FCC 47 CFR PART 15 SUBPART C
TEST REPORT

For

Signcomplex Limited

Yijia Industrial Park, Fuqian Road, Guanlan Town, Bao'an, Shenzhen, Guangdong, China

Model: LC-0RGB-D4-20, LC-0RGB-D4-20A, LR-0RGB-D1-03, LR-00DW-D1-03, LR-000W-D1-03

This Report Concerns: Original Report	Equipment Type: 2.4G Wireless Grouping controller
Test Engineer:	Anna Lv
Report No.:	16ZCTE120500FR
FCC ID:	ZR3LC0RGBD420
Receive EUT Date/Test Date:	Dec 7, 2016 / Dec 7, 2016- Dec 9, 2016
Reviewed By:	Tomy Wu
Prepared By:	**Shenzhen ZCT Technology Co.,Ltd.** 3F, 5th Building, Hongsheng Industrial Zone, No.4336 Bao'an Road, Bao'an District,Shenzhen, China Tel: 400-805-1899 Fax: 0755-23702323

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

Equipment	2.4G Wireless Grouping controller		
Model Name	LC-0RGB-D4-20, LC-0RGB-D4-20A, LR-0RGB-D1-03, LR-00DW-D1-03, LR-000W-D1-03		
Difference of Model	All models are identical in interior stucture, electrical circuits, only the appearance, color model No. are different .So we prepare LC-0RGB-D4-20 for test only.		
Product Description	Operation Frequency	2450MHz	
	Modulation Type		Data Rate
	GFSK		250K/bps
Power Supply	3V		
Battery	3V from CR2032 battery		
Adapter	N/A		
Antenna Type	Integrated antenna, maximum PK gain: 0 dBi		

1.2 Measurement uncertainty

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.32dB
Radiated Disturbance, 9k to 30 MHz	2.76dB (9KHz-150KHz) 2.45dB(150KHz-30MHz)
Radiated Disturbance, 30 to 1000 MHz	4.70 dB (Antenna Polarize: V) 4.84 dB (Antenna Polarize: H)
Radiated Disturbance, 1 to 18 GHz	4.10dB(1-6GHz) 4.40dB (6GHz-18Gz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

1.3 Test Facility

Test Location	Dongguan Dongdian Testing Service Co., Ltd
Address	No. 17, Zongbu Road 2, Songshan Lake Sci&Tech, Dongguan City, Guangdong Province, 523808, China
Accreditation Certificate	Dongguan Dongdian Testing Service Co., Ltd. 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 270092, Renewal date March 11, 2015, valid time is until July 12, 2017. The 3m Alternate Test Site of Dongguan Dongdian Testing Service Co., Ltd. Has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No.10288A on April 23, 2015, valid time is until April 23, 2018.

2 SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

Test Mode	Test Channel	Frequency
Tx mode	N/A	2450MHz

2.2 EUT Exercise Software

N/A

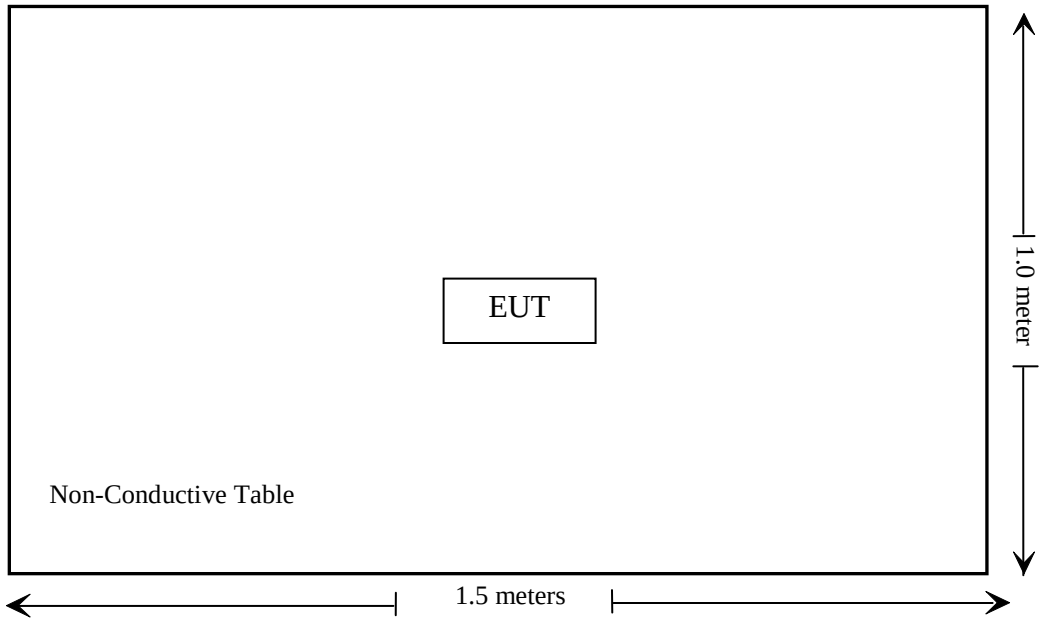
2.3 Special Accessories

No special accessory.

2.4 Equipment Modifications

No modification was made to the EUT.

2.5 Block Diagram of Test Setup



2.6 SUMMARY OF TEST RESULTS

FCC Rules	**Description of Test**	**Test Result**
FCC 15.249 (d)	20dB Bandwidth	Compliance
FCC 15.249 (a)(d)(e) FCC 15.209 FCC 15.205	Radiated Emission	Compliance
FCC 15.207	Conducted Emission Test For AC Power Port	Not Applicable
FCC Part 15: 15.203	Antenna requirement	Compliance

3 20 dB BANDWIDTH

3.1 LIMITS

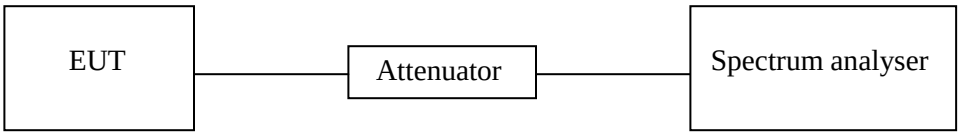
FCC Part15 (15.249) , Subpart C			
Section	Test Item	Limit	Frequency Range (MHz)
FCC 15.249(d)	Bandwidth	for reporting purposes only	2400-2483.5

3.2 Test Procedure

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The centre frequency of the channel under test
Detector	Peak
RBW	100K
VBW	≥3 × RBW
Trace	Max hold
Sweep	Auto couple

3.3 TEST SETUP



3.4 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
Spectrum analyzer	R&S	FSU26	1166.1660.26	2016/10/16	2017/10/16
Attenuator	Mini-Circuits	BW-S10W2	101109	2016/08/18	2017/08/18
RF Cable	Micable	C10-01-01-1	100309	2016/08/18	2017/08/18

3.5 Test Data

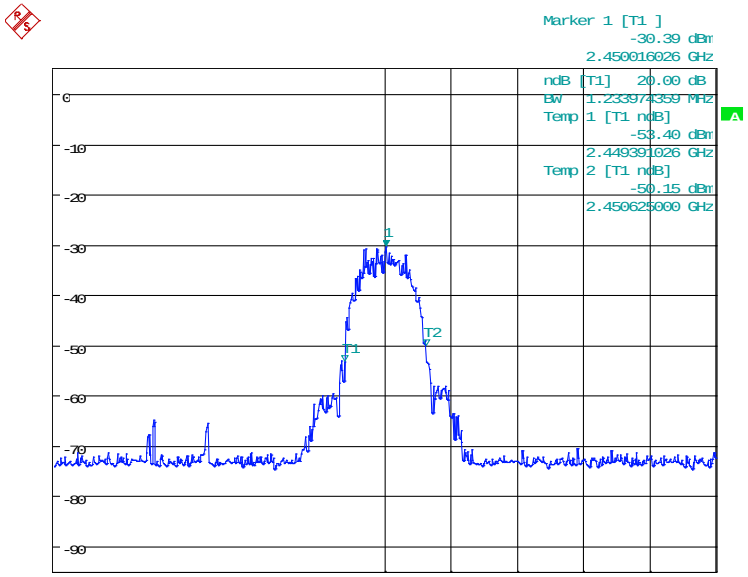
Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0kPa

Test Mode: Transmitting mode

3.6 RESULTS

Frequency (MHz)	20dB bandwidth(MHz)	Result
2450	1.234	Pass



4 Radiated Emission

4.1 LIMITS

Please refer to FCC §15.205 and §15.209
Please refer to FCC §15.249 (a)(d)(e)

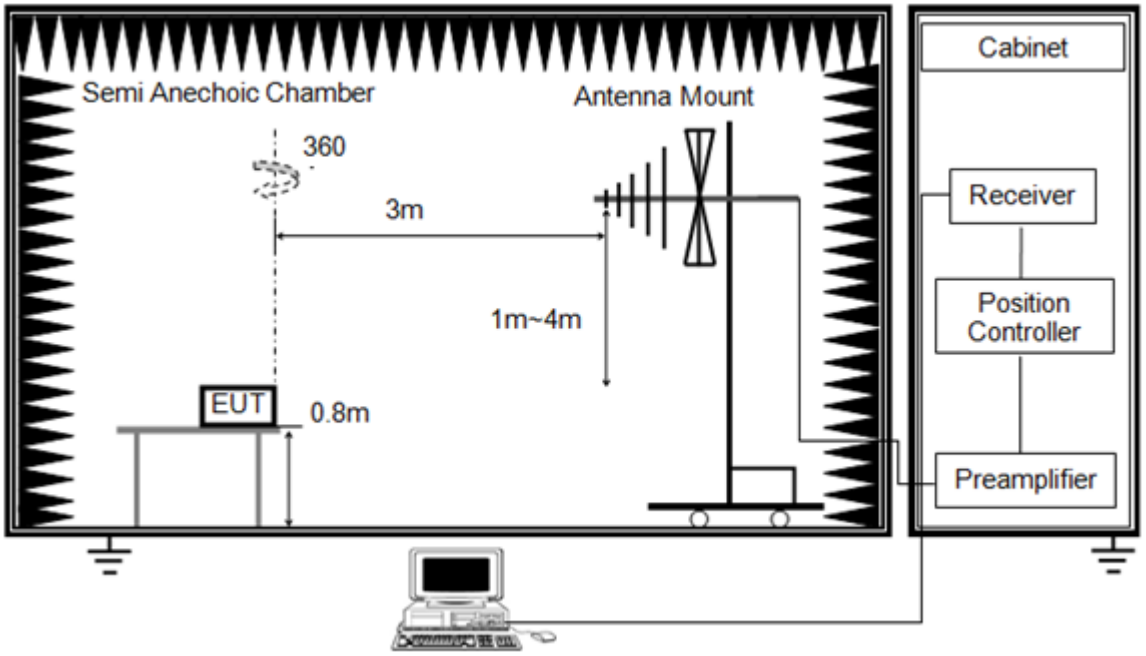
The field strength of emissions from intentional radiators operated within these frequency bands			
Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

Emissions radiated outside of the specified frequency bands			
Frequency Range (MHz) 30 - 88	Field Strength Limit (uV/m) at 3 m 100	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

4.2 Test Setup and Procedure

4.2.1 TEST SETUP AND PROCEDURE

Below 1G



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 0.8 meter above ground.

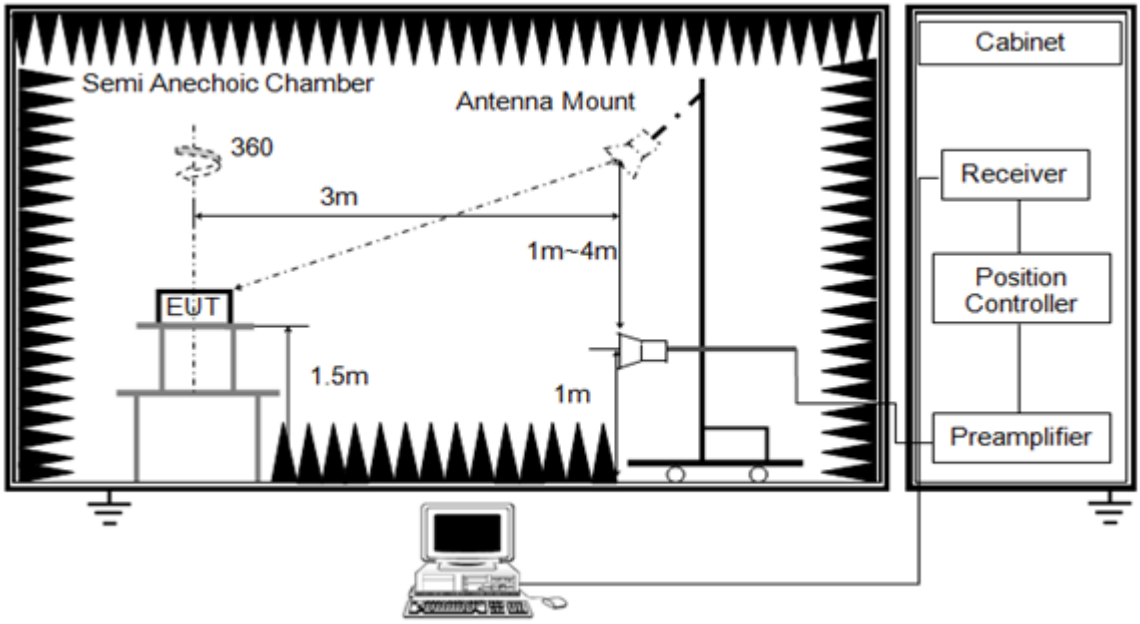
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

6. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

7. For the actual test configuration, please refer to the related ltem in this test report (Photographs of the Test Configuration)

ABOVE 1G



The setting of the spectrum analyser

RBW	1M
VBW	3M/10Hz for Average
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test

in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 1.5 meter above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

6. For measurement above 1GHz, the emission measurement will be measured by the peak detector and the AV detector.

7. For fundamental frequency test, set spectrum analyzer's RBW=3MHz, VBW=10MHz. peak detector for PK, RMS detector for AV, Read the Level in spectrum analyzer and record.

8. According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

4.2.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
EMI Test Receiver	R&S	ESU8	100316	2016/10/16	2017/10/16
Spectrum analyzer	R&S	FSU26	1166.1660.26	2016/10/16	2017/10/16
Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/10/27	2017/10/27
Active Loop antenna	Schwarzbeck	FMZB-1519	1519-038	2016/10/27	2017/10/27
Double Ridged Horn Antenna	R&S	HF907	100276	2016/10/12	2017/10/12
Pre-amplifier	A.H.	PAM-0118	360	2016/10/16	2017/10/16
RF Cable	HUBSER	CP-X2	W11.03	2016/10/16	2017/10/16
RF Cable	HUBSER	CP-X1	W12.02	2016/10/16	2017/10/16
MI Cable	HUBSER	C10-01-01-1M	1091629	2016/10/16	2017/10/16
Test software	Audix	E3	V 6.11111b	/	/

4.2.3 Test Data

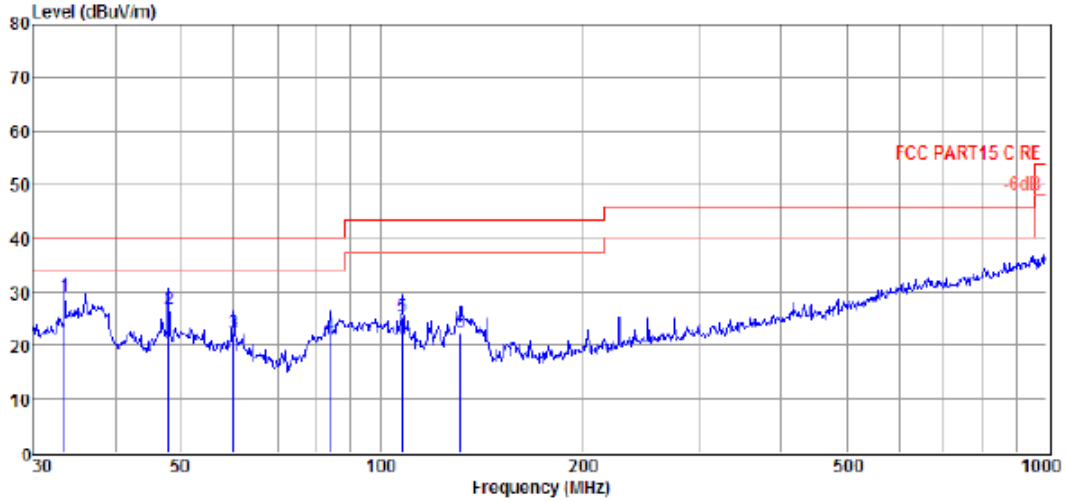
Environmental Conditions

Temperature:	26 ℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

Test Result: Compliant.

SPURIOUS EMISSIONS BELOW 1 GHz

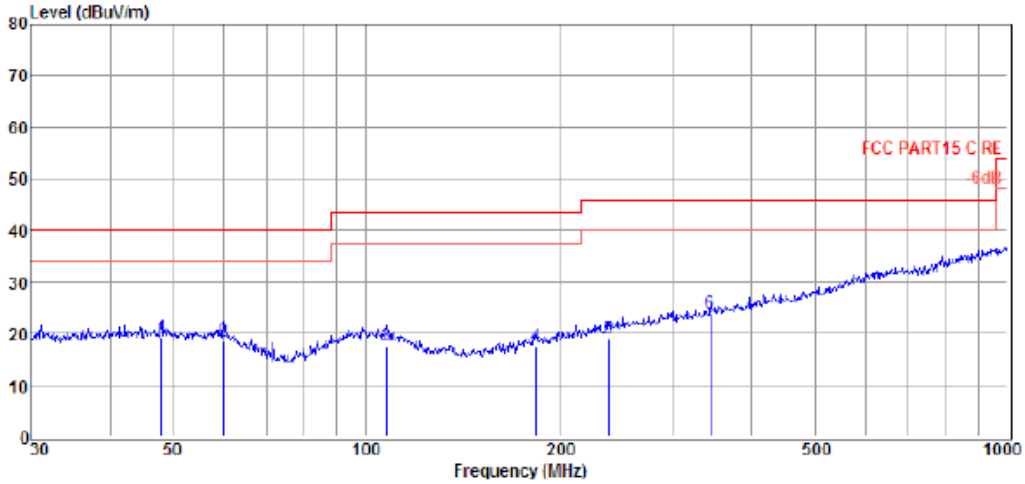
(TX mode, VERTICAL)



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	33.56	13.77	11.56	3.72	29.05	40.00	-10.95	QP	VERTICAL
2	47.99	10.40	12.30	3.87	26.57	40.00	-13.43	QP	VERTICAL
3	60.07	6.74	11.67	3.98	22.39	40.00	-17.61	QP	VERTICAL
4	83.82	8.98	8.58	4.18	21.74	40.00	-18.26	QP	VERTICAL
5	107.89	9.81	11.25	4.35	25.41	43.50	-18.09	QP	VERTICAL
6	131.76	10.01	7.83	4.49	22.33	43.50	-21.17	QP	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

(TX mode, HORIZONTAL)



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	47.99	3.09	12.30	3.87	19.26	40.00	-20.74	QP	HORIZONTAL
2	59.86	2.71	11.70	3.98	18.39	40.00	-21.61	QP	HORIZONTAL
3	107.89	1.95	11.25	4.35	17.55	43.50	-25.95	QP	HORIZONTAL
4	183.84	3.23	9.66	4.80	17.69	43.50	-25.81	QP	HORIZONTAL
5	239.15	1.99	11.87	5.09	18.95	46.00	-27.05	QP	HORIZONTAL
6	344.39	3.56	14.70	5.56	23.82	46.00	-22.18	QP	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

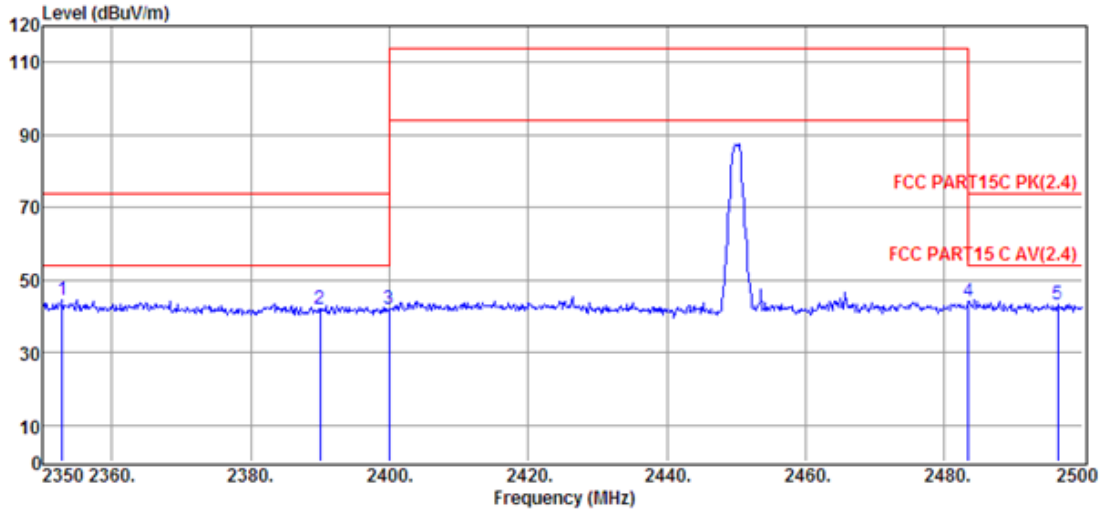
SPURIOUS EMISSIONS (1~18GHz)

Freq (MHz)	Read level (dBμV)	Antenna Factor (dB/m)	PRM Factor (dB)	Cable Loss (dB)	Result Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector type	Polarization
Tx mode									
2450.00	86.68	30.01	29.60	6.10	93.19	114.00	-20.81	Peak	HORIZONTAL
4017.00	38.15	33.41	29.04	7.63	50.15	74.00	-23.85	Peak	HORIZONTAL
4890.00	36.63	33.72	29.33	8.56	49.58	54.00	-4.42	Average	HORIZONTAL
4890.00	46.63	33.72	29.33	8.56	59.58	74.00	-14.42	Peak	HORIZONTAL
6201.00	35.81	35.33	29.36	9.78	51.56	74.00	-22.44	Peak	HORIZONTAL
7356.00	34.00	36.49	30.61	10.74	50.62	54.00	-3.38	Average	HORIZONTAL
7356.00	40.00	36.49	30.61	10.74	56.62	74.00	-17.38	Peak	HORIZONTAL
2450.00	80.36	30.01	29.60	6.10	86.87	114.00	-27.13	Peak	VERTICAL
3114.00	40.02	31.75	30.12	6.90	48.55	74.00	-25.45	Peak	VERTICAL
4890.00	35.79	33.72	29.33	8.56	48.74	54.00	-5.26	Average	VERTICAL
4890.00	42.79	33.72	29.33	8.56	55.74	74.00	-18.26	Peak	VERTICAL
6040.00	35.47	35.07	29.22	9.70	51.02	74.00	-22.98	Peak	VERTICAL
7104.00	35.29	36.29	30.43	10.53	51.68	74.00	-22.32	Peak	VERTICAL
7895.00	35.97	36.68	31.09	11.08	52.64	74.00	-21.36	Peak	VERTICAL

Note: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

RESTRICTED BANDEDGE

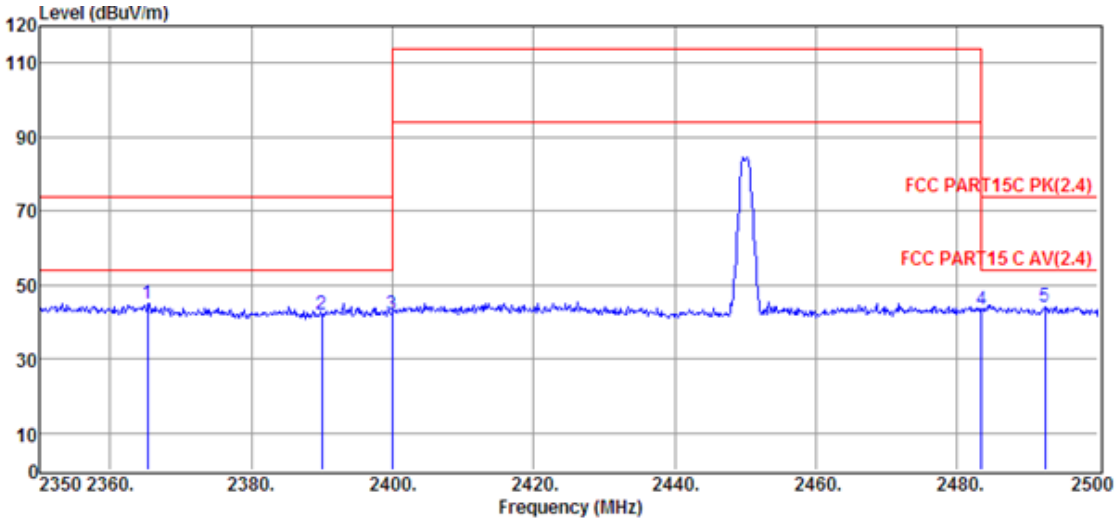
(HORIZONTAL)



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2352.85	38.40	29.63	29.34	5.96	44.65	74.00	-29.35	Peak	HORIZONTAL
2	2390.00	35.75	29.78	29.41	6.01	42.13	74.00	-31.87	Peak	HORIZONTAL
3	2400.00	35.62	29.82	29.44	6.03	42.03	74.00	-31.97	Peak	HORIZONTAL
4	2483.50	37.63	30.14	29.71	6.15	44.21	74.00	-29.79	Peak	HORIZONTAL
5	2496.40	36.91	30.19	29.75	6.15	43.50	74.00	-30.50	Peak	HORIZONTAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

(VERTICAL)



Item (Mark)	Freq. (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	PRM Factor dB	Cable Loss dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector	Polarization
1	2365.30	38.76	29.68	29.37	5.98	45.05	74.00	-28.95	Peak	VERTICAL
2	2390.00	35.89	29.78	29.41	6.01	42.27	74.00	-31.73	Peak	VERTICAL
3	2400.00	35.53	29.82	29.44	6.03	41.94	74.00	-32.06	Peak	VERTICAL
4	2483.50	36.67	30.14	29.71	6.15	43.25	74.00	-30.75	Peak	VERTICAL
5	2492.50	37.66	30.17	29.73	6.15	44.25	74.00	-29.75	Peak	VERTICAL

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - PRM Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Test setup: RBW: 1 MHz, VBW: 3 MHz, Sweep time: auto.

5 Antenna Requirements

5.1 Requirements

Please refer to FCC §15.203
If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. 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 FCC rule.

5.2 Antenna connector

EUT has an Integrated antenna without antenna connector.

5.3 Antenna Gain

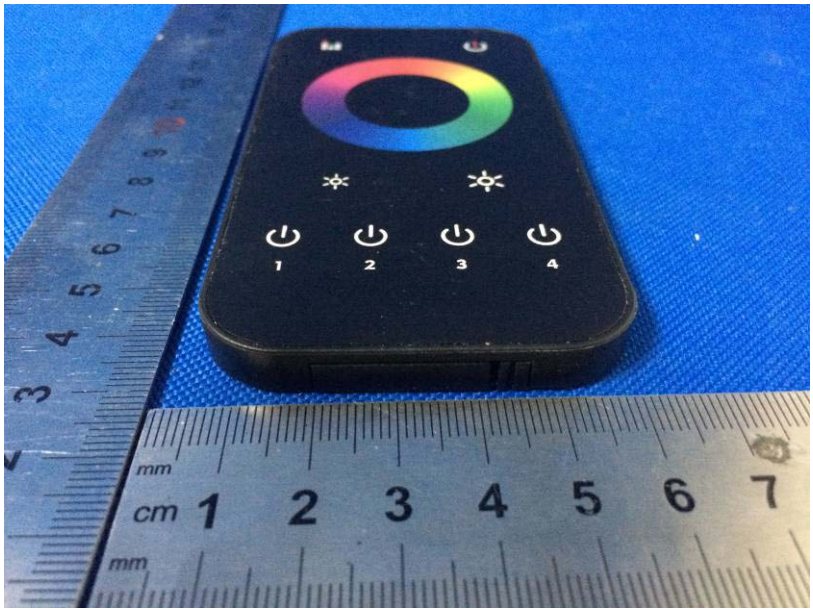
The antenna gain of EUT is less than 0 dBi.

6 EXHIBIT B - EUT PHOTOGRAPHS

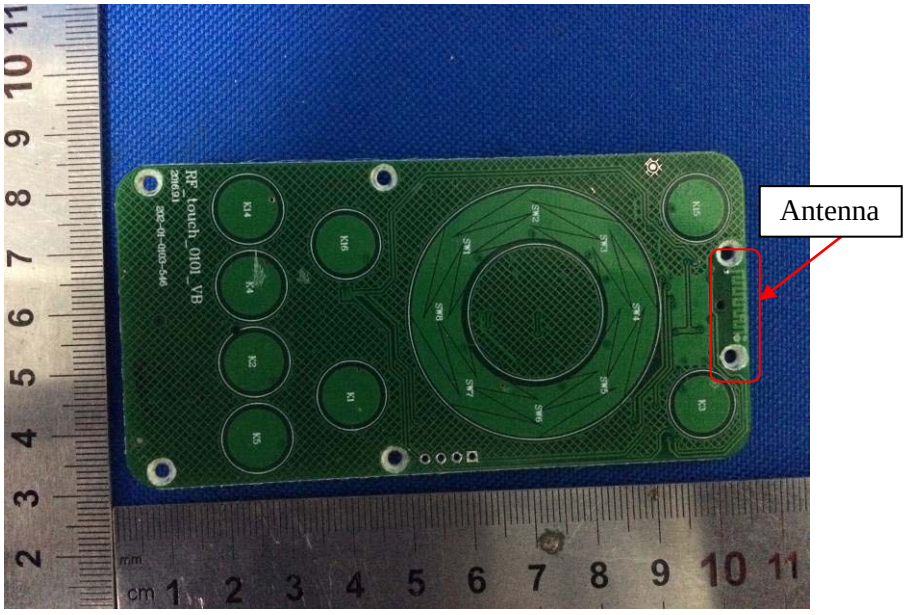
EUT – All View

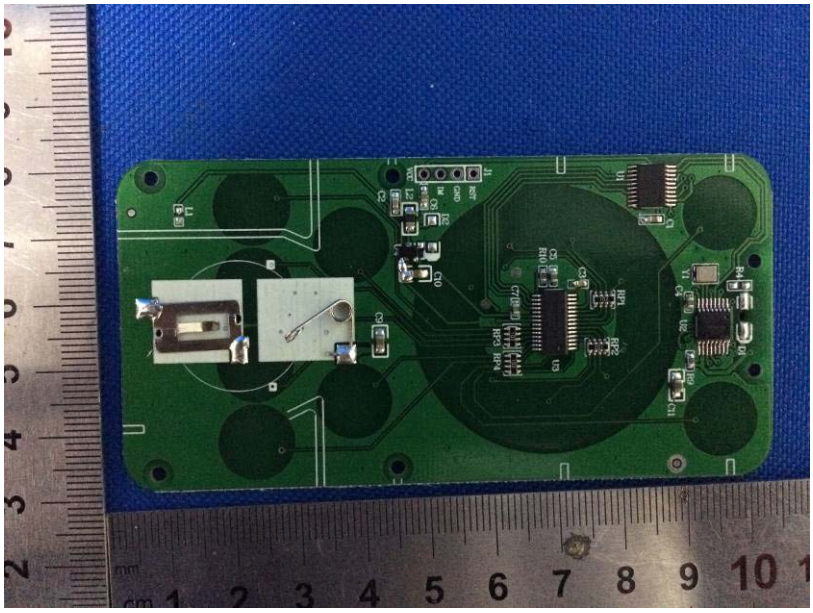

1
2
3
4


FREQUENCY 2.4G
USE BATTERY CR2032 SIZE


1
2
3
4
mm
cm 1 2 3 4 5 6 7
mm


mm
cm 1 2 3 4 5 6 7
mm


Antenna

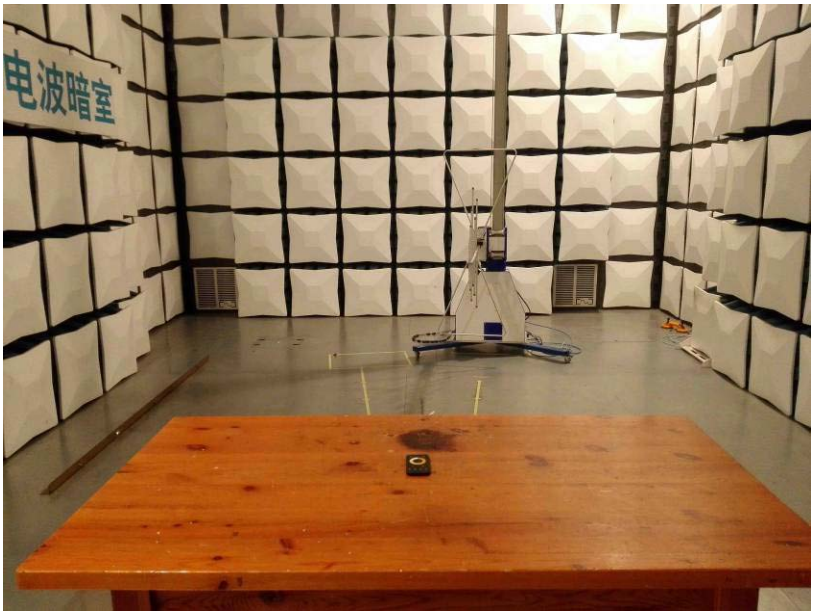



CR2032
3V THUMBCELLS
mm


2
3
4
5
6
mm

7 EXHIBIT C - TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions



*******END OF REPORT*******