



# **FCC TEST REPORT**

**FCC ID: 2ATWW-JHD-TWWR**

On Behalf of

**Shenzhen Jiangjing Lighting Co.,Ltd.**

**2.4G DC remote control**

**Model No.: JHD-TWWR, JWD-TWWR**

Prepared for : Shenzhen Jiangjing Lighting Co.,Ltd.  
Address : 3-5 Floor, Building A & 4-5 Floor, Building C, Aiqun Road, Tongfuyu  
Industrial Zone, Shangwu Community, Shiyan Street, Bao'an District,  
Shenzhen City, Guangdong Province, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.  
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,  
518103, Shenzhen, Guangdong, China

Report Number : A2011195-C03-R01  
Date of Receipt : December 25, 2020  
Date of Test : December 25, 2020– January 28, 2021  
Date of Report : February 23, 2021  
Version Number : V0

## TABLE OF CONTENTS

Description	Page
<b>1. Summary of Standards and Results .....</b>	<b>6</b>
1.1. Description of Standards and Results .....	6
<b>2. General Information .....</b>	<b>7</b>
2.1. Description of Device (EUT).....	7
2.2. Accessories of Device (EUT) .....	8
2.3. Tested Supporting System Details .....	8
2.4. Block Diagram of Connection Between EUT and Simulators .....	8
2.5. Test Mode Description.....	8
2.6. Test Conditions .....	9
2.7. Test Facility .....	9
2.8. Measurement Uncertainty .....	10
2.9. Test Equipment List.....	11
<b>3. Power Line Conducted Emission Test.....</b>	<b>12</b>
3.1. Block Diagram of Test Setup.....	12
3.2. Test Limits .....	12
3.3. Configuration of EUT on Test .....	13
3.4. Operating Condition of EUT .....	13
3.5. Test Procedure .....	13
3.6. Test Results .....	13
<b>4. Radiated Emission Test.....</b>	<b>14</b>
4.1. Block Diagram of Test Setup.....	14
4.2. Test Limit.....	15
4.3. Configuration of EUT on Test .....	16
4.4. Operating Condition of EUT .....	16
4.5. Test Procedure .....	16
4.6. Test Results .....	17
<b>5. Band Edge Test .....</b>	<b>22</b>
5.1. Block Diagram of Test Setup.....	22
5.2. Test Limit.....	22
5.3. Configuration of EUT on Test .....	23
5.4. Operating Condition of EUT .....	23
5.5. Test Procedure .....	23
5.6. Test Results .....	25
<b>6. Occupied Bandwidth Test.....</b>	<b>27</b>
6.1. Block Diagram of Test Setup.....	27
6.2. Test Limit.....	27
6.3. Test Procedure .....	27
6.4. Test Results .....	27
<b>7. Antenna Requirement .....</b>	<b>29</b>
7.1. Standard Requirement.....	29
7.2. Antenna Connected Construction .....	29

---

7.3. Results.....	29
<b>8. Photograph.....</b>	<b>30</b>
8.1. Photos of Radiated Emission Test .....	30
<b>9. Photos of The EUT .....</b>	<b>31</b>

## TEST REPORT DECLARATION

Applicant : Shenzhen Jiangjing Lighting Co.,Ltd.  
3-5 Floor, Building A & 4-5 Floor, Building C, Aiqun Road, Tongfuyu

Address : Industrial Zone, Shangwu Community, Shiyan Street, Bao'an District,  
Shenzhen City, Guangdong Province, China

Manufacturer : Shenzhen Jiangjing Lighting Co.,Ltd.  
3-5 Floor, Building A & 4-5 Floor, Building C, Aiqun Road, Tongfuyu Industrial

Address : Zone, Shangwu Community, Shiyan Street, Bao'an District, Shenzhen City,  
Guangdong Province, China

EUT Description : 2.4G DC remote control  
(A) Model No. : JHD-TWWR, JWD-TWWR  
(B) Trademark : 

Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.249**

**ANSI C63.10:2013**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC Part 15 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Lucas Pang  
Project Engineer



Approved by (name + signature).....: Simple Guan  
Project Manager



Date of issue.....: February 23, 2021

**Revision History**

Revision	Issue Date	Revisions	Revised By
V0	February 23, 2021	Initial released Issue	Lucas Pang

## 1. Summary of Standards and Results

### 1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

EMISSION			
Description of Test Item	Test Requirement	Standard Paragraph	Results
Power Line Conducted Emission Test	FCC Part 15	Section 15.207	P
Spurious Emission Test	FCC Part 15	Section 15.249&15.209	P
Occupied bandwidth	FCC Part 15	Section 15. 249	P
Band edge Requirement	FCC Part 15	Section 15.249	P
Antenna Requirement	FCC Part 15	Section 15.203	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.			

## 2. General Information

### 2.1. Description of Device (EUT)

EUT Name : 2.4G DC remote control

Trademark :



Model No. : JHD-TWWR, JWD-TWWR

DIFF. : There is no difference except for the appearance, shape and model name.  
So all the test were performed on the model JHD-TWWR.

Power supply : DC 3V from battery

#### 2.4G Technology

Operation frequency : 2402MHz-2465MHz

Channel No. : 64

Modulation type : FSK

Antenna Type : Internal antenna, Maximum Gain is 1.5dBi

Hardware version : V2.0

Software version : V03

*Note: new batteries used during all test.*

## 2.2.Accessories of Device (EUT)

Accessories1 : /  
 Manufacturer : /  
 Model : /  
 Power supply : /

## 2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	--	--	--	--	--

## 2.4.Block Diagram of Connection Between EUT and Simulators



## 2.5.Test Mode Description

Test mode:

Mode	Channel	Frequency (MHz)
FSK	Low :CH1	2402
FSK	Middle: CH32	2433
FSK	High: CH64	2465

Note:

1. The test was used to control EUT work in Continuous TX mode, and select test channel, wireless mode
2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
3. New battery is used during all tests.
4. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω , Cable Loss: 1.0 dB



Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
<b>1CH</b>	<b>2402</b>	17CH	2418	33CH	2434	49CH	2450
2CH	2403	18CH	2419	34CH	2435	50CH	2451
3CH	2404	19CH	2420	34CH	2436	51CH	2452
4CH	2405	20CH	2421	36CH	2437	52CH	2453
5CH	2406	21CH	2422	37CH	2438	53CH	2454
6CH	2407	22CH	2423	38CH	2439	54CH	2455
7CH	2408	23CH	2424	39CH	2440	55CH	2456
8CH	2409	24CH	2425	40CH	2441	56CH	2457
9CH	2410	25CH	2426	41CH	2442	57CH	2458
10CH	2411	26CH	2427	42CH	2443	58CH	2459
11CH	2412	27CH	2428	43CH	2444	59CH	2460
12CH	2413	28CH	2429	44CH	2445	60CH	2461
13CH	2414	29CH	2430	45CH	2446	61CH	2462
14CH	2415	30CH	2431	46CH	2447	62CH	2463
15CH	2416	31CH	2432	47CH	2448	63CH	2464
16CH	2417	<b>32CH</b>	<b>2433</b>	48CH	2449	<b>64CH</b>	<b>2465</b>

## 2.6. Test Conditions

Temperature range	21-25°C
Humidity range	40-75%
Pressure range	86-106kPa

## 2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd.

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,  
518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission  
Registration Number: 293961

July 15, 2019 Certificated by IC  
Registration Number: CN0085

## 2.8.Measurement Uncertainty

(95% confidence levels, k=2)

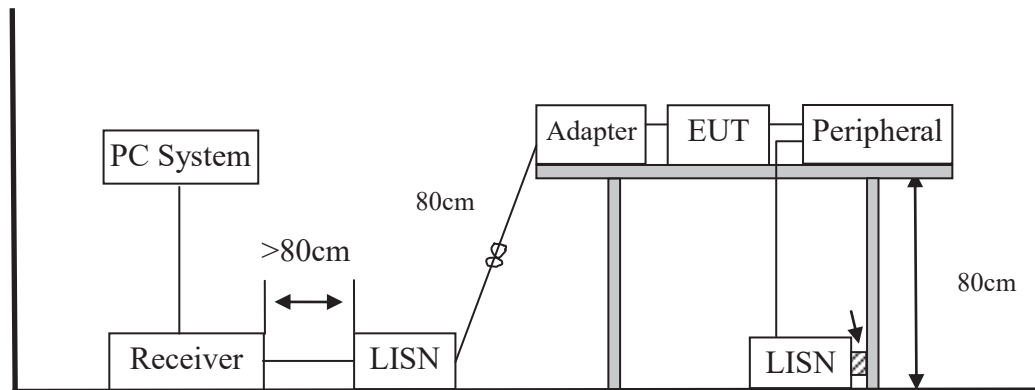
Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77 dB (Distance: 3m Polarize: V)
	3.80 dB (Distance: 3m Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.13 dB (Distance: 3m Polarize: V)
	4.16 dB (Distance: 3m Polarize: H)
Uncertainty for radio frequency	$5.8 \times 10^{-8}$
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

## 2.9. Test Equipment List

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2020.09.02	1 Year
Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2020.09.02	1 Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1 Year
Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-10208 2-Wa	2020.09.02	1 Year
Receiver	R&S	ESCI	101165	2020.09.02	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2019.09.07	2 Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2 Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2 Year
Cable	Resenberger	N/A	No.1	2020.09.02	1 Year
Cable	SCHWARZBECK	N/A	No.2	2020.09.02	1 Year
Cable	SCHWARZBECK	N/A	No.3	2020.09.02	1 Year
Pre-amplifier	HP	HP8347A	2834A00455	2020.09.02	1 Year
Pre-amplifier	Agilent	8449B	3008A02664	2020.09.02	1 Year
Temperature controller	Terchy	MHQ	120	2020.09.02	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126-466	2020.09.02	1 Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year

### 3. Power Line Conducted Emission Test

#### 3.1. Block Diagram of Test Setup



#### 3.2. Test Limits

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB( $\mu$ V)	Average Level dB( $\mu$ V)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

- Notes:
1. Emission level=Read level + LISN factor-Preamplifier factor + Cable loss
  2. \* Decreasing linearly with logarithm of frequency.
  3. The lower limit shall apply at the transition frequencies.

### 3.3.Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

### 3.4.Operating Condition of EUT

- (1) Setup the EUT as shown as Section 3.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 3.5.Test Procedure

- (1) The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on conducted Emission test.
- (2) The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver is set at 9kHz.
- (3) The frequency range from 30MHz to 1000MHz was pre-scanned with a Peak detector and all final readings of measurement from Test Receiver are Quasi-Peak and Average values.
- (4) The test results are reported on Section 3.6.

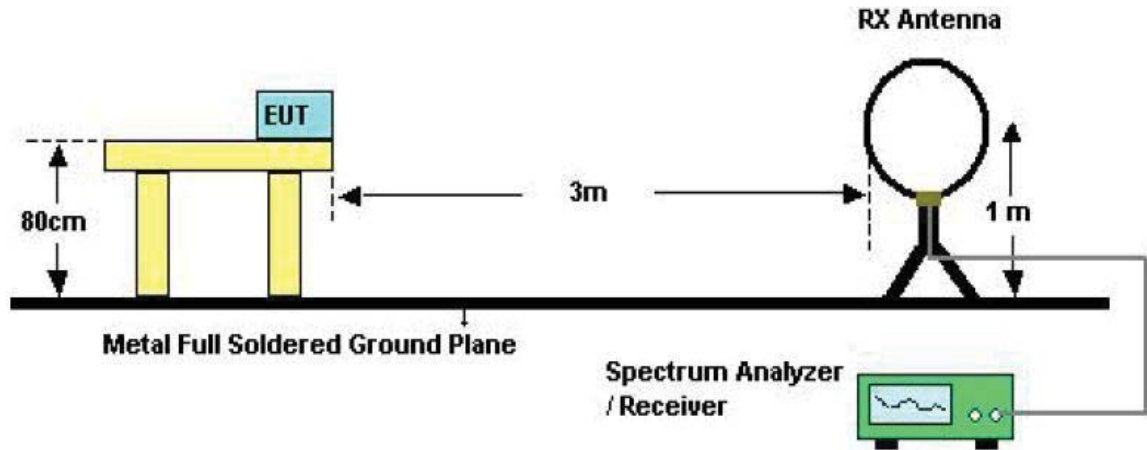
### 3.6.Test Results

Note: The EUT is supplied by battery, so this item does not applicable.

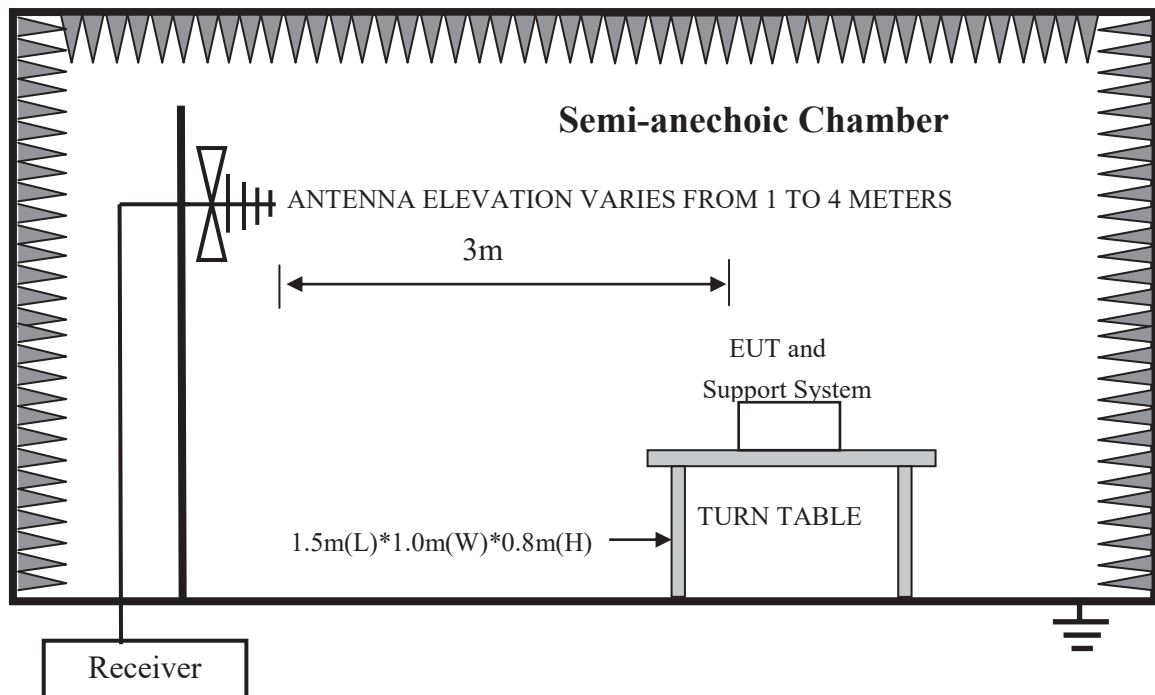
## 4. Radiated Emission Test

### 4.1. Block Diagram of Test Setup

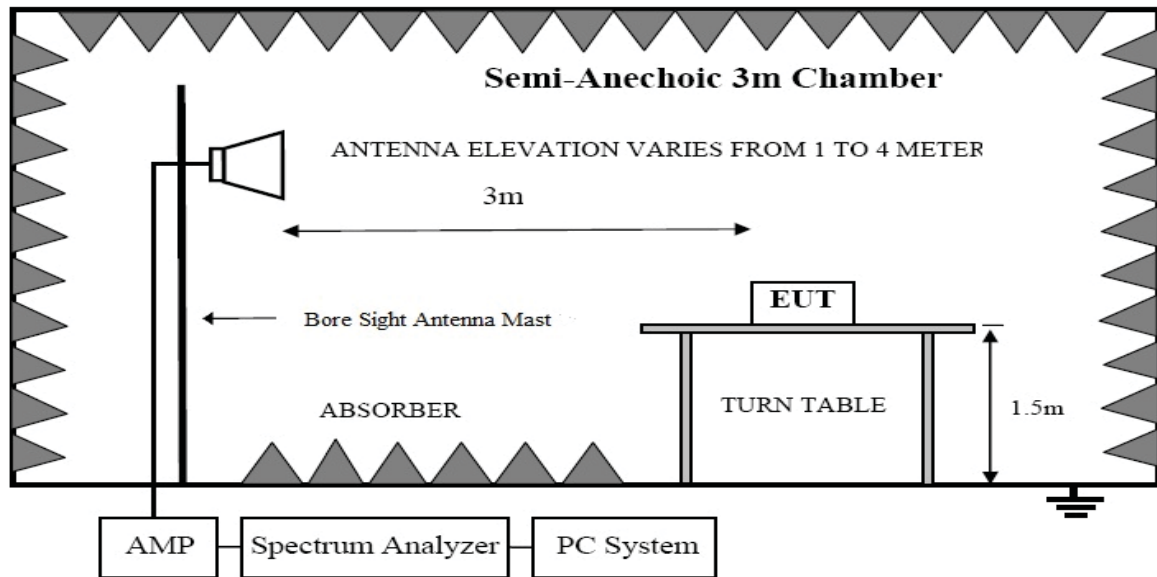
In Semi Anechoic Chamber (3m) Test Setup Diagram for 9KHz~30MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for 30MHz~1000MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for Above 1GHz



#### 4.2. Test Limit

Frequency MHz	Distance (Meters)	Field Strengths Limits	
		uV/m	dB uV/m
0.009 ~ 0.490	300	2400/F(kHz)	---
0.490 ~ 1.705	30	24000/F(kHz)	----
1.705 ~ 30	30	30	29.5
30 ~ 88	3	100(3nW)	40
88 ~ 216	3	150(6.8nW)	43.5
216 ~ 960	3	200(12nW)	46
Above 960	3	500(75nW)	54
Carrier frequency	3	50000(avg)	113.97(peak) 93.97(avg)

Notes:

1. Emission level = Read level + Antenna Factor - Preamp Factor + Cable Loss
2. The smaller limit shall apply at the cross point between two frequency bands.
3. Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
4. For frequencies above 1000 MHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

### 4.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

### 4.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 4.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 4.5. Test Procedure

- (1) The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) 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.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP
- (5) The frequency range from 9KHz to 150KHz is checked, the bandwidth of test receiver is



set at 200Hz.

The frequency range from 150KHz to 30MHz is checked, the bandwidth of test receiver is set at 9KHz.

The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver is set at 120kHz.

The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer is set at 1MHz.

- (6) The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values, the frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.
- (8) The test results are reported on Section 4.6.

#### 4.6. Test Results

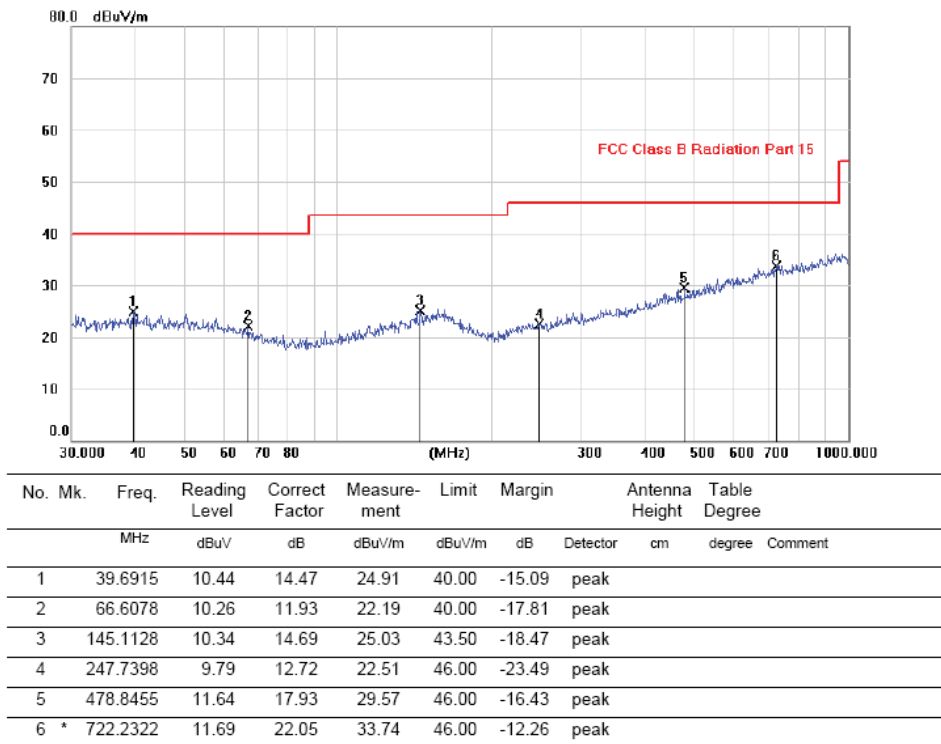
We have scanned the EUT from 9kHz up to the 10th harmonic of the fundamental. Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

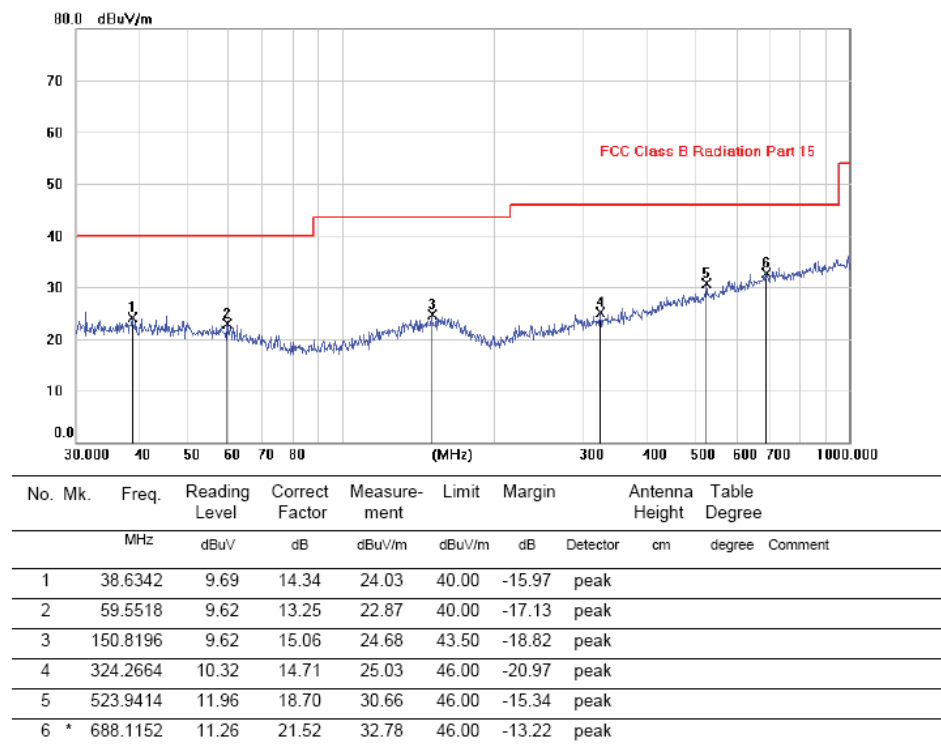
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Frequency Range	: <b>30MHz~1000MHz</b>
Test Mode	: TX 2402MHz
Test Results	: <b>PASS</b>
Note: 1. The test results are listed in next pages. 2. This mode is worst case mode, and this report only reflected the worst mode. 3. If the limits for the measurement with the quasi-peak detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out.	

## Vertical:



## Horizontal:



Note: This report only shall the worst case mode for TX 2402MHz.

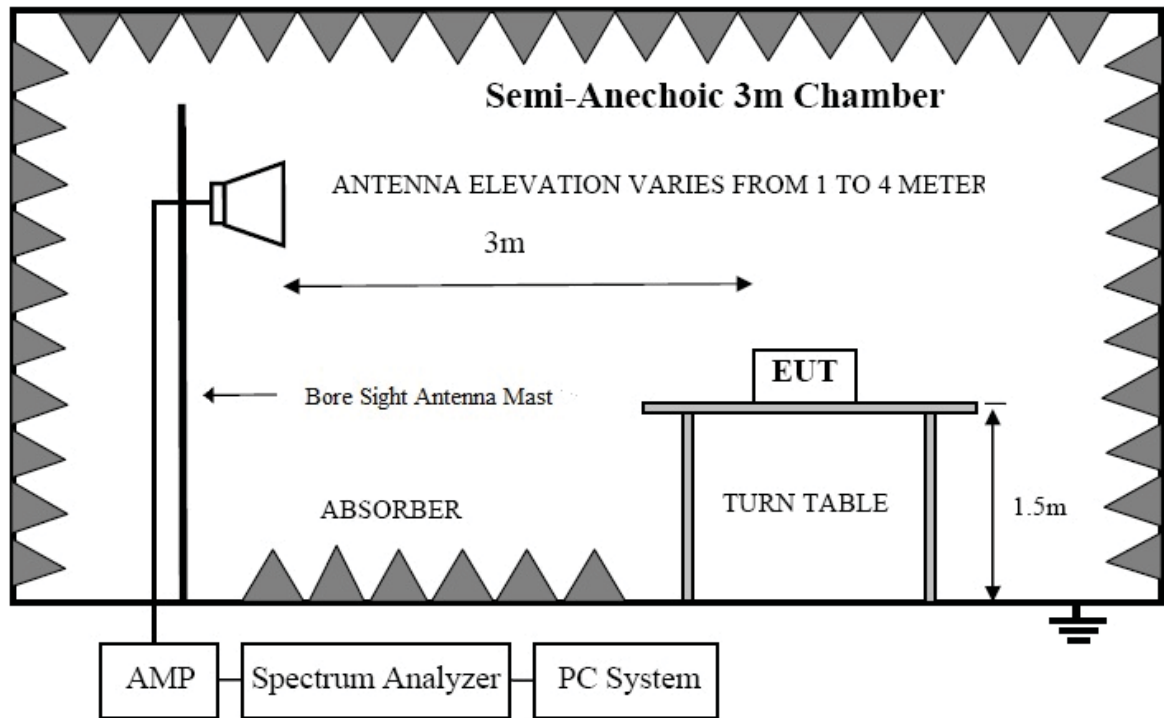
Frequency Range : <b>1GHz~25GHz</b>								
EUT : 2.4G DC remote control						Test Date : 2021.01.28		
M/N : JHD-TWWR, JWD-TWWR						Temperature : 24℃		
Test Engineer : Lucas Pang						Humidity : 56%		
Test Mode : TX 2402MHz								
Test Results : <b>PASS</b>								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2402	H	65.06	-3.41	61.65	113.97	-52.32	Peak
2	2402	H	--	-3.41	--	93.97	--	Avg
3	4804	H	46.45	3.23	49.68	74	-24.32	Peak
4	4804	H	--	3.23	--	54	--	Avg
1	2402	V	63.23	-3.41	59.82	113.97	-54.15	Peak
2	2402	V	--	-3.41	--	93.97	--	Avg
3	4804	V	39.77	3.23	43.00	74	-31.00	Peak
4	4804	V	--	3.23	--	54	--	Avg
<p>Note:</p> <p>1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.</p> <p>2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain. Result=Reading + Correct Factor. Margin= Result-Limit.</p> <p>3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.</p> <p>4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.</p> <p>5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.</p>								

Frequency Range : 1GHz~25GHz								
EUT : 2.4G DC remote control						Test Date : 2021.01.28		
M/N : JHD-TWWR, JWD-TWWR						Temperature : 24℃		
Test Engineer : Lucas Pang						Humidity : 56%		
Test Mode : TX 2433MHz								
Test Results : PASS								
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark
1	2433	H	69.75	-3.38	66.37	113.97	-47.60	Peak
2	2433	H	--	-3.38	--	93.97	--	Avg
3	4866	H	46.86	3.23	50.09	74	-23.91	Peak
4	4866	H	--	3.23	--	54	--	Avg
1	2433	V	59.34	-3.38	55.96	113.97	-58.01	Peak
2	2433	V	--	-3.38	--	93.97	--	Avg
3	4866	V	45.72	3.23	48.95	74	-25.05	Peak
4	4866	V	--	3.23	--	54	--	Avg
<p>Note:</p> <p>1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.</p> <p>2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain. Result=Reading + Correct Factor. Margin= Result-Limit.</p> <p>3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.</p> <p>4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.</p> <p>5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.</p>								

Frequency Range		: 1GHz~25GHz							
EUT		: 2.4G DC remote control				Test Date		: 2020.06.08	
M/N		: JHD-TWWR, JWD-TWWR				Temperature		: 24℃	
Test Engineer		: Lucas Pang				Humidity		: 56%	
Test Mode		: TX 2465MHz							
Test Results		: PASS							
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark	
1	2465	H	75.61	-3.38	72.23	113.97	-41.74	Peak	
2	2465	H	--	-3.38	--	93.97	--	Avg	
3	4930	H	45.35	3.23	48.58	74	-25.42	Peak	
4	4930□	H	--	3.23	--	54	--	Avg	
1	2465	V	63.84	-3.38	60.46	113.97	-53.51	Peak	
2	2465	V	--	-3.38	--	93.97	--	Avg	
3	4930	V	46.75	3.23	49.98	74	-24.02	Peak	
4	4930□	V	--	3.23	--	54	--	Avg	
Note:	1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.								
	2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain. Result=Reading + Correct Factor. Margin= Result-Limit.								
	3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.								
	4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.								
	5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.								

## 5. Band Edge Test

### 5.1. Block Diagram of Test Setup



### 5.2. Test Limit

Please refer section 15.249 and section 15.205.

249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

249(e) As shown in section 15.35(b), for frequencies above 1000MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

### 5.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

### 5.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 5.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

### 5.5. Test Procedure

- (1) The EUT was placed on a non-metallic table, 150 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) 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.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
  - (a) Change work frequency or channel of device if practicable.
  - (b) Change modulation type of device if practicable.
  - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

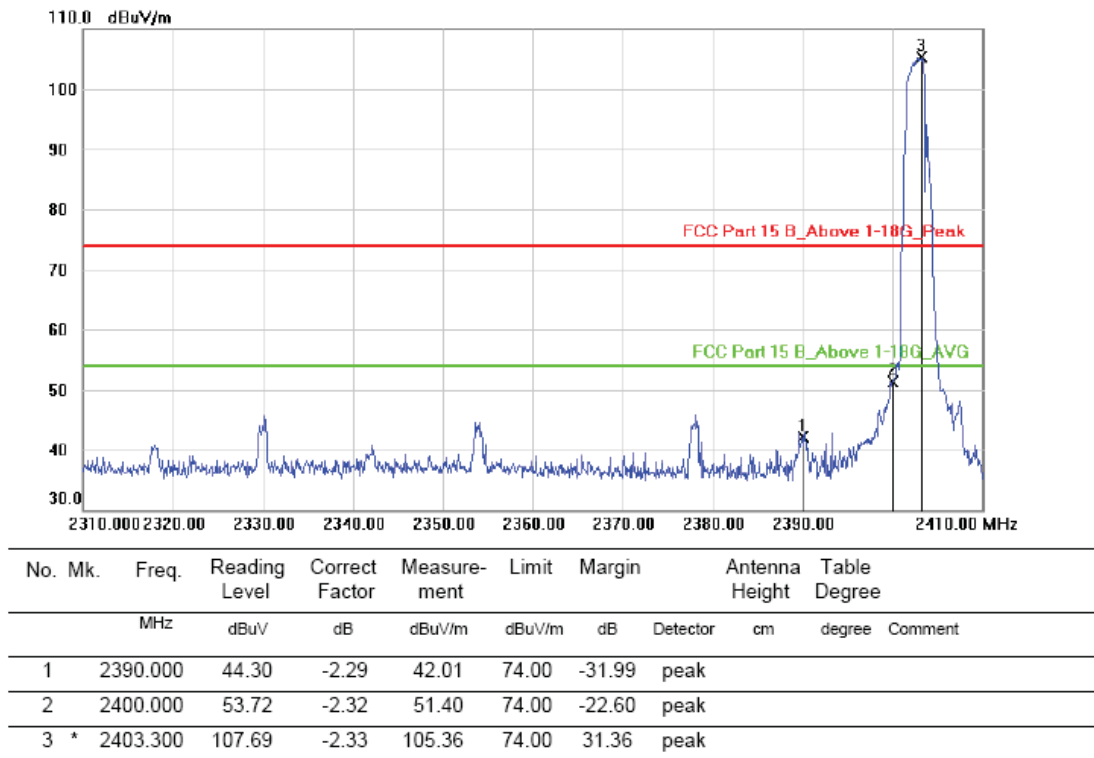
- (5) The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer is set at 1MHz.
- (6) The frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.
- (8) The test results are reported on Section 5.6.



## 5.6. Test Results

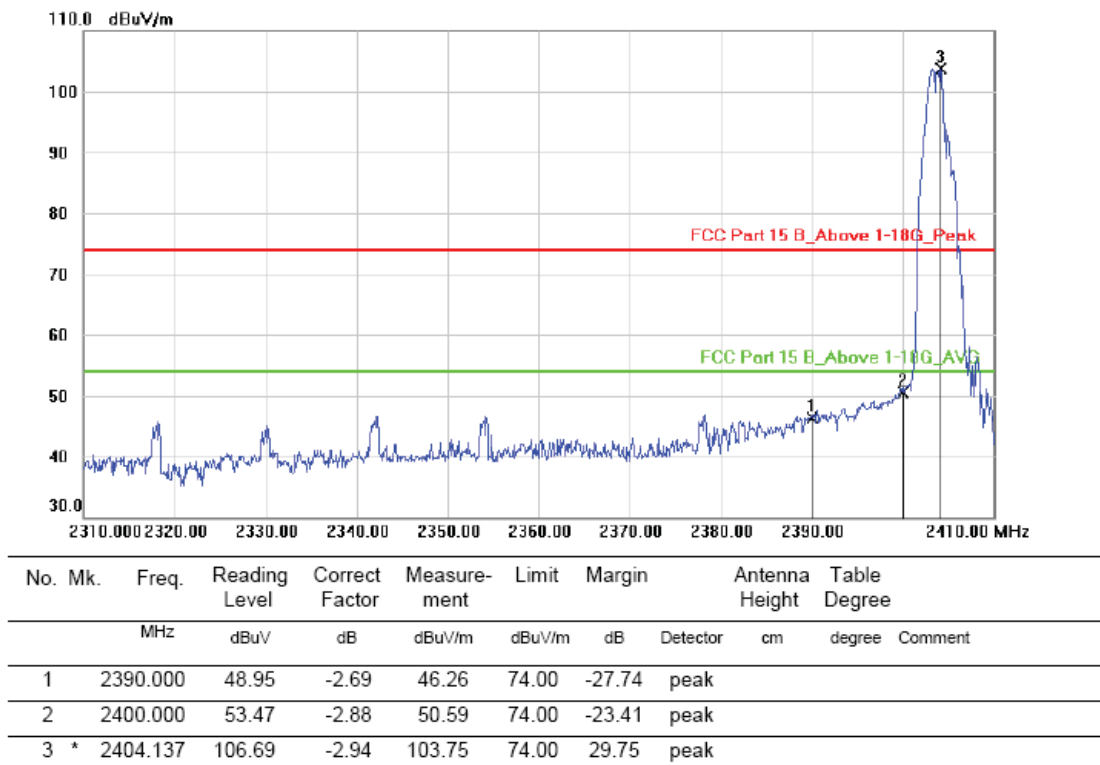
Polarization: Vertical

Test Mode: TX 2402MHz



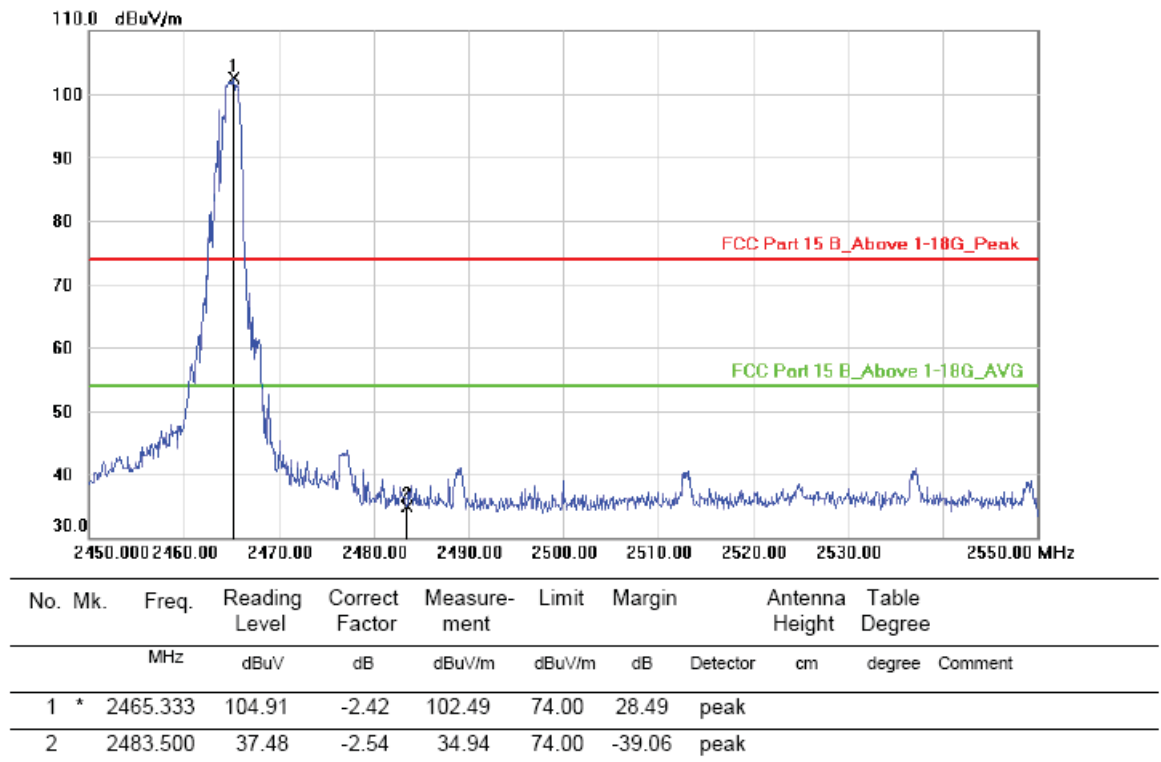
Polarization: Horizontal

Test Mode: TX 2402MHz



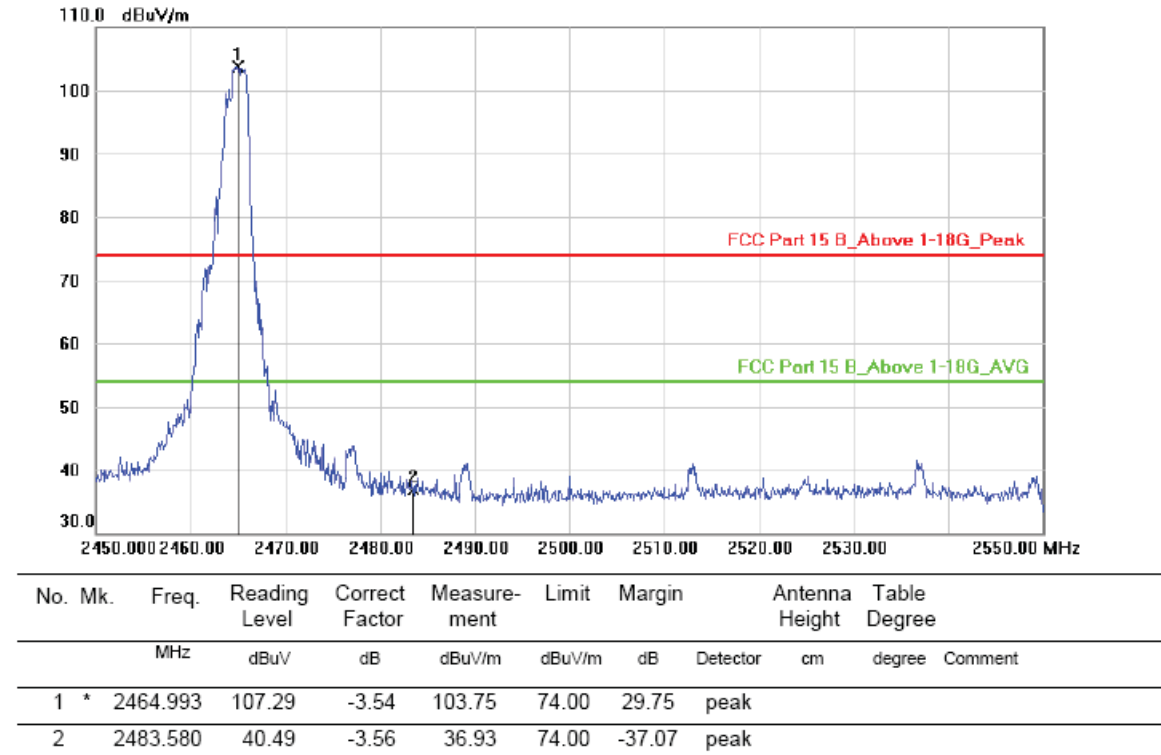
Polarization: Vertical

Test Mode: TX 2465MHz



Polarization: Horizontal

Test Mode: TX 2465MHz



Note: 1. \*:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

## 6. Occupied Bandwidth Test

### 6.1. Block Diagram of Test Setup



### 6.2. Test Limit

Please refer section 15.249 and section 15.205.

### 6.3. Test Procedure

- (1) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- (2) The test receiver RBW set 30KHz, VBW set 100KHz, Sweep time set auto.

### 6.4. Test Results

Mode		Frequency MHz	99% Bandwidth (MHz)	20dB Bandwidth (KHz)	Limit (kHz)
FSK	ANT1	2402	2.0499	2.452	/
		2433	3.7108	5.191	/
		2465	3.3008	3.495	/
Note: 1. The test results are listed in next pages.					

## Frequency: 2402MHz



## Frequency: 2433MHz



## Frequency: 2465MHz



## **7. Antenna Requirement**

### **7.1. Standard 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 shall be considered sufficient to comply with the provisions of this Section. 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.

### **7.2. Antenna Connected Construction**

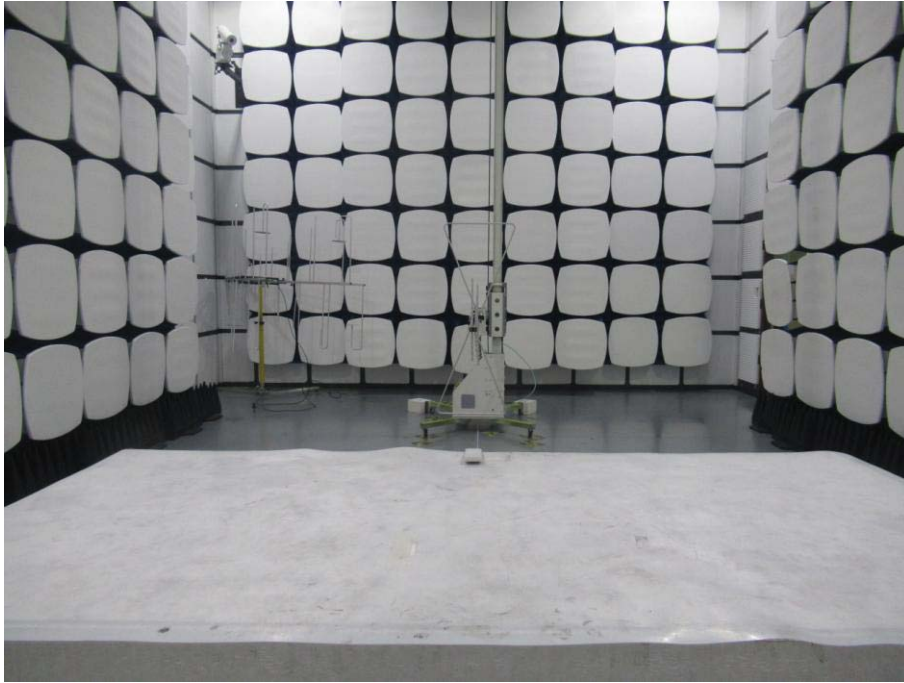
The directional gains of antenna used for transmitting is 1.5dBi, and the antenna is fixed antenna no consideration of replacement. Please see EUT photo for details.

### **7.3. Results**

The EUT antenna is Internal Antenna. It complies with the standard requirement.

## 8. Photograph

### 8.1.Photos of Radiated Emission Test



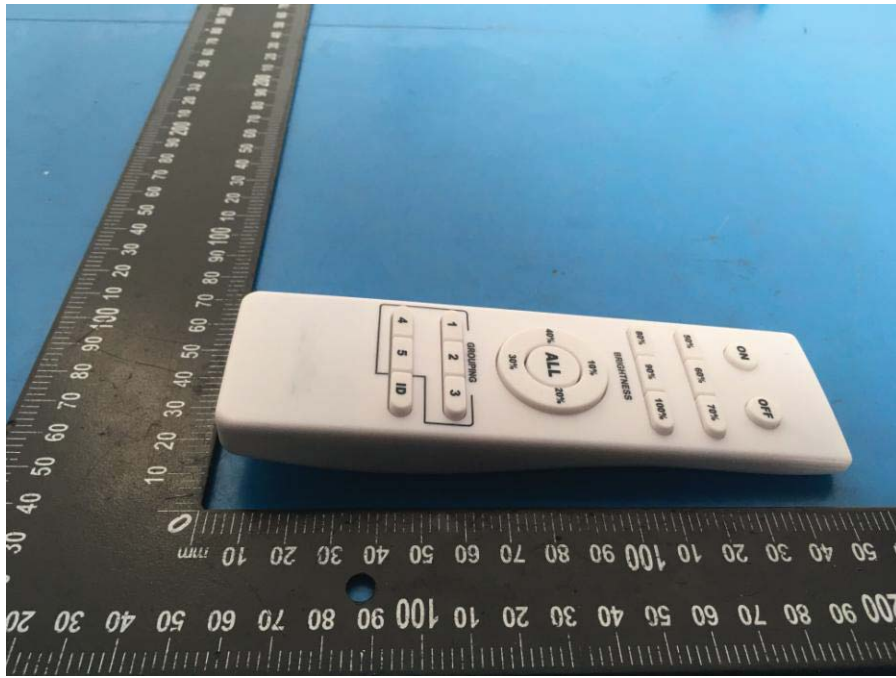
## 9. Photos of The EUT

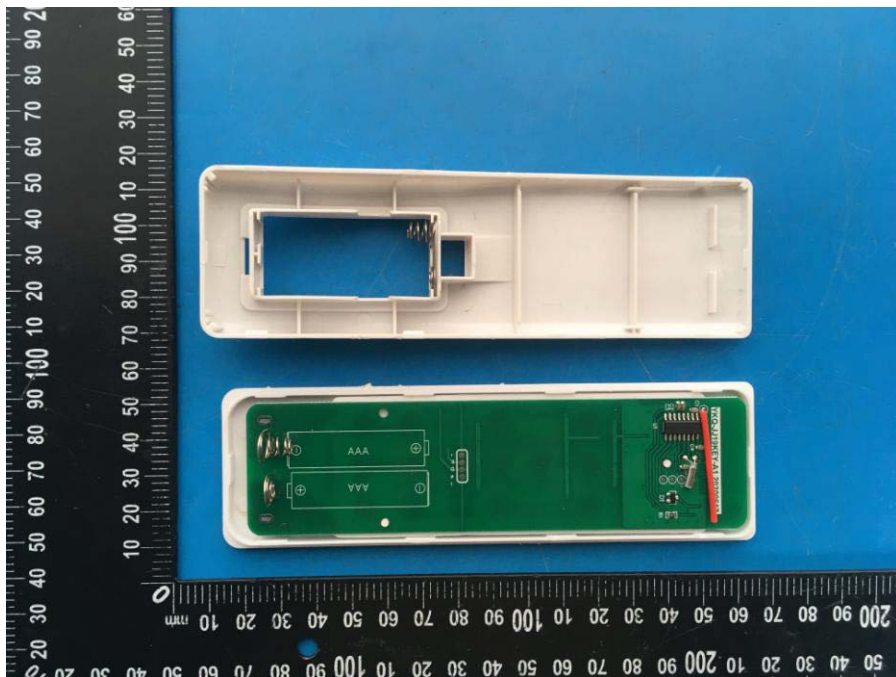


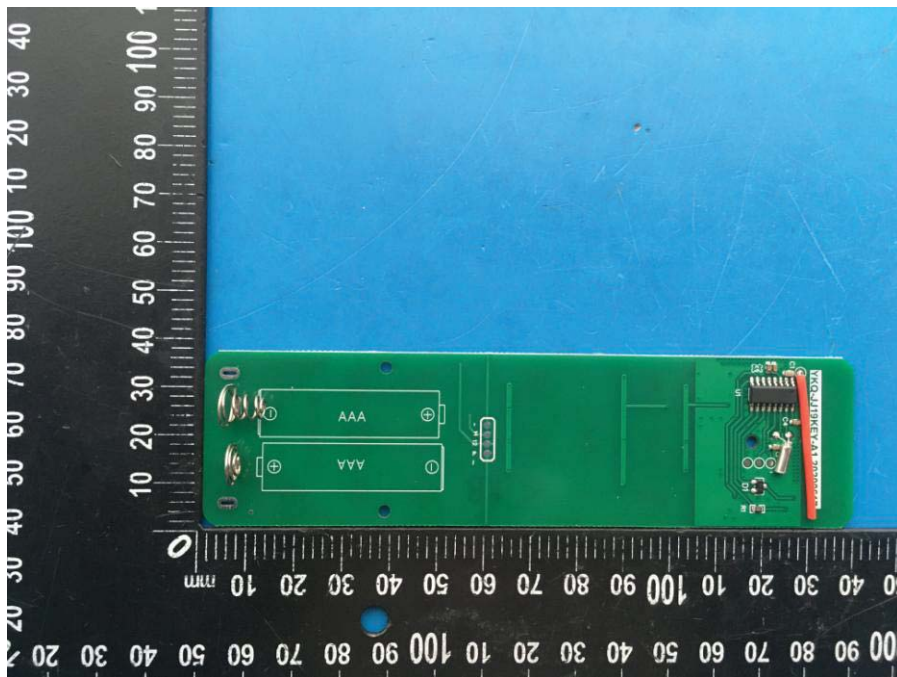
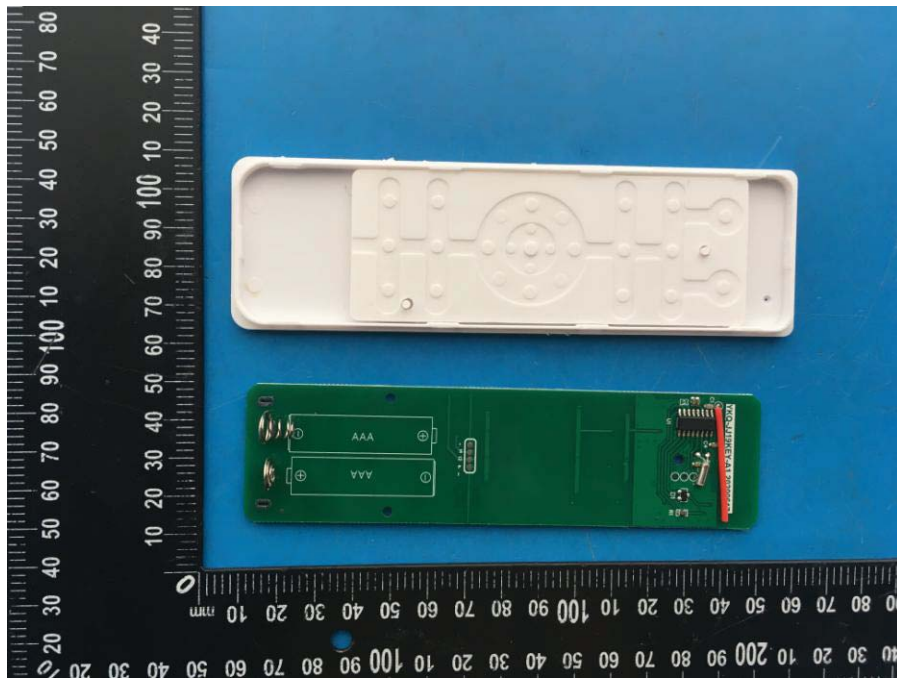


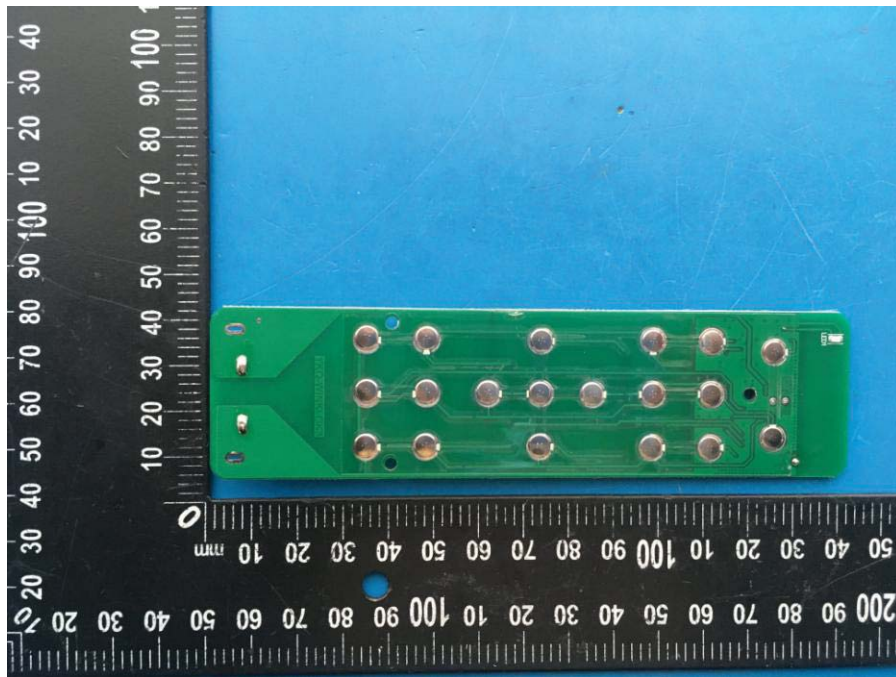












-----THE END OF REPORT-----