

FCC Test Report

Client Name : ZHENGZHOU YSAIR TECHNOLOGY CO.,LTD
Address : ROOM 709,SANJIANG BUILDING,NO.170 NANYANG ROAD,HUIJI DISTRICT,ZHENGZHOU HENAN CHINA
Product Name : Wireless call system
Date : May 26, 2022

Shenzhen Anbotek Compliance Laboratory Limited



Contents

- 1. General Information 4
 - 1.1. Client Information 4
 - 1.2. Description of Device (EUT) 4
 - 1.3. Auxiliary Equipment Used During Test 5
 - 1.4. Description of Test Modes 5
 - 1.5. List of channels 5
 - 1.6. Description Of Test Setup 6
 - 1.7. Test Equipment List 7
 - 1.8. Measurement Uncertainty 8
 - 1.9. Description of Test Facility 8
- 2. Summary of Test Results 9
- 3. Conducted Emission Test 10
 - 3.1. Test Standard and Limit 10
 - 3.2. Test Setup 10
 - 3.3. Test Procedure 10
 - 3.4. Test Data 10
- 4. Radiation Spurious Emission and Band Edge 13
 - 4.1. Test Standard and Limit 13
 - 4.2. Test Setup 14
 - 4.3. Test Procedure 15
 - 4.4. Test Data 15
- 5. 20DB Occupy Bandwidth Test 20
 - 5.1. Test Standard and Limit 20
 - 5.2. Test Setup 20
 - 5.3. Test Procedure 20
 - 5.4. Test Data 20
- 6. Dwell Time Test 22
 - 6.1. Test Standard and Limit 22
 - 6.2. Test Setup 22
 - 6.3. Test Procedure 22
 - 6.4. Test Data 22
- 7. Antenna Requirement 24
 - 7.1. Test Standard and Requirement 24
 - 7.2. Antenna Connected Construction 24
- APPENDIX I -- TEST SETUP PHOTOGRAPH 25
- APPENDIX II -- EXTERNAL PHOTOGRAPH 27
- APPENDIX III -- INTERNAL PHOTOGRAPH 31

TEST REPORT

Applicant : ZHENGZHOU YSAIR TECHNOLOGY CO.,LTD
Manufacturer : ZHENGZHOU YSAIR TECHNOLOGY CO.,LTD
Product Name : Wireless call system
Model No. : TD029, TD154
Trade Mark : RETEKES
Rating(s) : Input: DC 12V, 1A

Test Standard(s) : FCC Part15 Subpart C, Section 15.231

Test Method(s) : ANSI C63.10: 2013

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

Apr. 25, 2022

Date of Test

Apr. 25~May 09, 2022

Prepared by

Nian xiu Chen

(Nianxiu Chen)

Approved & Authorized Signer

Kingkong Jin

(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	ZHENGZHOU YSAIR TECHNOLOGY CO.,LTD
Address	:	ROOM 709,SANJIANG BUILDING,NO.170 NANYANG ROAD,HUIJI DISTRICT,ZHENGZHOU HENAN CHINA
Manufacturer	:	ZHENGZHOU YSAIR TECHNOLOGY CO.,LTD
Address	:	ROOM 709,SANJIANG BUILDING,NO.170 NANYANG ROAD,HUIJI DISTRICT,ZHENGZHOU HENAN CHINA

1.2. Description of Device (EUT)

Product Name	:	Wireless call system	
Model No.	:	TD029, TD154 (Note: All samples are the same except the model number, so we prepare "TD029" for test only.)	
Trade Mark	:	RETEKESS	
Test Power Supply	:	AC 120V, 60Hz for Adapter	
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)	
Product Description	:	Operation Frequency:	433.92MHz
		Number of Channel:	1 Channel
		Modulation Type:	ASK
		Antenna Type:	PCB Antenna
		Antenna Gain(Peak):	0 dBi (Provided by customer)
		Adapter:	Model: DSA-12PFU-12 FUS 120100 Input: 100-240V~50/60Hz, 0.5A Output: DC 12V, 1A
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

N/A	
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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.

Pretest Mode	Description
Mode 1	TX Mode

For Conducted Emission	
Final Test Mode	Description
Mode 1	TX Mode

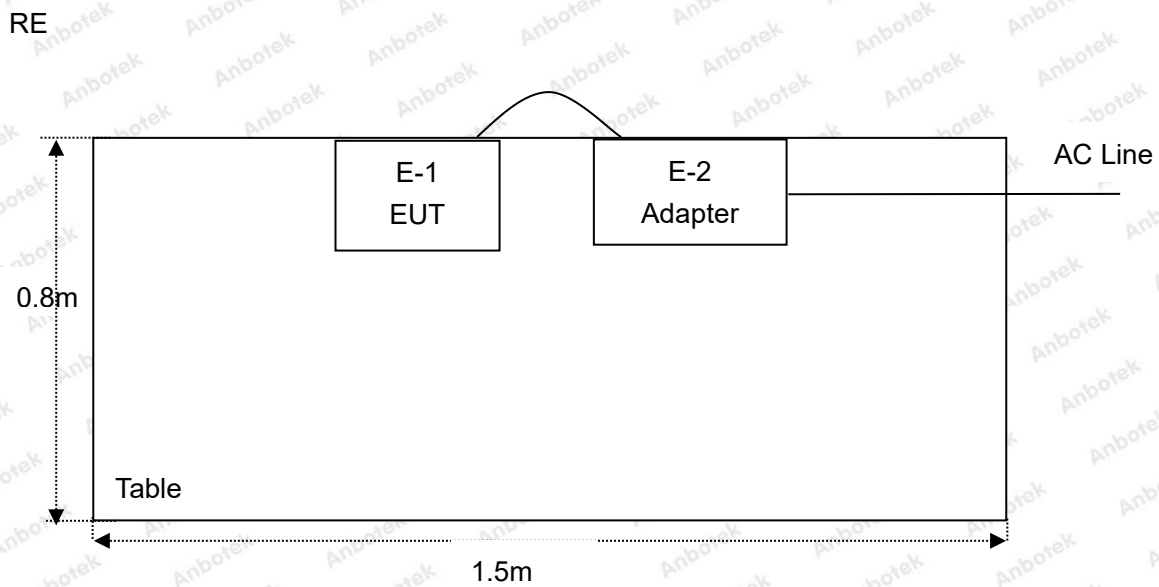
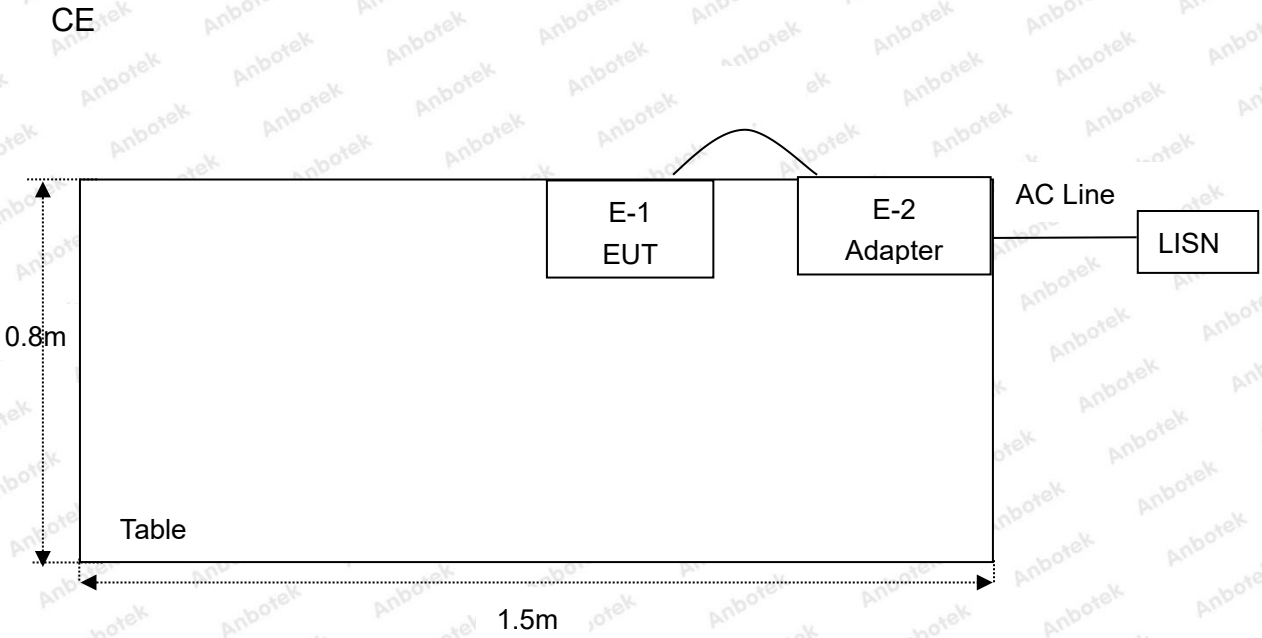
For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

Note: During the test, the EUT was keeping continuous transmission.

1.5. List of channels

Channel	Freq. (MHz)	Note (Modulation Type)
01	433.92	ASK

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	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

1.8. 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	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209/15.231(b)	Spurious Emission	PASS
15.231(c)	20dB Occupied Bandwidth	PASS
15.231(a)	Dwell time	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

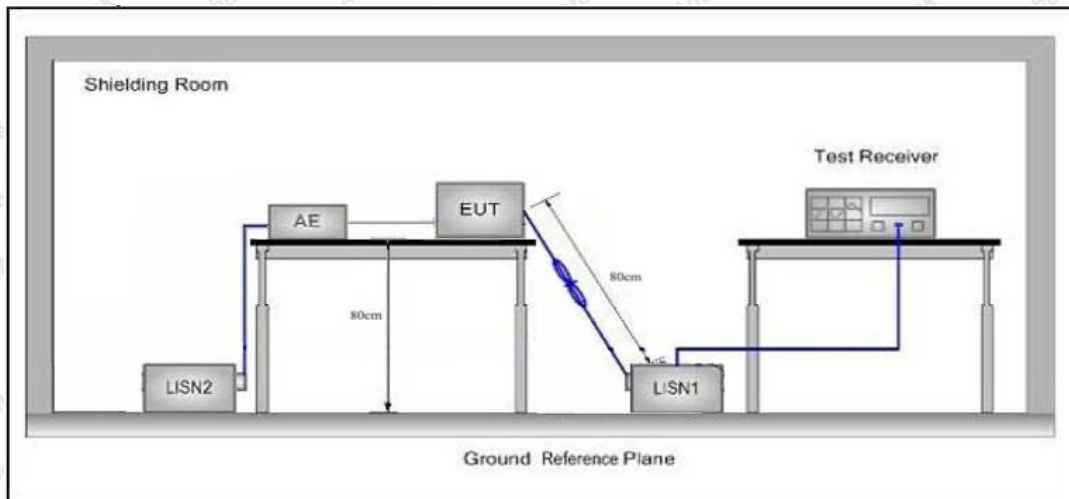
3. Conducted Emission Test

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.

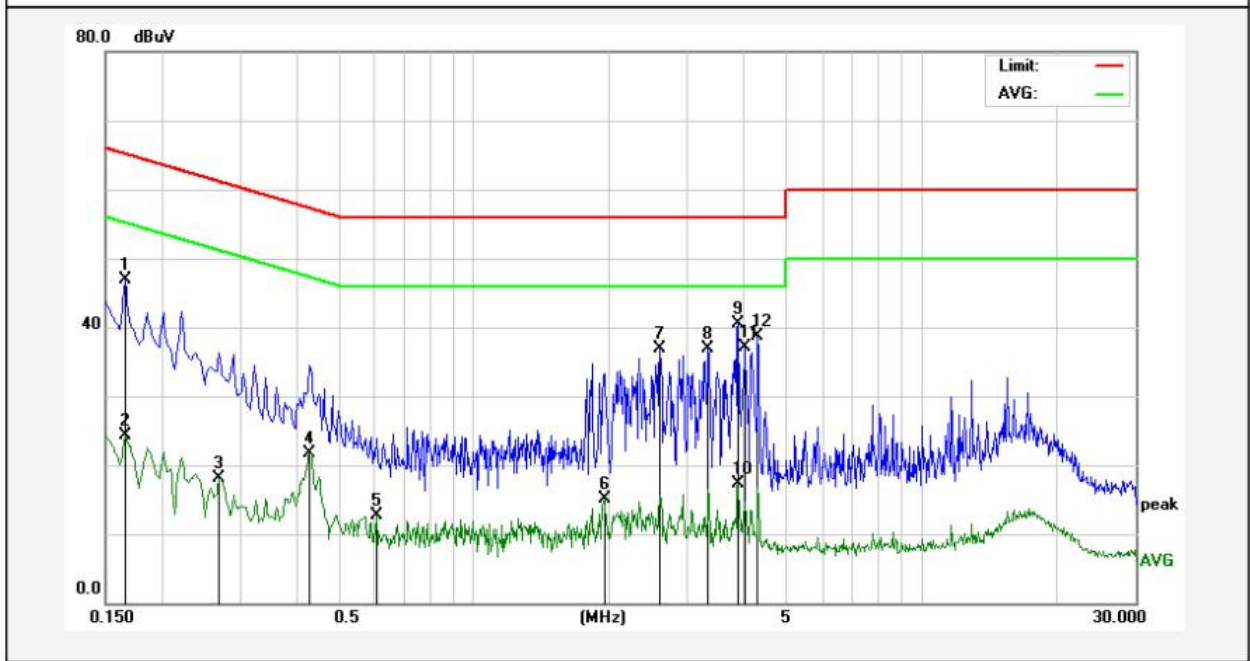
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages.

Conducted Emission Test Data

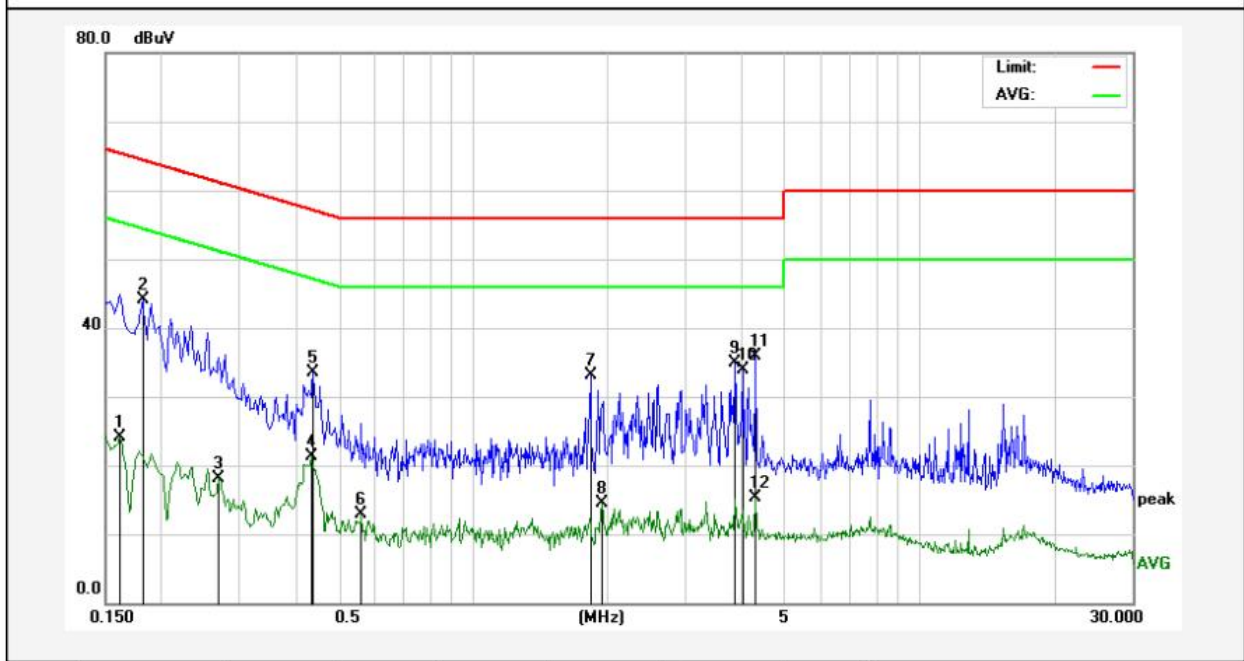
Test Site: 1# Shielded Room
 Operating Condition: Mode 1
 Test Specification: AC 120V, 60Hz for Adapter
 Comment: Live Line
 Tem.: 23.1°C Hum.: 48%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1660	46.71	0.12	46.83	65.15	-18.32	QP	
2	0.1660	24.26	0.12	24.38	55.15	-30.77	AVG	
3	0.2700	17.94	0.13	18.07	51.12	-33.05	AVG	
4	0.4300	21.56	0.12	21.68	47.25	-25.57	AVG	
5	0.6060	12.63	0.15	12.78	46.00	-33.22	AVG	
6	1.9500	15.00	0.12	15.12	46.00	-30.88	AVG	
7	2.6060	36.79	0.12	36.91	56.00	-19.09	QP	
8	3.3380	36.80	0.12	36.92	56.00	-19.08	QP	
9	3.8860	40.29	0.12	40.41	56.00	-15.59	QP	
10	3.8860	17.24	0.12	17.36	46.00	-28.64	AVG	
11	4.0340	37.05	0.11	37.16	56.00	-18.84	QP	
12	4.3100	38.68	0.11	38.79	56.00	-17.21	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.: 23.1°C Hum.: 48%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1620	23.92	0.12	24.04	55.36	-31.32	AVG	
2	0.1819	43.99	0.12	44.11	64.39	-20.28	QP	
3	0.2700	17.98	0.13	18.11	51.12	-33.01	AVG	
4	0.4340	21.27	0.12	21.39	47.18	-25.79	AVG	
5	0.4380	33.29	0.13	33.42	57.10	-23.68	QP	
6	0.5620	12.69	0.15	12.84	46.00	-33.16	AVG	
7	1.8300	32.92	0.13	33.05	56.00	-22.95	QP	
8	1.9420	14.41	0.12	14.53	46.00	-31.47	AVG	
9	3.8660	34.70	0.12	34.82	56.00	-21.18	QP	
10	4.0140	33.72	0.11	33.83	56.00	-22.17	QP	
11	4.2940	35.72	0.11	35.83	56.00	-20.17	QP	
12	4.2940	15.20	0.11	15.31	46.00	-30.69	AVG	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.231(b)				
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.

the formulas for calculating the maximum permitted fundamental field strengths are as follows:

for the band 260-470 MHz, $\mu\text{V/m}$ at 3 meters = $41.6667(F) - 7083.3333$.

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level

$$\text{Emission Level (dBuV/m)} = 20 \log \text{Emission Level}(\mu\text{V/m})$$

The field strength of emission limits have been calculated in below table:

Fundamental Frequency (MHz)	Field Strength of Fundamental (dBuV/m)@3m
433.92	80.83 (AVG)
433.92	100.83 (Peak)

4.2. Test Setup

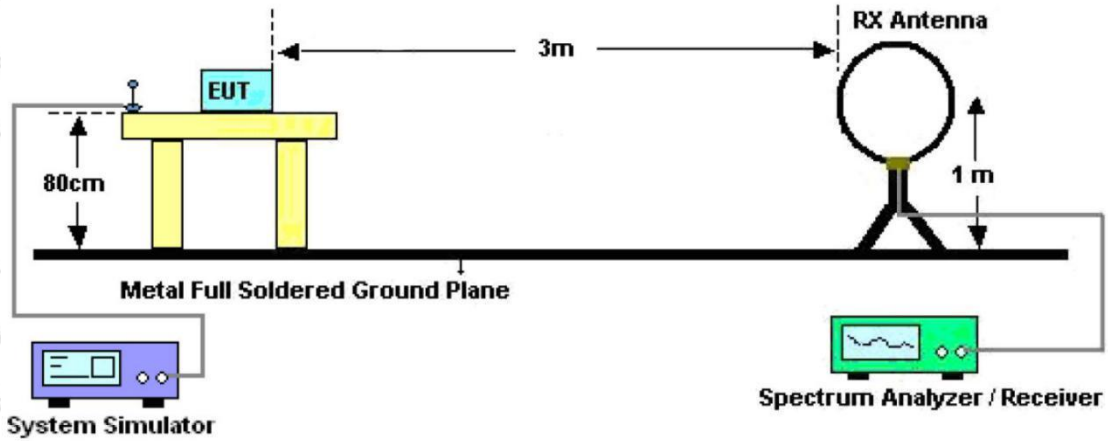


Figure 1. Below 30MHz

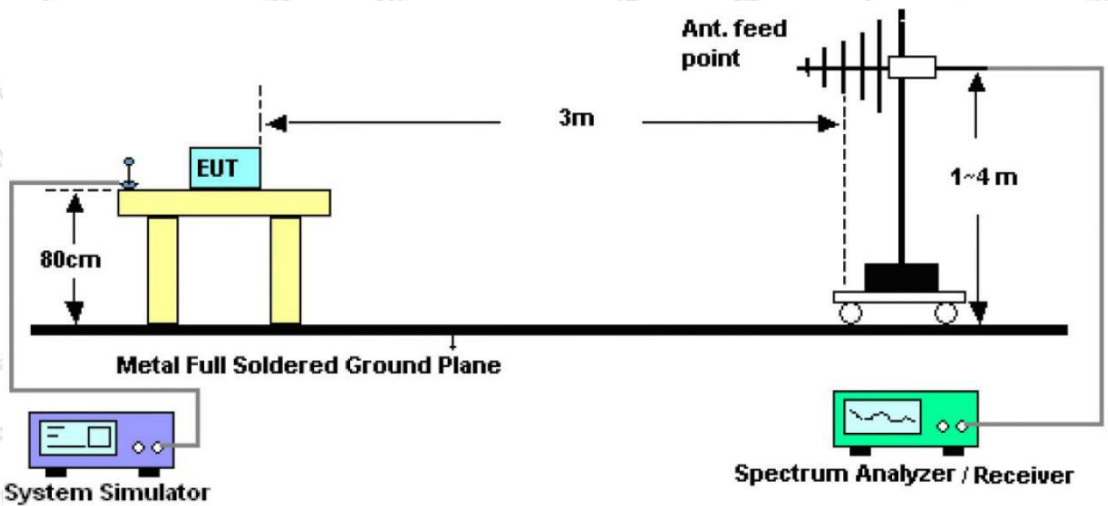


Figure 2. 30MHz to 1GHz

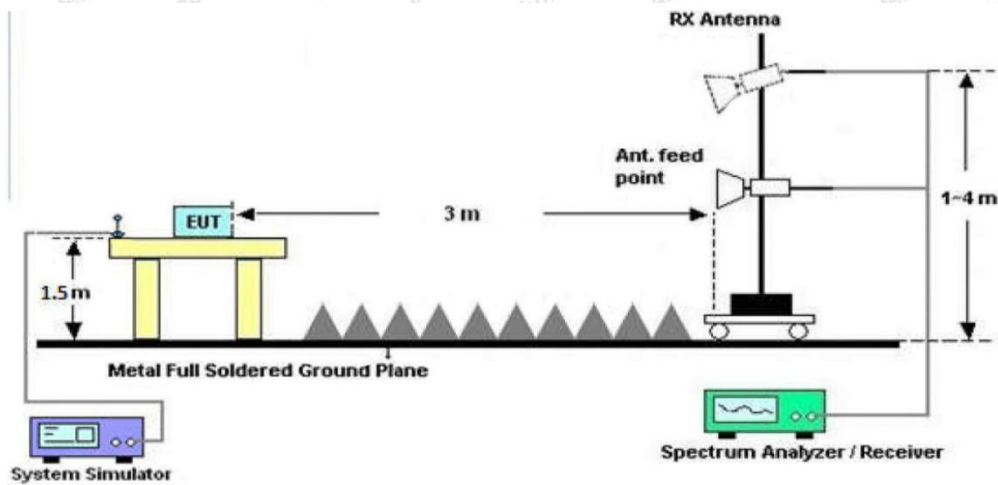


Figure 3. Above 1 GHz

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 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

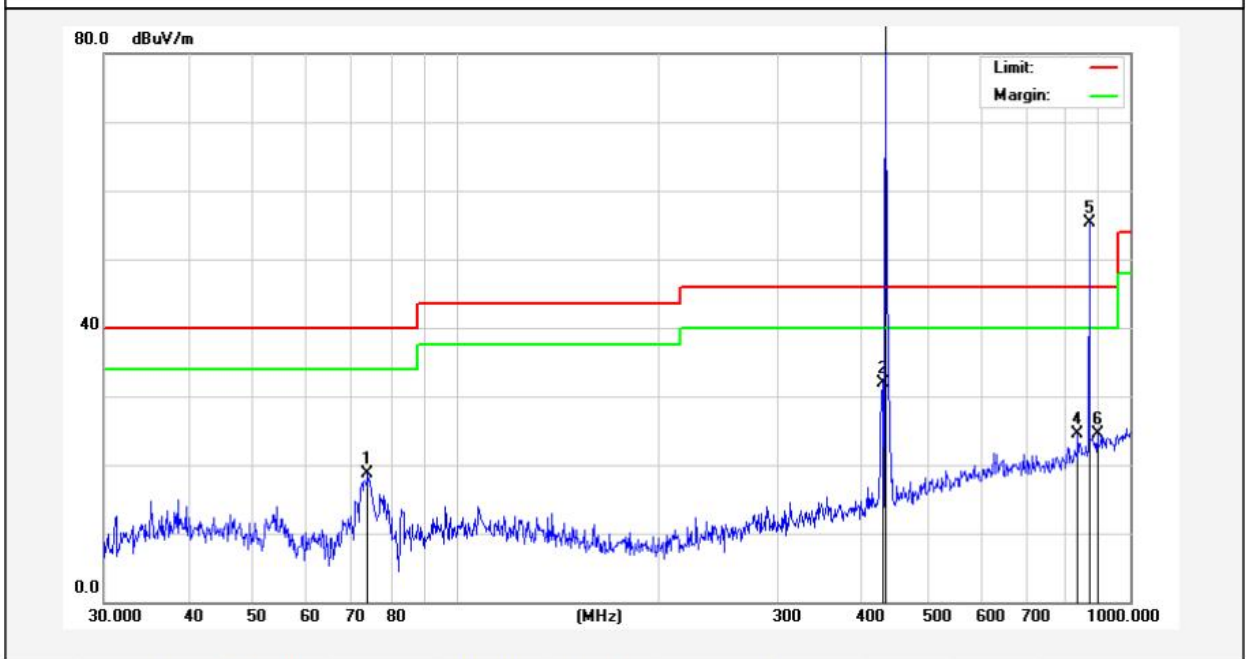
PASS

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

The test results of 9kHz-30MHz and above 1800MHz are attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

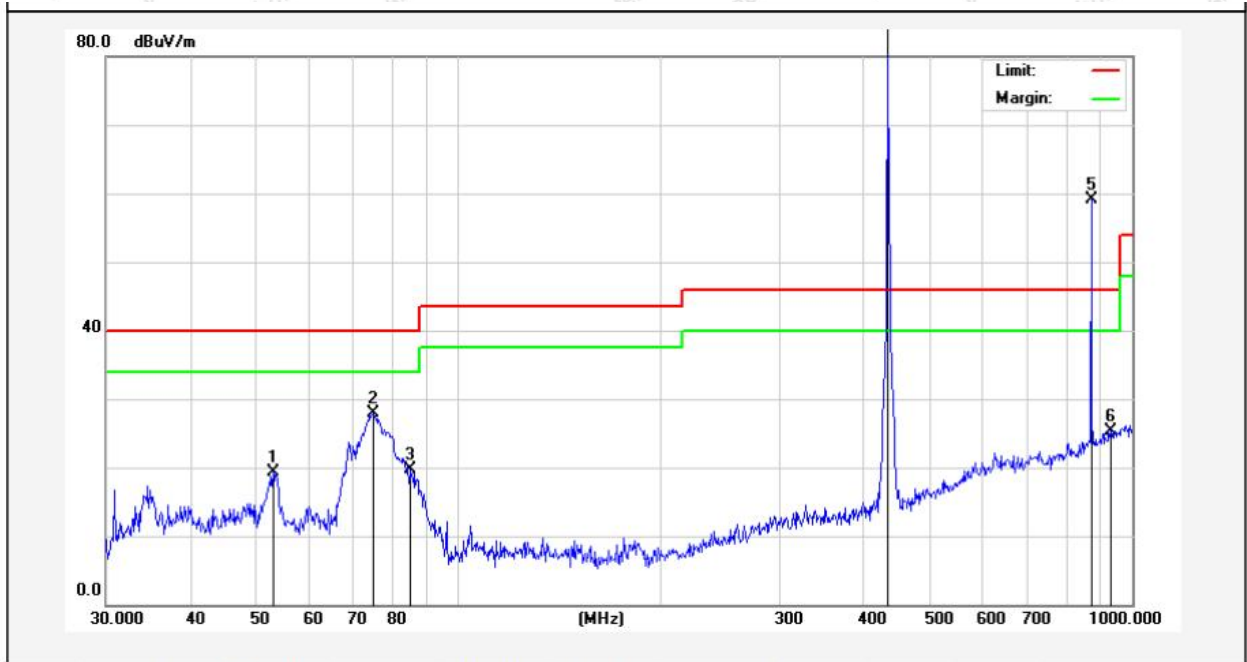
Test Mode: Mode 1
 Power Source: AC 120V, 60Hz for Adapter
 Polarization: Horizontal
 Temp.(°C)/Hum.(%RH): 24.1°C/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	73.8756	40.70	-22.04	18.66	40.00	-21.34	QP			
2	429.5228	47.63	-15.75	31.88	46.00	-14.12	QP			
3	433.9251	103.59	-15.70	87.89	/	/	peak			
4	836.2443	32.21	-7.70	24.51	46.00	-21.49	QP			
5	867.9602	62.28	-7.00	55.28	/	/	peak			
6	893.8567	30.80	-6.37	24.43	46.00	-21.57	QP			

Test Results (30~1000MHz)

Test Mode: Mode 1
 Power Source: AC 120V, 60Hz for Adapter
 Polarization: Vertical
 Temp.(°C)/Hum.(%RH): 24.1°C/48%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	36.20	-16.93	19.27	40.00	-20.73	QP			
2	74.9191	47.75	-19.89	27.86	40.00	-12.14	QP			
3	84.9995	38.30	-18.55	19.75	40.00	-20.25	QP			
4	433.9251	104.60	-13.93	90.67	/	/	peak			
5	867.9602	66.03	-7.00	59.03	/	/	peak			
6	929.0082	31.22	-5.88	25.34	46.00	-20.66	QP			

Test Results (Fundamental)

Mode	Freq. (MHz)	Antenna Pol.	Reading (dBuV/m)	Factor (dB)	Duty cycle Factor (dB)	Results (dBuV/m)	Limits (dBuV/m)	Det. Mode
TX Mode	433.9251	H	103.59	-15.7	-	87.89	100.83	PK
	433.9251	H	103.59	-15.7	-15.06	72.83	80.83	AV
	433.9251	V	104.6	-15.7	-	88.9	100.83	PK
	433.9251	V	104.6	-15.7	-15.06	73.84	80.83	AV

Remark:

1. Result = Reading + Factor + Duty cycle Factor
2. Pulse Desensitization Correction Factor
3. AV=PEAK +Duty Cycle Factor

Mode	Freq. (MHz)	Pulse Width (ms)	2/Pulse Width (kHz)
TX Mode	433.92	0.12	16.667

RBW(1000kHz) > 2/Pulse Width

Therefore PDCF is not needed.

4. Duty Cycle Factor

Mode	Freq. (MHz)	T on1 (ms)	N1	T on2 (ms)	N2	T on(ms)	T period (ms)	Duty Cycle	Duty Cycle Factor
TX Mode	433.92	0.12	21	0.54	4	4.680	26.5	17.66%	-15.06

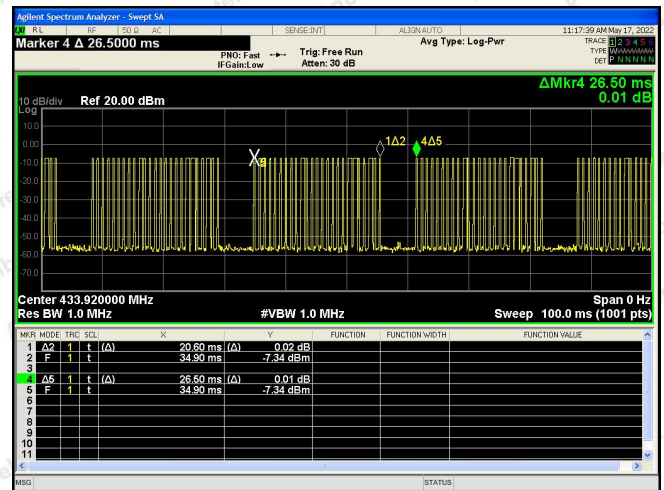
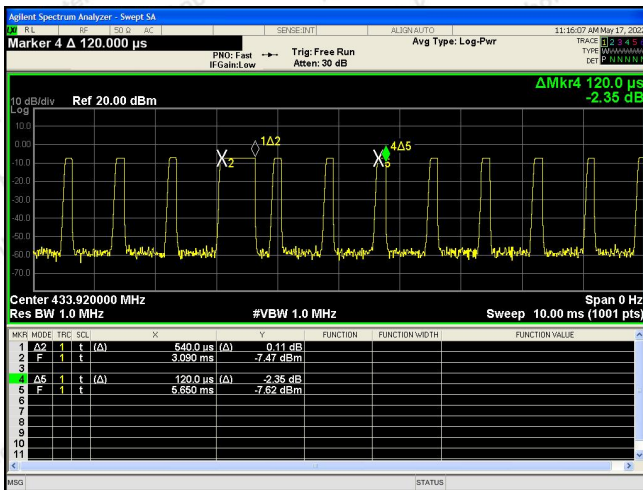
$T_{on} = T_{on1} * N1 + T_{on2} * N2$

$Duty\ Cycle = T_{on} / T_{period}$

$Duty\ Cycle\ Factor = 20 * \lg(Duty\ Cycle)$

T on1 & T on2

T period



Test Results (Harmonics Emissions+Radiated Emissions from 1G-4G)

433.92MHz

Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Factor (dB)	Duty cycle Factor (dB)	Results (dBuV/m)	Limits (dBuV/m)	Det Mode
867.9602	H	62.28	-7.00	-	55.28	80.83	PK
867.9602	H	62.28	-7.00	-15.06	40.22	60.83	AV
867.9602	V	66.03	-7.00	-	59.03	80.83	PK
867.9602	V	66.03	-7.00	-15.06	43.97	60.83	AV
1301.942	H	45.63	1.36	-	46.99	74	PK
1301.942	H	45.63	1.36	-15.06	31.93	54	AV
1301.942	V	47.55	1.36	-	48.91	74	PK
1301.942	V	47.55	1.36	-15.06	33.85	54	AV

Remark:

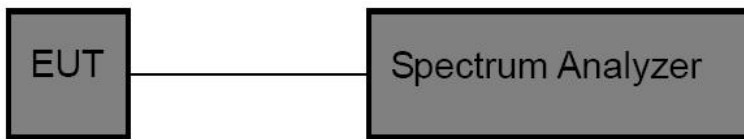
1. Result = Reading + Factor + Duty cycle Factor

5. 20DB Occupy Bandwidth Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.231 (c)				
Test Limit	<p>According to FCC Part 15.231(c), The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20dB down from the modulated carrier.</p> <p>So the emission bandwidth limits have been calculated in below table:</p> <table border="1"> <thead> <tr> <th>Fundamental Frequency</th> <th>Limit of 20dB Bandwidth</th> </tr> </thead> <tbody> <tr> <td>433.92 MHz</td> <td>$433920 \times 0.0025 = 1084.95 \text{ kHz}$</td> </tr> </tbody> </table>	Fundamental Frequency	Limit of 20dB Bandwidth	433.92 MHz	$433920 \times 0.0025 = 1084.95 \text{ kHz}$
Fundamental Frequency	Limit of 20dB Bandwidth				
433.92 MHz	$433920 \times 0.0025 = 1084.95 \text{ kHz}$				

5.2. Test Setup



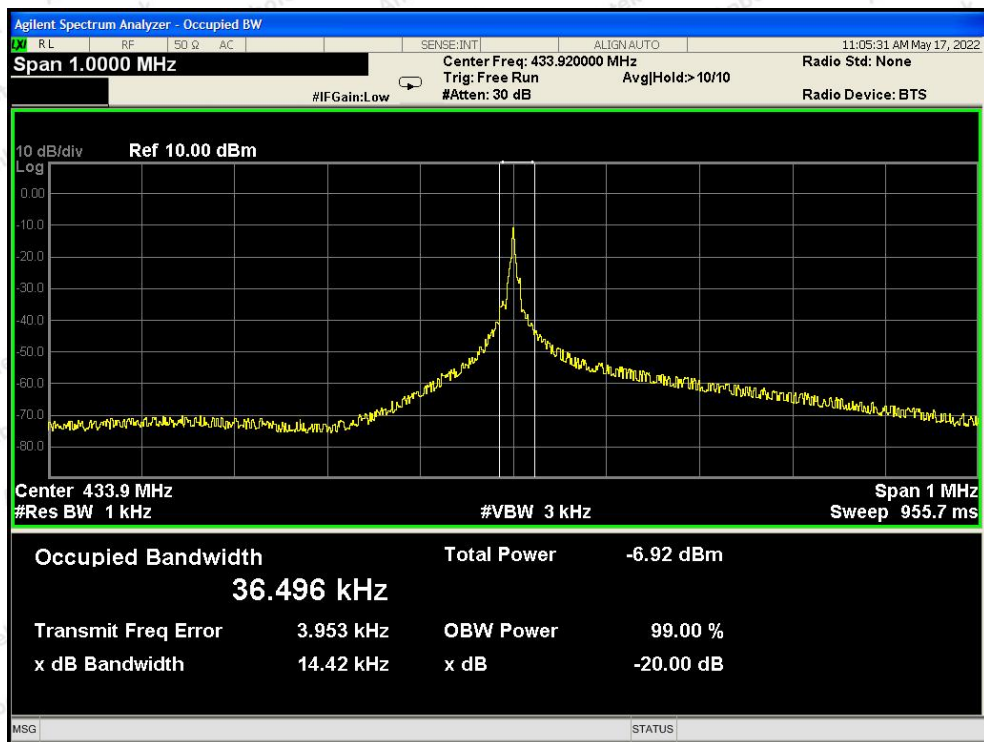
5.3. Test Procedure

1. Place the EUT on the table and set it in the continuously 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 = 1% to 5% of the OBW, $VBW \geq 3 \times RBW$,
 - Span= $2 \times OBW \sim 5 \times OBW$
 - Detector= Peak
 - Trace mode= Max hold.
 - Sweep- auto couple.
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

5.4. Test Data

Test Item	: 20dB Bandwidth	Test Mode	: Continuously transmitting
Test Voltage	: AC 120V, 60Hz for Adapter	Temperature	: 23.6°C
Test Result	: PASS	Humidity	: 54%RH

Freq. (MHz)	Modulation Type	Bandwidth (kHz)	Limit (kHz)	Results
433.92	ASK	19.29	<1084.95	PASS



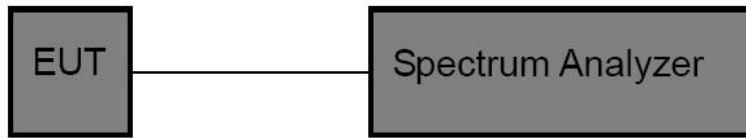
433.92MHz

6. Dwell Time Test

6.1. Test Standard and Limit

Test Standard	FCC Part 15.231(a)(1)
Test Limit	According to FCC Part 15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released

6.2. Test Setup



6.3. Test Procedure

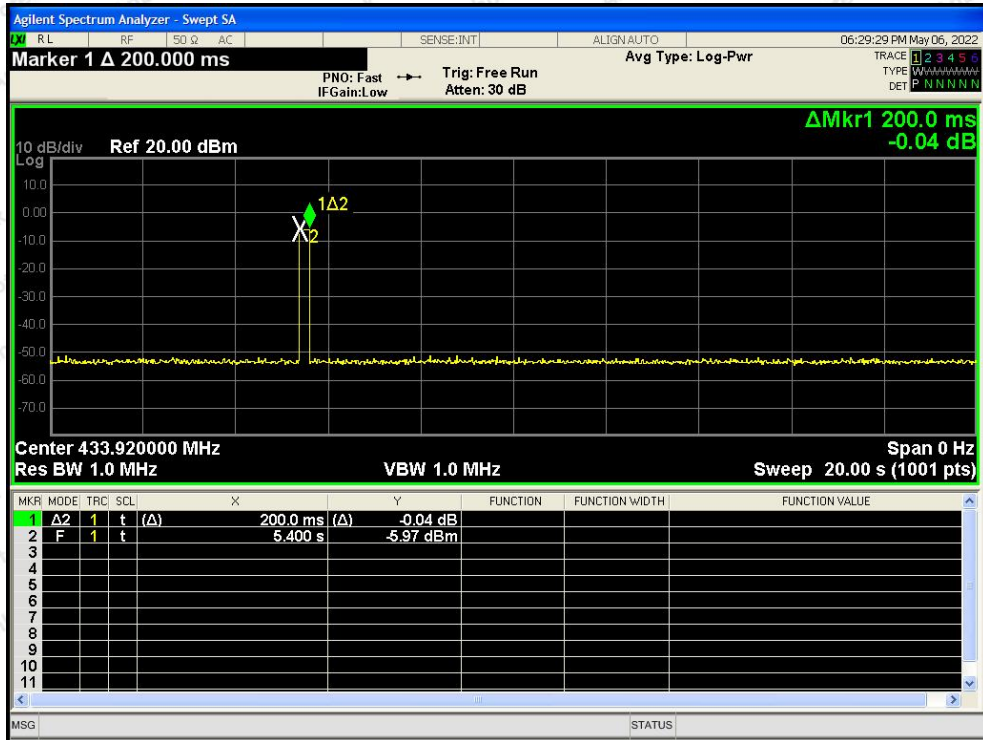
1. Place the EUT on the table and set it in continuously transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as
RBW=1000kHz, VBW= 1000 kHz, Span= 0Hz, Sweep Time= 20 Seconds.
3. Record the Delta mark time.

6.4. Test Data

Test Item	: Dwell Time	Test Mode	: Continuously transmitting
Test Voltage	: AC 120V, 60Hz for Adapter	Temperature	: 23.6°C
Test Result	: PASS	Humidity	: 54%RH

Test Mode	Transmitting time(s)	Limit(s)	Result
ASK mode	0.200	≤5	PASS

Please refer the following plot.



Dwell Time



7. Antenna Requirement

7.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
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. Antenna requirement must meet at least one of the following: 1) Antenna must be permanently attached to device. 2) The antenna must use a unique type of connector to attach to the device. 3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

7.2. Antenna Connected Construction

The antenna is a PCB antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Test



Photo of Radiation Emission Test

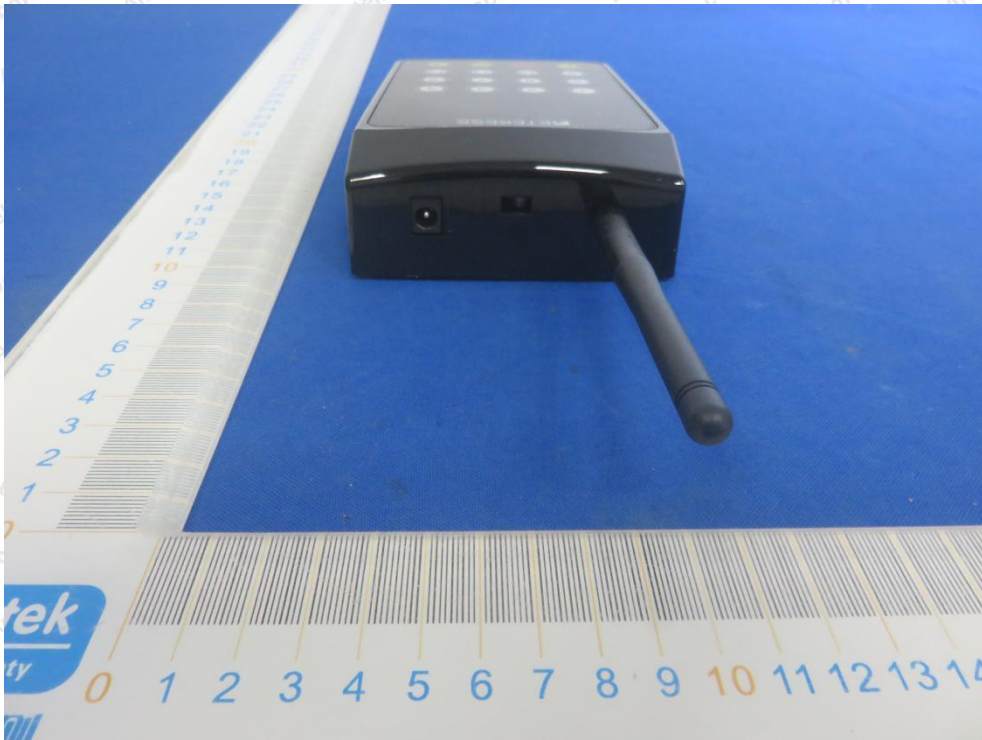




APPENDIX II -- EXTERNAL PHOTOGRAPH

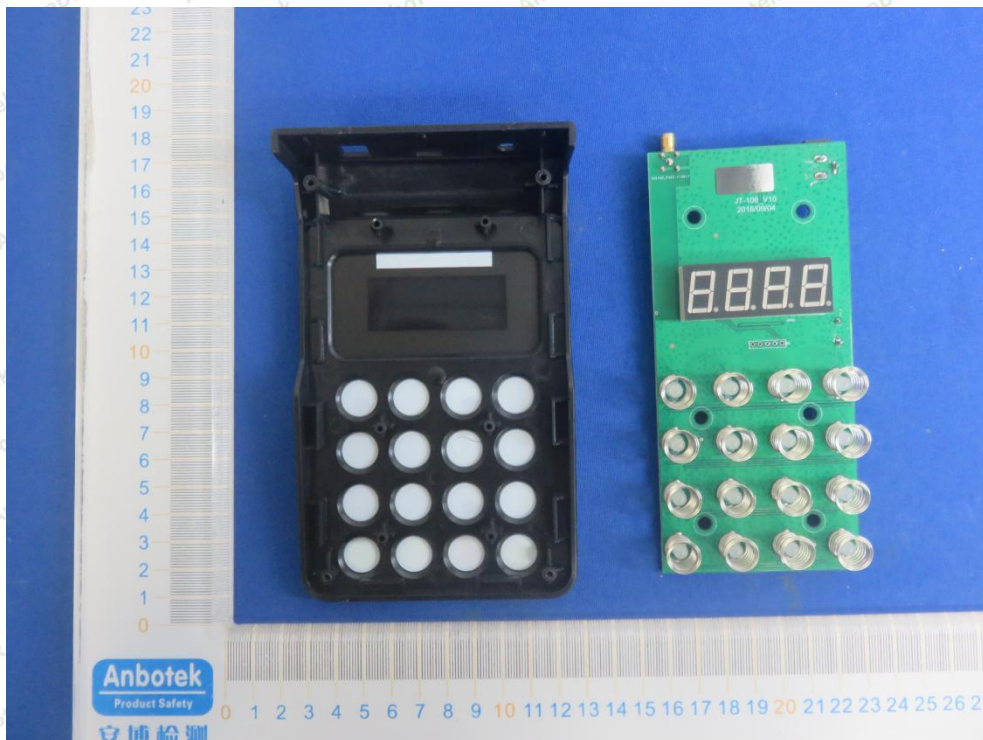
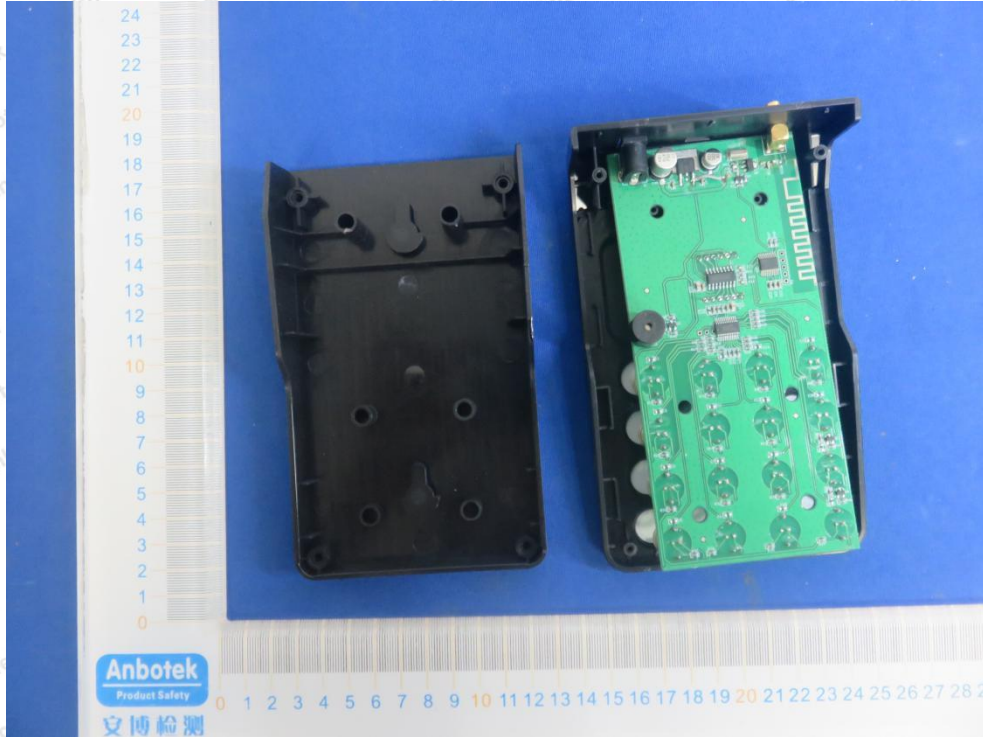


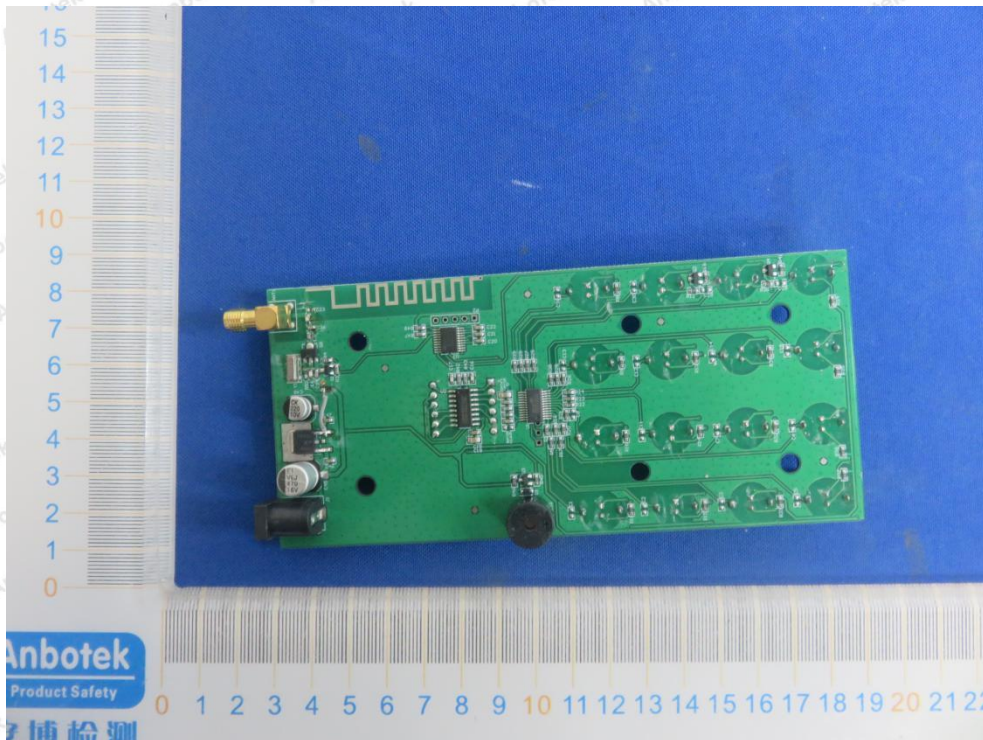




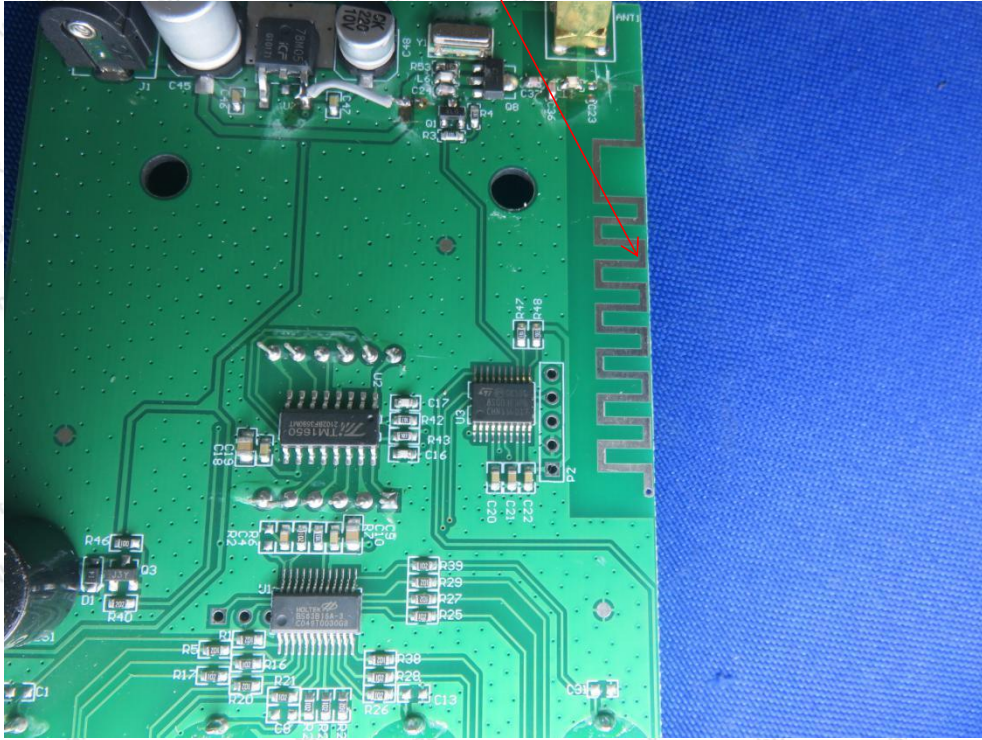


APPENDIX III -- INTERNAL PHOTOGRAPH





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----- End of Report -----