FCC TEST REPORT

Client Name	:	Allynk Technology Co. Ltd.
Address	:	8F., No.20, Chenggong 13th St. Zhubei City, Hsinchu County 30264, Taiwan
Product Name	:	Electronic Shelf Label
Date	:	May 07, 2022

Shenzhen Anbotek Compliance Laboratory Limited

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TEST REPORT

Applicant	:	Allynk Technology Co. Ltd.
Manufacturer	:	HangZhou Zkong Networks Co., Ltd.
Product Name	:	Electronic Shelf Label
Model No.	:	AKE58V
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 3V battery

Test Standard(s)	:	**FCC Part15 Subpart, Section 15.247**
Test Method(s)	:	**ANSI C63.10: 2020, KDB558074 D01 DTS Meas Guidance v05r02**

The device described above is tested by Shenzhen Anbotek 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 Anbotek 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 Anbotek Compliance Laboratory Limited.

Date of receipt	Mar. 28, 2022
Date of Test	Mar. 28~Apr. 25, 2022

Prepared By

Nian xiu Chen

(Nianxiu Chen)

Approved & Authorized Signer

Kingkong Jin

(Kingkong Jin)

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1. General Information

1.1. Client Information

Applicant	:	Allynk Technology Co. Ltd.
Address	:	8F., No.20, Chenggong 13th St. Zhubei City, Hsinchu County 30264, Taiwan
Manufacturer	:	HangZhou Zkong Networks Co., Ltd.
Address	:	Room 1208-1210, 17 Block 57, Baiyang Street Science Park Road, Hangzhou Economic and Technological Development Zone, Zhejiang Province, China
Factory		Zhejiang Sunparl Information Technology Co., Ltd
Address		No.19,Xinxing Road,Haining Lianhang Economic Zone,Zhejiang,China

1.2. Description of Device (EUT)

Product Name	:	Electronic Shelf Label	
Model No.	:	AKE58V	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 3V battery	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	904~926MHz
		Number of Channel:	106 Channels
		Modulation Type:	FSK
		Antenna Type:	PCB antenna
		Antenna Gain(Peak):	3 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. 2) This report for DTS only.			

1.3. Auxiliary Equipment Used During Test

N/A		

1.4. Description of Test Configuration

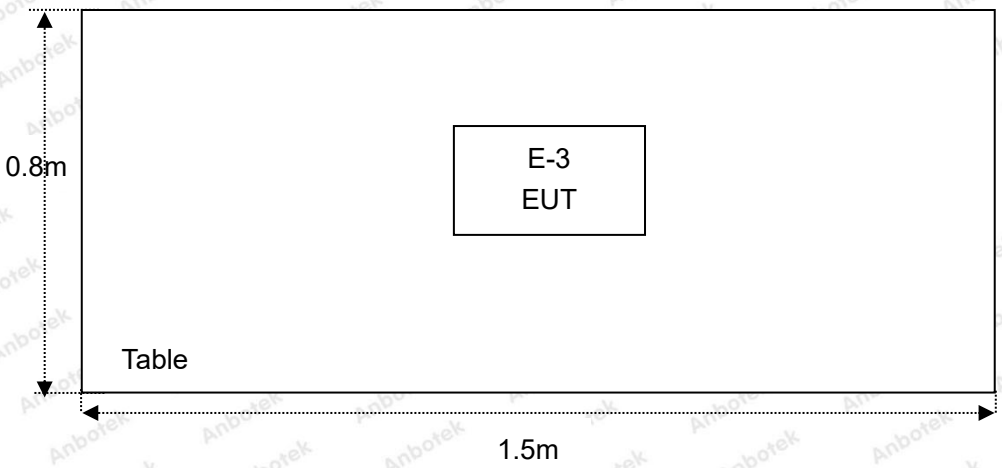
The system was configured for testing in testing mode, which was provided by manufacturer.
For LoRa mode, Detailed Frequency as below:

CH.	Freq. (MHz)	CH.	Freq. (MHz)	CH.	Freq. (MHz)	CH.	Freq. (MHz)	CH.	Freq. (MHz)
1	**904**	23	908.4	45	912.8	67	917.2	89	921.6
2	904.2	24	908.6	46	913	68	917.4	90	921.8
3	904.4	25	908.8	47	913.2	69	917.6	91	922
4	904.6	26	909	48	913.4	70	917.8	92	923.2
5	904.8	27	909.2	49	913.6	71	918	93	923.4
6	905	28	909.4	50	913.8	72	918.2	94	923.6
7	905.2	29	909.6	51	914	73	918.4	95	923.8
8	905.4	30	909.8	52	914.2	74	918.6	96	924
9	905.6	31	910	53	914.4	75	918.8	97	924.2
10	905.8	32	910.2	54	914.6	76	919	98	924.4
11	906	33	910.4	55	914.8	77	919.2	99	924.6
12	906.2	34	910.6	56	915	78	919.4	100	924.8
13	906.4	35	910.8	57	915.2	79	919.6	101	925
14	906.6	36	911	58	915.4	80	919.8	102	925.2
15	906.8	37	911.2	59	915.6	81	920	103	925.4
16	907	38	911.4	60	915.8	82	920.2	104	925.6
17	907.2	39	911.6	61	916	83	920.4	105	925.8
18	907.4	40	911.8	62	916.2	84	920.6	106	**926**
19	907.6	41	**912**	63	916.4	85	920.8	/	/
20	907.8	42	912.2	64	916.6	86	921	/	/
21	908	43	912.4	65	916.8	87	921.2	/	/
22	908.2	44	912.6	66	917	88	921.4	/	/

Note: EUT was tested with Channel 1, 41 and 106.

1.5. Description Of Test Setup

RE



1.6. 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	BK1G18G30D	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-KF	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	15I00041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	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-KHWS80B	N/A	Oct. 22, 2021	1 Year

1.7. Measurement Uncertainty

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

1.8. 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

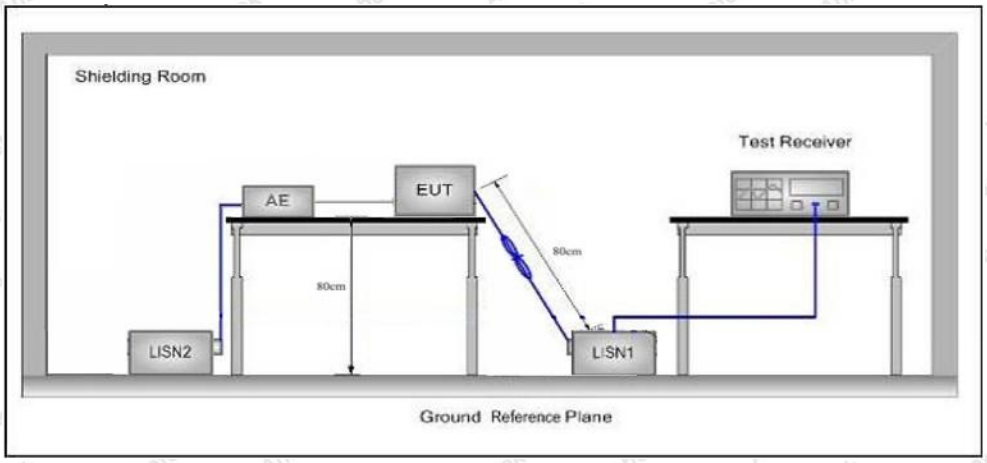
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	N/A
15.205/15.209	Spurious Emission	PASS
15.247(b)(3)	Conducted Peak Output Power	PASS
15.247(a)(2)	6dB Occupied Bandwidth	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Band Edge	PASS
Remark: “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 C63.10-2013 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

Not applicable. The EUT is powered by DC 3V battery inside, so there is no need to conduct this test.

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

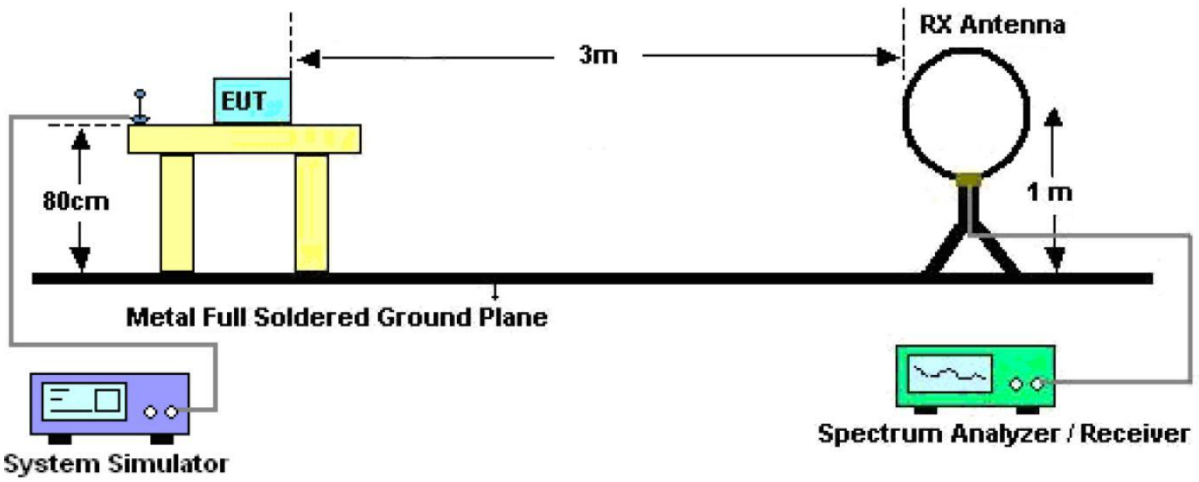


Figure 1. Below 30MHz

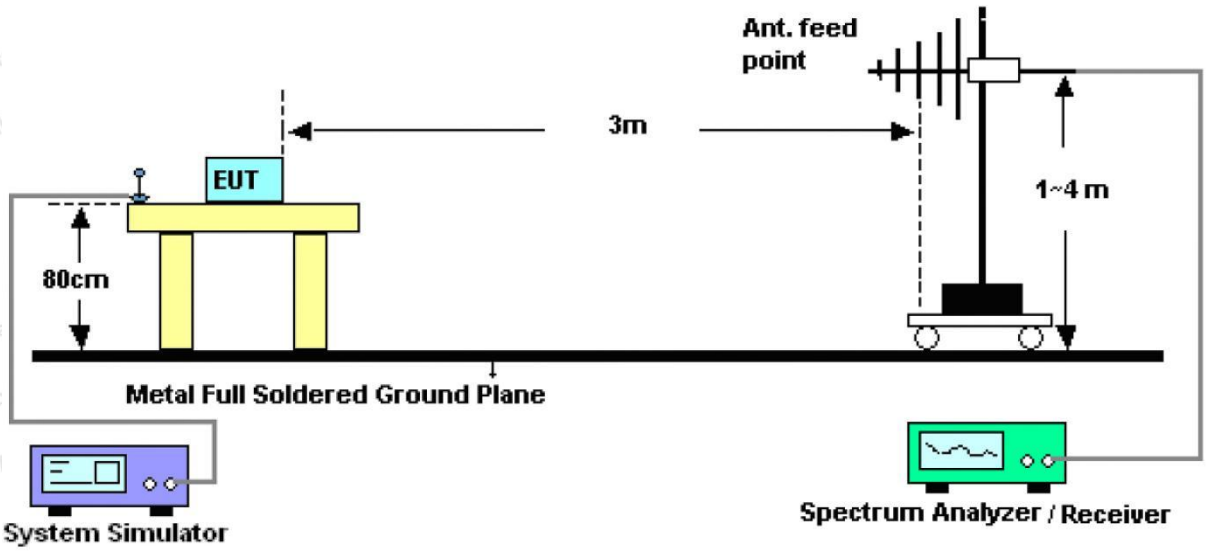


Figure 2. 30MHz to 1GHz

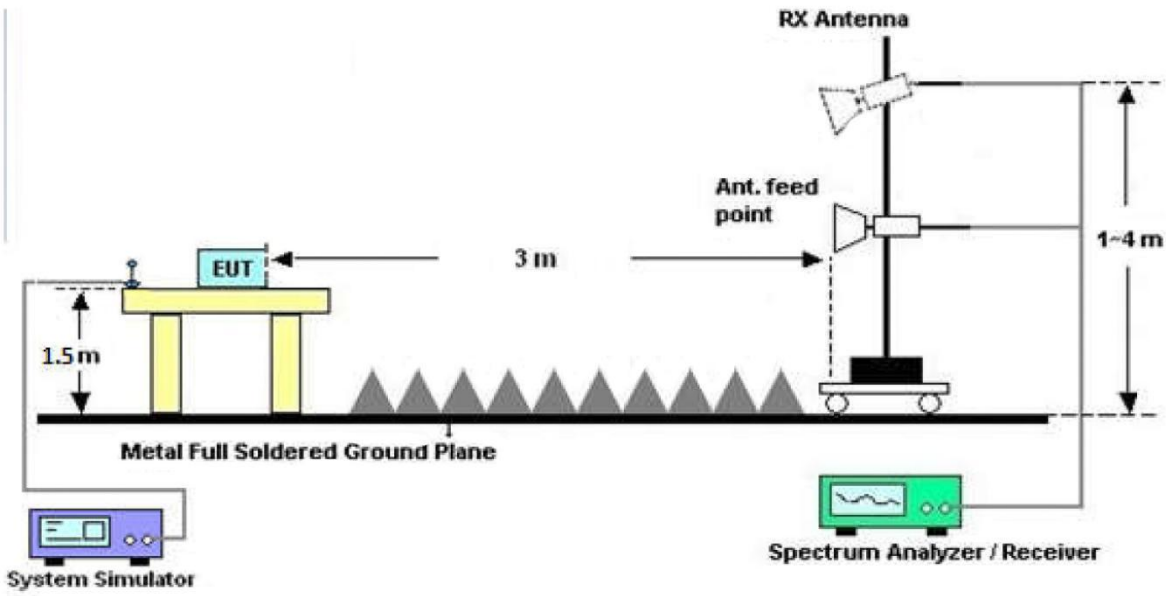


Figure 3. Above 1 GHz

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 = 100kHz, 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.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

PASS

During the test, pre-scan all the modes, 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.

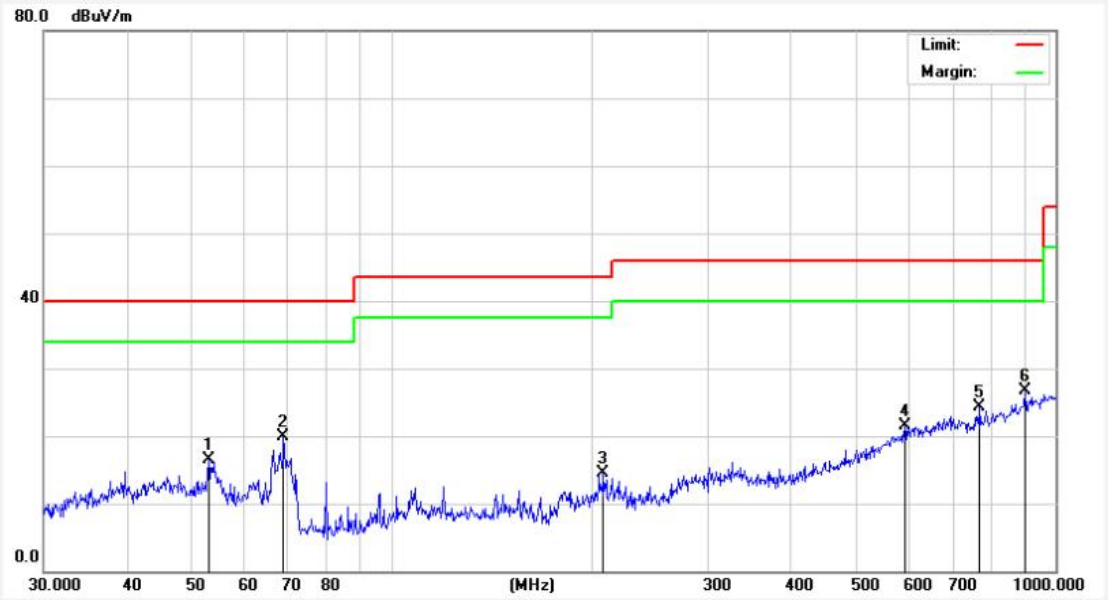
Test Results (30~1000MHz)

Test Mode: CH41

Power Source: DC 3V battery

Polarization: Vertical

Temp.(℃)/Hum.(%RH): 23.1℃/46%RH



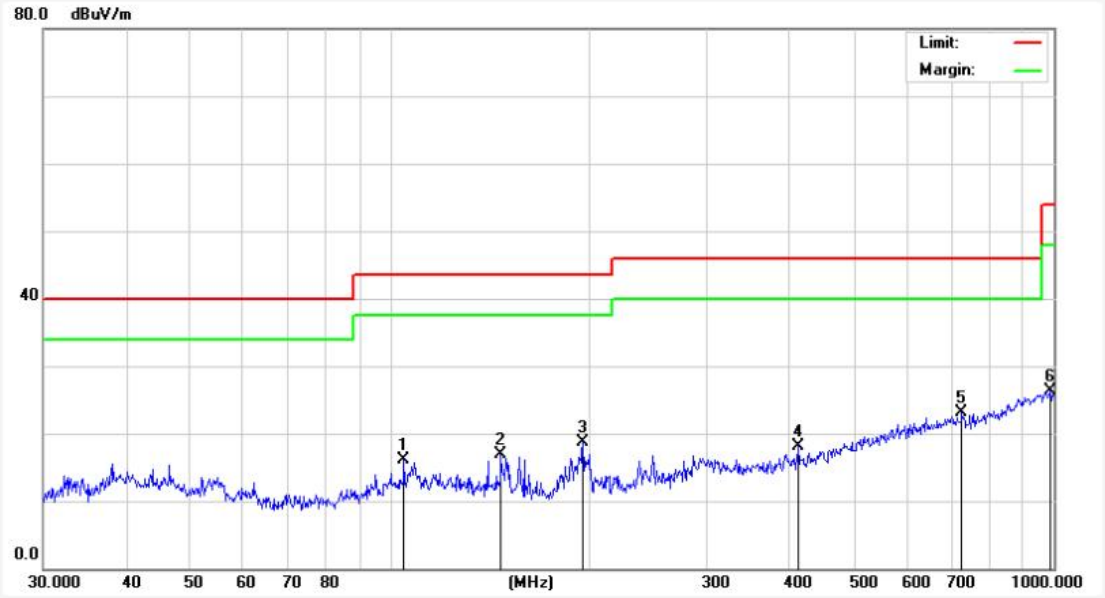
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	53.1313	33.46	-16.93	16.53	40.00	-23.47	QP			
2	68.8721	39.76	-19.82	19.94	40.00	-20.06	QP			
3	208.5803	33.78	-19.36	14.42	43.50	-29.08	QP			
4	593.0497	32.19	-10.69	21.50	46.00	-24.50	QP			
5	768.7481	33.24	-8.87	24.37	46.00	-21.63	QP			
6	900.1474	33.00	-6.22	26.78	46.00	-19.22	QP			

Test Mode: CH41

Power Source: DC 3V battery

Polarization: Horizontal

Temp.(℃)/Hum.(%RH): 23.1℃/46%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	104.9033	38.23	-22.21	16.02	43.50	-27.48	QP			
2	146.8877	39.84	-22.92	16.92	43.50	-26.58	QP			
3	195.1365	41.26	-22.53	18.73	43.50	-24.77	QP			
4	411.8240	34.18	-15.98	18.20	46.00	-27.80	QP			
5	726.8052	32.69	-9.56	23.13	46.00	-22.87	QP			
6	989.5355	31.21	-4.95	26.26	54.00	-27.74	QP			

Test Results (1GHz-25GHz)

Test Mode: CH01					Test channel: Lowest				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1808.0000	H	43.16	7.39	28.73	26.31	52.97	74	-21.03	PK
1808.0000	H	34.48	7.39	28.73	26.31	44.29	54	-9.71	AV
2712.0000	H	41.39	8.10	29.71	27.01	52.19	74	-21.81	PK
2712.0000	H	34.60	8.10	29.71	27.01	45.40	54	-8.60	AV
3616.0000	H	--	--	--	--	--	--	--	PK
3616.0000	H	--	--	--	--	--	--	--	AV
1808.0000	V	42.49	7.39	28.73	26.31	52.30	74	-21.70	PK
1808.0000	V	34.54	7.39	28.73	26.31	44.35	54	-9.65	AV
2712.0000	V	41.33	8.10	29.71	27.01	52.13	74	-21.87	PK
2712.0000	V	34.16	8.10	29.71	27.01	44.96	54	-9.04	AV
3616.0000	V	--	--	--	--	--	--	--	PK
3616.0000	V	--	--	--	--	--	--	--	AV

Test Mode: CH41					Test channel: Middle				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1824.0000	H	47.11	7.41	28.72	26.31	56.93	74	-17.07	PK
1824.0000	H	37.17	7.41	28.72	26.31	46.99	54	-7.01	AV
2736.0000	H	46.40	8.11	29.71	27.01	57.21	74	-16.79	PK
2736.0000	H	34.20	8.11	29.71	27.01	45.01	54	-8.99	AV
3648.0000	H	--	--	--	--	--	--	--	PK
3648.0000	H	--	--	--	--	--	--	--	AV
1824.0000	V	47.44	7.41	28.72	26.31	57.26	74	-16.74	PK
1824.0000	V	35.53	7.41	28.72	26.31	45.35	54	-8.65	AV
2736.0000	V	45.61	8.11	29.71	27.01	56.42	74	-17.58	PK
2736.0000	V	34.68	8.11	29.71	27.01	45.49	54	-8.51	AV
3648.0000	V	--	--	--	--	--	--	--	PK
3648.0000	V	--	--	--	--	--	--	--	AV

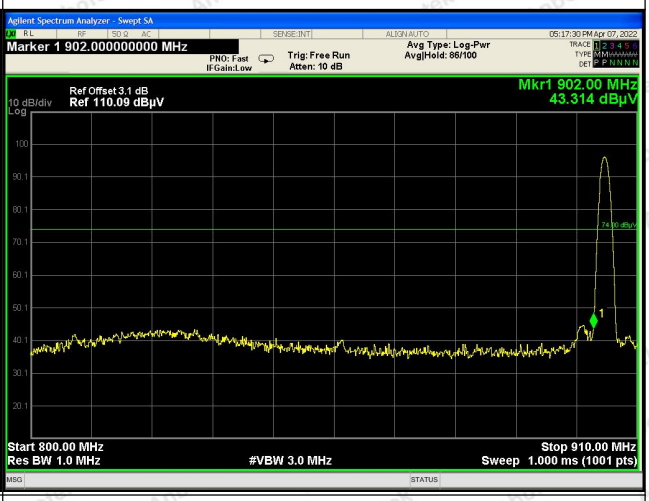
Test Mode: CH106					Test channel: High				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1852.0000	H	47.92	7.43	28.69	26.31	57.73	74	-16.27	PK
1852.0000	H	37.15	7.43	28.69	26.31	46.96	54	-7.04	AV
2778.0000	H	46.82	8.15	29.84	27.01	57.80	74	-16.20	PK
2778.0000	H	34.42	8.15	29.84	27.01	45.40	54	-8.60	AV
3704.0000	H	--	--	--	--	--	--	--	PK
3704.0000	H	--	--	--	--	--	--	--	AV
1852.0000	V	47.74	7.43	28.69	26.31	57.55	74	-16.45	PK
1852.0000	V	36.23	7.43	28.69	26.31	46.04	54	-7.96	AV
2778.0000	V	46.87	8.15	29.84	27.01	57.85	74	-16.15	PK
2778.0000	V	34.55	8.15	29.84	27.01	45.53	54	-8.47	AV
3704.0000	V	--	--	--	--	--	--	--	PK
3704.0000	V	--	--	--	--	--	--	--	AV

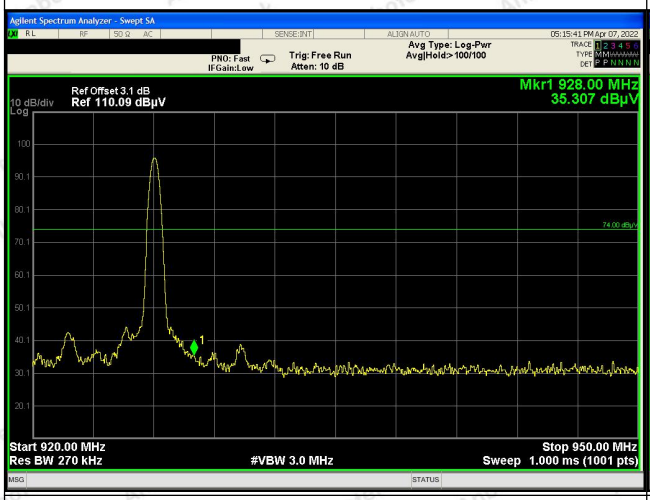
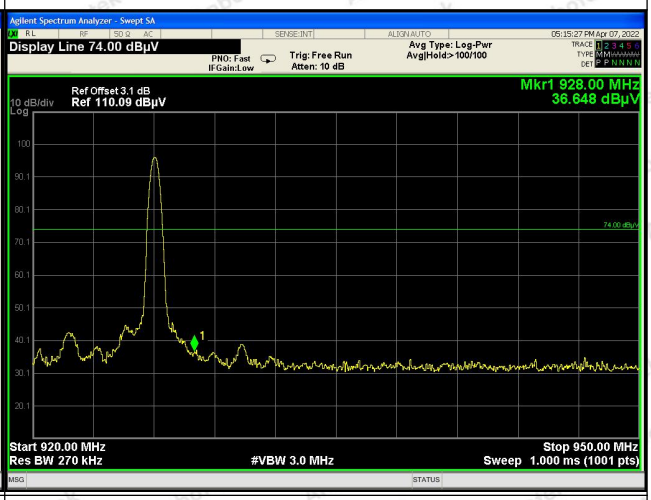
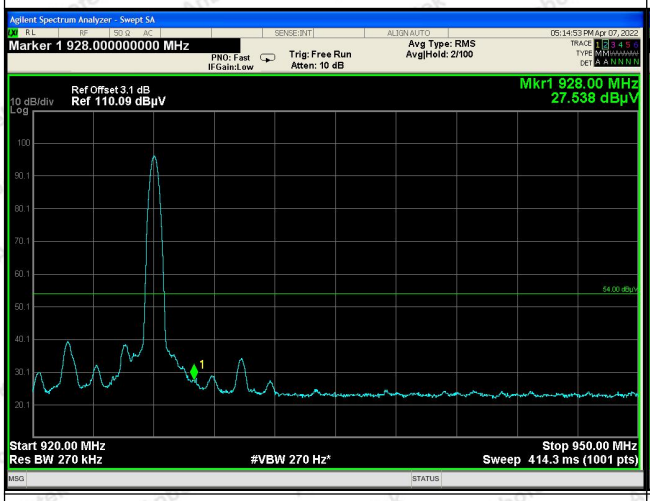
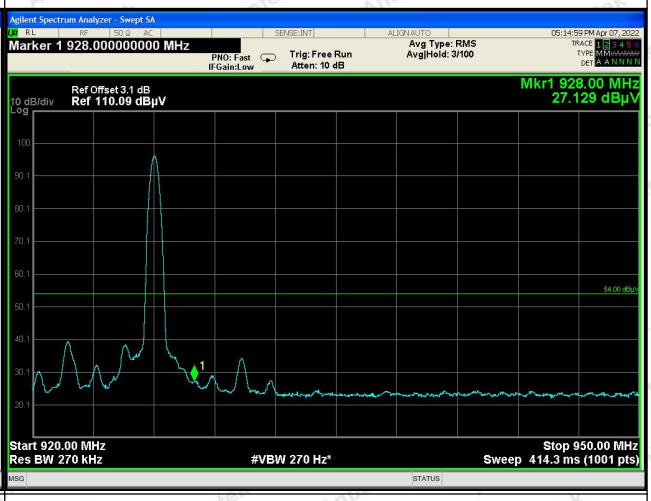
Remark:

1. Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. "*" means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500
www.anbotek.com

Radiated Band Edge:

Test Mode: CH01	Test channel: Lowest
	
Peak Value(Vertical)	Peak Value(Horizontal)
Average Value(Vertical)	Average Value(Horizontal)

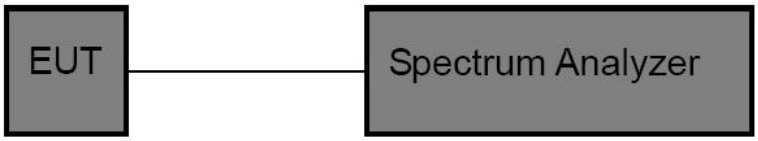
Test Mode: CH106	Test channel: Highest
	
Peak Value(Vertical)	Peak Value(Horizontal)
	
Average Value(Vertical)	Average Value(Horizontal)

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(3)
Test Limit	30dBm

5.2. Test Setup



5.3. Test Procedure

This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

1. Set the RBW ≥DTS bandwidth.
2. Set the VBW≥3*RBW.
3. Set the span≥ 3*RBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

5.4. Test Data

Pass

Please refer to Appendix C of the Appendix Test Data.

Additional test for duty cycle.

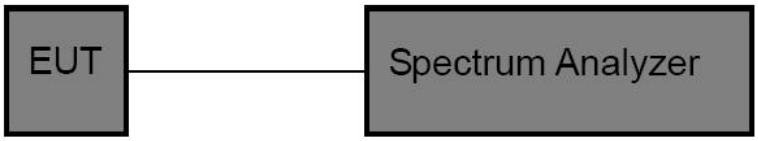
Please refer to Appendix G of the Appendix Test Data.

6. 6DB Occupy Bandwidth Test

6.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(2)
Test Limit	>500kHz

6.2. Test Setup



6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
RBW = 100kHz, VBW≥3*RBW =300kHz,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

6.4. Test Data

Pass

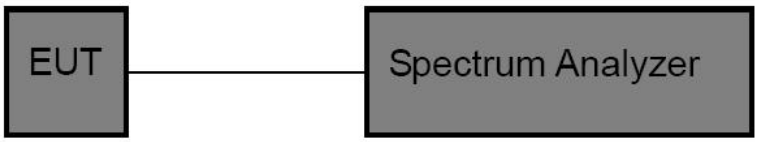
Please refer to Appendix A of the Appendix Test Data.

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (e)
Test Limit	8dBm/3KHz

7.2. Test Setup



7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

7.4. Test Data

Pass

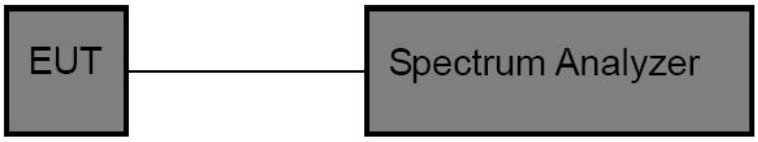
Please refer to Appendix D of the Appendix Test Data.

8. 100kHz Bandwidth of Frequency Band Edge Requirement

8.1. 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 in 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 in15.209(a).

8.2. Test Setup



8.3. Test Procedure

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.

8.4. Test Data

Pass

Please refer to Appendix E&Appendix F of the Appendix Test Data.

9. Antenna Requirement

9.1. 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

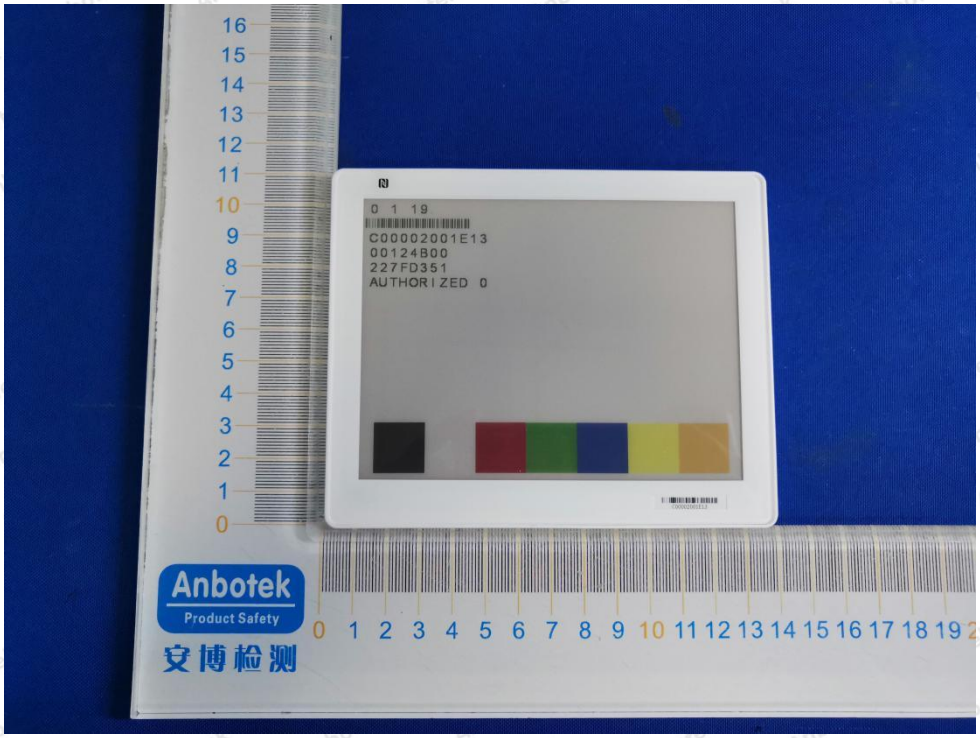
9.2. Antenna Connected Construction

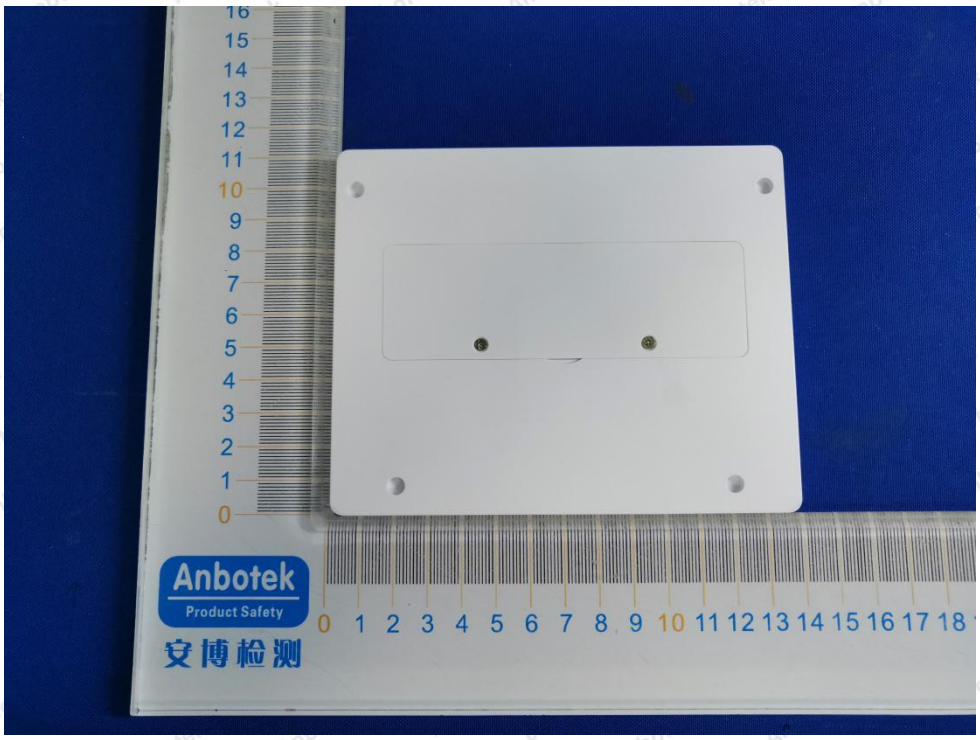
The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 3dBi. It complies with the standard requirement.

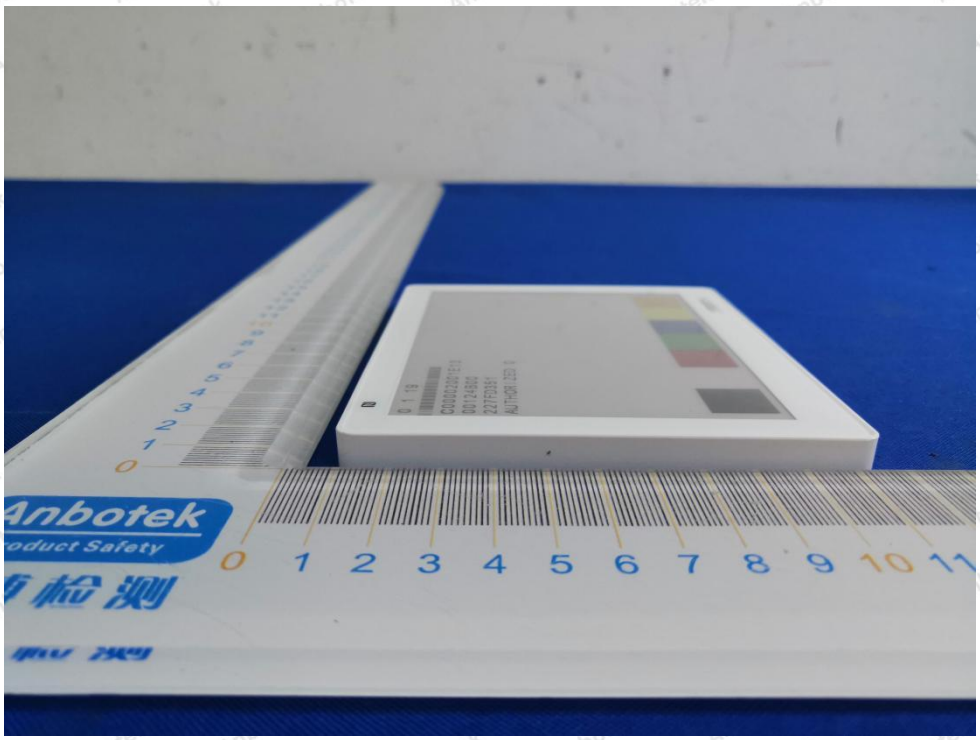
APPENDIX I -- TEST SETUP PHOTOGRAPH

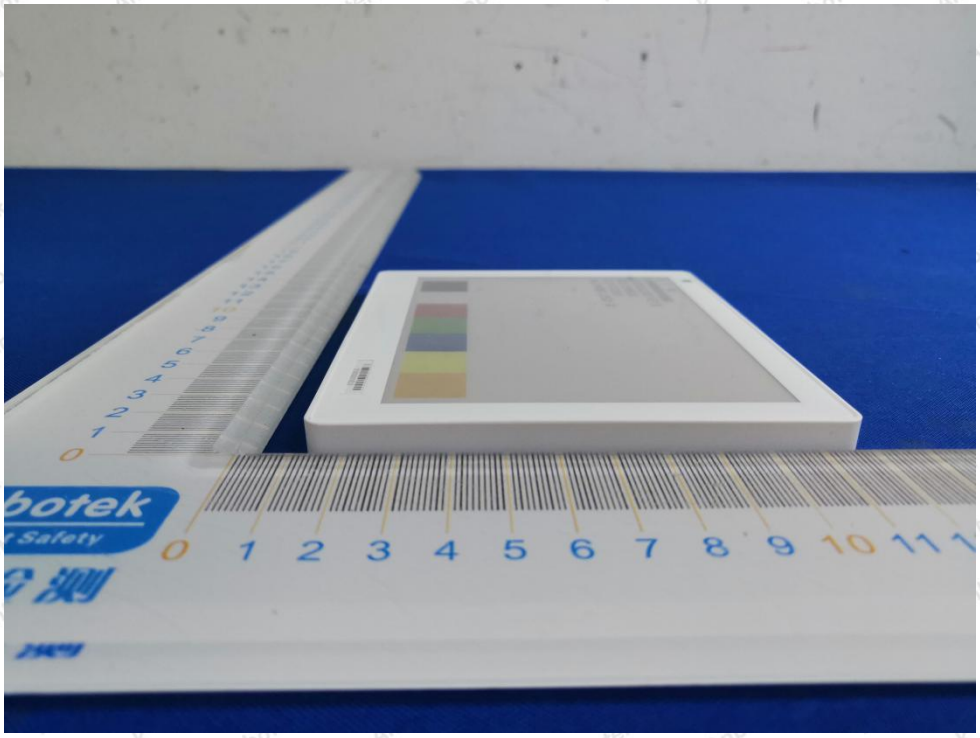
Photo of Radiation Emission Test

APPENDIX II -- EXTERNAL PHOTOGRAPH

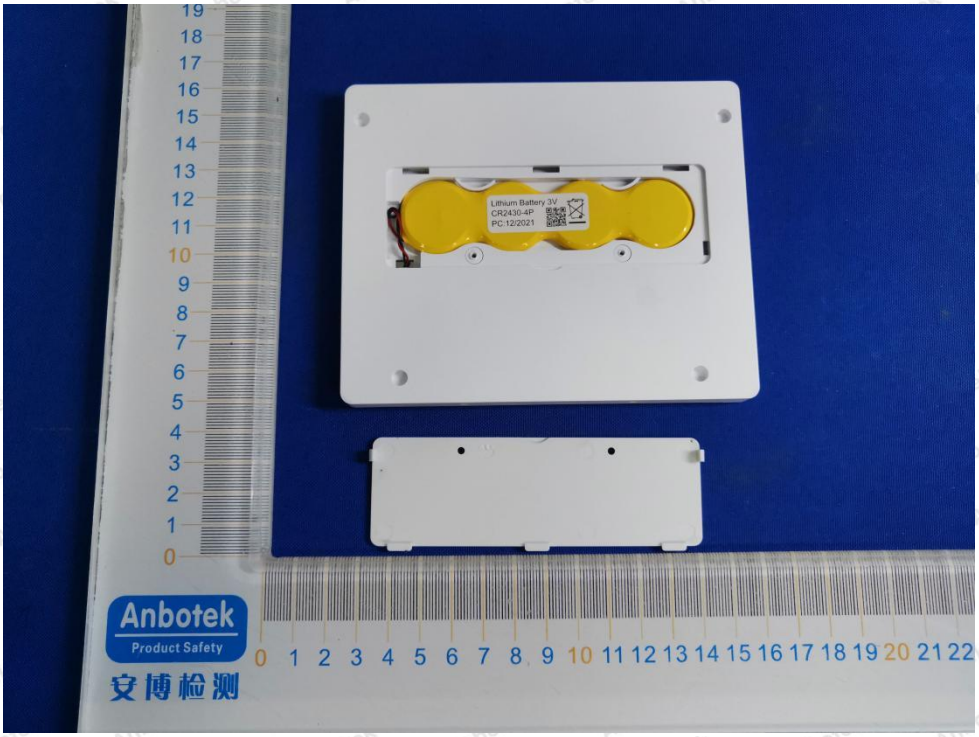


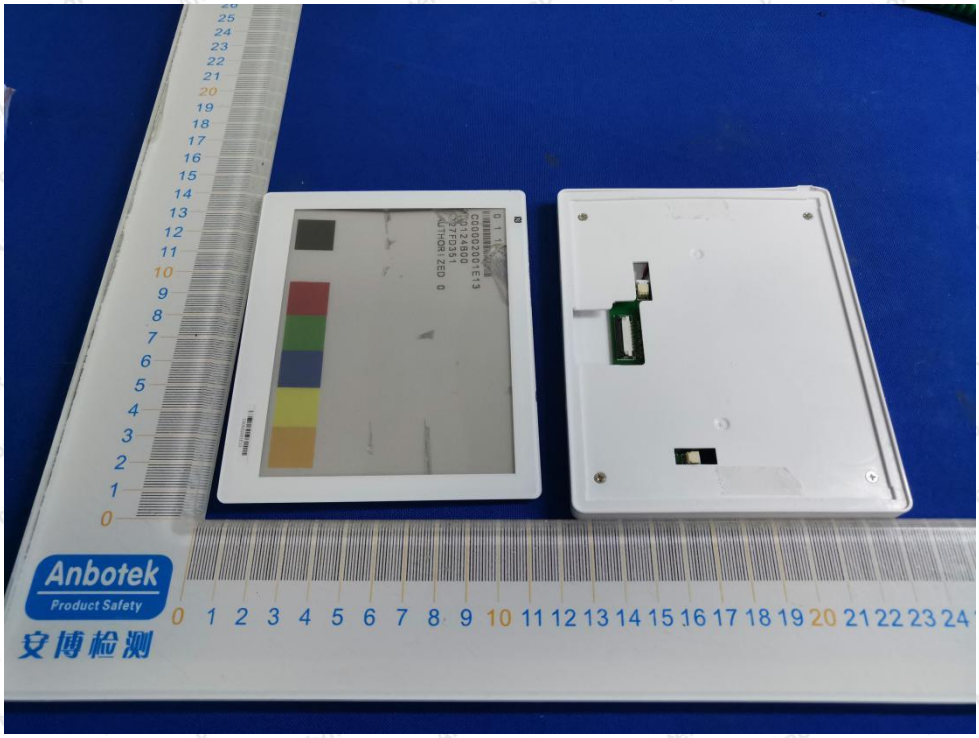


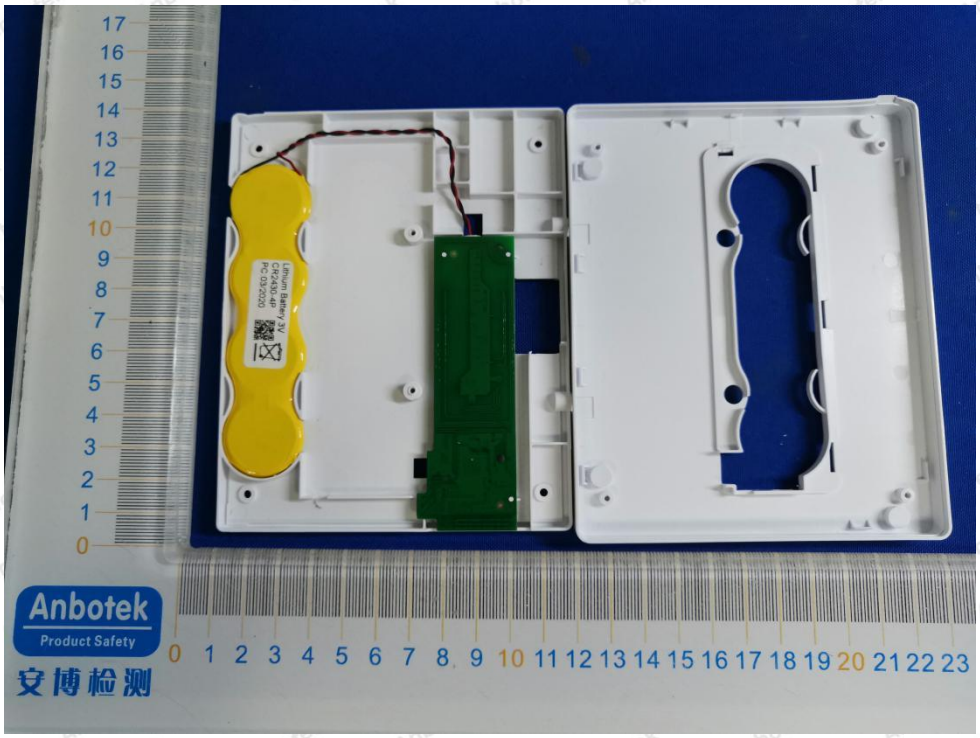


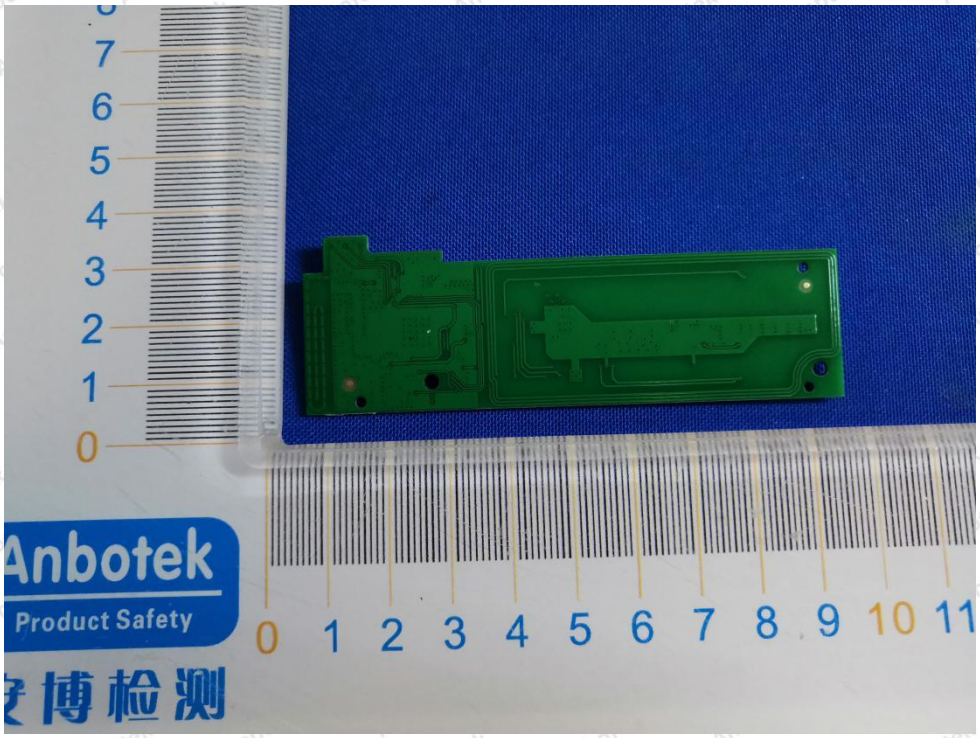


APPENDIX III -- INTERNAL PHOTOGRAPH









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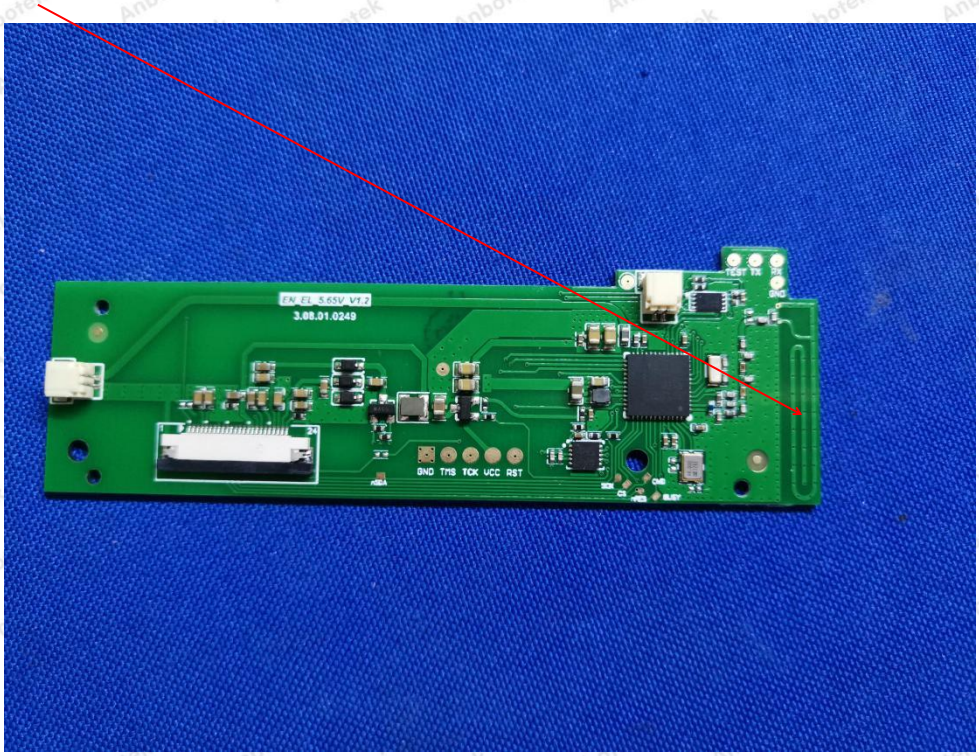

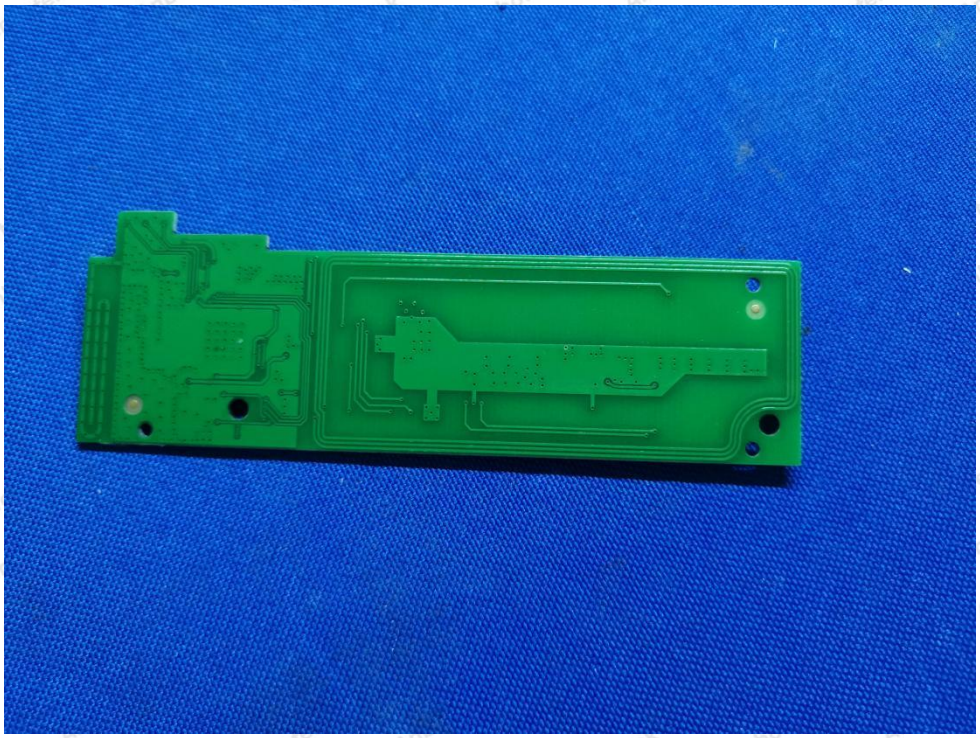

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