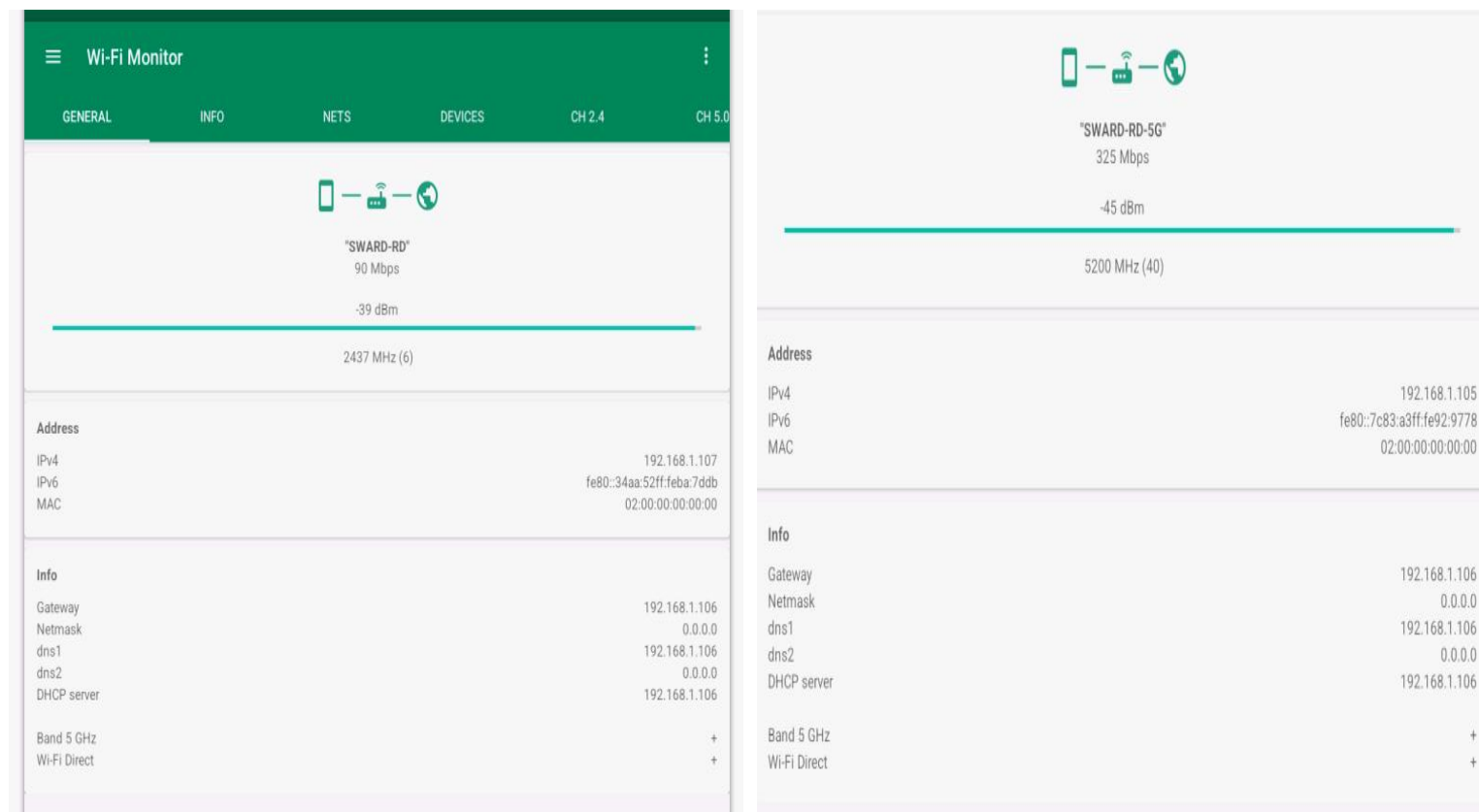


5G WIFI antenna efficiency

Passive Test For 5Gwifi						
Freq	Effi	Effi	Gain	Gain	Max	Min
(MHz)	(%)	(dB)	(dBi)	(dBd)	(dB)	(dB)
5000	25.85	-5.88	-1.61	-3.76	-1.61	-31.1
5100	27.66	-5.58	-0.24	-2.39	-0.24	-18.06
5200	28.02	-5.53	-0.18	-2.33	-0.18	-16.79
5300	32	-4.95	-0.39	-2.54	-0.39	-15.15
5400	31.94	-4.96	-0.23	-2.38	-0.23	-13.97
5500	35.72	-4.47	0.66	-1.49	0.66	-11.59
5600	35.79	-4.46	1.56	-0.59	1.56	-15.29
5700	33.24	-4.78	1.12	-1.03	1.12	-18.46
5800	38.24	-4.17	1.6	-0.55	1.6	-20.88
5900	33.89	-4.7	2.48	0.33	2.48	-15.29
6000	36.19	-4.41	3.27	1.12	3.27	-14.22



WIFI antenna signal strength measurement picture (data)



Test location: Our R&D office

Test time: 15:00-15:30

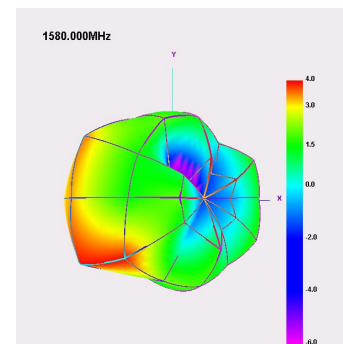
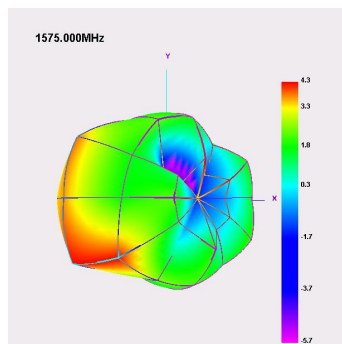
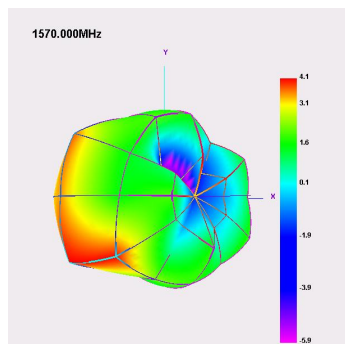
Test distance: 10-15 meters

Signal strength: -48dBm to -38dBm

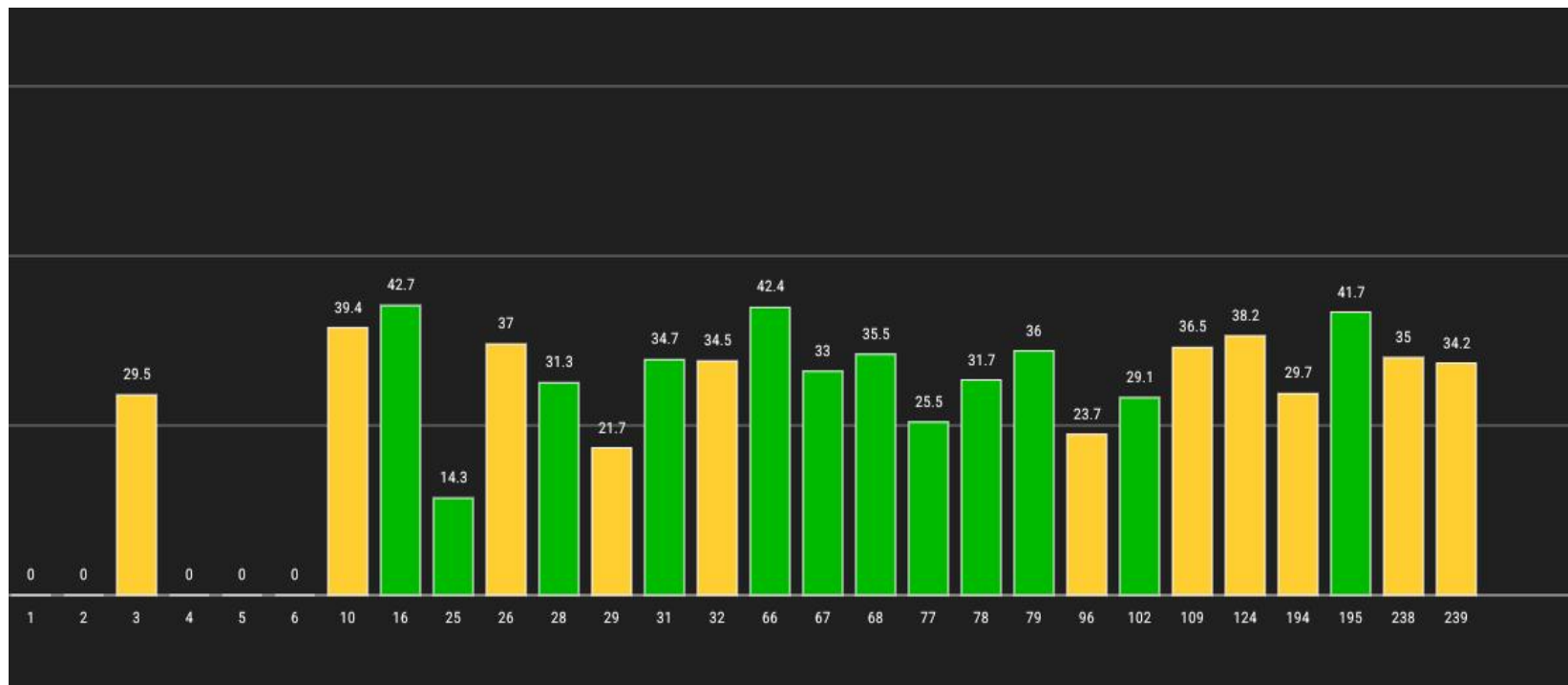
Building B, Hexi Hangcheng Industrial Zone, No. 135 Qianjin No. 2 Road, Baoan District, Shenzhen

GPS antenna efficiency

Passive Test For GPS2						
Freq	Effi	Effi	Gain	Gain	Max	Min
(MHz)	(%)	(dB)	(dBi)	(dBd)	(dB)	(dB)
1570	66.21	-1.79	4.06	1.91	4.06	-16.67
1571	66.67	-1.76	4.09	1.94	4.09	-16.83
1572	67.36	-1.72	4.12	1.97	4.12	-16.88
1573	68.25	-1.66	4.16	2.01	4.16	-16.91
1574	69.4	-1.59	4.21	2.06	4.21	-16.94
1575	68.65	-1.63	4.25	2.1	4.25	-17.01
1576	68.29	-1.66	4.2	2.05	4.2	-17.17
1577	68.02	-1.67	4.16	2.01	4.16	-17.35
1578	67.77	-1.69	4.11	1.96	4.11	-17.33
1579	67.67	-1.7	4.05	1.9	4.05	-17.51
1580	67.55	-1.7	4	1.85	4	-17.6



GPS measured images (data)



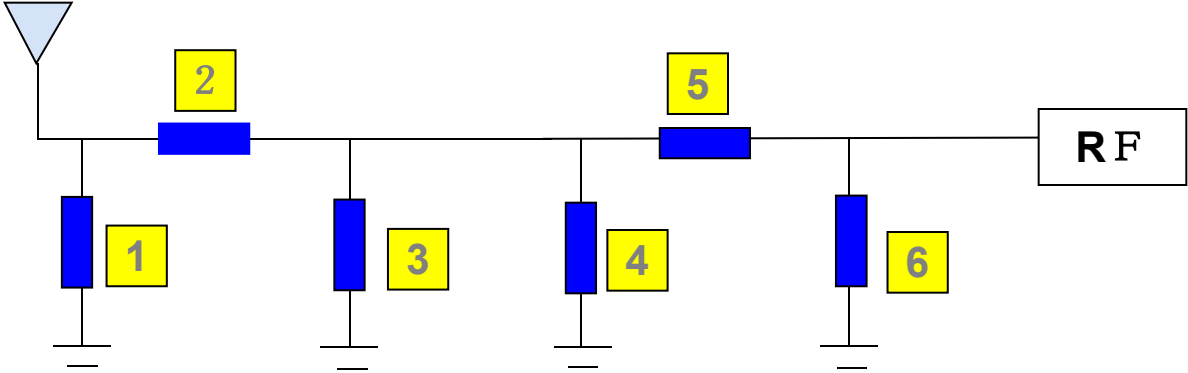
Test location: Our company's rooftop

Test time: 17:00 to 17:30

Test direction: East, South, West, North

Cold start positioning
time:<60 seconds

antenna matching

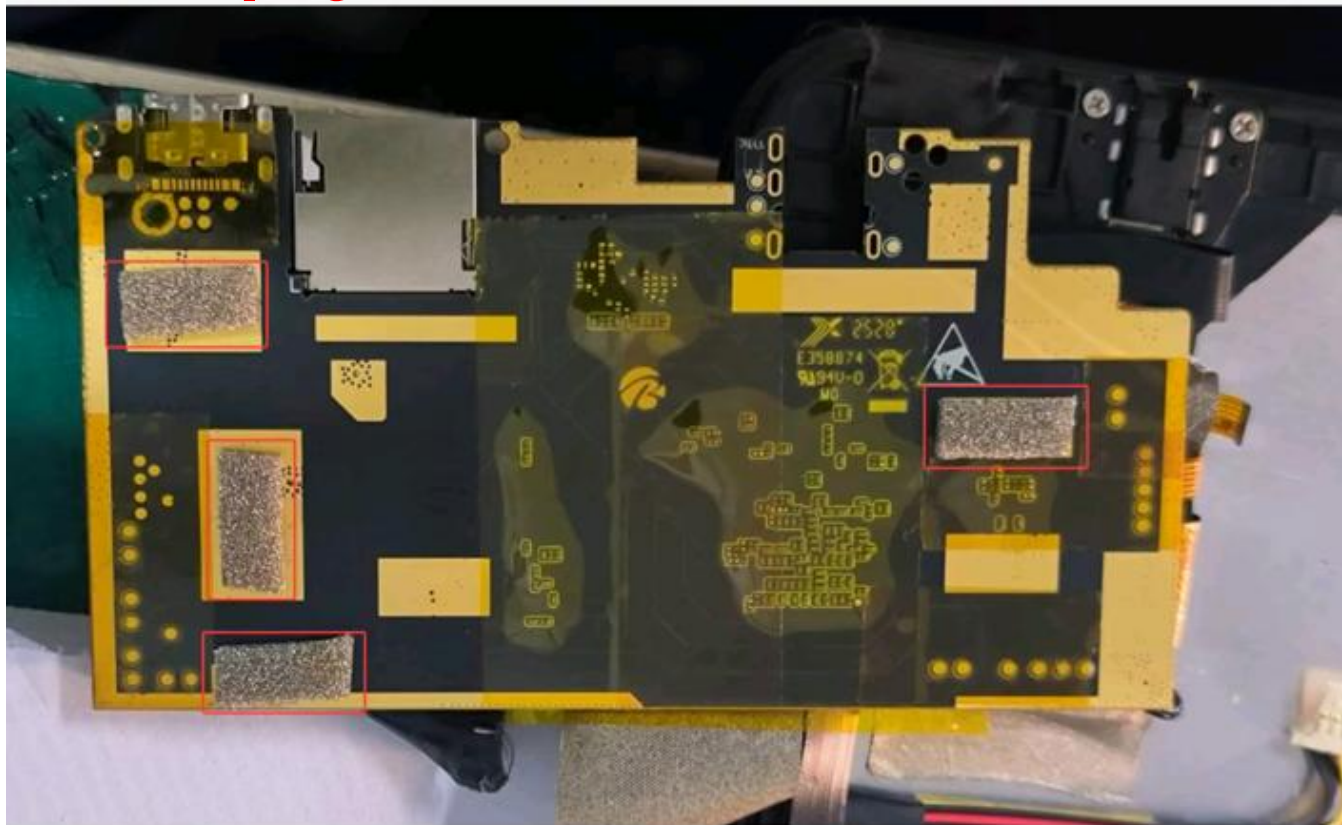


No antenna matching has been changed.

Main antenna	1	2	3	4	5	6	remarks
Original matching							
Change Matching							

Environmental treatment and assembly instructions

ES510 motherboard with conductive
sponge attached to the back



1. At the red frame, stick a conductive sponge (recommended 2mm) on the back of the motherboard;

Environmental treatment and assembly instructions



2. At the red frame, the front shielding cover of the motherboard is grounded with conductive cloth;

