

FCC TEST REPORT

Client Name : Shenzhen Radiomaster Technology Co.,Ltd

Address : 411, building 11, Shenzhen Bay science and technology
ecological park, No. 16, Keji South Road, community,
high tech Zone, Nanshan District, Shenzhen, China

Product Name : ZORRO ELRS

Date : Mar. 25, 2022



Shenzhen Anbotek Compliance Laboratory Limited



Contents

1. General Information	5
1.1. Client Information	5
1.2. Description of Device (EUT)	5
1.3. Auxiliary Equipment Used During Test	6
1.4. Description of Test Modes	6
1.5. List of channels	7
1.6. Description Of Test Setup	8
1.7. Test Equipment List	9
1.8. Measurement Uncertainty	10
1.9. Description of Test Facility	10
2. Summary of Test Results	11
3. Conducted Emission Test	12
3.1. Test Standard and Limit	12
3.2. Test Setup	12
3.3. Test Procedure	12
3.4. Test Data	12
4. Radiation Spurious Emission and Band Edge	15
4.1. Test Standard and Limit	15
4.2. Test Setup	15
4.3. Test Procedure	16
4.4. Test Data	17
5. Maximum Peak Output Power Test	25
5.1. Test Standard and Limit	25
5.2. Test Setup	25
5.3. Test Procedure	25
5.4. Test Data	25
6. 20DB Occupy Bandwidth Test	26
6.1. Test Standard	26
6.2. Test Setup	26
6.3. Test Procedure	26
6.4. Test Data	26
7. Carrier Frequency Separation Test	27
7.1. Test Standard and Limit	27
7.2. Test Setup	27
7.3. Test Procedure	27
7.4. Test Data	27
8. Number of Hopping Channel Test	28
8.1. Test Standard and Limit	28



8.2. Test Setup	28
8.3. Test Procedure	28
8.4. Test Data	28
9. Dwell Time Test	29
9.1. Test Standard and Limit	29
9.2. Test Setup	29
9.3. Test Procedure	29
9.4. Test Data	29
10. 100kHz Bandwidth of Frequency Band Edge Requirement.....	30
10.1. Test Standard and Limit.....	30
10.2. Test Setup.....	30
10.3. Test Procedure	30
10.4. Test Data	30
11. Antenna Requirement.....	31
11.1. Test Standard and Requirement.....	31
11.2. Antenna Connected Construction.....	31
APPENDIX I -- TEST SETUP PHOTOGRAPH.....	32
APPENDIX II -- EXTERNAL PHOTOGRAPH.....	34
APPENDIX III -- INTERNAL PHOTOGRAPH	38
APPENDIX IV -- Appendix Test Data	43



TEST REPORT

Applicant : Shenzhen Radiomaster Technology Co.,Ltd
Manufacturer : Shenzhen Radiomaster Technology Co.,Ltd
Product Name : ZORRO ELRS
Model No. : ZORRO, ZORRO ELRS, ZORRO Max, ZORRO Maxpro, ZORRO Lite,
ZORRO Master fire, ZORRO Mark II , ZORRO Glider, ZORRO LE, ZORRO
CNC
Trade Mark : Radiomaster
Rating(s) : Input: DC 6.6-8.4V, 500mA

Test Standard(s) : FCC Part15 Subpart C, Section 15.247

Test Method(s) : ANSI C63.10: 2020

The device described above is tested by Shenzhen Anbotech Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotech Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotech Compliance Laboratory Limited.

Date of receipt

Dec. 23, 2021

Date of Test

Dec. 23, 2021~Feb. 23, 2022

Prepared by

Tu Tu Hong

(TuTu Hong)

Approved & Authorized Signer

Tom Chen

(Tom Chen)

1. General Information

1.1. Client Information

Applicant	:	Shenzhen Radiomaster Technology Co.,Ltd
Address	:	411, building 11, Shenzhen Bay science and technology ecological park, No. 16, Keji South Road, community, high tech Zone, Nanshan District, Shenzhen, China
Manufacturer	:	Shenzhen Radiomaster Technology Co.,Ltd
Address	:	411, building 11, Shenzhen Bay science and technology ecological park, No. 16, Keji South Road, community, high tech Zone, Nanshan District, Shenzhen, China
Factory	:	Shenzhen Radiomaster Technology Co.,Ltd
Address	:	411, building 11, Shenzhen Bay science and technology ecological park, No. 16, Keji South Road, community, high tech Zone, Nanshan District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	ZORRO ELRS
Model No.	:	ZORRO, ZORRO ELRS, ZORRO Max, ZORRO Maxpro, ZORRO Lite, ZORRO Master fire, ZORRO Mark II, ZORRO Glider, ZORRO LE, ZORRO CNC (Note: All samples are the same except the model number, so we prepare "ZORRO" for test only.)
Trade Mark	:	Radiomaster
Test Power Supply	:	AC 120V, 60Hz for adapter/DC 8.4V battery inside
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Operation Frequency:	2405-2479MHz
	Number of Channel:	75 Channels
	Modulation Type:	GFSK
	Antenna Type:	Monopole Antenna
	Antenna Gain(Peak):	2 dBi (Provided by customer)
	Adapter:	N/A
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.		

1.3. Auxiliary Equipment Used During Test

Adapter	:	M/N: A2023
		Input: AC 100-240V 0.7A 50-60Hz
		USB1 Output: DC 5V 2.4A
		USB2 Output: DC 5V 2.4A

1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

TEST MODE:

Pretest Mode	Description	
Mode 1	CH01	TX Only/TX+Charging
Mode 2	CH37	
Mode 3	CH75	

Note:

- (1) The measurements are performed at the highest, middle, lowest available channels.
- (2) The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

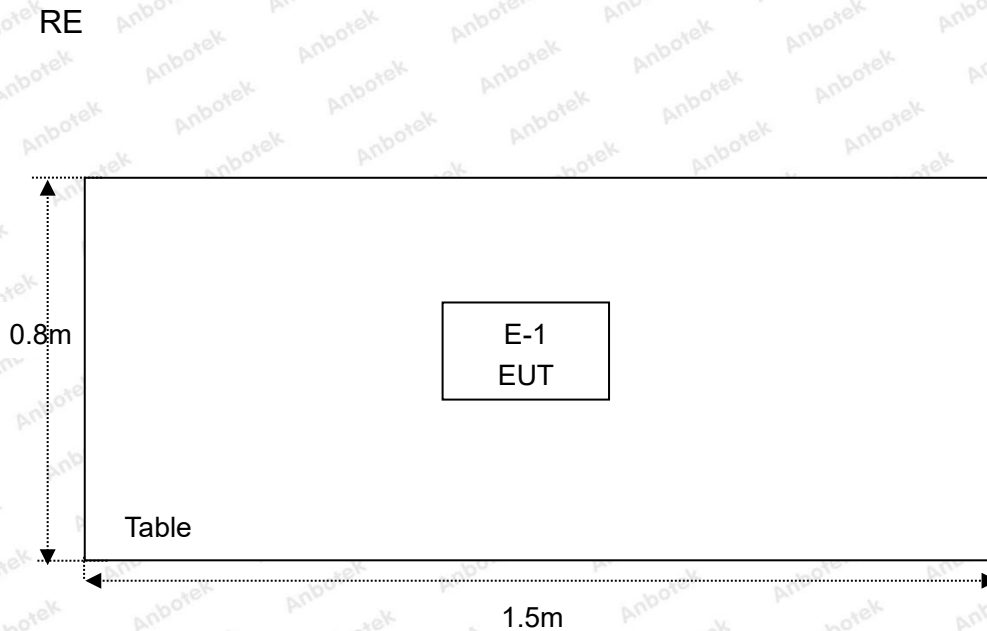
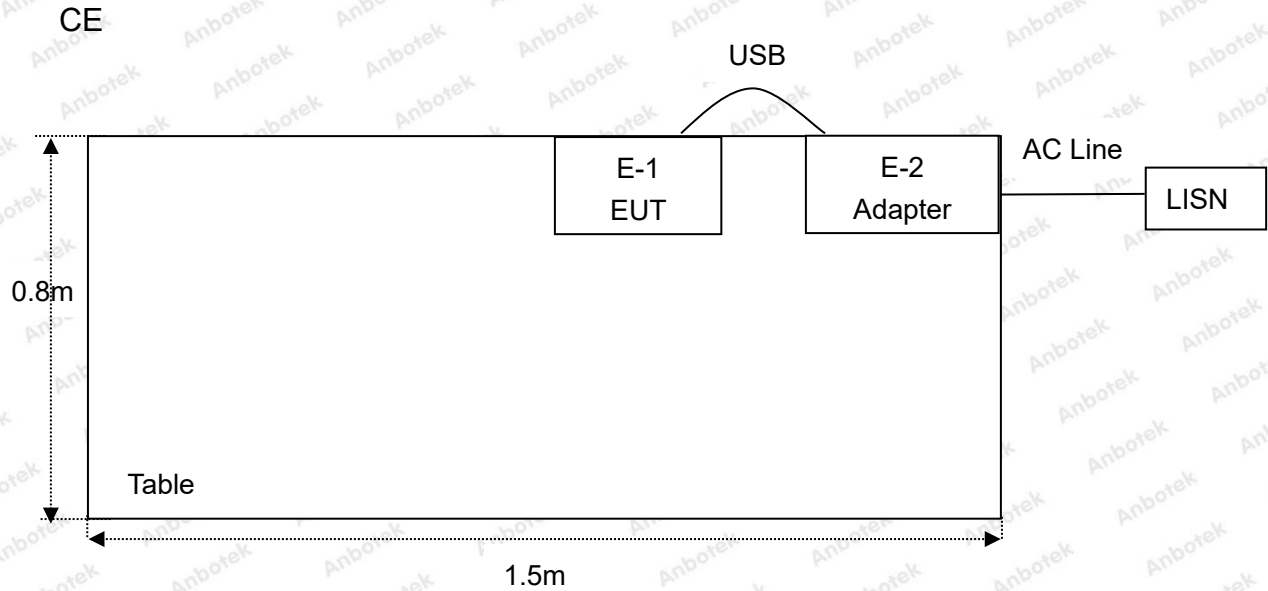
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	2405	18	2422	35	2439	52	2456	69	2473
02	2406	19	2423	36	2440	53	2457	70	2474
03	2407	20	2424	37	2441	54	2458	71	2475
04	2408	21	2425	38	2442	55	2459	72	2476
05	2409	22	2426	39	2443	56	2460	73	2477
06	2410	23	2427	40	2444	57	2461	74	2478
07	2411	24	2428	41	2445	58	2462	75	2479
08	2412	25	2429	42	2446	59	2463		
09	2413	26	2430	43	2447	60	2464		
10	2414	27	2431	44	2448	61	2465		
11	2415	28	2432	45	2449	62	2466		
12	2416	29	2433	46	2450	63	2467		
13	2417	30	2434	47	2451	64	2468		
14	2418	31	2435	48	2452	65	2469		
15	2419	32	2436	49	2453	66	2470		
16	2420	33	2437	50	2454	67	2471		
17	2421	34	2438	51	2455	68	2472		

Note:

1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.



1.6. Description Of Test Setup



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul 05, 2021	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 22, 2021	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Oct. 22, 2021	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 22, 2021	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
10.	Horn Antenna	A-INFO	LB-180400-K F	J211060628	Oct. 22, 2021	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 22, 2021	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Oct. 22, 2021	1 Year
14.	Power Sensor	DAER	RPR3006W	15100041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15100041SN046	Oct. 22, 2021	1 Year
16.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 22, 2021	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2021	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80 B	N/A	Oct. 22, 2021	1 Year



1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111.

ISED-Registration No.: 8058A

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.

1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102



2. Summary of Test Results

Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(1)	Conducted Peak Output Power	PASS
15.247(a)(1)	20dB Occupied Bandwidth	PASS
15.247(a)(1)	Carrier Frequencies Separation	PASS
15.247(a)(1)	Hopping Channel Number	PASS
15.247(a)(1)	Dwell Time	PASS
15.247(d)	Band Edge	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

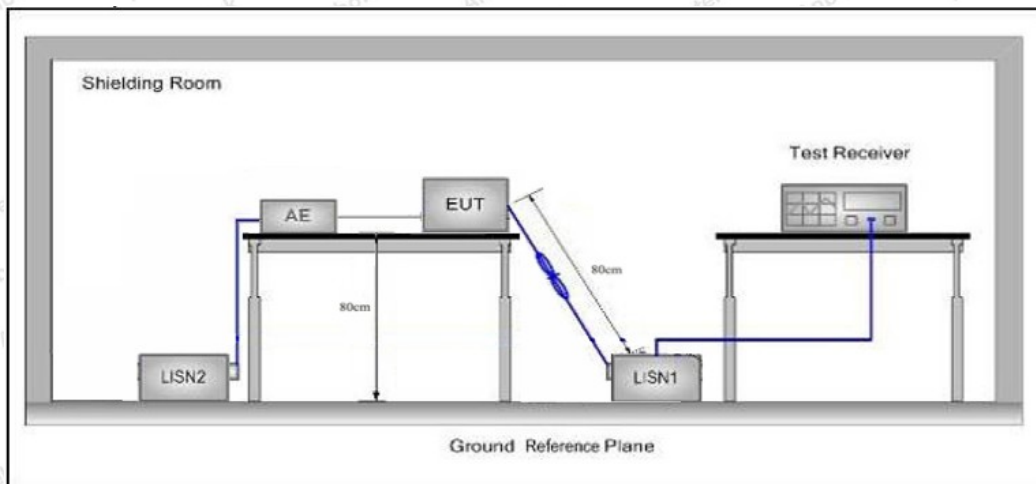


3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

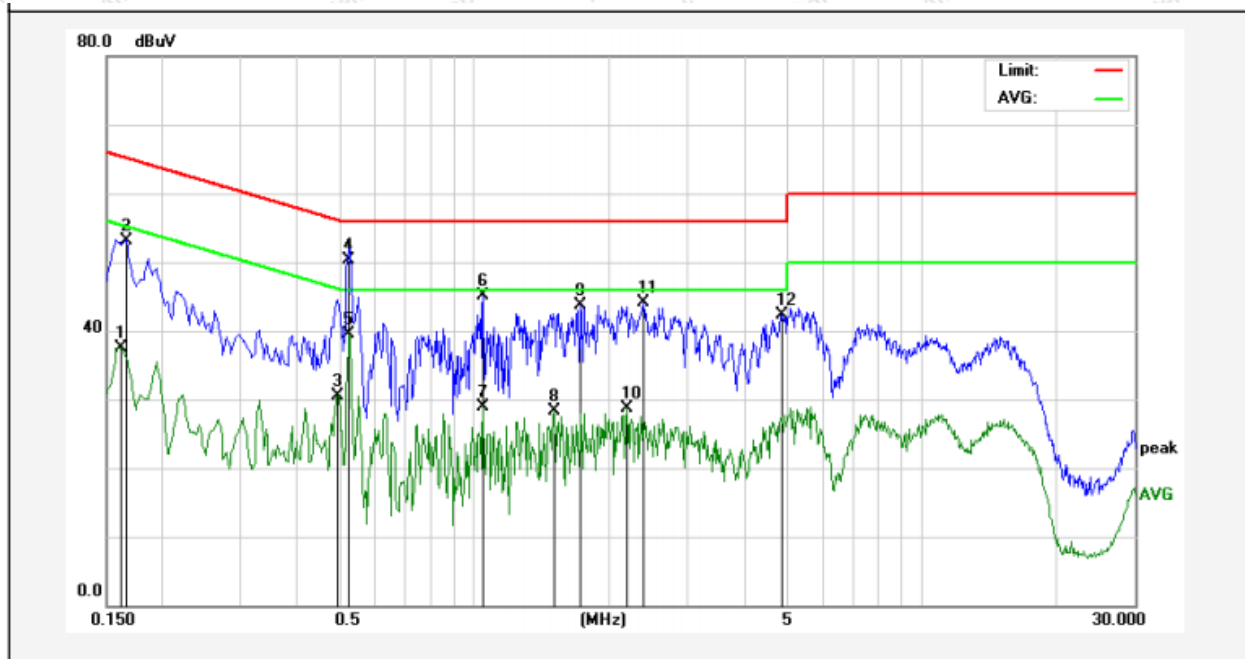
3.4. Test Data

During the test, pre-scan the GFSK modulation, and found the GFSK modulation Low channel (TX+Charging Mode) which is the worst case, only the worst case is recorded in the report.

Please to see the following pages.

Conducted Emission Test Data

Test Site: 1# Shielded Room
 Operating Condition: Mode 1
 Test Specification: AC 120V, 60Hz for adapter
 Comment: Live Line
 Tem.: 24.2°C Hum.: 49%

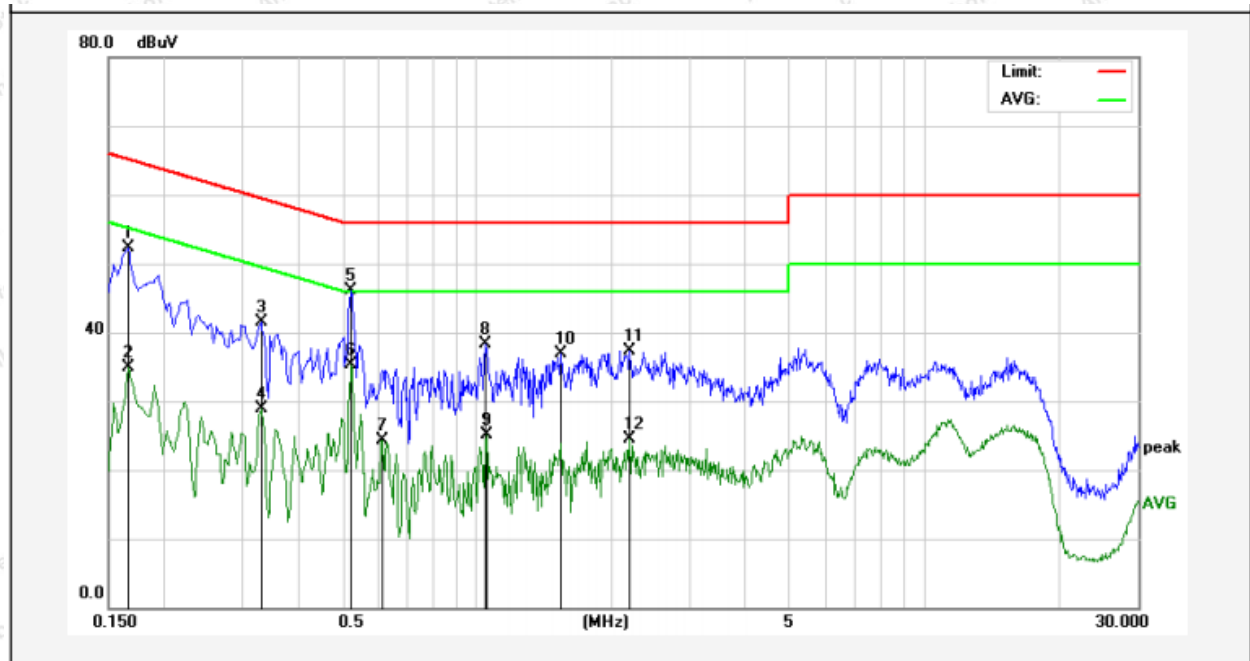


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1620	37.42	0.12	37.54	55.36	-17.82	AVG	
2	0.1660	53.08	0.12	53.20	65.15	-11.95	QP	
3	0.4940	30.40	0.15	30.55	46.10	-15.55	AVG	
4	0.5220	50.21	0.15	50.36	56.00	-5.64	QP	
5	0.5220	39.34	0.15	39.49	46.00	-6.51	AVG	
6	1.0460	45.04	0.15	45.19	56.00	-10.81	QP	
7	1.0460	28.72	0.15	28.87	46.00	-17.13	AVG	
8	1.5060	28.08	0.13	28.21	46.00	-17.79	AVG	
9	1.7260	43.56	0.13	43.69	56.00	-12.31	QP	
10	2.1980	28.62	0.12	28.74	46.00	-17.26	AVG	
11	2.3860	44.05	0.12	44.17	56.00	-11.83	QP	
12	4.8820	42.25	0.11	42.36	56.00	-13.64	QP	



Conducted Emission Test Data

Test Site: 1# Shielded Room
 Operating Condition: Mode 1
 Test Specification: AC 120V, 60Hz for adapter
 Comment: Neutral Line
 Tem.: 24.2°C Hum.: 49%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1660	52.28	0.12	52.40	65.15	-12.75	QP	
2	0.1660	34.71	0.12	34.83	55.15	-20.32	AVG	
3	0.3300	41.43	0.12	41.55	59.45	-17.90	QP	
4	0.3300	28.79	0.12	28.91	49.45	-20.54	AVG	
5	0.5220	45.90	0.15	46.05	56.00	-9.95	QP	
6	0.5220	35.19	0.15	35.34	46.00	-10.66	AVG	
7	0.6140	24.23	0.15	24.38	46.00	-21.62	AVG	
8	1.0460	38.09	0.15	38.24	56.00	-17.76	QP	
9	1.0500	25.03	0.15	25.18	46.00	-20.82	AVG	
10	1.5380	36.69	0.13	36.82	56.00	-19.18	QP	
11	2.1900	37.24	0.12	37.36	56.00	-18.64	QP	
12	2.1900	24.46	0.12	24.58	46.00	-21.42	AVG	



4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:

(1) The lower limit shall apply at the transition frequency.

(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

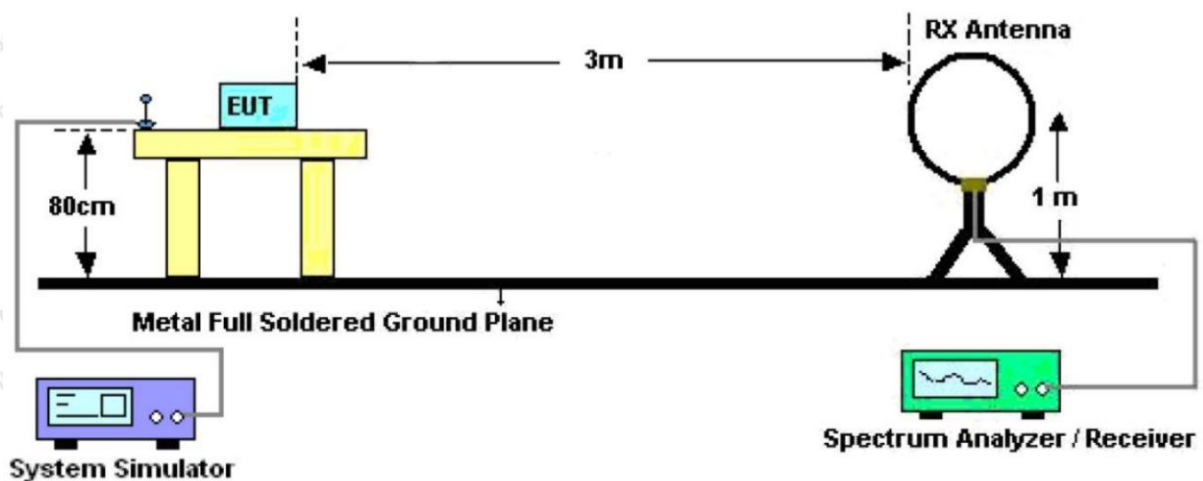


Figure 1. Below 30MHz

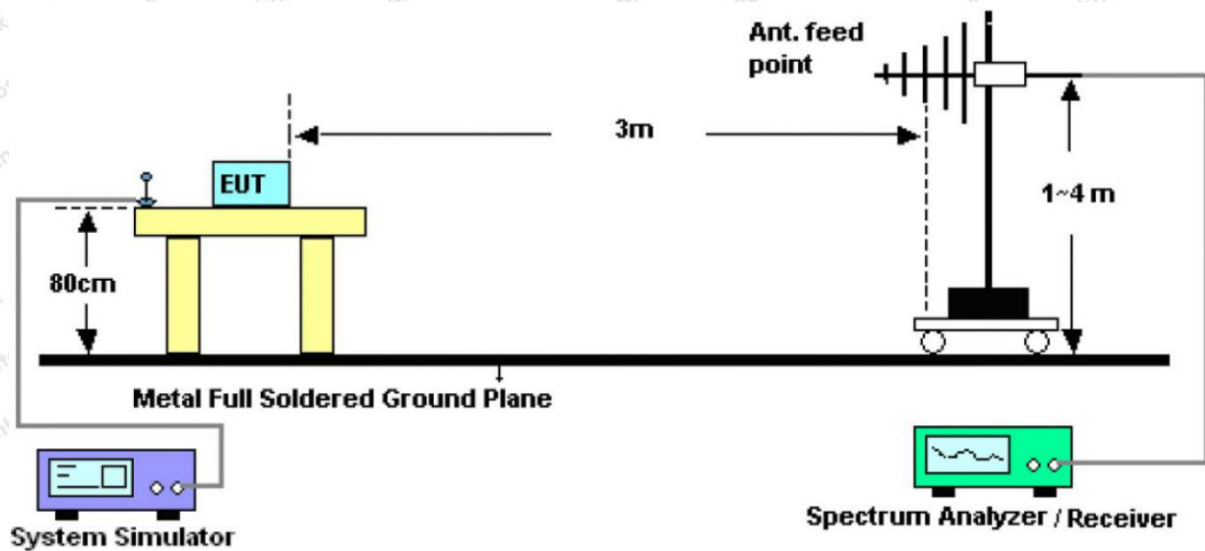


Figure 2. 30MHz to 1GHz

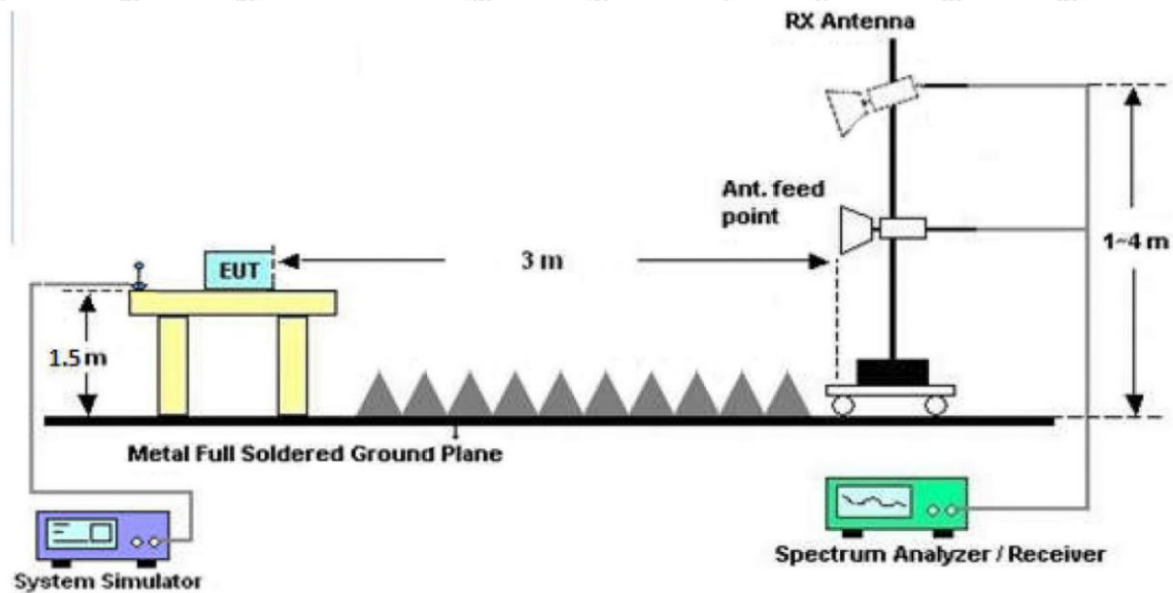


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:

RBW = 200Hz, VBW = 1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:

RBW = 9KHz, VBW = 30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:

RBW = 120kHz, VBW = 300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz, Set the spectrum analyzer as:

RBW = 1MHz, VBW = 1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.

For average measurement: use duty cycle correction factor method (DCCF)

Average level = Peak level + DCCF

4.4. Test Data

PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

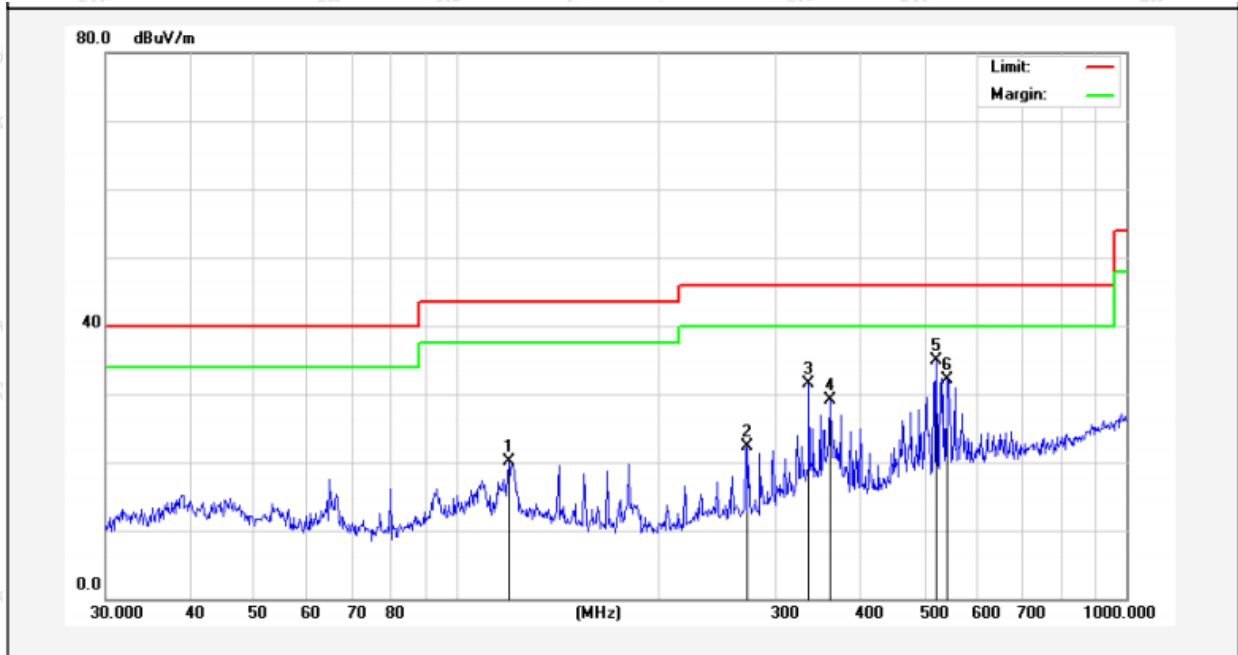
During the test, pre-scan the GFSK modulation, and found the GFSK modulation Low channel(TX+Charging Mode) which is the worst case, only the worst case is recorded in the report

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.



Test Results (30~1000MHz)

Test Mode: Mode 1
Power Source: DC 8.4V battery inside
Polarization: Vertical
Temp.(°C)/Hum.(% RH): 22.1°C/52%RH

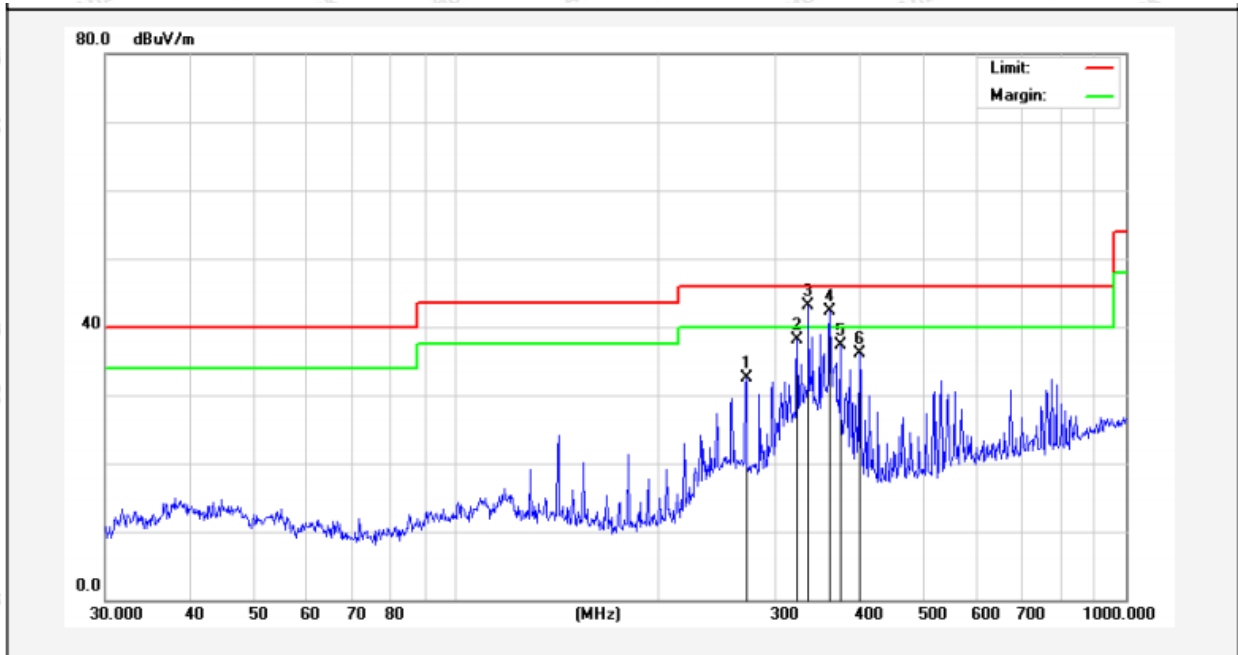


No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	119.8556	40.04	-19.90	20.14	43.50	-23.36	QP			
2	271.3246	39.47	-17.22	22.25	46.00	-23.75	QP			
3	336.0352	46.89	-15.35	31.54	46.00	-14.46	QP			
4	361.7139	44.06	-14.87	29.19	46.00	-16.81	QP			
5	520.8882	46.87	-12.03	34.84	46.00	-11.16	QP			
6	541.3725	43.86	-11.85	32.01	46.00	-13.99	QP			



Test Results (30~1000MHz)

Test Mode: Mode 1
Power Source: DC 8.4V battery inside
Polarization: Horizontal
Temp.(°C)/Hum.(% RH): 22.1°C/52%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	271.3246	52.22	-19.64	32.58	46.00	-13.42	QP			
2	323.3204	54.68	-16.62	38.06	46.00	-7.94	QP			
3	336.0352	59.51	-16.32	43.19	46.00	-2.81	QP			
4	361.7139	58.31	-16.03	42.28	46.00	-3.72	QP			
5	374.6225	53.33	-16.07	37.26	46.00	-8.74	QP			
6	400.4319	52.19	-16.14	36.05	46.00	-9.95	QP			



Test Results (1GHz-25GHz)

Test Mode: CH01

Test channel: Lowest

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4810.00	26.90	15.27	42.17	74.00	-31.83	Vertical
7215.00	28.11	18.09	46.20	74.00	-27.80	Vertical
9620.00	28.84	23.76	52.60	74.00	-21.40	Vertical
12025.00	*			74.00		Vertical
14430.00	*			74.00		Vertical
4810.00	27.30	15.27	42.57	74.00	-31.43	Horizontal
7215.00	28.18	18.09	46.27	74.00	-27.73	Horizontal
9620.00	28.12	23.76	51.88	74.00	-22.12	Horizontal
12025.00	*			74.00		Horizontal
14430.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4810.00	16.28	15.27	31.55	54.00	-22.45	Vertical
7215.00	17.14	18.09	35.23	54.00	-18.77	Vertical
9620.00	17.86	23.76	41.62	54.00	-12.38	Vertical
12025.00	*			54.00		Vertical
14430.00	*			54.00		Vertical
4810.00	15.65	15.27	30.92	54.00	-23.08	Horizontal
7215.00	17.24	18.09	35.33	54.00	-18.67	Horizontal
9620.00	17.43	23.76	41.19	54.00	-12.81	Horizontal
12025.00	*			54.00		Horizontal
14430.00	*			54.00		Horizontal



Test Results (1GHz-25GHz)

Test Mode: CH37

Test channel: Middle

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4882.00	26.92	15.42	42.34	74.00	-31.66	Vertical
7323.00	27.96	18.02	45.98	74.00	-28.02	Vertical
9764.00	27.85	23.80	51.65	74.00	-22.35	Vertical
12205.00	*			74.00		Vertical
14646.00	*			74.00		Vertical
4882.00	27.00	15.42	42.42	74.00	-31.58	Horizontal
7323.00	28.17	18.02	46.19	74.00	-27.81	Horizontal
9764.00	27.82	23.80	51.62	74.00	-22.38	Horizontal
12205.00	*			74.00		Horizontal
14646.00	*			74.00		Horizontal

Average value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4882.00	16.01	15.42	31.43	54.00	-22.57	Vertical
7323.00	17.24	18.02	35.26	54.00	-18.74	Vertical
9764.00	17.72	23.80	41.52	54.00	-12.48	Vertical
12205.00	*			54.00		Vertical
14646.00	*			54.00		Vertical
4882.00	15.56	15.42	30.98	54.00	-23.02	Horizontal
7323.00	16.80	18.02	34.82	54.00	-19.18	Horizontal
9764.00	17.94	23.80	41.74	54.00	-12.26	Horizontal
12205.00	*			54.00		Horizontal
14646.00	*			54.00		Horizontal



Test Results (1GHz-25GHz)

Test Mode: CH75	Test channel: Highest
-----------------	-----------------------

Peak value:

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4958.00	27.19	15.58	42.77	74.00	-31.23	Vertical
7437.00	27.97	17.93	45.90	74.00	-28.10	Vertical
9916.00	28.40	23.83	52.23	74.00	-21.77	Vertical
12395.00	*			74.00		Vertical
14874.00	*			74.00		Vertical
4958.00	27.07	15.58	42.65	74.00	-31.35	Horizontal
7437.00	28.20	17.93	46.13	74.00	-27.87	Horizontal
9916.00	28.50	23.83	52.33	74.00	-21.67	Horizontal
12395.00	*			74.00		Horizontal
14874.00	*			74.00		Horizontal

Average value:

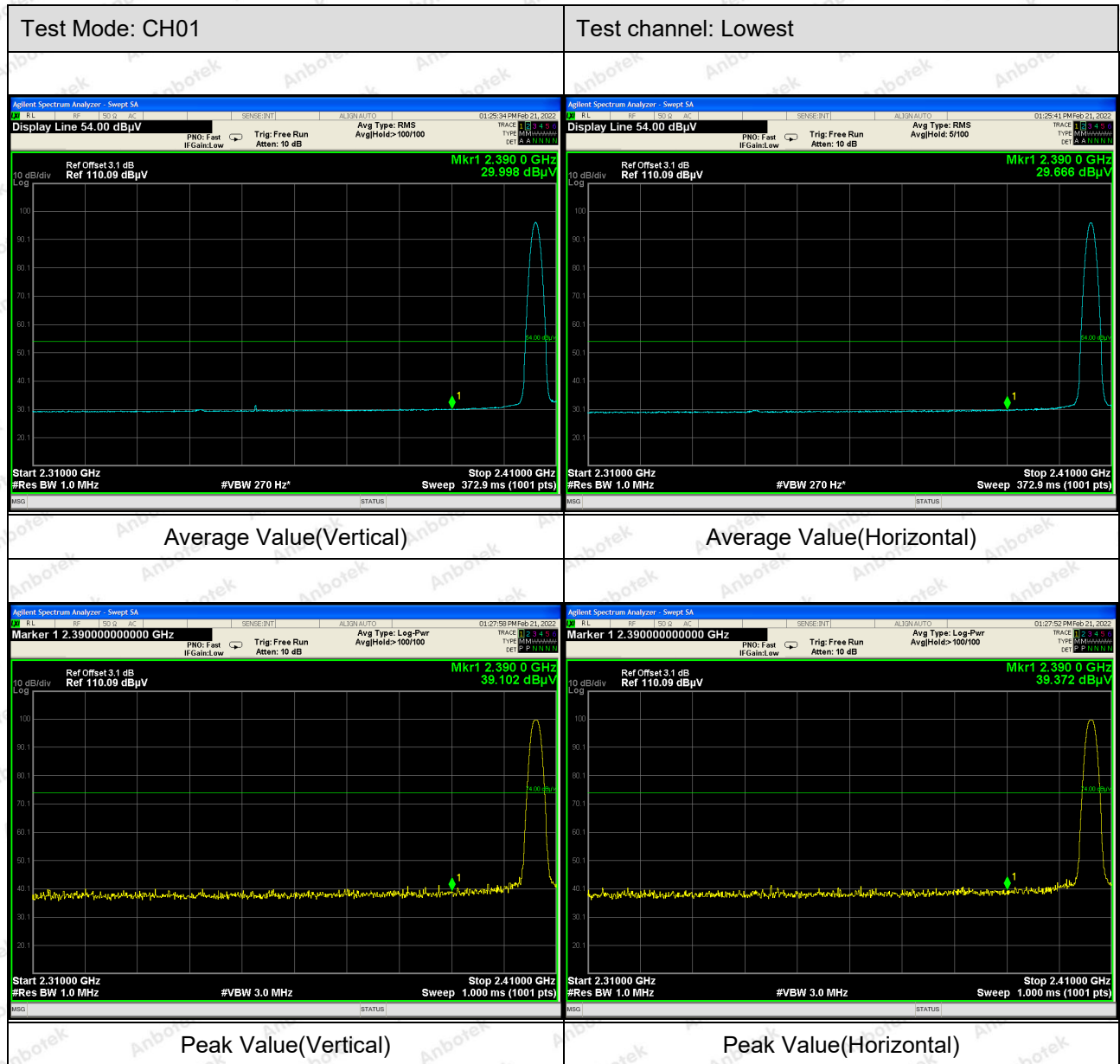
Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	polarization
4958.00	17.13	15.58	32.71	54.00	-21.29	Vertical
7437.00	18.25	17.93	36.18	54.00	-17.82	Vertical
9916.00	18.27	23.83	42.10	54.00	-11.90	Vertical
12395.00				54.00		Vertical
14874.00				54.00		Vertical
4958.00	17.00	15.58	32.58	54.00	-21.42	Horizontal
7437.00	18.17	17.93	36.10	54.00	-17.90	Horizontal
9916.00	17.84	23.83	41.67	54.00	-12.33	Horizontal
12395.00	*			54.00		Horizontal
14874.00	*			54.00		Horizontal

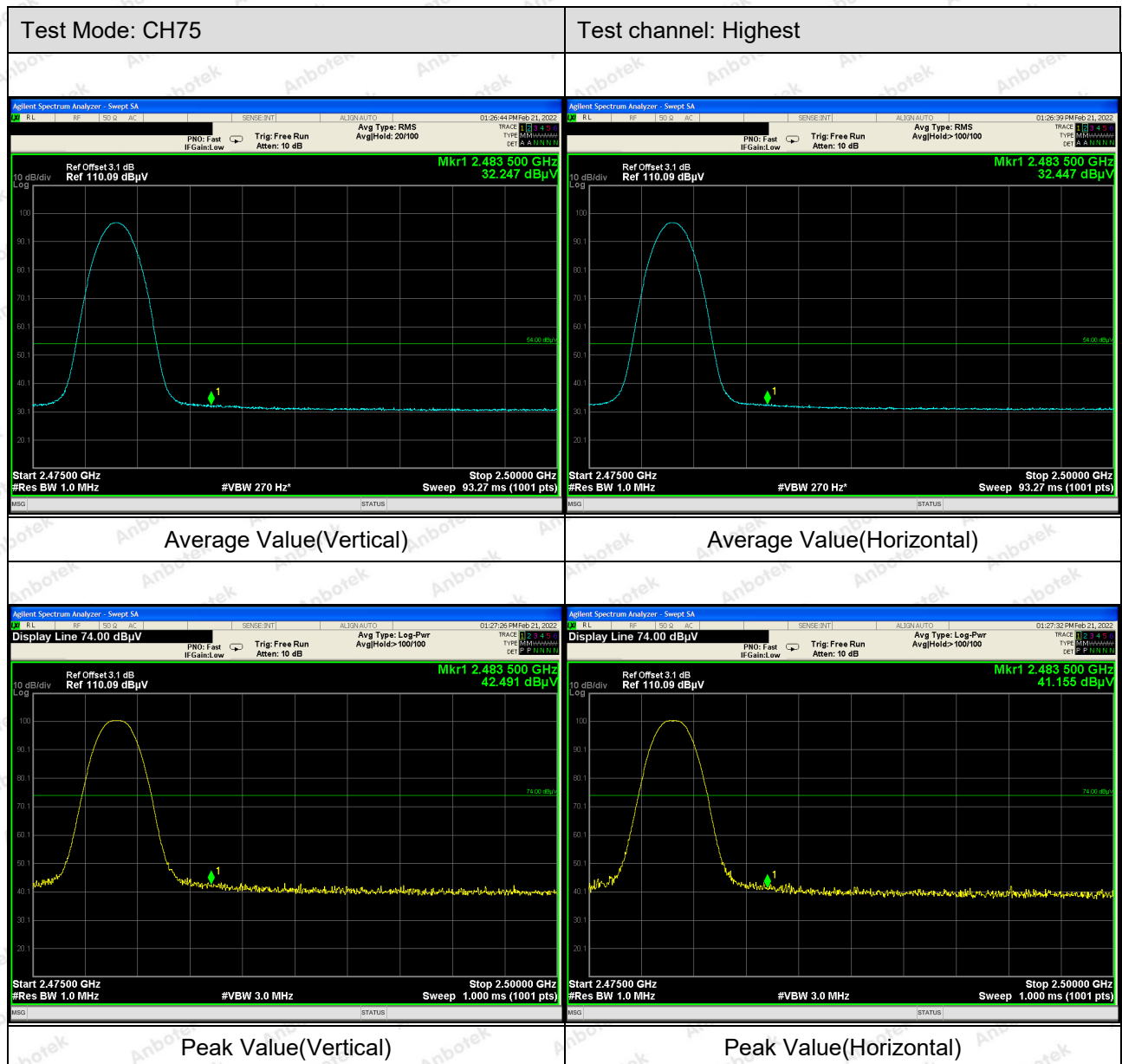
Remark:

1.Result =Read level + Factor

2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Radiated Band Edge:



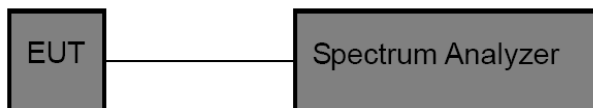


5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(1)
Test Limit	According to §15.247(b) (1), For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

5.2. Test Setup



5.3. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
 - RBW > the 20 dB bandwidth of the emission being measured
 - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
 - VBW ≥ RBW
 - Sweep = auto
 - Detector function = peak
 - Trace = max hold

5.4. Test Data

Pass

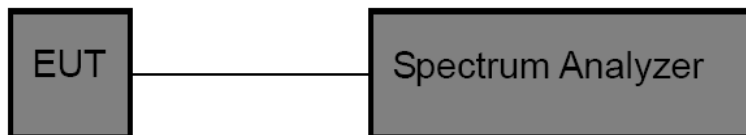
Please refer to Appendix C of the Appendix Test Data.

6. 20DB Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)
---------------	------------------------------------

6.2. Test Setup



6.3. Test Procedure

Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW $\geq 1\%$ of the 20 dB bandwidth.
3. Set the VBW $\geq$ RBW
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

6.4. Test Data

Pass

Please refer to Appendix A of the Appendix Test Data.

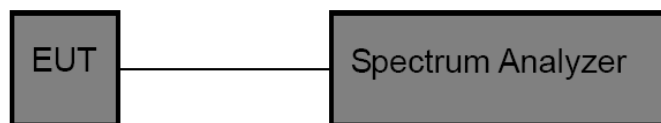


7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	>25KHz or >two-thirds of the 20 dB bandwidth

7.2. Test Setup



7.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels
2. Set the RBW =approximately 30% of the channel spacing.
3. Set the VBW $\geq$ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

7.4. Test Data

Pass

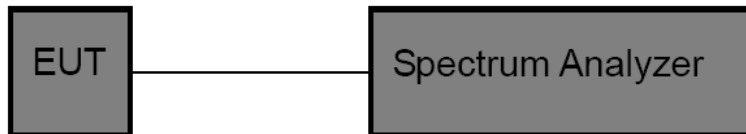
Please refer to Appendix D of the Appendix Test Data.

8. Number of Hopping Channel Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	>15 channels

8.2. Test Setup



8.3. Test Procedure

The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

1. Span= the frequency band of operation
2. Set the RBW = less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. Set the VBW $\geq$ RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

8.4. Test Data

Pass

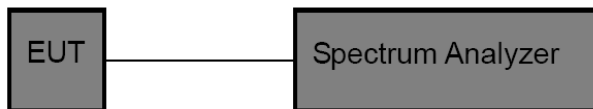
Please refer to Appendix F of the Appendix Test Data.

9. Dwell Time Test

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	0.4 sec

9.2. Test Setup



9.3. Test Procedure

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 3 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

9.4. Test Data

Pass

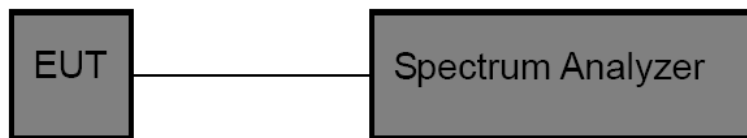
Please refer to Appendix E of the Appendix Test Data.

10. 100kHz Bandwidth of Frequency Band Edge Requirement

10.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

10.2. Test Setup



10.3. Test Procedure

The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

10.4. Test Data

Pass

Please refer to Appendix G & Appendix H of the Appendix Test Data.

11. Antenna Requirement

11.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

11.2. Antenna Connected Construction

The antenna is Monopole Antenna which permanently attached, and the best case gain of the antenna is 2 dBi. It complies with the standard requirement.



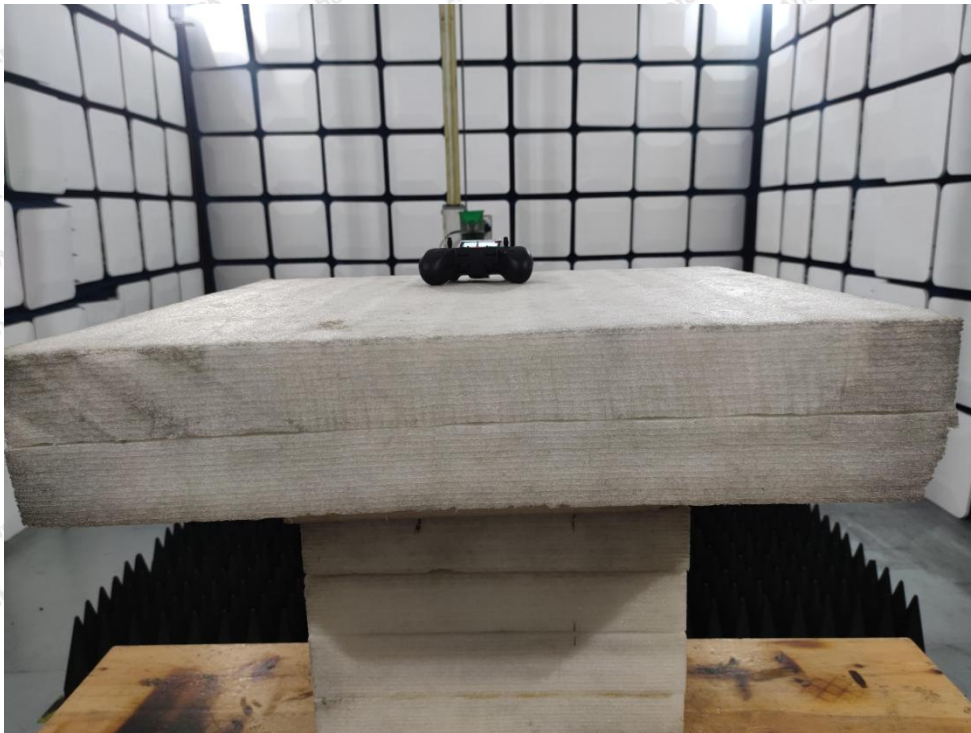
APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement



Photo of Radiation Emission Test

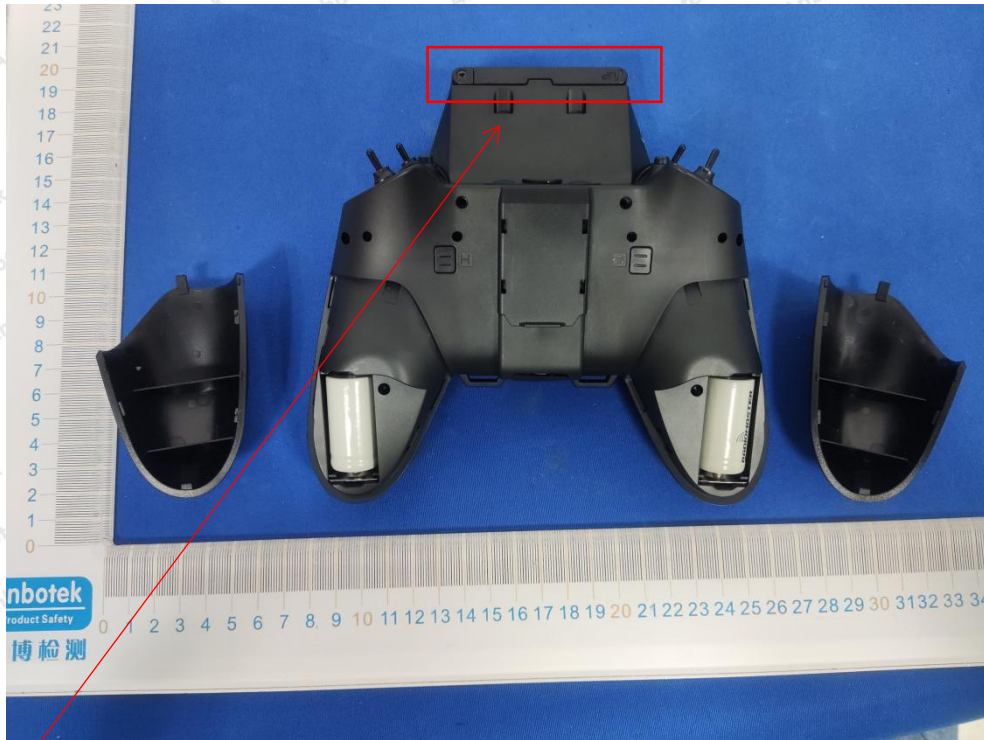




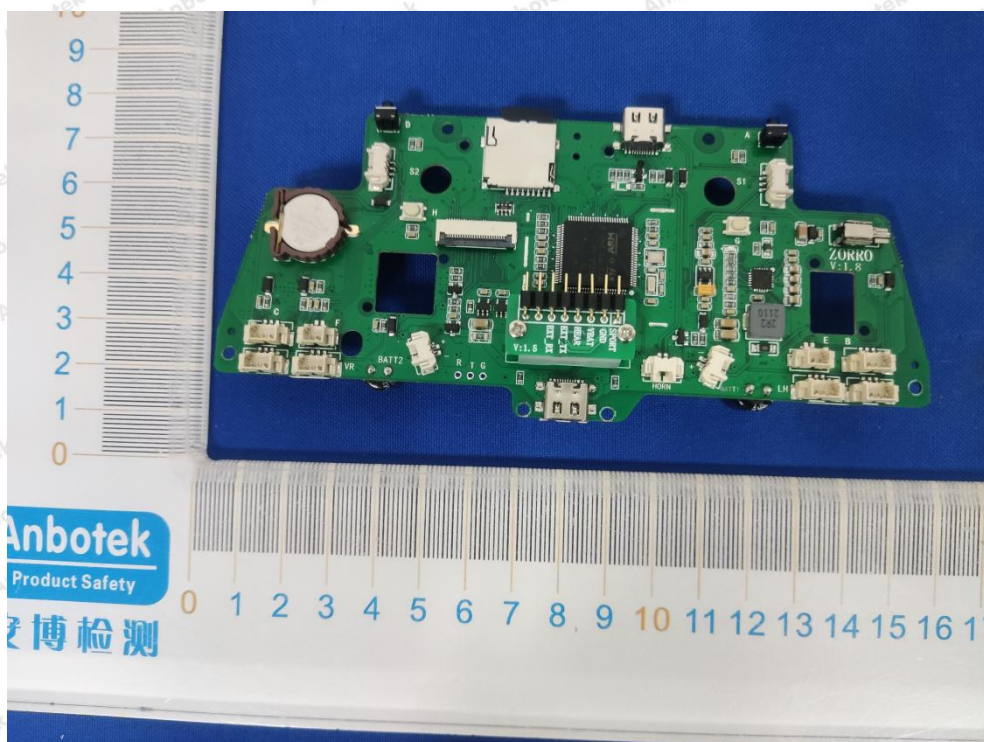
APPENDIX II -- EXTERNAL PHOTOGRAPH

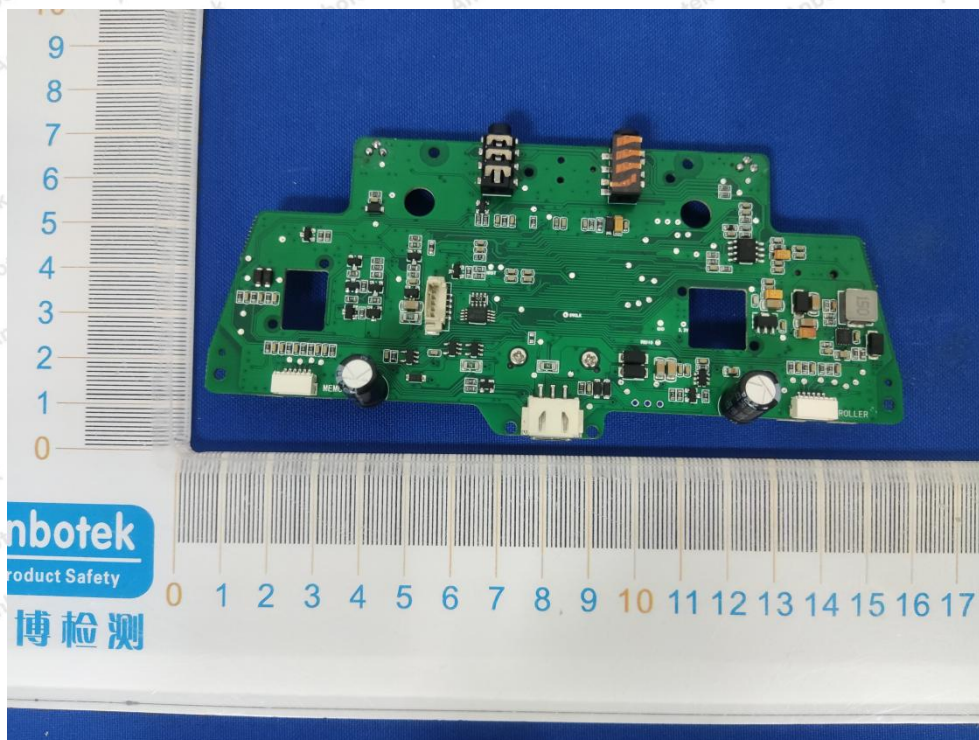


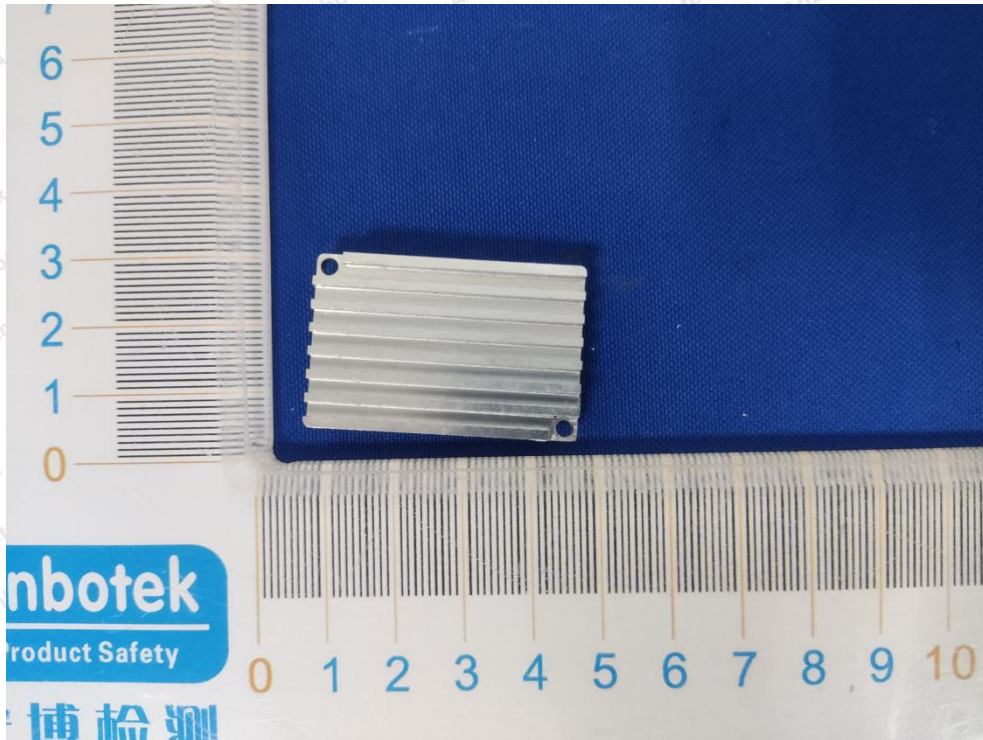


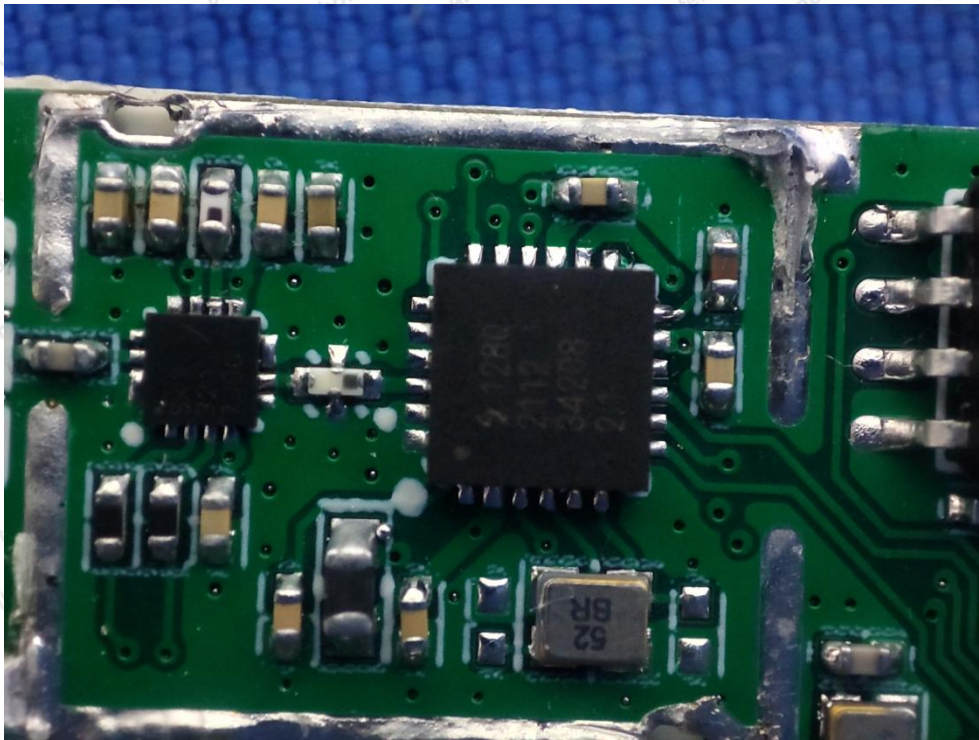


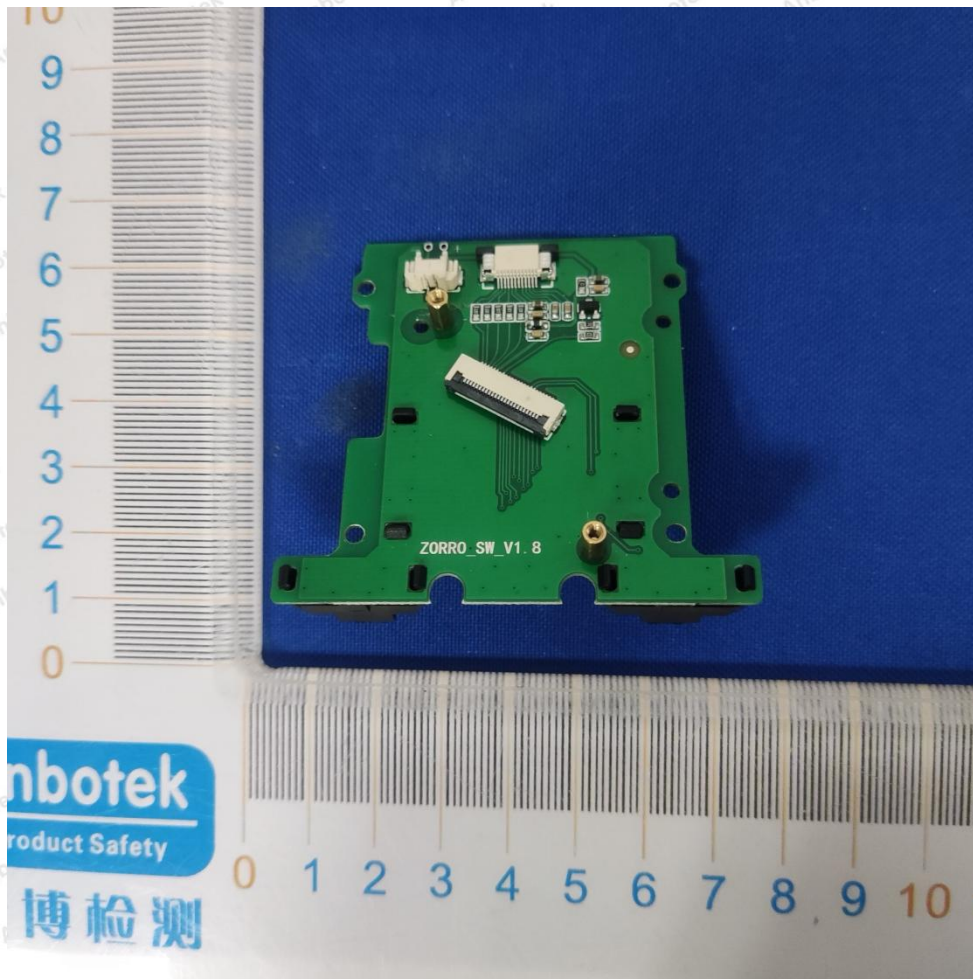
ANT

APPENDIX III -- INTERNAL PHOTOGRAPH









APPENDIX IV – Appendix Test Data

