

SWARD

SWD-FM-RD-002 A.0/2020.1
IATF16949:2016&ISO9001:2015Dual system
certified enterprise

ShenZhen SWARD Communi cation Technology Co.Ltd

Project Name: VA-16-AX210D2W Module

Date: December 7th, 2024

Project Introduction

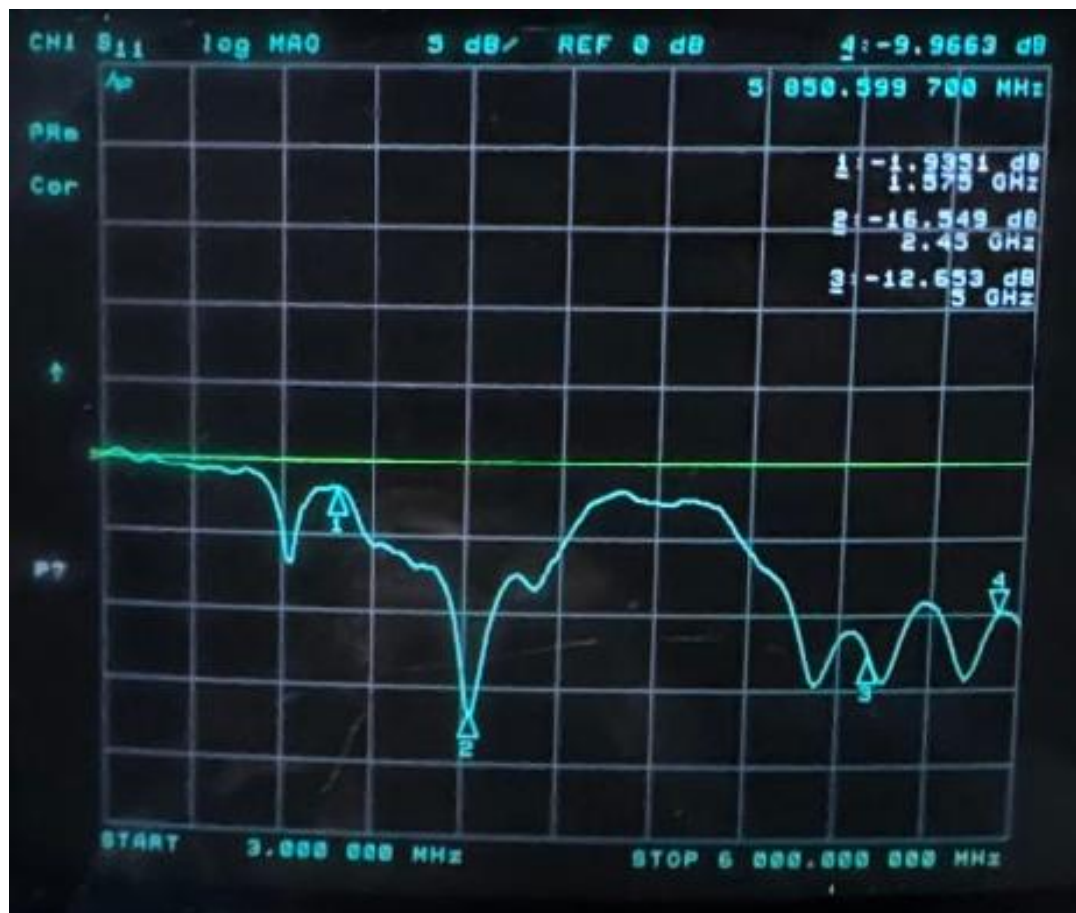
1.Resume

Antennas	Type
4	computer
Material of the whole machine shell: 16 inch metal shell	

2.Description

Num.	Function	Frequency Band / MHz	Material / Structure	Manufacturer
1	WIFI&BT&5Gwifi	2400MHz/2500MHz&5. 8GHz	PCB	ShenZhen SWARD Communica tionTechn ology Co. Ltd
2	WIFI&BT&5Gwifi	2400MHz/2500MHz&5. 8GHz	PCB	
3	WIFI	2400MHz/2500MHz	PCB	
4	GPS	1575MHz	Ceramic Antenna	

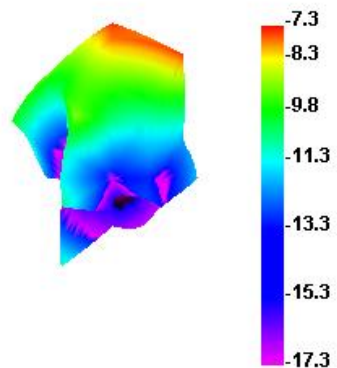
WIFI&BT Main antenna S11



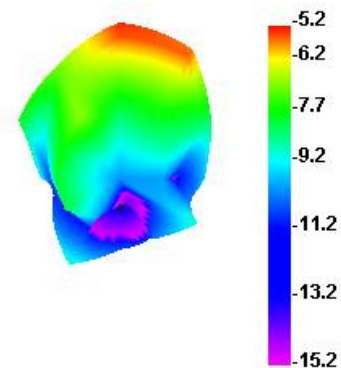
WIFI&BT Main antenna efficiency

Passive Test For 2.4G			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
2400	24.62	-6.09	-7.34
2410	24.72	-6.07	-7.05
2420	25.43	-5.95	-6.77
2430	26.66	-5.74	-5.46
2440	27.91	-5.54	-4.58
2450	26.99	-5.69	-5.23
2460	27.21	-5.65	-5.27
2470	26.43	-5.78	-5.94
2480	27.51	-5.61	-5.34
2490	29.71	-5.27	-4.23
2500	32.19	-4.92	-3.13

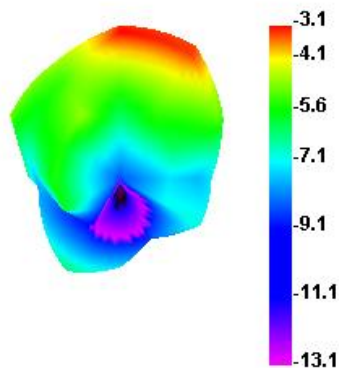
2400.000MHz



2450.000MHz



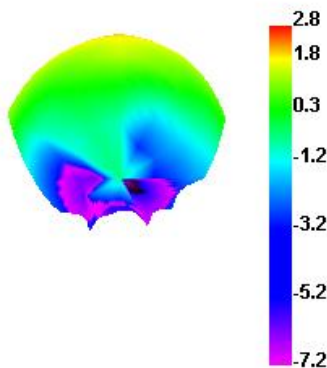
2500.000MHz



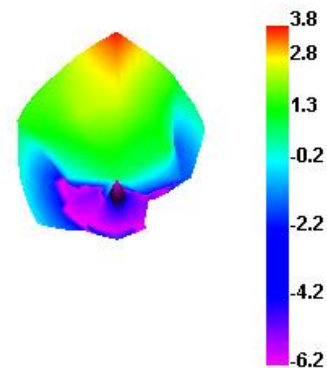
5GWIFI Main antenna efficiency

Passive Test For 5G-WIFI			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
5000	31.59	-5.00	2.79
5100	26.9	-5.70	2.19
5200	25.69	-5.90	3.81
5300	20.84	-6.81	2.17
5400	27.15	-5.66	4.26
5500	27.26	-5.64	3.76
5600	22.16	-6.54	2.81
5700	22.17	-6.54	1.99
5800	27.15	-5.66	0.17
5900	23.26	-6.33	-1.64
6000	22.51	-6.48	-2.26

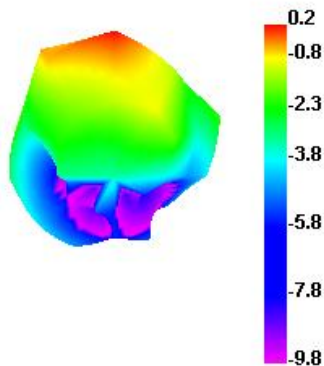
5000.000MHz



5500.000MHz

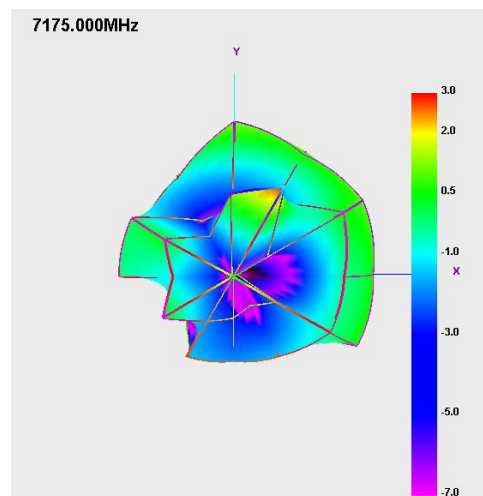
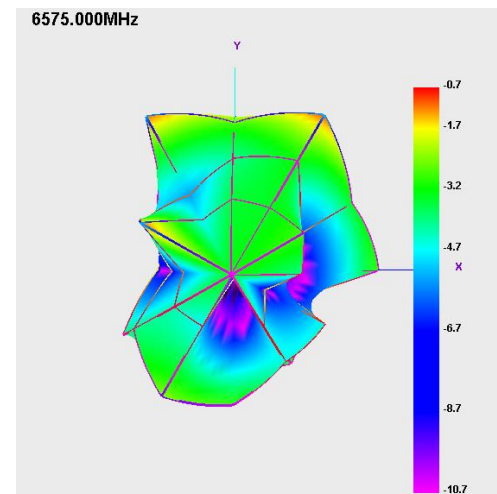
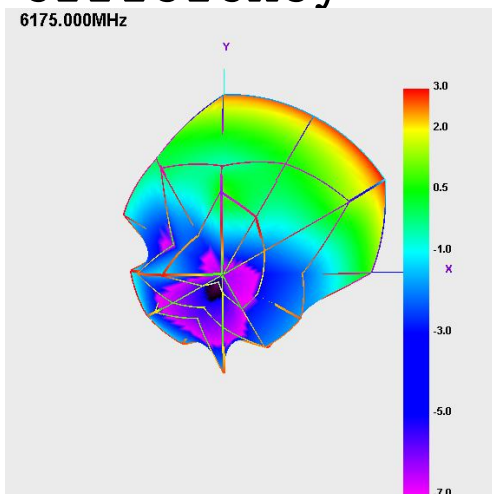


5800.000MHz



WIFI 6E Main antenna efficiency

Passive Test For 6E			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
6175	39.46	-4.04	2.97
6275	44.68	-3.5	4.47
6375	43.54	-3.61	3.22
6475	36.73	-4.35	0.51
6575	25.02	-6.02	-0.66
6675	30.27	-5.19	0.73
6775	28.54	-5.44	-0.93
6875	38.51	-4.14	1.74
6975	36.6	-4.37	3.38
7075	42.8	-3.69	1.43
7175	41.72	-3.8	3

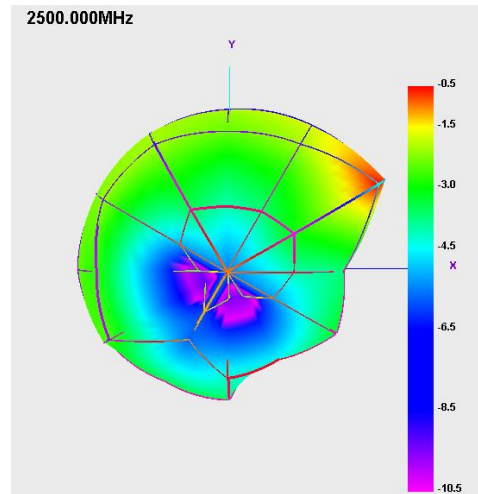
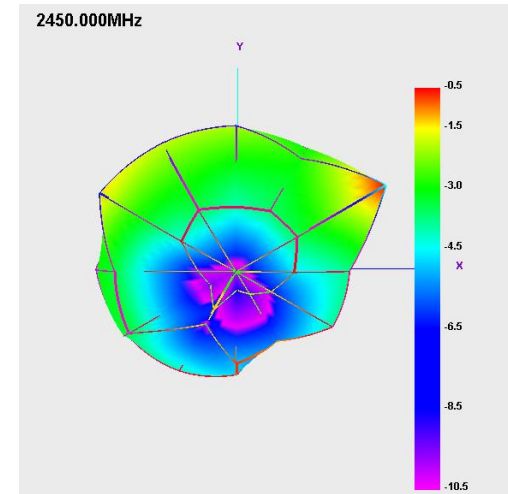
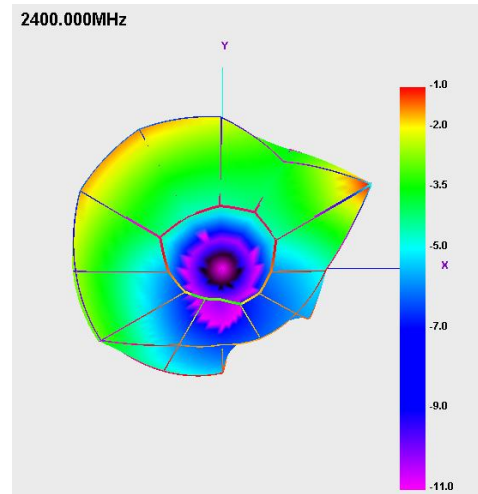


WIFI&BT&5Gwifi Secondary antenna S11



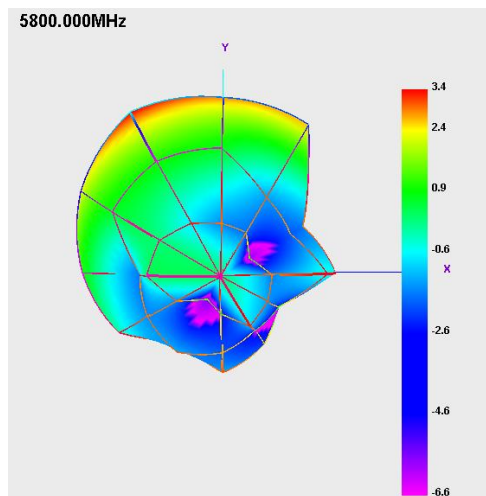
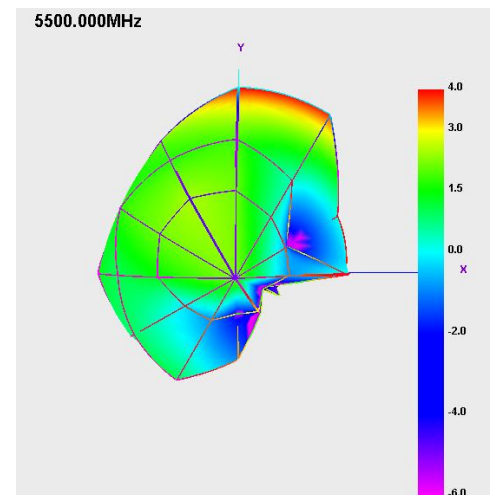
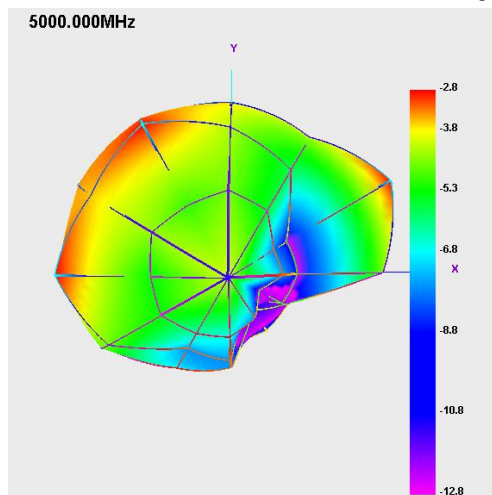
WIFI&BT Secondary antenna efficiency

Passive Test For 2.4G			
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
2400	18.04	-7.44	-0.96
2410	18.52	-7.32	-0.73
2420	20.84	-6.81	-0.13
2430	22.83	-6.42	0.28
2440	23.65	-6.26	0.42
2450	18.97	-7.22	-0.49
2460	18.3	-7.38	-0.7
2470	15.36	-8.14	-1.5
2480	16.66	-7.78	-1.25
2490	18.21	-7.4	-1.04
2500	22.33	-6.51	-0.51



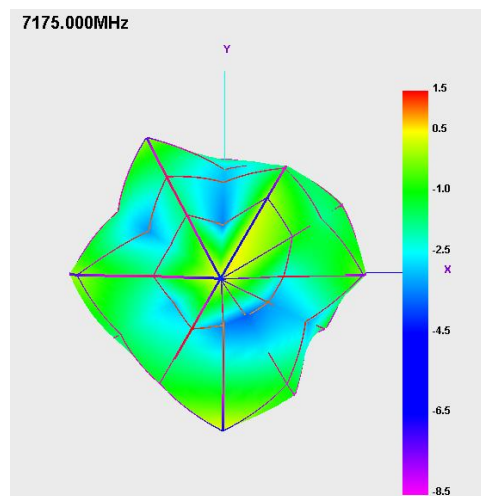
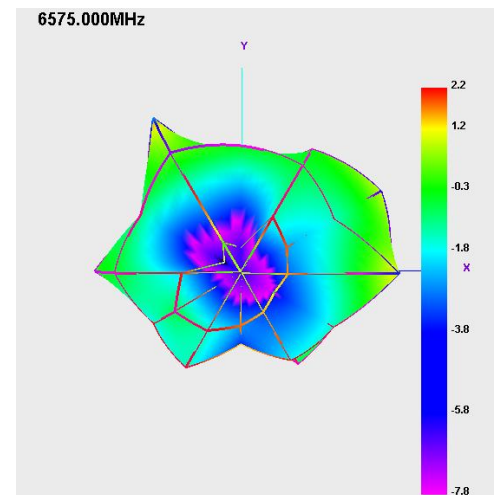
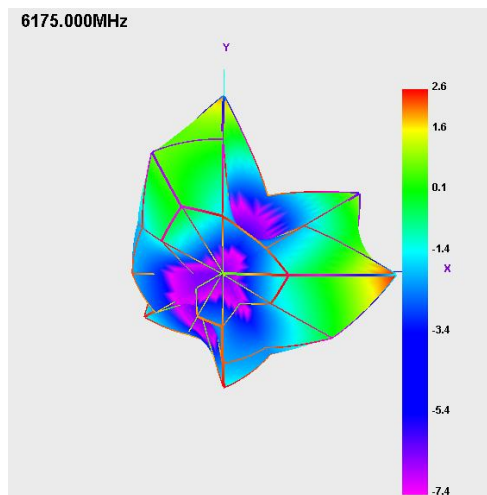
5GWIFI Secondary antenna efficiency

Passive Test For 5G-WIFI			
Freq (MHz)	Effi (%)	Effi (dB)	Gain (dBi)
5000	16.42	-7.85	-2.75
5100	16.05	-7.94	-1.36
5200	21.11	-6.75	0.26
5300	32.19	-4.92	3.67
5400	45.46	-3.42	5.62
5500	42.49	-3.72	4.04
5600	29.29	-5.33	2.01
5700	24.06	-6.19	0.74
5800	31.84	-4.97	3.43
5900	25.27	-5.97	1.71
6000	29.31	-5.33	2.76

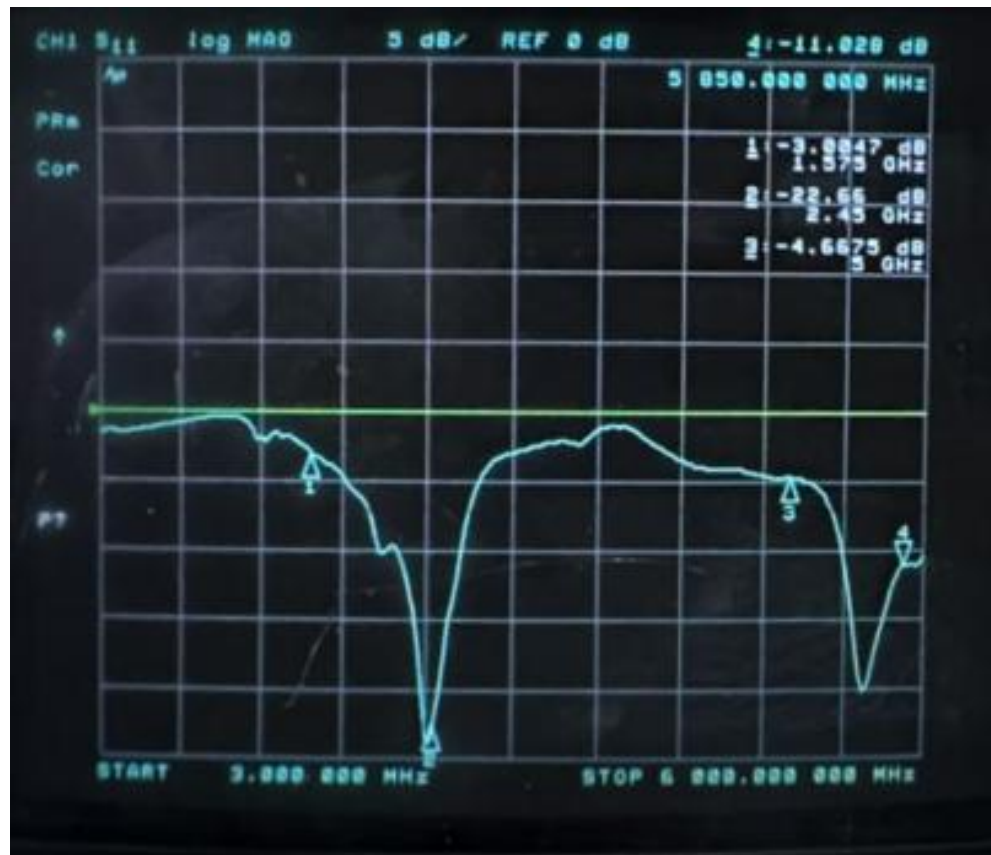


WIFI 6E Secondary antenna efficiency

Passive Test For 6E			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
6175	37.78	-4.23	1.47
6275	35.45	-4.5	2.62
6375	43.95	-3.57	2.44
6475	65.25	-1.85	4.33
6575	47.98	-3.19	2.3
6675	42.71	-3.69	2.22
6775	33.51	-4.75	0.77
6875	33.2	-4.79	2.21
6975	30.77	-5.12	-1.4
7075	31.56	-5.01	0.33
7175	28.23	-5.49	0.22



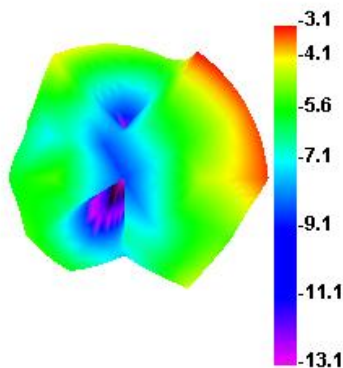
2. 4GWIFI Remote control antenna S11



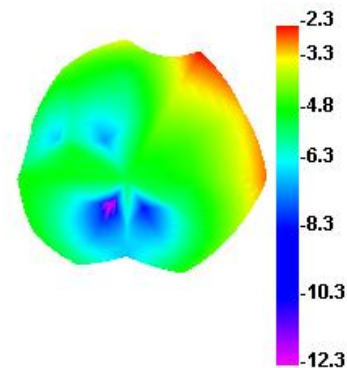
2.4GHz WIFI remote control antenna efficiency

Passive Test For 2.4G			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
2400	14.34	-8.43	-3.09
2410	14.7	-8.33	-2.76
2420	11.95	-9.23	-3.38
2430	11.76	-9.3	-3.35
2440	11.46	-9.41	-3.36
2450	14.4	-8.42	-2.34
2460	15.47	-8.11	-1.93
2470	17.24	-7.63	-1.38
2480	15.72	-8.04	-1.59
2490	15.77	-8.02	-1.6
2500	12.78	-8.93	-2.47

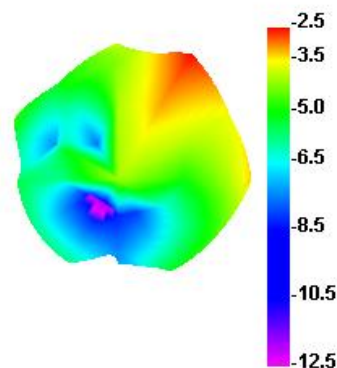
2400.000MHz



2450.000MHz



2500.000MHz

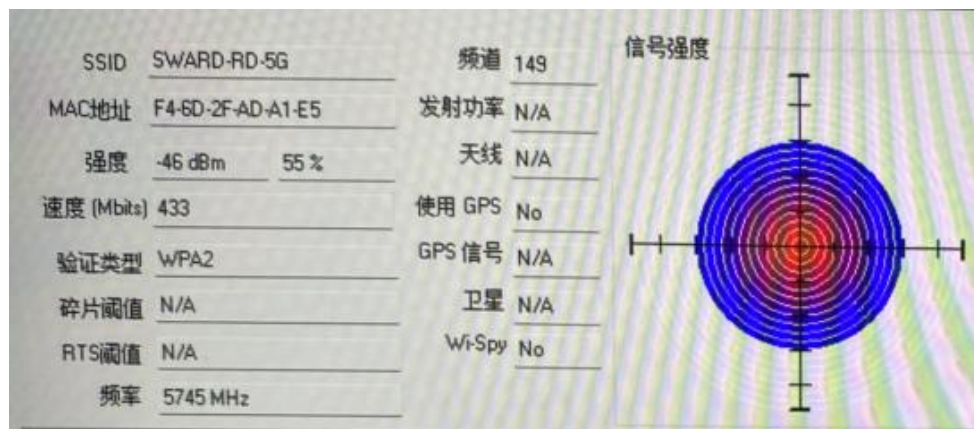


WIFI antenna throughput test

lperf throughput test						
Type		Module		Software version		
No.	Freq.	Status	Angle	Average Value (TX) /1min	Average Value (RX) /1min	Remarks (Packet loss)
2.4GWIFI		15m	0°	55.7M/S	103M/S	0
			90°	58.1M/S	106M/S	
			180°	57.6M/S	105M/S	
			270°	56.9M/S	107M/S	
5GWIFI		15m	0°	202M/S	310M/S	0
			90°	204M/S	311M/S	
			180°	206M/S	312M/S	
			270°	203M/S	317M/S	

BT antenna measured distance

Actual test effect	
Model number	1
Testing Environment	Soward R&D Center
Test equipment	Huawei AM08
test distance	10m

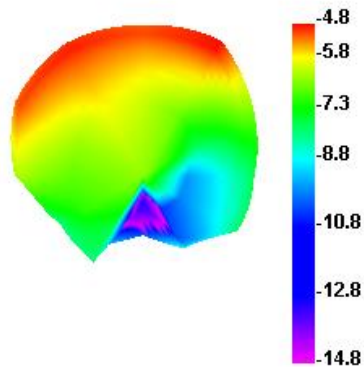
WIFI antenna signal strength measurement
picture (data)

Test location: Our R&D office
Test time: 14:00-14:30
Test distance: 10-15 meters
Signal strength:- 48dBm to -39dBm

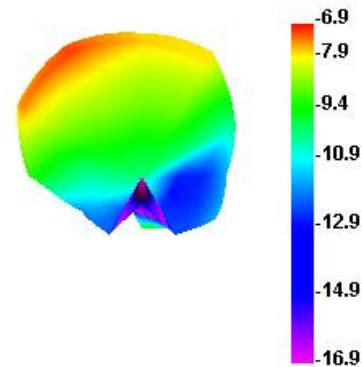
GPS antenna efficiency

Passive Test For GPS			
Freq	Effi	Effi	Gain
(MHz)	(%)	(dB)	(dBi)
1570	23.73	-6.25	-4.84
1571	22.68	-6.44	-5.3
1572	21.35	-6.71	-5.61
1573	20.91	-6.80	-5.96
1574	23.52	-6.29	-6.43
1575	25.28	-5.97	-6.91
1576	26.25	-5.81	-7.4
1577	25.36	-5.96	-8
1578	24.63	-6.09	-8.52
1579	24.05	-6.19	-9.05
1580	23.59	-6.27	-9.58

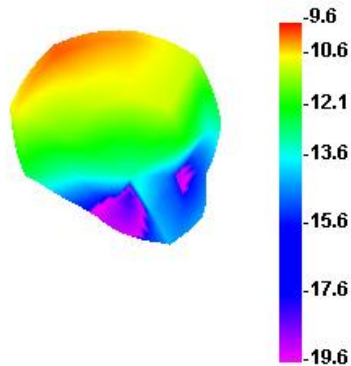
1570.000MHz



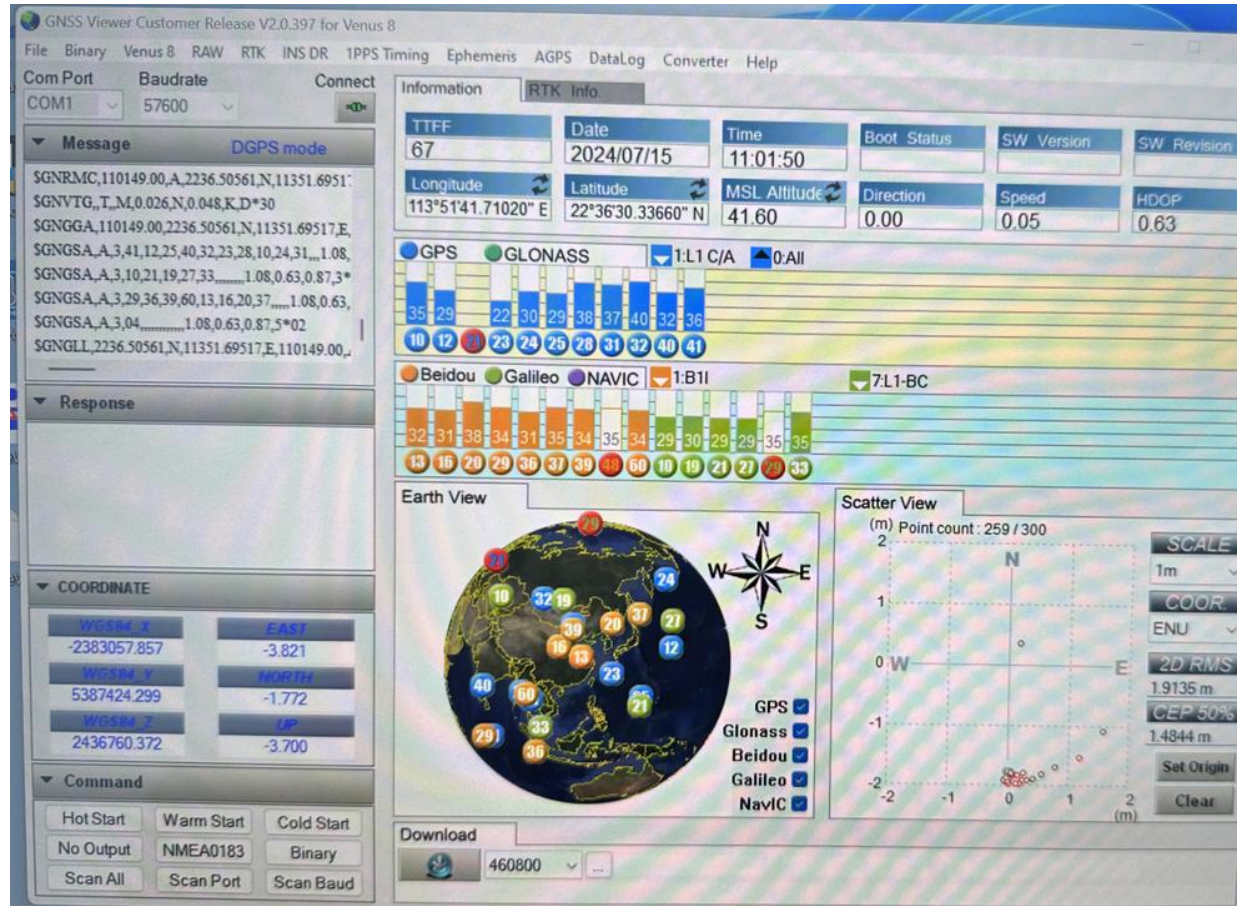
1575.000MHz



1580.000MHz



GPS measured images (data)



Test location: Our company's rooftop
Test time: 19:00 to 19:30
Test direction: East, South, West, North
Cold start positioning time: 60 seconds

Note: 1. This report is based on the actual debugging and testing of the prototype, including environmental treatment, antenna position, and assembly position of each component

Cannot be changed arbitrarily;

If there are any changes in the materials used in the prototype, please promptly provide feedback to our company for further verification;

3. List of sensitive components:

TP (Material, Coating, Wiring, etc.)

Screen (amplifier circuit, LED, cable design, etc.)

Shell material (antenna assembly method, structural interference, shell material, antenna position height and area, etc.)

Motherboard (motherboard conduction, RF circuit matching, PA, dual power, filtering, LNA, power circuit, etc.)

Camera, battery, motor MIC、Fingerprint recognition module, etc

4. Due to the small number or only one sample testing machine, some probabilistic issues cannot be fully identified. It is recommended to conduct a small batch trial production before mass production to investigate the problem points (such as flashing screens, speaker noise, TP jump points, black screen crashes, signal drops, etc.)

