

## ***FCC TEST REPORT***

**FCC ID** : YOIN3-015TX

**Applicant** : PEGA HK LIMITED

**Address of Applicant** : Unit 10A,12/F,Tower2,China HongKong City,No.33 Canton Road,  
Tsim Sha Tsui,HongKong

**Equipment Under Test (EUT) :**

Product description : Raven (Alternate Version )


Model No. : N3-015 ( 83081 )

Frequency Range : 2410MHz to 2470MHz

**Standards** : FCC 15 Paragraph 15.247

**Date of Test** : August 2~12,2010

**Test Engineer** : Zero Zhou

**Reviewed By** : 

PREPARED BY:

**Waltek Services (Shenzhen) Co., Ltd.**

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen  
518105, China

Tel : +86-755-27553488

Fax : +86-755-27553868

## 2 Contents

	Page
<b>1 COVER PAGE.....</b>	<b>1</b>
<b>2 CONTENTS.....</b>	<b>2</b>
<b>3 TEST SUMMARY.....</b>	<b>4</b>
<b>4 GENERAL INFORMATION.....</b>	<b>5</b>
4.1 CLIENT INFORMATION .....	5
4.2 GENERAL DESCRIPTION OF E.U.T.....	5
4.3 DETAILS OF E.U.T. ....	5
4.4 DESCRIPTION OF SUPPORT UNITS .....	5
4.5 STANDARDS APPLICABLE FOR TESTING.....	5
4.6 TEST FACILITY.....	6
4.7 TEST LOCATION.....	6
4.8 EQUIPMENT USED DURING TEST .....	7
<b>5 RADIATION EMISSION TEST.....</b>	<b>10</b>
5.1 TEST EQUIPMENT.....	10
5.2 MEASUREMENT UNCERTAINTY.....	10
5.3 TEST PROCEDURE .....	10
5.4 RADIATED TEST SETUP .....	11
5.5 SPECTRUM ANALYZER SETUP.....	11
5.6 CORRECTED AMPLITUDE & MARGIN CALCULATION .....	12
5.7 EUT OPERATING CONDITION .....	13
5.8 RADIATED EMISSIONS LIMIT ON PARAGRAPH 15.209 .....	13
5.9 RADIATED EMISSIONS TEST RESULT .....	14
5.10 RADIATED EMISSION DATA .....	14
5.10.1 Test Data for Receiving mode .....	15
5.10.2 Test Data for Transmitting mode .....	19
<b>6 ANTENNA REQUIREMENT.....</b>	<b>23</b>
<b>7 MAXIMUM PEAK OUTPUT POWER.....</b>	<b>23</b>
<b>8 HOPPING CHANNEL NUMBER.....</b>	<b>24</b>
<b>9 FREQUENCY SEPARATED.....</b>	<b>25</b>
<b>10 DWELL TIME.....</b>	<b>28</b>
<b>11 20-DB BANDWIDTH.....</b>	<b>32</b>
<b>12 RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND .....</b>	<b>34</b>
<b>13 PHOTOGRAPHS OF TEST SETUP FOR CTX AND CRX .....</b>	<b>36</b>
<b>14 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS .....</b>	<b>37</b>
14.1 EUT - FRONT VIEW .....	37
14.2 EUT - BACK VIEW .....	37
14.3 EUT- OPEN VIEW .....	38

14.4 PCB1- FRONT VIEW .....38

14.5 PCB1- BACK VIEW .....39

14.6 PCB2- FRONT VIEW .....39

14.7 PCB2 - BACK VIEW .....40

**15 FCC ID LABEL.....41**

### 3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2008	ANSI C63.4: 2003	125mW	PASS
Restricted Band	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
Dwell time	FCC Part 15:2008	ANSI C63.4: 2003	Maximum:0.4 s	PASS
Channel separation	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
Hopping channel No.	FCC Part 15:2008	ANSI C63.4: 2003	As the test data	PASS
20-dB Bandwidth	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
Mains Terminal Disturbance Voltage, 150kHz to 30MHz	FCC Part 15:2008	ANSI C63.4: 2003	N/A	N/A
Spurious Radiation Emission, 30MHz to 25GHz	FCC Part 15:2008	ANSI C63.4: 2003	N/A	PASS

**N/A:** Not Applicable,since the EUT operation with battery.

**Note :** denote that for more details of the EUT , please refer to the relating test items as below .

**Remark :** the methods of measurement in all the test items were according to the FCC Public Notice DA 00-705 .

## 4 General Information

### 4.1 Client Information

Applicant: PEGA HK LIMITED  
Address of Applicant: Unit 10A,12/F,Tower2,China HongKong City,No.33 Canton Road,Tsim Sha Tsui,HongKong

Manufacturer: SHENZHEN PEGA ELECTRONICS TECHNOLOGY CO.,LTD  
Address of Manufacturer: 7Floor, Building A, PEGA Industrial Zone, Xingye Road, the 65th Block, Xixiang Town, Bao'an District, Shenzhen City, China

### 4.2 General Description of E.U.T.

Product description: Raven (Alternate Version )  
Model No.: N3-015 ( 83081 )

### 4.3 Details of E.U.T.

Power Supply: Game Pad:DC3.7V/30mA

### 4.4 Description of Support Units

The EUT has been tested as an independent unit.

### 4.5 Standards Applicable for Testing

The customer requested FCC tests for a Raven (Alternate Version ). The standards used were FCC 15 Paragraph 15.247, Paragraph 15.205, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

#### 4.6 Test Facility

The test facility has a test site registered with the following organizations:

- **FCC – Registration No.: 880581**

Waltek Services(Shenzhen) 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 880581, June 24, 2008.

- **IC – Registration No.: IC 7760A**

Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration No.: 7760A, August 3, 2010.

#### 4.7 Test Location

All Emission tests were performed at:-

1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen 518105, Guangdong, China.

**Remark :** All the test results of the peripherals were conformed to the Fcc Verification requirements.

**4.8 Equipment Used during Test**

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY451149 43	W2008001	9k-26.5GHz	Aug-10	Aug-11	Wws200 81596	±1dB
Trilog Broadband Antenne 30-3000 MHz	SCHWARZB ECK MESS- ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug-10	Aug-11		±1dB
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM / VULB9163	667	W2008003	1-18GHz	Aug-10	Aug-11		f<10 GHz: ±1dB 10GHz<f< 18 GHz: ±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS- ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug-10	Aug-11		±1.2dB
10m Coaxial Cable with N-male Connectors usable up to 25GHz,	SCHWARZB ECK MESS- ELEKTROM / AK 9515 H	-	-	-	Aug-10	Aug-11		-
10m 50 Ohm Coaxial Cable with N-plug, individual length,usable up to 3(5)GHz, Connector	SCHWARZB ECK MESS- ELEKTROM / AK 9513				Aug-10	Aug-11		
Positioning Controller	C&C LAB/ CC-C-IF				N/A	N/A		
Color Monitor	SUNSP0/ SP-14C				N/A	N/A		
Test Receiver	ROHDE&SC HWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug-10	Aug-11	Wws200 80942	±1dB
EMI Receiver	Beijingkehua n	KH3931		9k-1GHz	Aug-10	Aug-11		
Two-Line V-Network	ROHDE&SC HWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug-10	Aug-11	Wws200 80941	±10%
Absorbing Clamp	ROHDE&SC HWARZ/ MDS-21	100205	W2005003	impedance50 Ω loss : 17 dB	Aug-10	Aug-11	Wws200 80943	±1dB

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connectors	SCHWARZBECK MESS-ELEKTROM / AK 9514				Aug-10	Aug-11		
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V07451 03095	W2008012	Power: 2000VA Vol-range: 0-300V Freq_range: 10-80Hz	Aug-10	Aug-11	Wwd200 81185	Voltage distinguish: 0.025% Power_freq distinguish: 0.02Hz
Power Source	Em Test AG/Switzerland/ ACS 500	V07451 03096	W2008013	Vol-range: 0-300V Power_freq: 10-80Hz				
Electrostatic Discharge Simulator	Em Test AG/Switzerland/DITO	V07451 03094	W2008005	Contact discharge: 500V-10KV Air discharge: 500V-16.5KV	Aug-10	Aug-11	Wwc200 82400	7.5A current will be changed in $V_m=1.5V$
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Freq-range: 9K-1GHz RF voltage: -60 dBm-+10dBm	Aug-10	Aug-11	Wws200 81890	Power_freq distinguish 0.1Hz RF electricity distinguish 0.1 B
CDN M-Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug-10	Aug-11	Wwc200 82396	150K-80MHz: $\pm 1dB$ 80-230MHz: -2-+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range: 0.15-1000 MHz	Aug-10	Aug-11	Wwc200 82397	0.3-400 MHz: $\pm 4dB$ Other freq: $\pm 5dB$
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365			Aug-10	Aug-11	Wws200 81597	
All Modules Generator	SCHAFFNER/6150	34579	W2008006	voltage: 200V-4.4KV Pulse current: 100A-2.2KA	Aug-10	Aug-11	Wwc200 82401	voltage: $\pm 10\%$ Pulse current: $\pm 10\%$



Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Capacitive Coupling Clamp	SCHAFFNE R/ CDN 8014	25311			Aug-10	Aug-11	Wwc200 82398	-
Signal and Data Line Coupling Network	SCHAFFNE R/ CDN 117	25627	W2008011	1.2/50 $\mu$ S	Aug-10	Aug-11	Wwc200 82399	-
AC Power Supply	TONGYUN/ DTDGC-4				Aug-10	Aug-11	Wws200 80944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/230 4/03	M-0155	w2008022	Test freq range: 1—400kHz	Aug-10	Aug-11	Wwd200 81191	Test uncertainly: 1—120kHz:±1.83%, 120 kHz-400 kHz: ±4.06%
Magnetic Field Probe 100cm <sup>2</sup>	Narda Safety TEST Solutions/230 0/90.10	M-1070	w2008021	Test freq range: 1—400kHz				Test uncertainly: 1Hz-10Hz: ±16.2%, 10Hz - 120kHz:±2.2%, 120 kHz-400 kHz: ±4.7%
Active Loop Antenna Charger 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug-10	Aug-11		±1dB

## 5 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	30MHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth) Quasi-Peak if maximised peak within 6dB of limit

### 5.1 Test Equipment

Please refer to Section 4 this report.

### 5.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

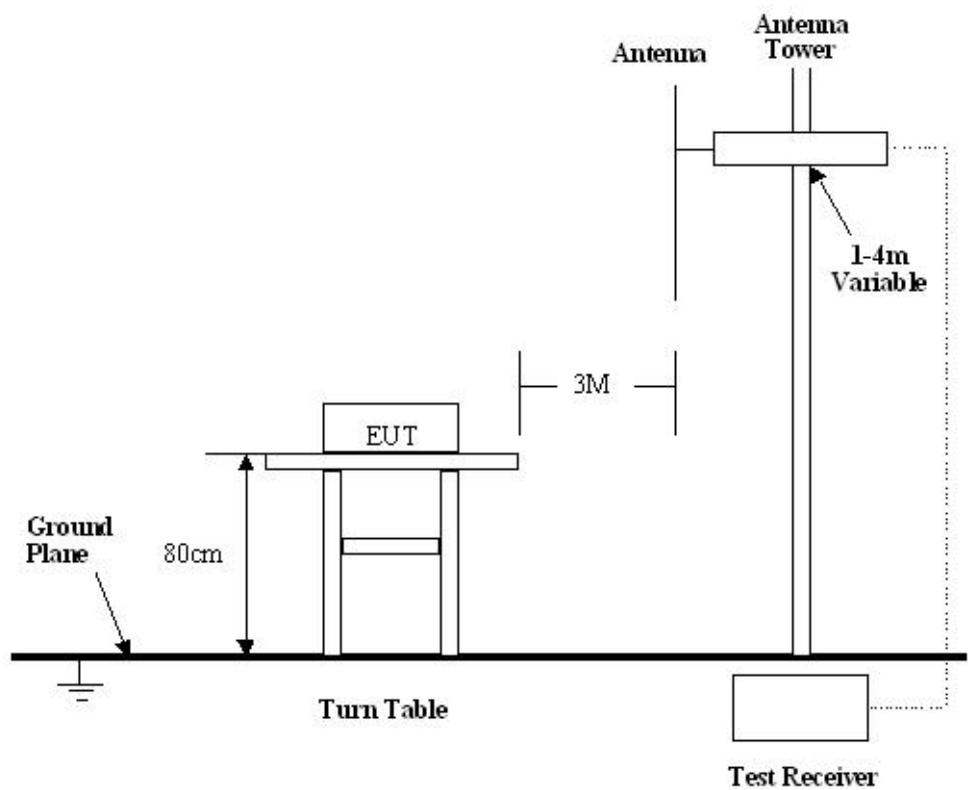
Based on ANSI C63.4:2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is  $\pm 5.03$  dB.

### 5.3 Test Procedure

1. New batteries were installed in the equipment under test for radiated emissions test
2. This is a handheld device, The radiation emission should be tested under 3-axes(X,Y,Z) position(X denotes lying on the table,Y denotes side stand and Z denotes vertical stand),After pre-test,It was found that the worse radiation emission was get at the X position.So the data shown was the X position only.
3. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
4. All data was recorded in the peak and average detection mode.
5. The EUT was under working mode during the final qualification test and the configuration was used to represent the worst case results.

5.4Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.209 limits and Paragraph 15.247 limits.



5.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested up to 25000 MHz. Below 1GHz

- Start Frequency .....30 MHz
- Stop Frequency .....1000 MHz
- Sweep Speed Auto
- IF Bandwidth.....120 kHz
- Video Bandwidth.....100KHz
- Quasi-Peak Adapter Bandwidth .....120 kHz
- Quasi-Peak Adapter Mode.....Normal
- Resolution Bandwidth .....100KHz

Above 1GHz

Start Frequency .....	1000 MHz
Stop Frequency .....	25000MHz
Sweep Speed	Auto
IF Bandwidth.....	120 kHz
Video Bandwidth .....	1MHz
Quasi-Peak Adapter Bandwidth .....	120 kHz
Quasi-Peak Adapter Mode.....	Normal
Resolution Bandwidth .....	1MHz

5.6Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor – Amplifier Gain

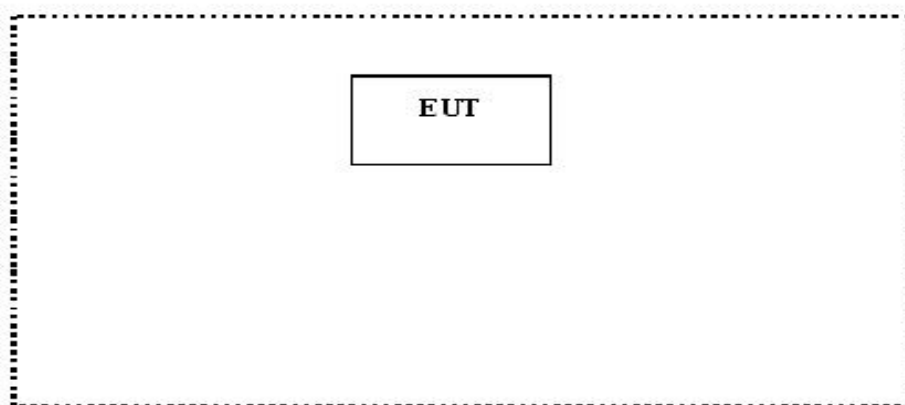
The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dBμV means the emission is 7dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

### 5.7 EUT Operating Condition

Operating condition is according to ANSI C63.4:2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



### 5.8 Radiated Emissions Limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

- Note:**
- (1)  $\text{RF Voltage(dBuV)} = 20 \log \text{RF Voltage(uV)}$
  - (2) In the Above Table, the tighter limit applies at the band edges.
  - (3) Distance refers to the distance in meters between the measuring instrument antenna.
  - (4) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
  - (5) Above 1GHz, make a Peak and average measurements for all emissions, Limit for peak is 74dBuV/m, According to Part 15.35(b) and average is 54BuV/m.

### 5.9 Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding  
The meter reading of the spectrum analyzer (which is set to read in units of dBuV/m)  
To the antenna correction factor supplied by the antenna manufacturer. The antenna  
Correction factors are stated in terms of dB. The gain of the preselector was accounted  
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33            20dBuV+10.36dB=30.36dBuV/m @3m

### 5.10 Radiated Emission Data

Test Condition:

Temperature:                    25.5 °C

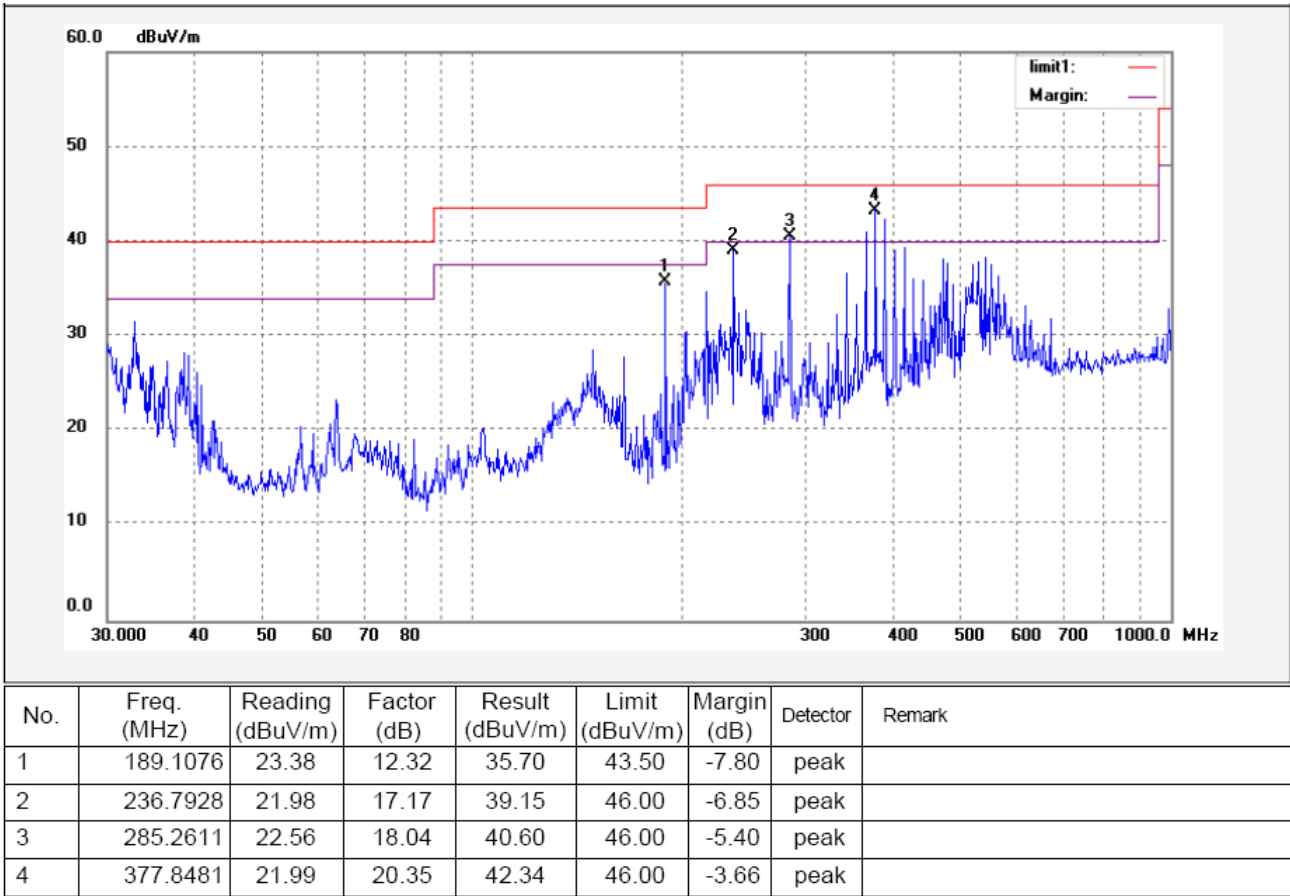
Humidity:                        51%RH

5.10.1 Test Data for Receiving mode

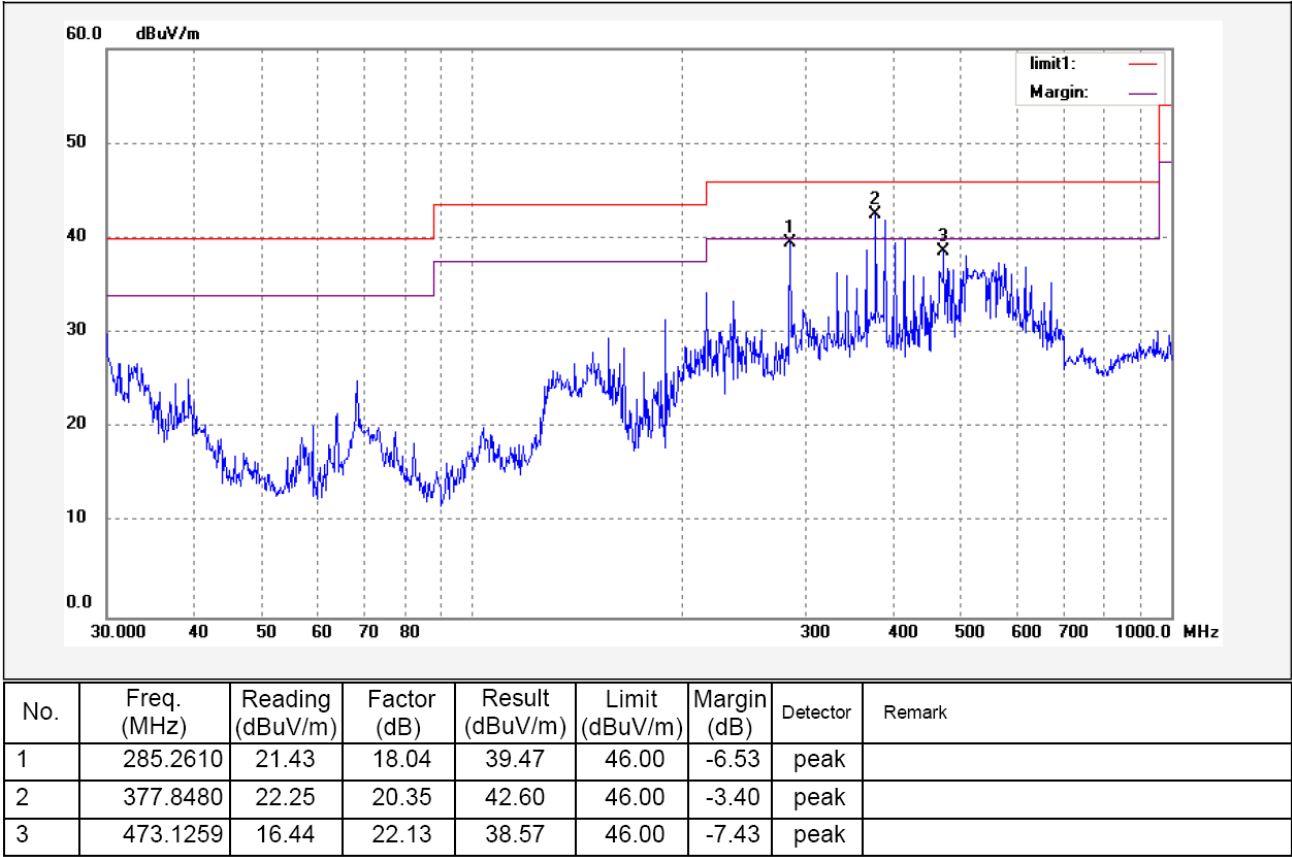
Remark: the EUT was pretested at the high,middle and low channel, and the worse case was the low Channel,so the data show was the low channel only.

Test frequency : 30-1000MHz radiation test data:

Vertical

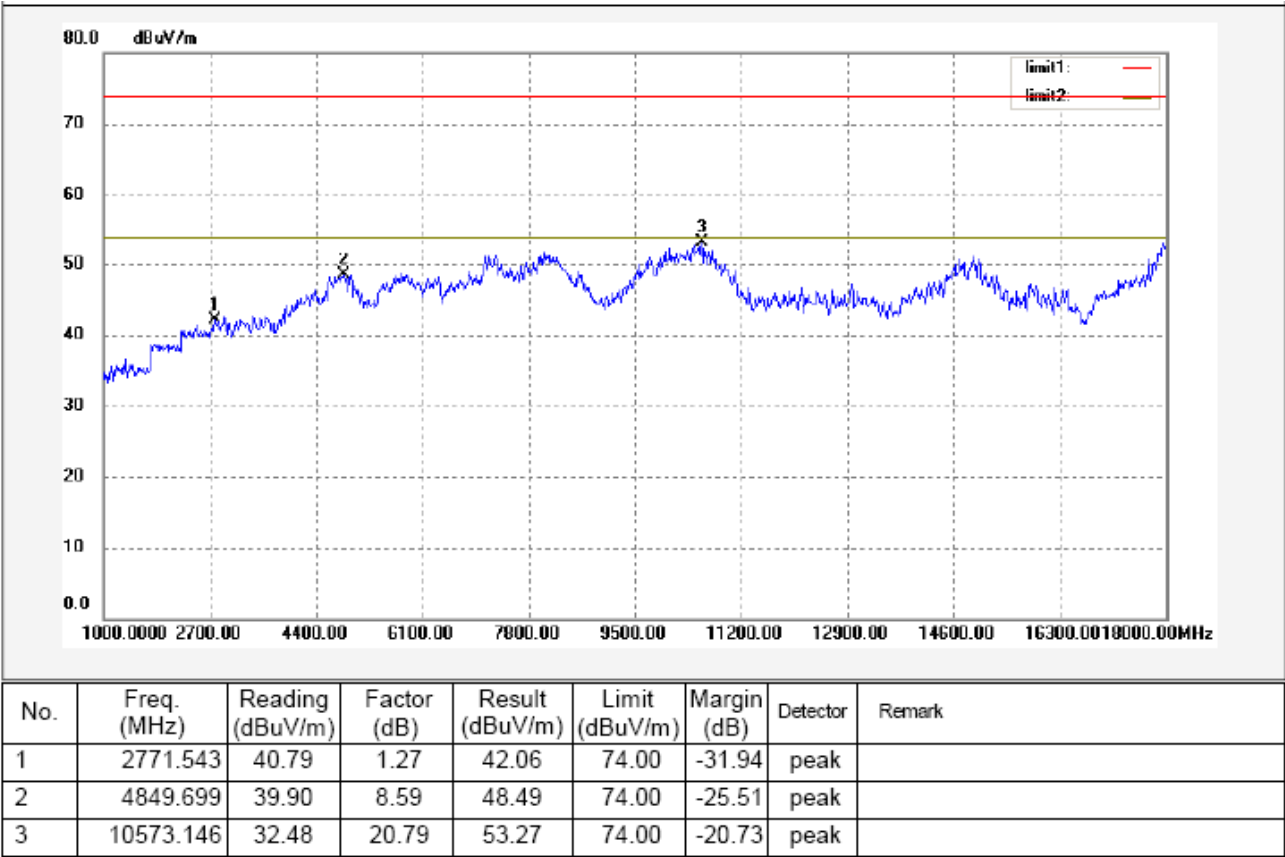


Horizontal

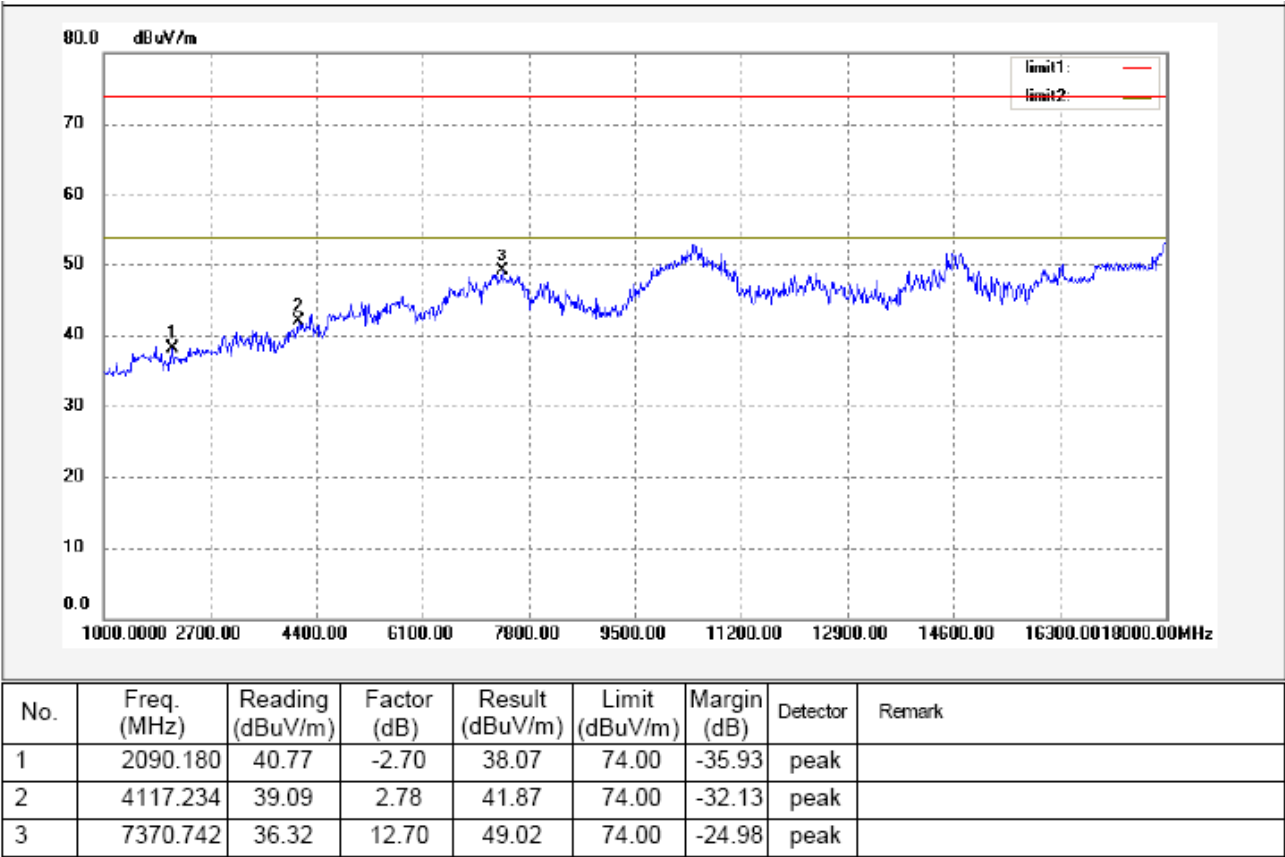




Test frequency: Above 1GHz radiation test data:  
Remark: above 18GHz,the test signal below the noise level,so the data was not perfomed.  
Vertical



Horizontal



### 5.10.2 Test Data for Transmitting mode

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

And the below is the Fundamental and Harmonic .

Frequency (MHz)	Detect or	Antenna Polarization	Emission Level (dBuV/m)	FCC Part15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2410	AV	Vertical	85.63		(Fund.)	1.0	120
4820	AV	Vertical	49.67	54.00	4.33	1.2	10
7230	AV	Vertical	41.48	54.00	12.52	1.2	135
9640	AV	Vertical	40.04	54.00	13.96	1.0	120
12050	AV	Vertical	39.75	54.00	14.25	1.1	110
14460	AV	Vertical	38.74	54.00	15.26	1.0	100
16870	AV	Vertical	38.68	54.00	15.32	1.0	110
19280	AV	Vertical	38.42	54.00	15.58	1.2	30
21690	AV	Vertical	37.44	54.00	16.55	1.2	110
24100	AV	Vertical	37.37	54.00	16.63	1.0	100
2410	AV	Horizontal	88.52		(Fund.)	1.0	90
4820	AV	Horizontal	48.25	54.00	5.75	1.0	60
7230	AV	Horizontal	43.66	54.00	10.34	1.1	100
9640	AV	Horizontal	38.58	54.00	15.42	1.2	110
12050	AV	Horizontal	33.42	54.00	20.58	1.0	135
14460	AV	Horizontal	32.42	54.00	21.58	1.1	120
16870	AV	Horizontal	31.99	54.00	22.01	1.0	110
19280	AV	Horizontal	32.09	54.00	21.91	1.1	60
21690	AV	Horizontal	31.27	54.00	22.73	1.0	100
24100	AV	Horizontal	32.47	54.00	21.53	1.0	100
2410	PK	Vertical	95.86		(Fund.)	1.0	110
4820	PK	Vertical	63.32	74.00	10.68	1.0	30
7230	PK	Vertical	52.63	74.00	21.37	1.1	110
9640	PK	Vertical	50.32	74.00	23.68	1.0	100
12050	PK	Vertical	49.32	74.00	24.68	1.1	90
14460	PK	Vertical	47.87	74.00	26.13	1.0	60

16870	PK	Vertical	48.63	74.00	25.37	1.1	100
19280	PK	Vertical	45.36	74.00	28.64	1.0	110
21690	PK	Vertical	46.34	74.00	27.66	1.2	30
24100	PK	Vertical	42.87	74.00	31.13	1.0	110
2410	PK	Horizontal	99.87		(Fund.)	1.0	100
4820	PK	Horizontal	62.02	74.00	11.98	1.0	90
7230	PK	Horizontal	52.52	74.00	21.48	1.0	110
9640	PK	Horizontal	46.89	74.00	27.11	1.0	110
12050	PK	Horizontal	42.78	74.00	31.22	1.2	10
14460	PK	Horizontal	41.36	74.00	32.64	1.0	90
16870	PK	Horizontal	41.32	74.00	32.68	1.0	120
19280	PK	Horizontal	41.03	74.00	32.97	1.0	110
21690	PK	Horizontal	41.00	74.00	34.00	1.2	250
24100	PK	Horizontal	36.95	74.00	37.05	1.0	20
Middle frequency							
2440	AV	Vertical	84.15		(Fund.)	1.1	100
4880	AV	Vertical	49.87	54.00	4.13	1.2	110
7320	AV	Vertical	45.58	54.00	8.42	1.0	30
9760	AV	Vertical	42.36	54.00	11.64	1.0	110
12200	AV	Vertical	39.42	54.00	14.58	1.2	100
14640	AV	Vertical	40.00	54.00	14.00	1.2	90
17080	AV	Vertical	39.40	54.00	14.60	1.0	60
19520	AV	Vertical	37.44	54.00	16.56	1.0	100
21960	AV	Vertical	36.04	54.00	17.96	1.0	110
24400	AV	Vertical	35.66	54.00	18.34	1.2	30
2440	AV	Horizontal	88.33		(Fund.)	1.0	110
4880	AV	Horizontal	47.78	54.00	6.22	1.0	10
7320	AV	Horizontal	42.38	54.00	11.62	1.0	45
9760	AV	Horizontal	38.69	54.00	15.31	1.2	90
12200	AV	Horizontal	36.58	54.00	17.42	1.1	60
14640	AV	Horizontal	34.75	54.00	19.25	1.1	100
17080	AV	Horizontal	35.75	54.00	18.25	1.1	110
19520	AV	Horizontal	35.32	54.00	18.68	1.2	30
21960	AV	Horizontal	33.43	54.00	20.57	1.2	110
24400	AV	Horizontal	33.36	54.00	20.64	1.1	10

2440	PK	Vertical	98.32		(Fund.)	1.0	50
4880	PK	Vertical	63.58	74.00	10.42	1.1	90
7320	PK	Vertical	51.00	74.00	23.00	1.0	60
9760	PK	Vertical	49.12	74.00	24.88	1.1	100
12200	PK	Vertical	48.36	74.00	25.64	1.0	110
14640	PK	Vertical	47.69	74.00	26.31	1.2	30
17080	PK	Vertical	48.34	74.00	25.66	1.1	110
19520	PK	Vertical	46.38	74.00	27.62	1.1	10
21960	PK	Vertical	46.98	74.00	27.02	1.1	90
24400	PK	Vertical	45.23	74.00	28.74	1.2	60
2440	PK	Horizontal	102.66		(Fund.)	1.0	100
4880	PK	Horizontal	63.58	74.00	11.42	1.1	45
7320	PK	Horizontal	48.87	74.00	25.13	1.1	90
9760	PK	Horizontal	45.64	74.00	28.36	1.1	10
12200	PK	Horizontal	44.84	74.00	29.16	1.1	145
14640	PK	Horizontal	44.89	74.00	29.11	1.2	190
17080	PK	Horizontal	44.69	74.00	29.31	1.1	160
19520	PK	Horizontal	44.26	74.00	29.74	1.1	100
21960	PK	Horizontal	42.37	74.00	31.63	1.1	100
24400	PK	Horizontal	39.87	74.00	34.13	1.1	50
High frequency							
2470	AV	Vertical	83.67		(Fund.)	1.1	100
4940	AV	Vertical	49.63	54.00	4.37	1.0	60
7410	AV	Vertical	42.52	54.00	11.48	1.2	120
9880	AV	Vertical	42.00	54.00	12.00	1.0	120
12350	AV	Vertical	40.95	54.00	13.05	1.1	10
14820	AV	Vertical	40.69	54.00	13.31	1.1	45
17290	AV	Vertical	40.74	54.00	13.26	1.1	90
19760	AV	Vertical	39.04	54.00	14.96	1.1	10
22230	AV	Vertical	39.65	54.00	14.35	1.1	45
24700	AV	Vertical	35.89	54.00	18.11	1.1	90
2470	AV	Horizontal	86.82		(Fund.)	1.0	60
4940	AV	Horizontal	47.12	54.00	6.88	1.2	10
7410	AV	Horizontal	42.36	54.00	11.64	1.2	10
9880	AV	Horizontal	40.33	54.00	13.67	1.0	100

12350	AV	Horizontal	40.85	54.00	13.15	1.1	160
14820	AV	Horizontal	38.91	54.00	15.09	1.2	10
17290	AV	Horizontal	36.71	54.00	17.29	1.0	45
19760	AV	Horizontal	34.75	54.00	19.25	1.0	90
22230	AV	Horizontal	34.32	54.00	19.68	1.1	160
24700	AV	Horizontal	33.33	54.00	20.67	1.0	10
2470	PK	Vertical	95.71		(Fund.)	1.0	10
4940	PK	Vertical	63.66	74.00	10.34	1.1	45
7410	PK	Vertical	50.14	74.00	23.86	1.0	90
9880	PK	Vertical	50.34	74.00	23.66	1.0	60
12350	PK	Vertical	49.89	74.00	24.11	1.1	10
14820	PK	Vertical	49.63	74.00	24.37	1.2	110
17290	PK	Vertical	49.68	74.00	24.32	1.2	45
19760	PK	Vertical	47.98	74.00	26.02	1.2	120
22230	PK	Vertical	47.68	74.00	26.32	1.1	10
24700	PK	Vertical	47.36	74.00	26.64	1.4	45
2470	PK	Horizontal	98.63		(Fund.)	1.1	90
4940	PK	Horizontal	61.54	74.00	12.46	1.0	60
7410	PK	Horizontal	47.56	74.00	26.44	1.0	10
9880	PK	Horizontal	46.36	74.00	27.64	1.2	120
12350	PK	Horizontal	46.85	74.00	27.15	1.1	10
14820	PK	Horizontal	45.85	74.00	28.15	1.1	45
17290	PK	Horizontal	45.65	74.00	28.35	1.1	10
19760	PK	Horizontal	43.69	74.00	30.31	1.0	45
22230	PK	Horizontal	43.45	74.00	30.55	1.1	90
24700	PK	Horizontal	40.63	74.00	33.37	1.0	160

## 6 Antenna Requirement

According to the FCC Part 15 Paragraph 15.203, 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 to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a permanent antenna printed on the PCB, fulfil the requirement of this section.

## 7 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI C63.4:2003
Test Result:	PASS
Test mode:	Compliance test in the worse case: Tx Lower/Tx Middle/Tx Upper
Requirements:	Regulation 15.247(b) The limit of Maximum Peak Output Power Measurement is 0.125W

### Test procedure:

The following test procedure as below:

The transmitter output (antenna port) was connected to the spectrum analyzer.EUT and its simulators are placed on a table, let EUT working in test mode,then test it.

The bandwidth of the fundamental frequency was measured with the spectrum analyser using 100kHz RBW and 100kHz VBW.

**Test Result:** The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Peak Output Power (dBm)	Peak Output Power (mW)	Limit (mW)	Power output level
Lower	2410	-5.95	0.254	125	conducted
Middle	2440	-5.48	0.283	125	conducted
Upper	2470	-5.50	0.282	125	conducted

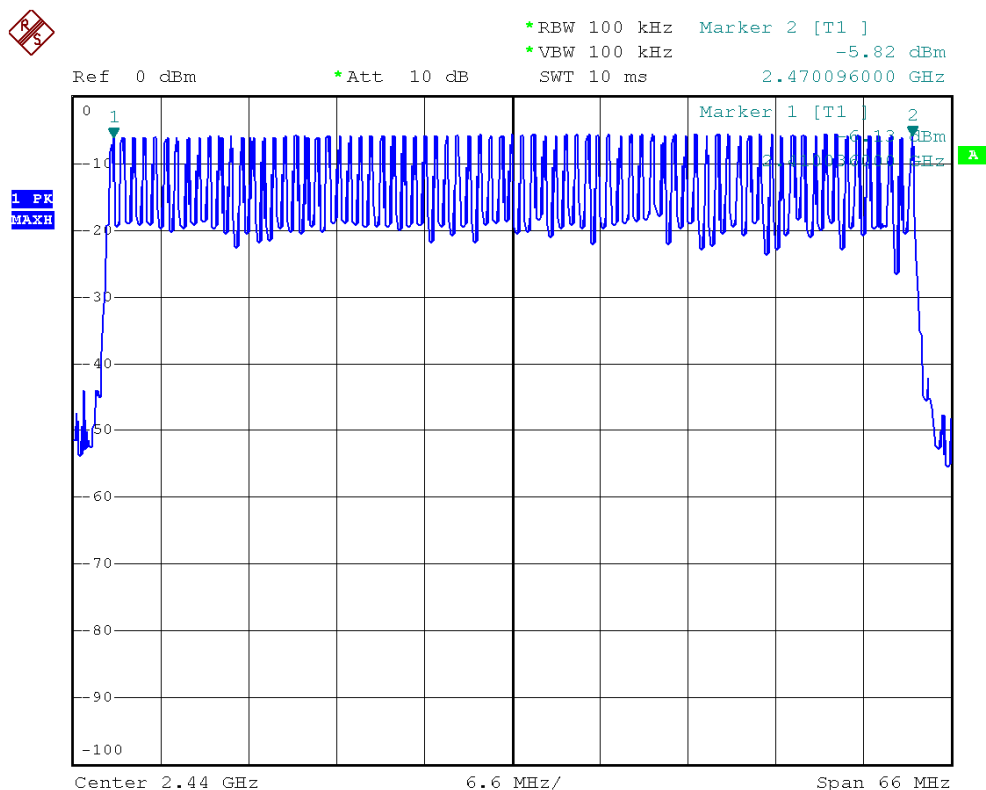
## 8 Hopping Channel Number

Test Requirement: FCC Part15 C  
Test Method: Based on FCC Part15 Paragraph 15.247  
Test Result: PASS  
Test mode: The EUT work in test mode(Tx) and test it  
Requirements: Regulation 15.247(b) For frequency hopping systems  
operating

In the 2400-2483.5MHz band employing at least 15 hopping channels.

Test result: The total number of channels would be 75 channels.  
The unit does meet the FCC requirements.

Please refer the graph as below:





## 9 Frequency Separated

The requirements in this clause are only applicable to equipment using frequency hopping spread spectrum (FHSS) modulation.

### Channel Separated

Definition: A hopping channel is any of the centre frequencies defined within the hopping sequence of a FHSS system.

Limit: Non-adaptive frequency hopping system shall make use of non-overlapping channels separated by the channel bandwidth as measured at 20dB below peak power.

Operating Environment:

Temperature: 25.50 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

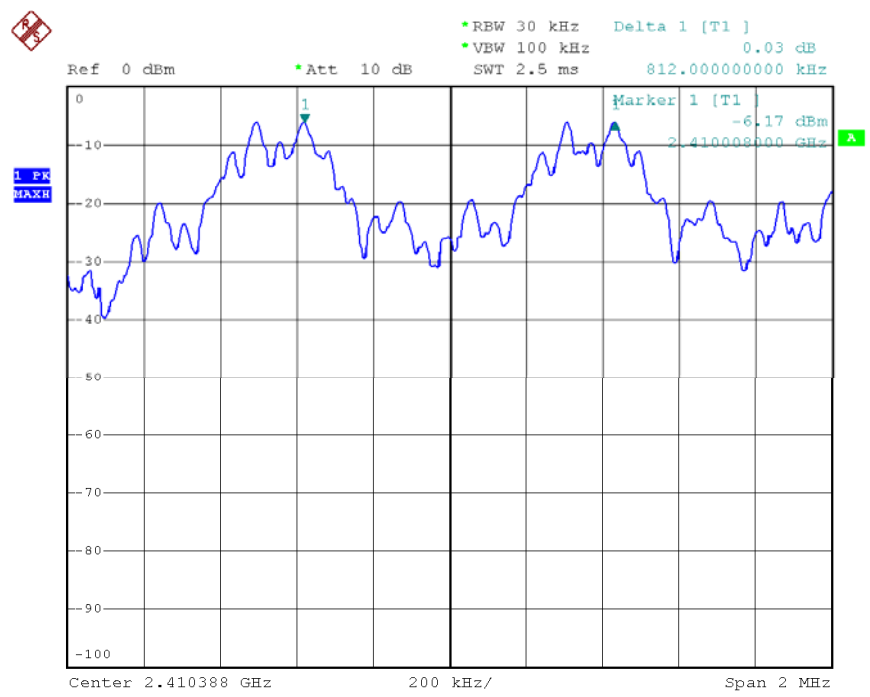
The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

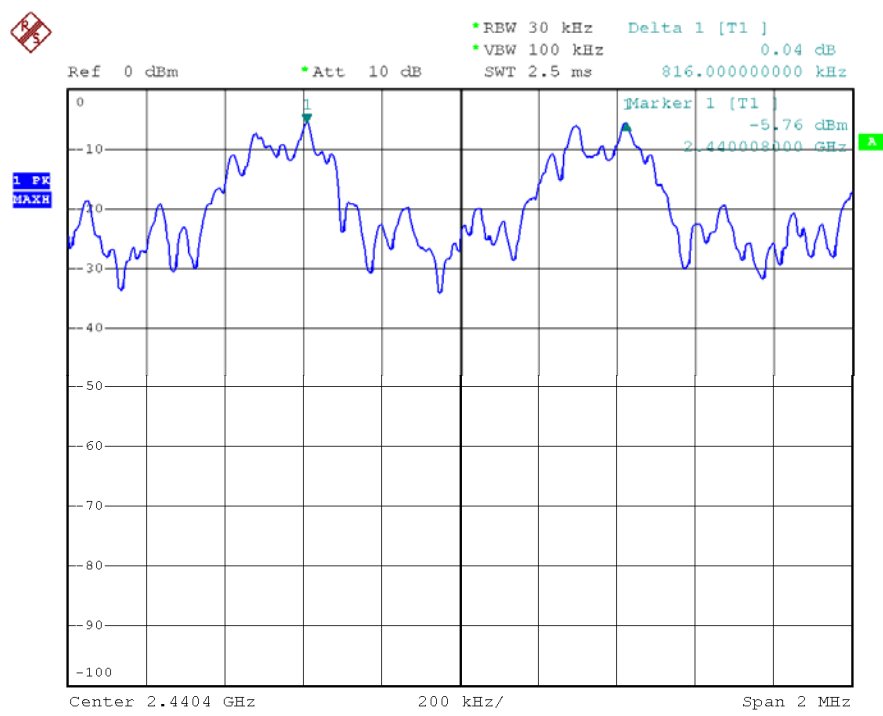
Test Channel	Channel Separation	PASS/FAIL
Lower Channels	812kHz	Pass
Middle Channels	816kHz	Pass
Upper Channels	812kHz	Pass

Please refer to the below photos for more details

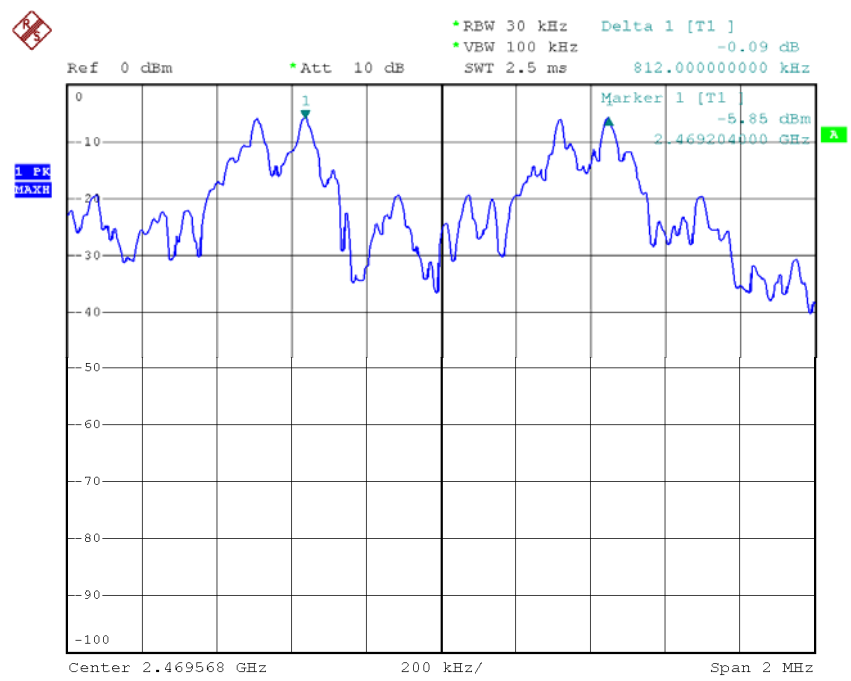
Lower Channel



Middle Channel



Upper Channel



## 10 Dwell time

The dwell time is the time spent at a particular frequency during any single hop.

Limit: the maximum dwell time shall be less than 0.4s.

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

### 11.2 Test Procedure

The EUT output antenna port was connected to the spectrum analyzer. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, and the frequency span to zero span, measure the maximum time duration of one single pulse. So, the Dwell Time can be calculated as follows:

$$T = T_{\text{on-time}} * N_{\text{times}} / 1S * 0.4 * 75 \leq 0.4S.$$

### 11.3 Test Result: PASS

Please refer to the below photos for more details.

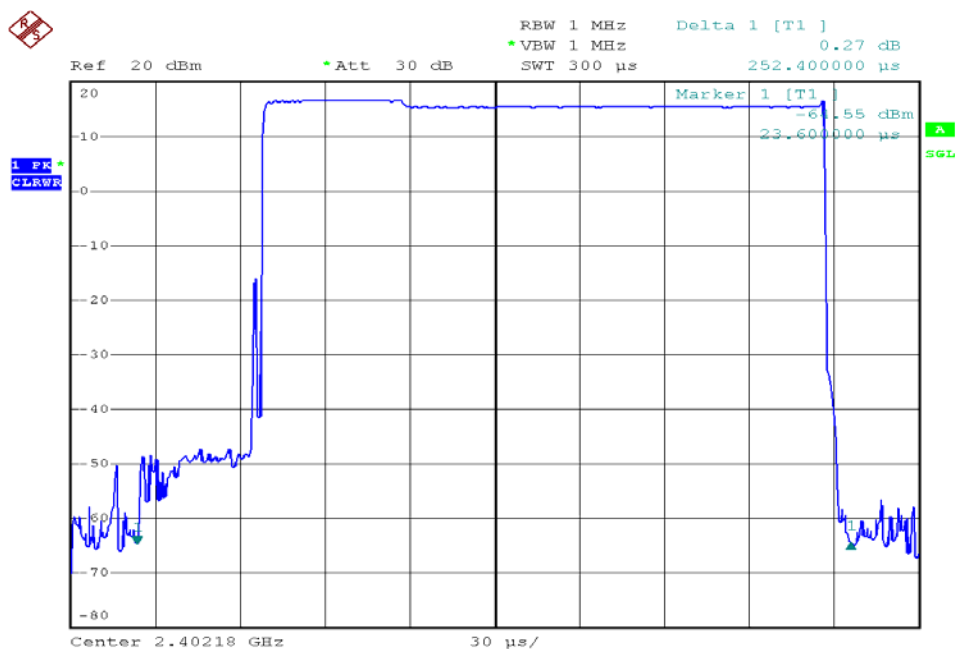
**Channel 2410MHz**

Dwell time of each occupation in this channel as follows:

$$0.00002524 \times 300 / 1S \times 0.4 \times 75 = 0.2272 < 0.4S$$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.



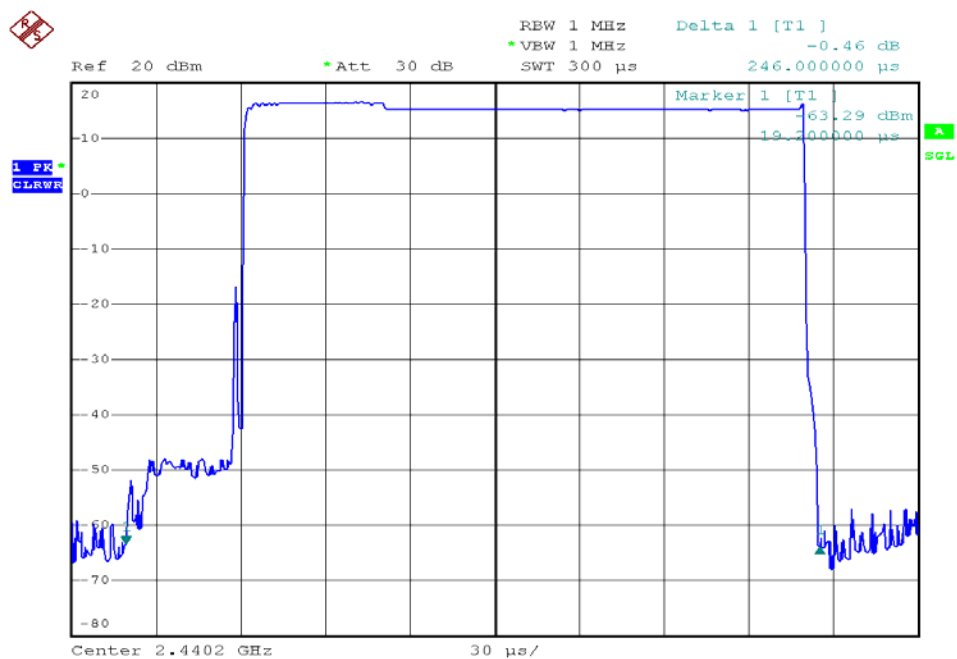
**Channel 2440MHz**

Dwell time of each occupation in this channel as follows:

$$0.0000246 * 300 / 1S * 0.4 * 75 = 0.2214 < 0.4S$$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.



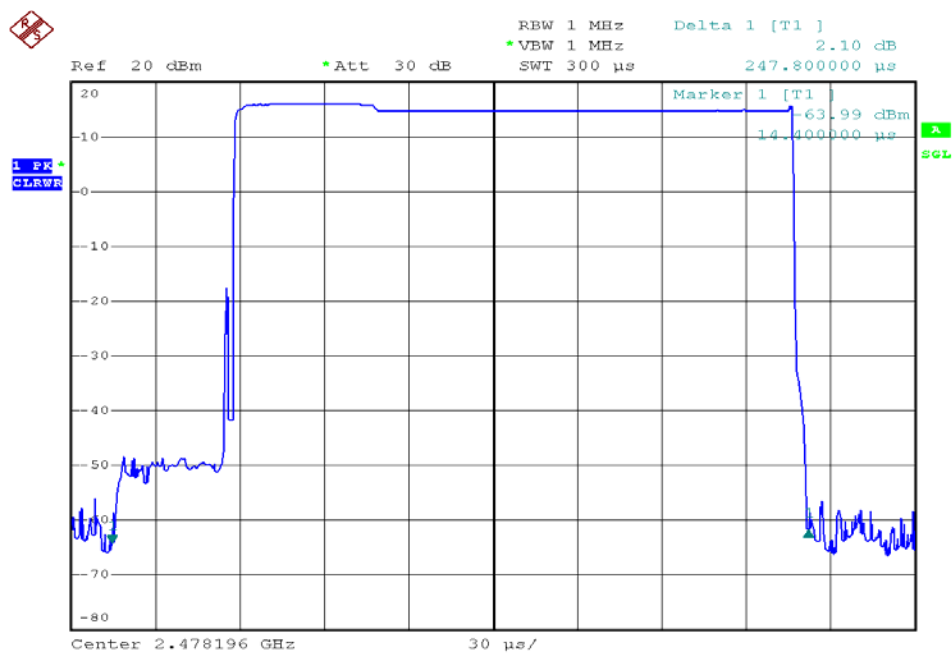
**Channel 2470MHz**

Dwell time of each occupation in this channel as follows:

$$0.0000247 \times 300 / 1\text{S} \times 0.4 \times 75 = 0.2223 < 0.4\text{S}$$

**Test Result: PASS**

The Results are not be greater than 0.4 seconds.



11 20-dB Bandwidth

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
Test Result:	PASS
Test mode:	The EUT work in test mode(Tx) and test it

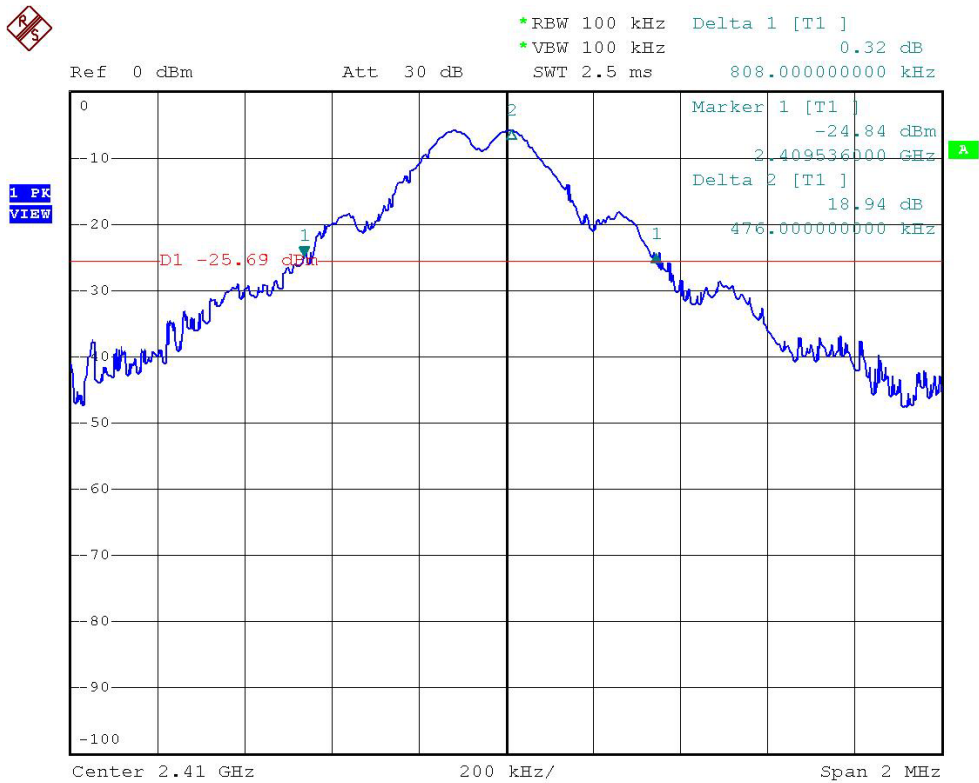
Test Procedure

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100KHz RBW and 100KHz VBW.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

Test Result

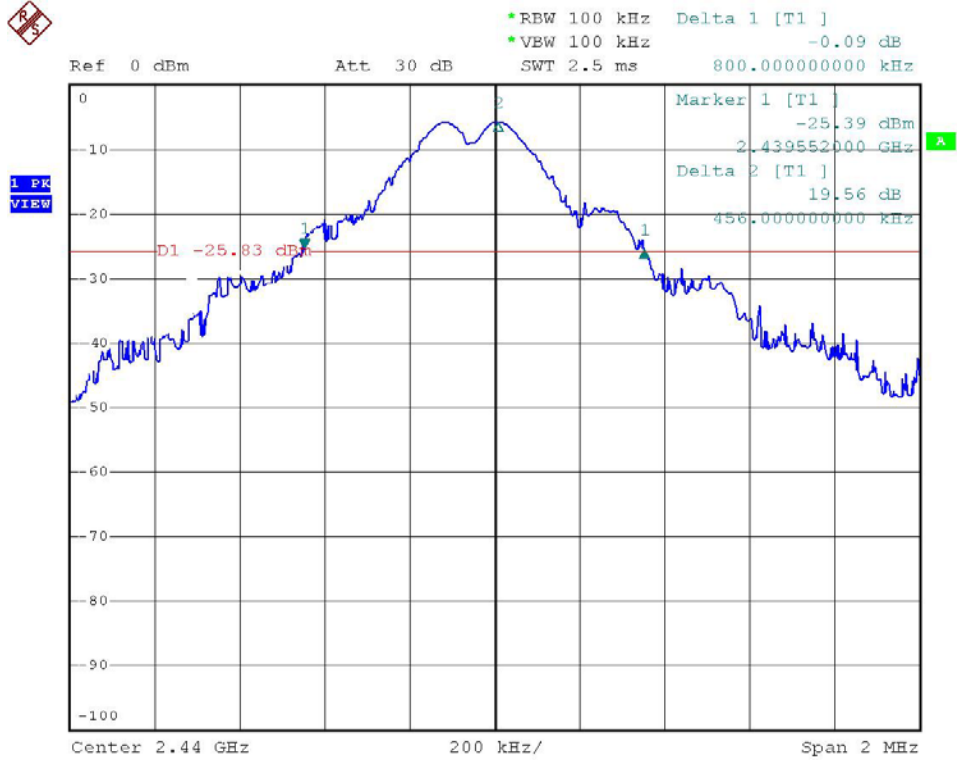
Please refer the graph as below:

Lower Channel 2410MHz

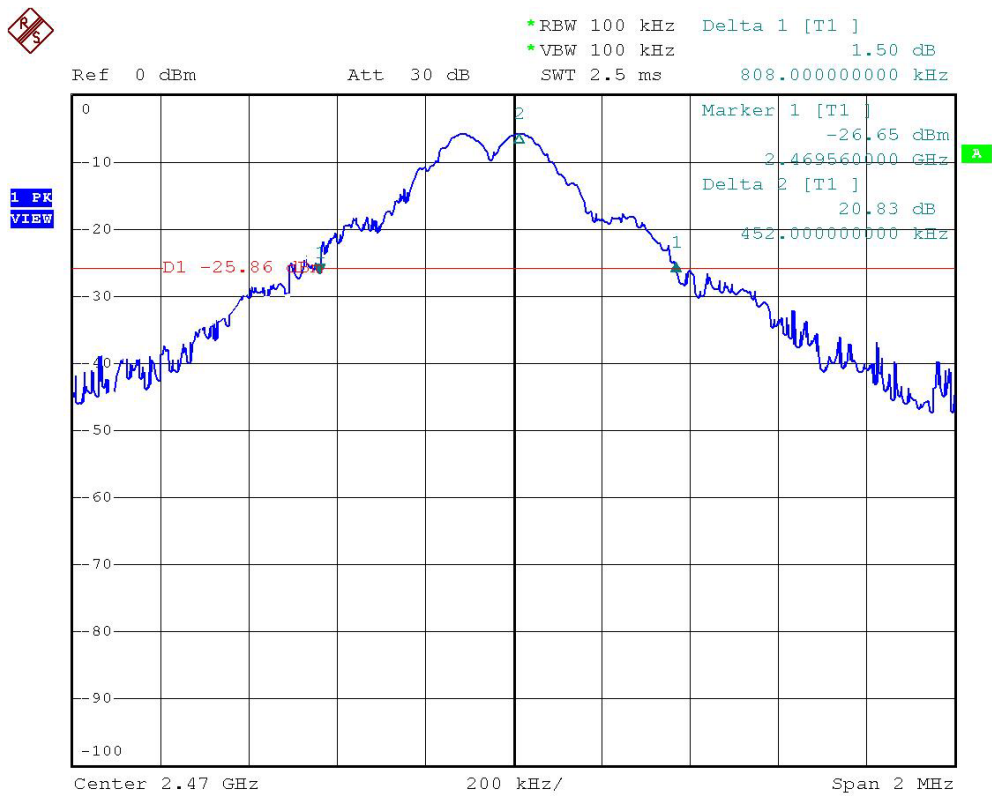




Middle Channel 2440MHz



Upper Channel 2470MHz



## 12 Radiated spurious emissions into adjacent restricted band

Test Requirement:	FCC Part15 Paragraph 15.205
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Result:	PASS
Requirements:	The EUT work in test mode(Tx) and test it

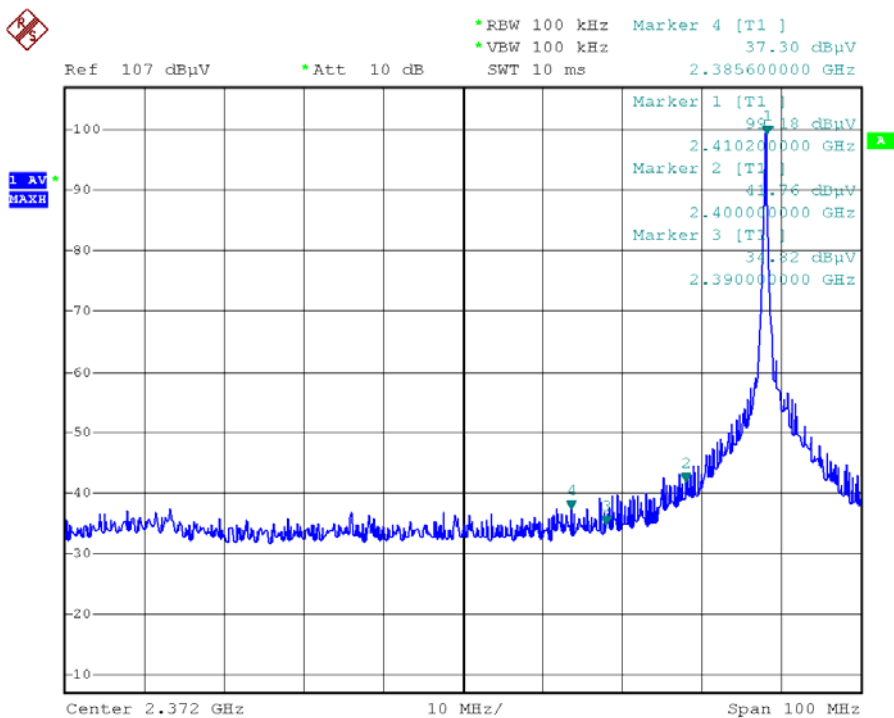
### Requiments:

emissions that fall in the restricted bands(15.205).Above 1000MHz, compliance with the emissions limits in section 15.209 shall be demonstrated based on the average value of the measured emissions,The provisions in section 15.35 apply to these measurements.

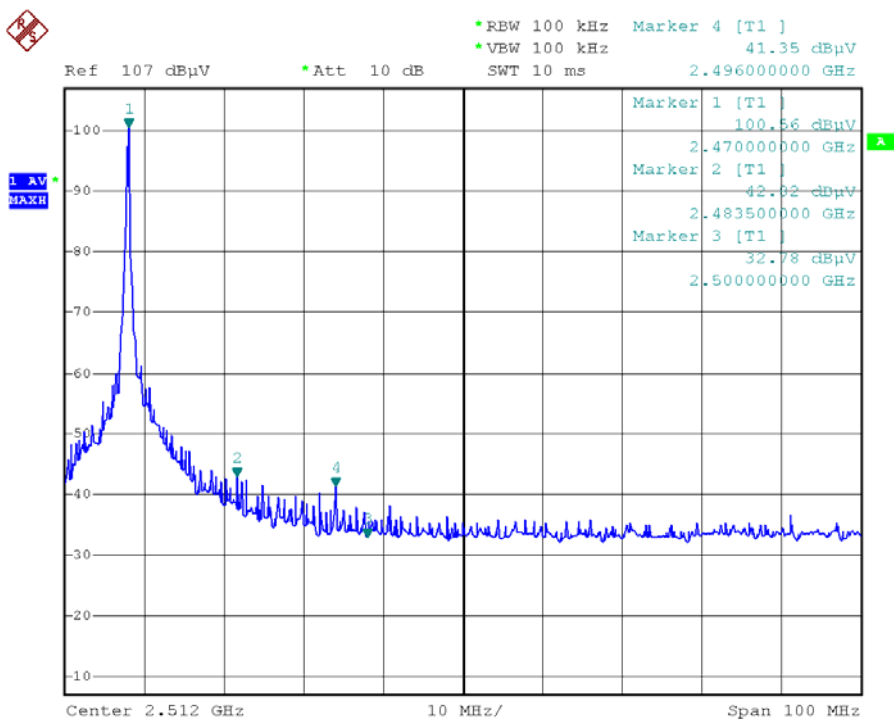
### Test procedure:

An in band field strength measurement of the fundamental emission using the RBW and detector function required by ANSI C63.4:2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

Lower bandedge/ restricted band (Average Value)

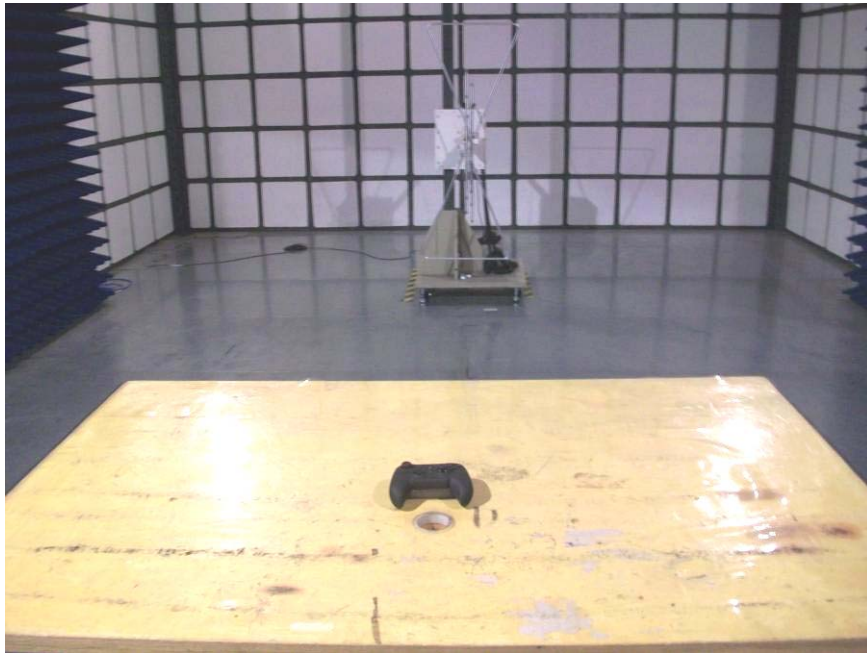


Upper Bandedge/ Restricted Band (Average Value)

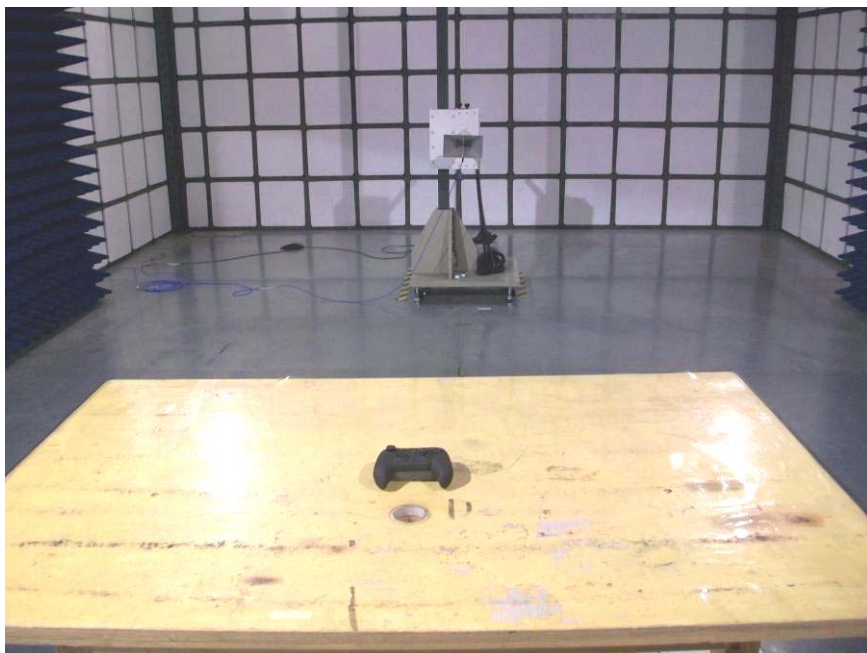


### **13 Photographs of Test Setup for CTX and CRX**

#### **Radiation Emission Test View For 30MHz-1000MHz**



#### **Radiation Emission Test View For 1GHz-25GHz**



## 14 Photographs - Constructional Details

### 14.1 EUT - Front View

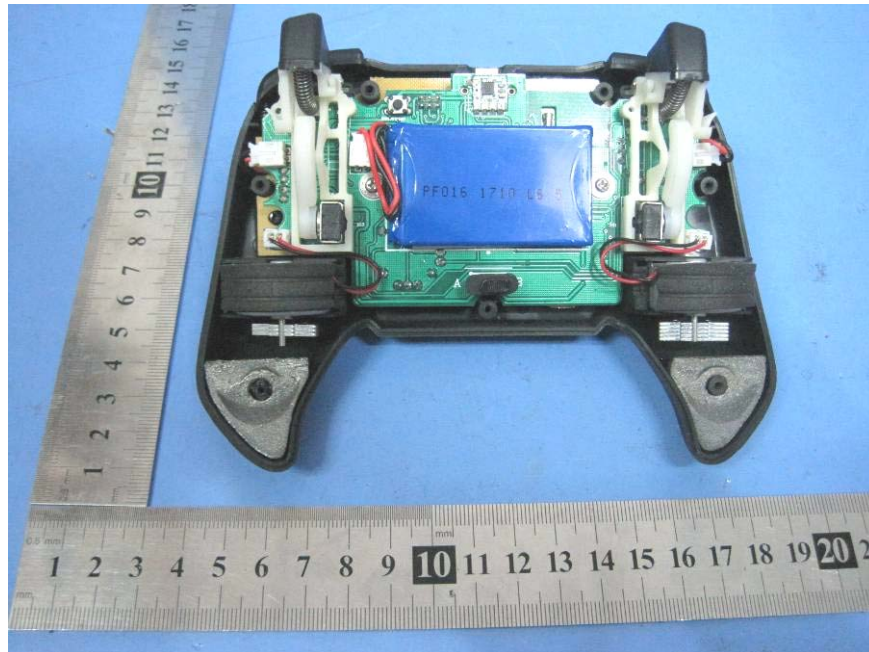


### 14.2 EUT - Back View

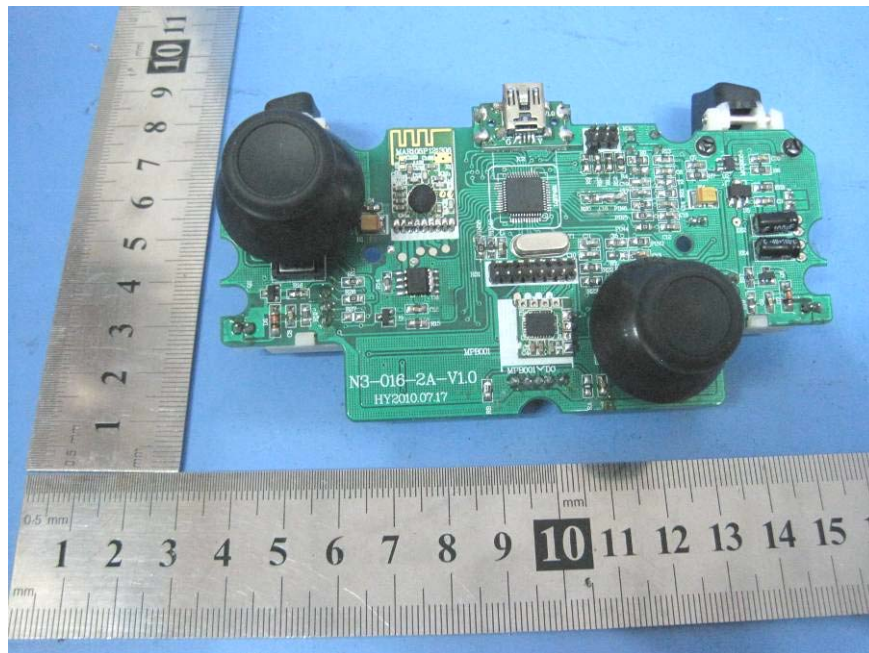




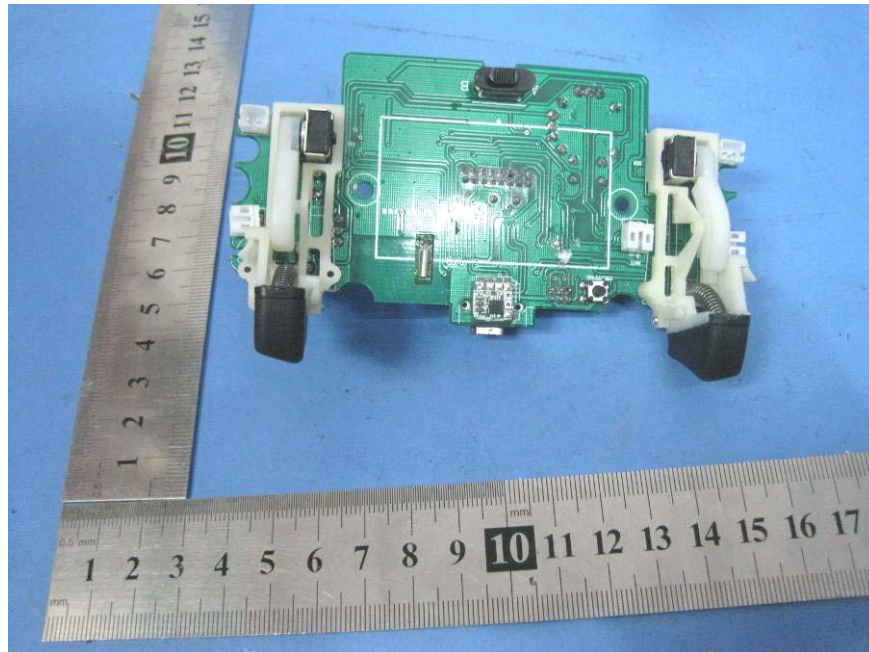
### 14.3 EUT- Open View



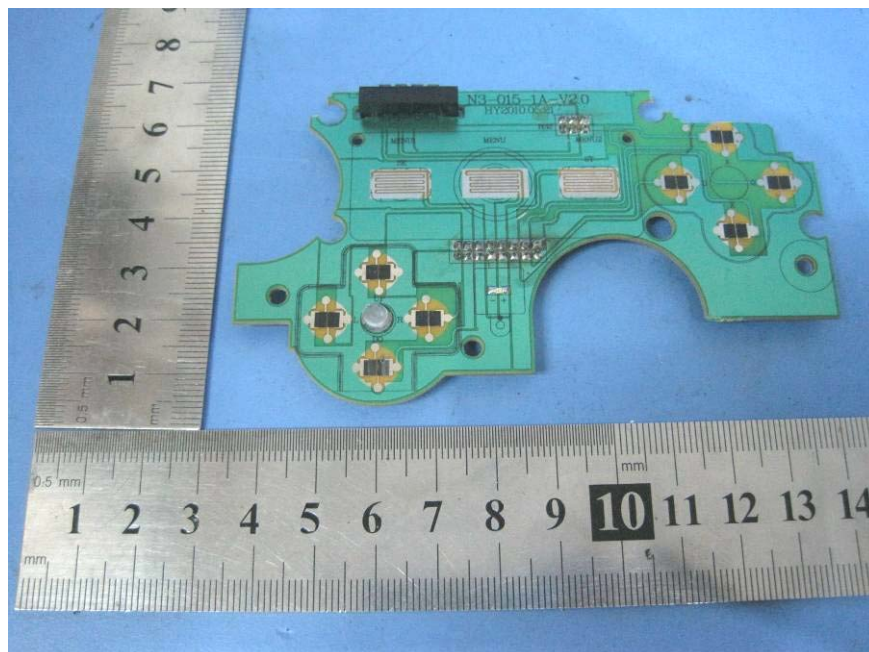
### 14.4 PCB1- Front View



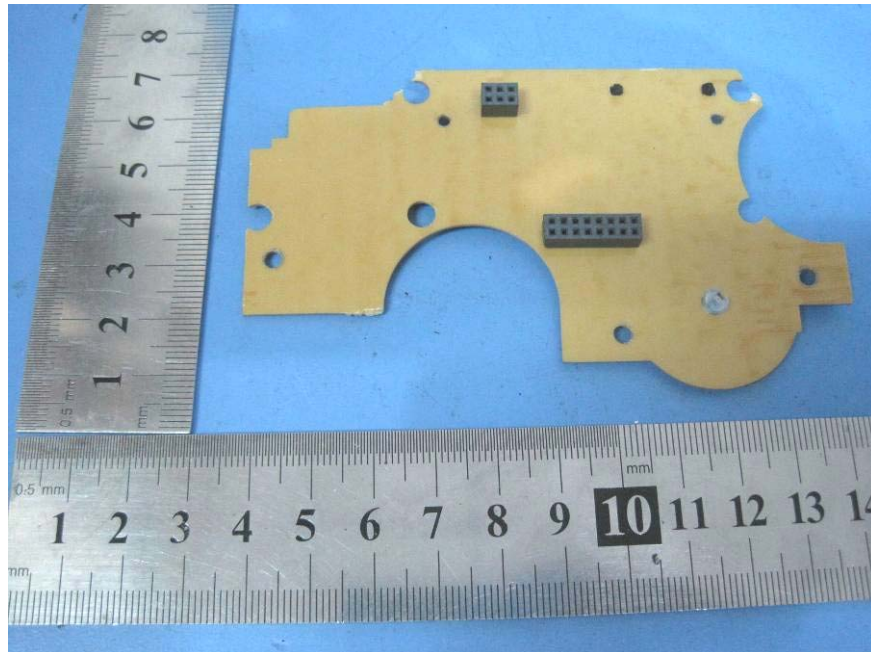
#### 14.5 PCB1- Back View



#### 14.6 PCB2- Front View



#### 14.7 PCB2 - Back View





## 15 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT  
EUT Bottom View/proposed FCC Mark Location

