

FCC TEST REPORT

FCC ID : VU5P5HM-002

Applicant : Storm Electronics Co. Ltd

Address of Applicant : 22/F., Com Web Plaza, 12 Cheung Yue Street,
Lai Ch, Kowloon, Hong Kong

Equipment Under Test (EUT) :


Product description : Bluetooth Headset

Model No. : ASD116,P5HM-002

Standards : FCC 15 Paragraph 15.247

Date of Test : July 05, 2010

Test Engineer : Olic huang

Reviewed By : 

PERPARED BY:

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3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2008	ANSI C63.4: 2003	30dBm	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	Channel separation at least 1MHz	PASS
Hopping channel No.	FCC Part 15:2008	ANSI C63.4: 2003	Total 79 channels	PASS
20-dB Bandwidth	FCC Part 15:2008	ANSI C63.4: 2003	Note	PASS
RF Exposure Test	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	PASS
Radiation Emission, 30MHz to 25GHz	FCC Part 15:2008	ANSI C63.4: 2003	N/A	PASS

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: Storm Electronics Co. Ltd
Address of Applicant: 22/F., Com Web Plaza, 12 Cheung Yue Street,
Lai Ch, Kowloon, Hong Kong

Manufacturer: Asoka Electronic (Shenzhen) Company Limited
Address of Manufacturer: Da Yang Industrial Park, Lou Gang Road, Song Gang Town,
Bao An District, Shen Zhen City, China.

4.2 General Description of E.U.T.

Product description: Bluetooth Headset
Model No.: ASD116, P5HM-002
Remark: ASD116 (trademark: i-Con), P5HM-002 (trademark: Storm)

4.3 Details of E.U.T.

Power Supply: Battery DC 3.7V

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 Bluetooth Headset. 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 is recognized, certified, or accredited by 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 IC7760A, July 24, 2008.

4.7 Test Location

All Emissions 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	MY45114943	W2008001	9k-26.5GHz	Aug-09	Aug-10	Wws20081596	±1dB
Trilog Broadband Antenne 30-3000 MHz	SCHWARZB ECK MESS-ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug-09	Aug-10		±1dB
Broad-band Horn Antenna 1-18 GHz	SCHWARZB ECK MESS-ELEKTROM / VULB9163	667	W2008003	1-18GHz	Aug-09	Aug-10		f<10 GHz: ±1dB 10GHz<f<18 GHz: ±1.5dB
Broadband Preamplifier 0.5-18 GHz	SCHWARZB ECK MESS-ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug-09	Aug-10		±1.2dB
10m Coaxial Cable with N-male Connectors usable up to 18GHz,	SCHWARZB ECK MESS-ELEKTROM / AK 9515 H	-	-	-	Aug-09	Aug-10		-
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connector	SCHWARZB ECK MESS-ELEKTROM / AK 9513				Aug-09	Aug-10		
Positioning Controller	C&C LAB/ CC-C-IF				N/A	N/A		
Color Monitor	SUNSPO/ SP-14C				N/A	N/A		
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug-09	Aug-10	Wws20080942	±1dB
EMI Receiver	Beijingkehua n	KH3931		9k-1GHz	Aug-09	Aug-10		
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug-09	Aug-10	Wws20080941	±10%

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Absorbing Clamp	ROHDE&SC HWAZ/ MDS-21	100205	W2005003	impedance 50 Ω loss : 17 dB	Aug-09	Aug-10	Wws200 80943	± 1 dB
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connectors	SCHWARZB ECK MESS- ELEKTROM / AK 9514				Aug-09	Aug-10		
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V07451 03095	W2008012	Power: 2000VA Vol-range: 0-300V Freq_range: 10-80Hz	Aug-09	Aug-10	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-09	Aug-10	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-09	Aug-10	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-09	Aug-10	Wwc200 82396	150K-80MHz: ± 1 dB 80-230MHz:-2-+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range: 0.15-1000 MHz	Aug-09	Aug-10	Wwc200 82397	0.3-400 MHz: ± 4 dB Other freq: ± 5 dB
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365			Aug-09	Aug-10	Wws200 81597	

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
All Modules Generator	SCHAFFNER/6150	34579	W2008006	voltage:200V-4.4KV Pulse current: 100A-2.2KA	Aug-09	Aug-10	Wwc20082401	voltage: $\pm 10\%$ Pulse current: $\pm 10\%$
Capacitive Coupling Clamp	SCHAFFNER/CDN 8014	25311			Aug-09	Aug-10	Wwc20082398	-
Signal and Data Line Coupling Network	SCHAFFNER/CDN 117	25627	W2008011	1.2/50 μ S	Aug-09	Aug-10	Wwc20082399	-
AC Power Supply	TONGYUN/DTDC-4				Aug-09	Aug-10	Wws20080944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/2304/03	M-0155	w2008022	Test freq range: 1—400kHz	Aug-09	Aug-10	Wwd20081191	Test uncertainty : 1—120kHz: $\pm 1.83\%$, 120 kHz-400 kHz: $\pm 4.06\%$
Magnetic Field Probe 100cm ²	Narda Safety TEST Solutions/2300/90.10	M-1070	w2008021	Test freq range: 1—400kHz				Test uncertainty : 1Hz-10Hz: $\pm 16.2\%$, 10Hz - 120kHz: $\pm 2.2\%$, 120 kHz-400 kHz: $\pm 4.7\%$
Active Loop Antenna Charger 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug-09	Aug-10		$\pm 1\text{dB}$

5 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
Test Date:	July 05,2010
Frequency Range:	150kHz to 30MHz
Class:	Class B
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

5.1 Test Equipment

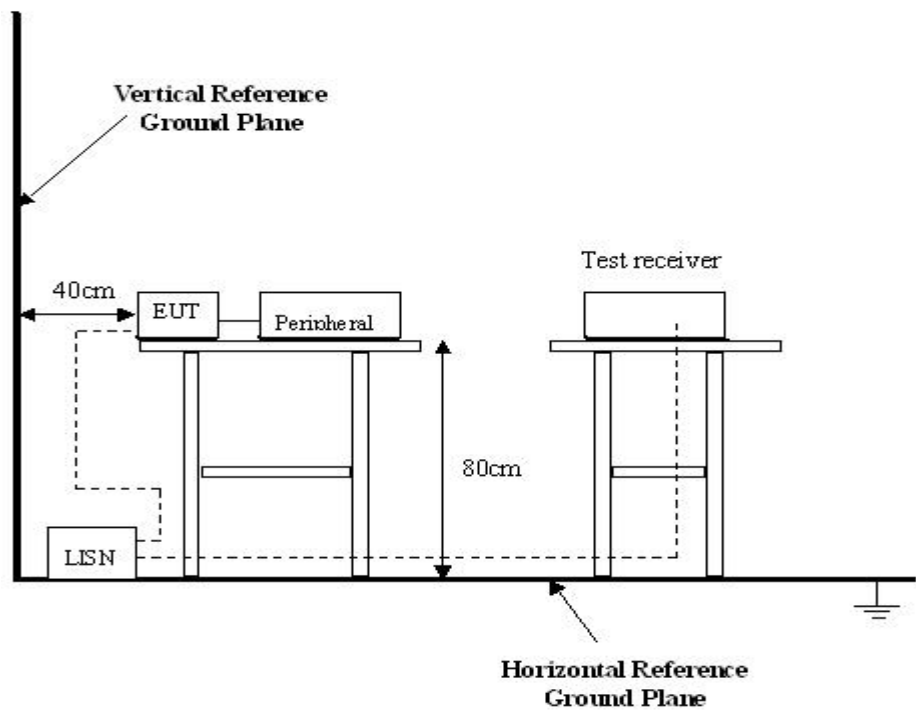
Please refer to Section 5 this report.

5.2 Test Procedure

1. The EUT was connected with signal generator and placed on a table.
2. The EUT was tested according to ANSI C63.4:2009. The frequency spectrum from 150kHz to 30MHz was investigated.
3. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

5.3 Conducted Test Setup

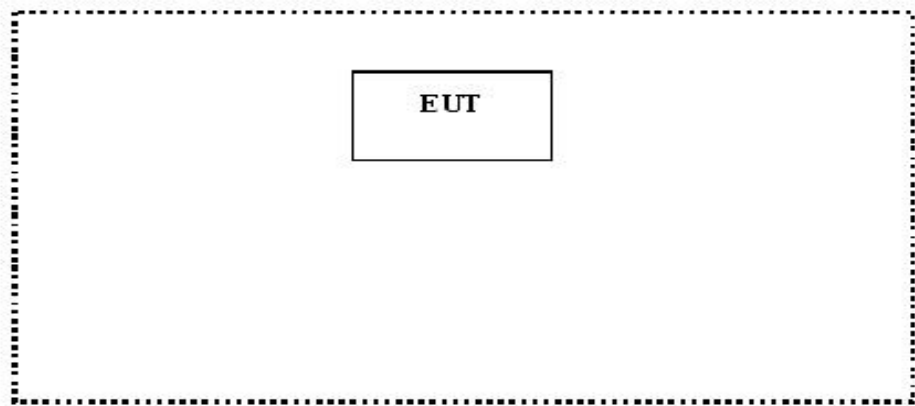
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2009, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



5.4EUT Operating Condition

Operating condition is according to ANSI C63.4:2009.

- 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.



5.5 Conducted Emission Limits

66-56 dB μ V between 0.15MHz & 0.5MHz

56 dB μ V between 0.5MHz & 5MHz

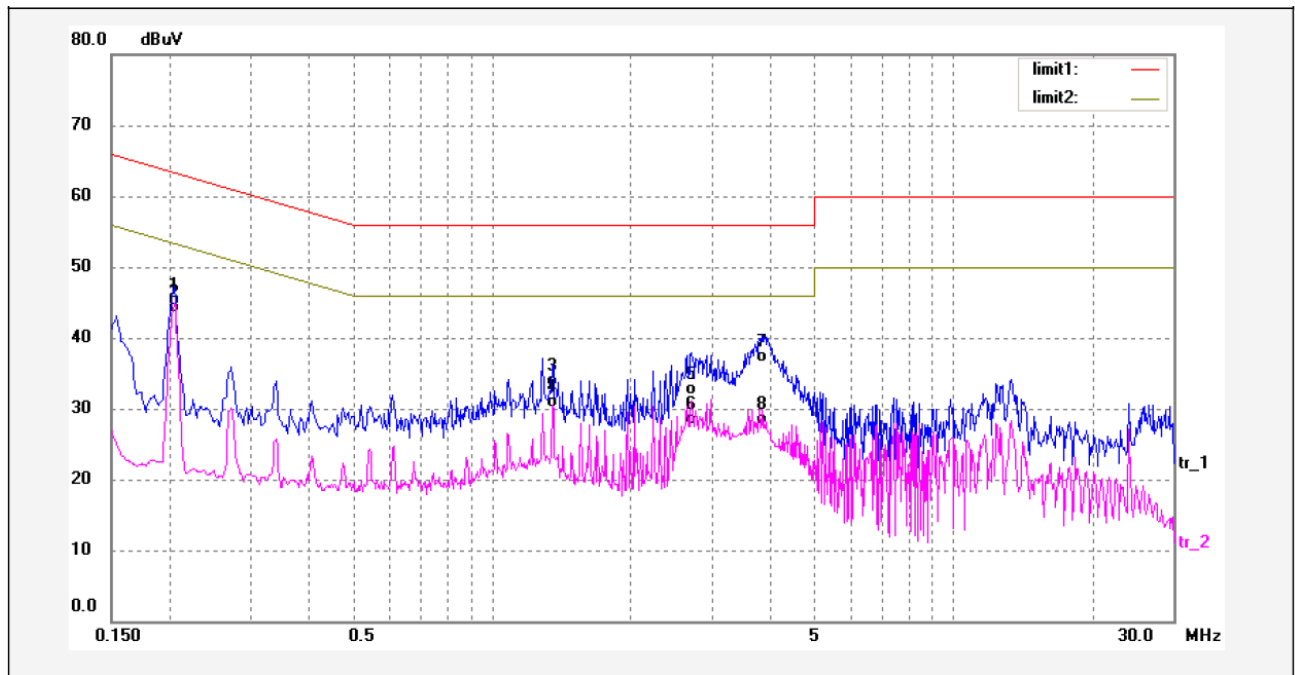
60 dB μ V between 5MHz & 30MHz

Note: In the above limits, the tighter limit applies at the band edges.

5.6 Conducted Emission Test Data

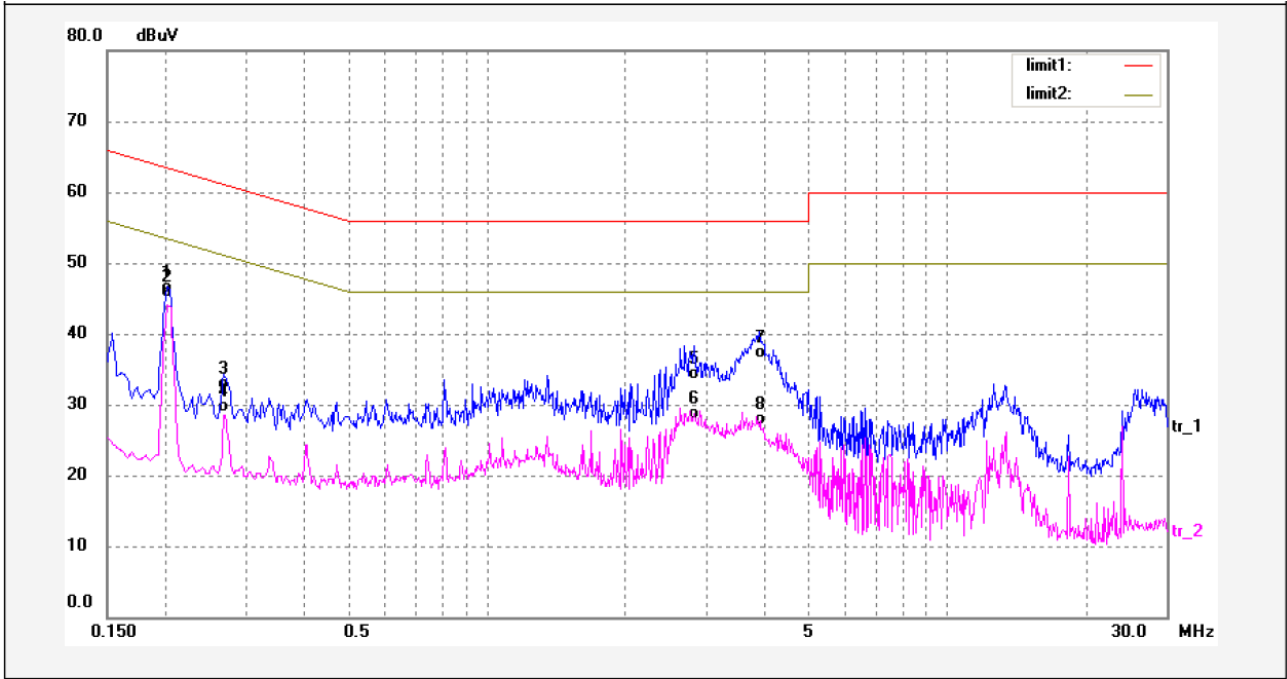
Remark: the EUT was working in the charging mode.

Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2060	33.79	10.67	44.46	63.36	-18.90	QP	
2	0.2060	32.80	10.67	43.47	53.36	-9.89	AVG	
3	1.3580	21.00	12.19	33.19	56.00	-22.81	QP	
4	1.3580	17.84	12.19	30.03	46.00	-15.97	AVG	
5	2.7180	19.59	12.35	31.94	56.00	-24.06	QP	
6	2.7180	15.43	12.35	27.78	46.00	-18.22	AVG	
7	3.8740	23.93	12.52	36.45	56.00	-19.55	QP	
8	3.8740	15.27	12.52	27.79	46.00	-18.21	AVG	

Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2020	35.13	10.67	45.80	63.52	-17.72	QP	
2	0.2020	34.34	10.67	45.01	53.52	-8.51	AVG	
3	0.2700	21.46	10.62	32.08	61.12	-29.04	QP	
4	0.2700	18.30	10.62	28.92	51.12	-22.20	AVG	
5	2.8340	21.21	12.39	33.60	56.00	-22.40	QP	
6	2.8340	15.43	12.39	27.82	46.00	-18.18	AVG	
7	3.9060	23.90	12.52	36.42	56.00	-19.58	QP	
8	3.9060	14.51	12.52	27.03	46.00	-18.97	AVG	

5.7 Conducted Emission Test Setup View

Front View



Back View



6 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI C63.4: 2003
Test Date:	July 05,2010
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

6.1 Test Equipment

Please refer to Section 5 this report.

6.2 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.

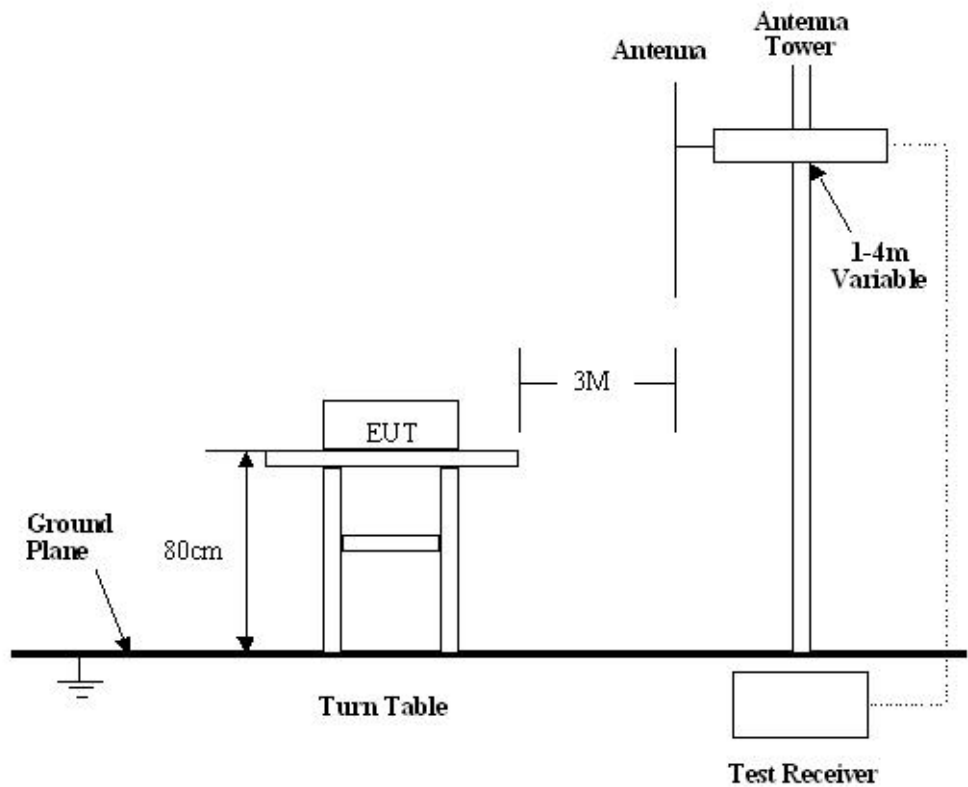
Based on ANSI C63.4:2009, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at WALTEK SERVICES EMC Lab is +/-5.03 dB.

6.3 Test Procedure

1. New battery 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 continuously transmit mode which control by the program during the final qualification test and the configuration was used to represent the worst case results.

6.4Radiated 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.



6.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested 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

6.6Corrected 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{Class B Limit}$$

6.7 Summary of Test Results

According to the data in section 7.11, the EUT complied with the FCC Part15 Paragraph 15.247 standards.

6.8 EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

6.9 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.

6.10 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 pressletor was accounted
For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS
33 20dBuV+10.36dB=30.36dBuV/m @3m

6.11 Radiated Emission Data

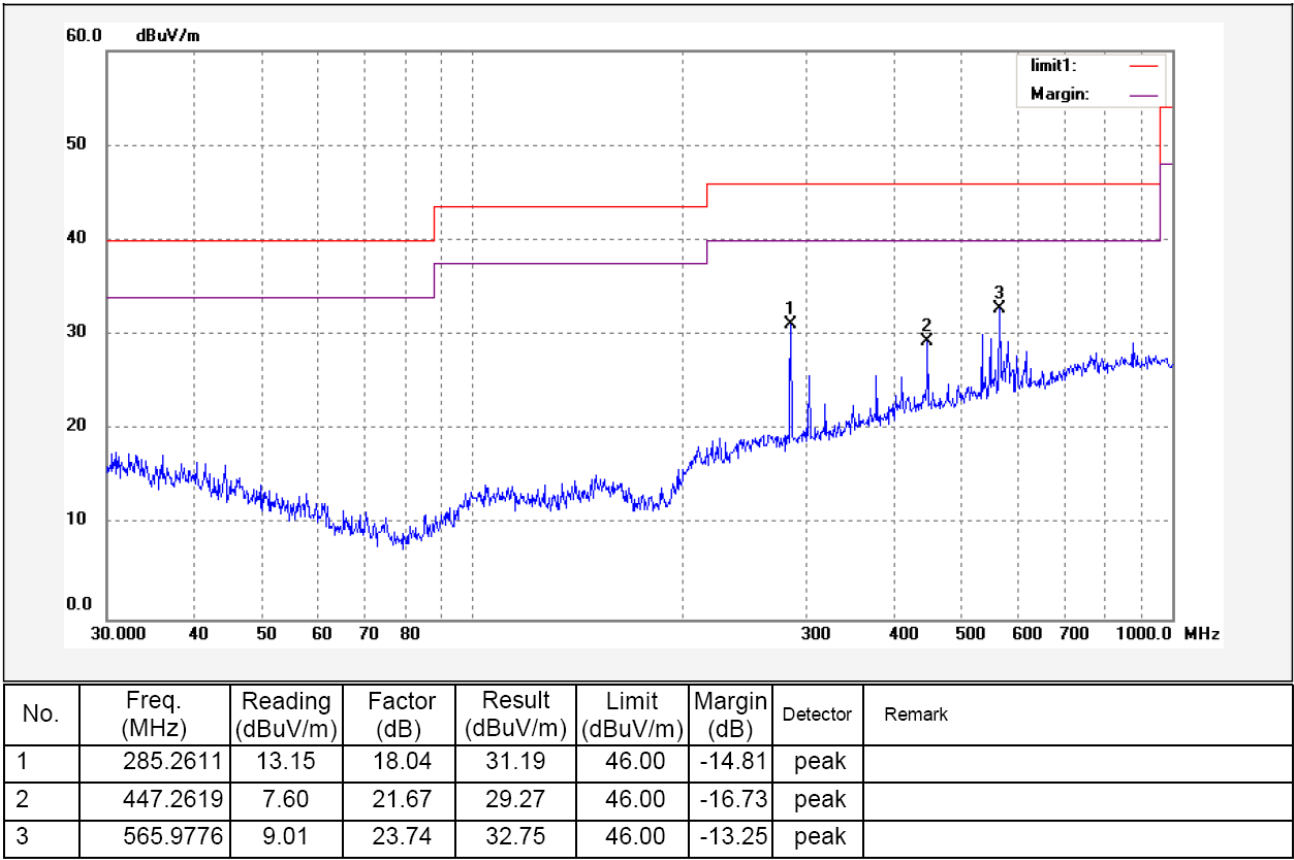
A. Test Item:	Radiated Emission Data
Test Voltage:	Battery 3.0V
Test Mode:	CTX and CRX On
Temperature:	25.5 °C
Humidity:	51%RH
Test Result:	PASS

6.11.1 Test mode: continuously receive mode.

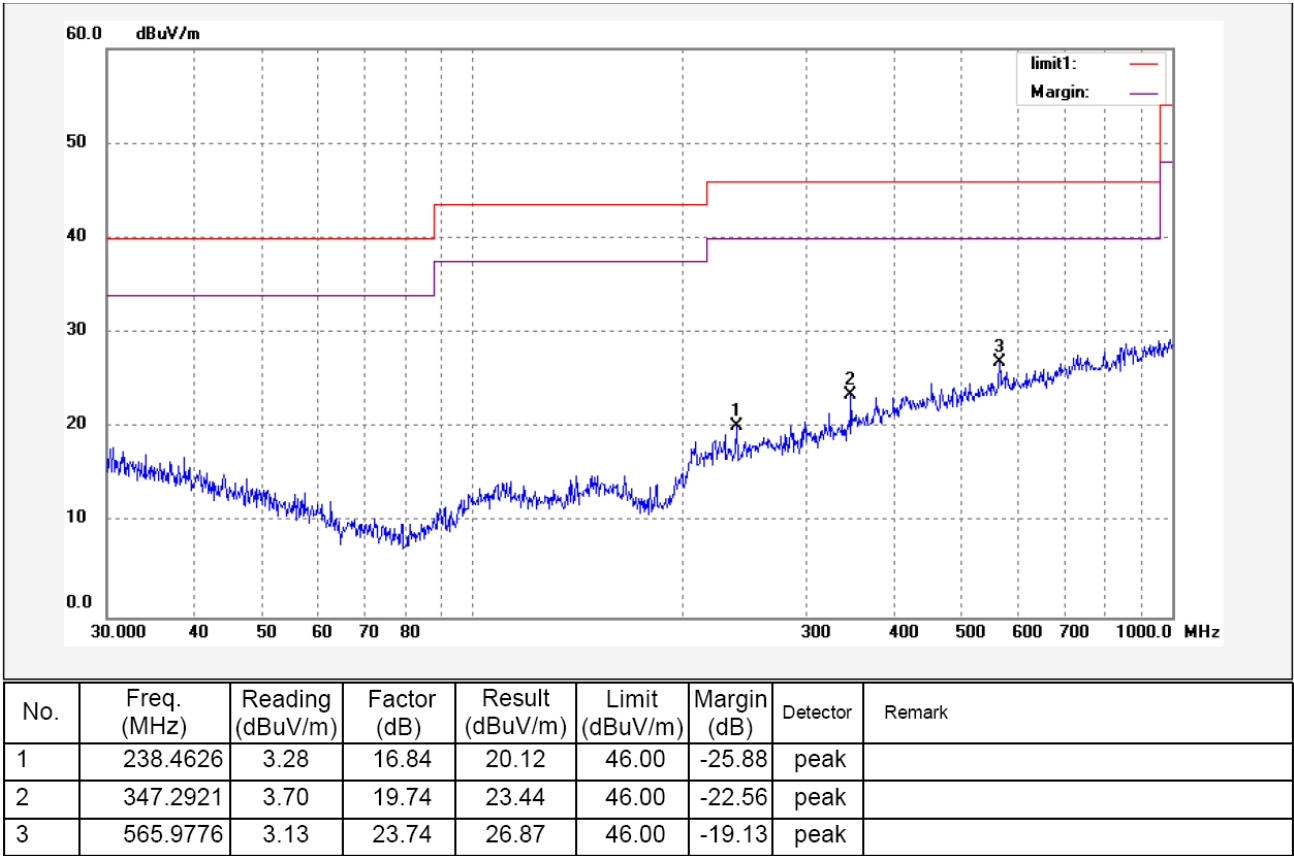
Remark: the EUT was pretested at the high,middle and low channel, and the worse case was the low Channel,so the data show was the low channel only.

Test frequency : 30-1000MHz radiation test data:

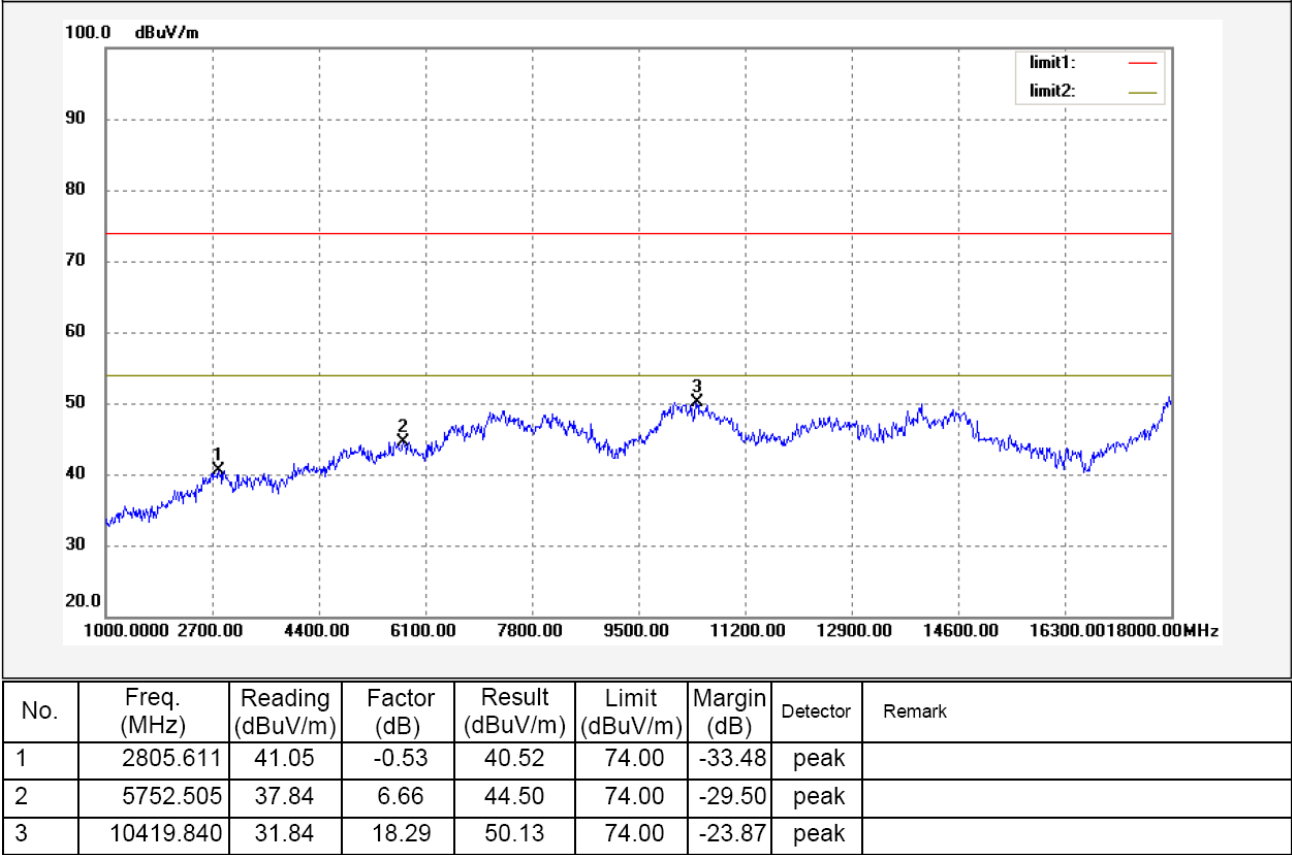
Vertical



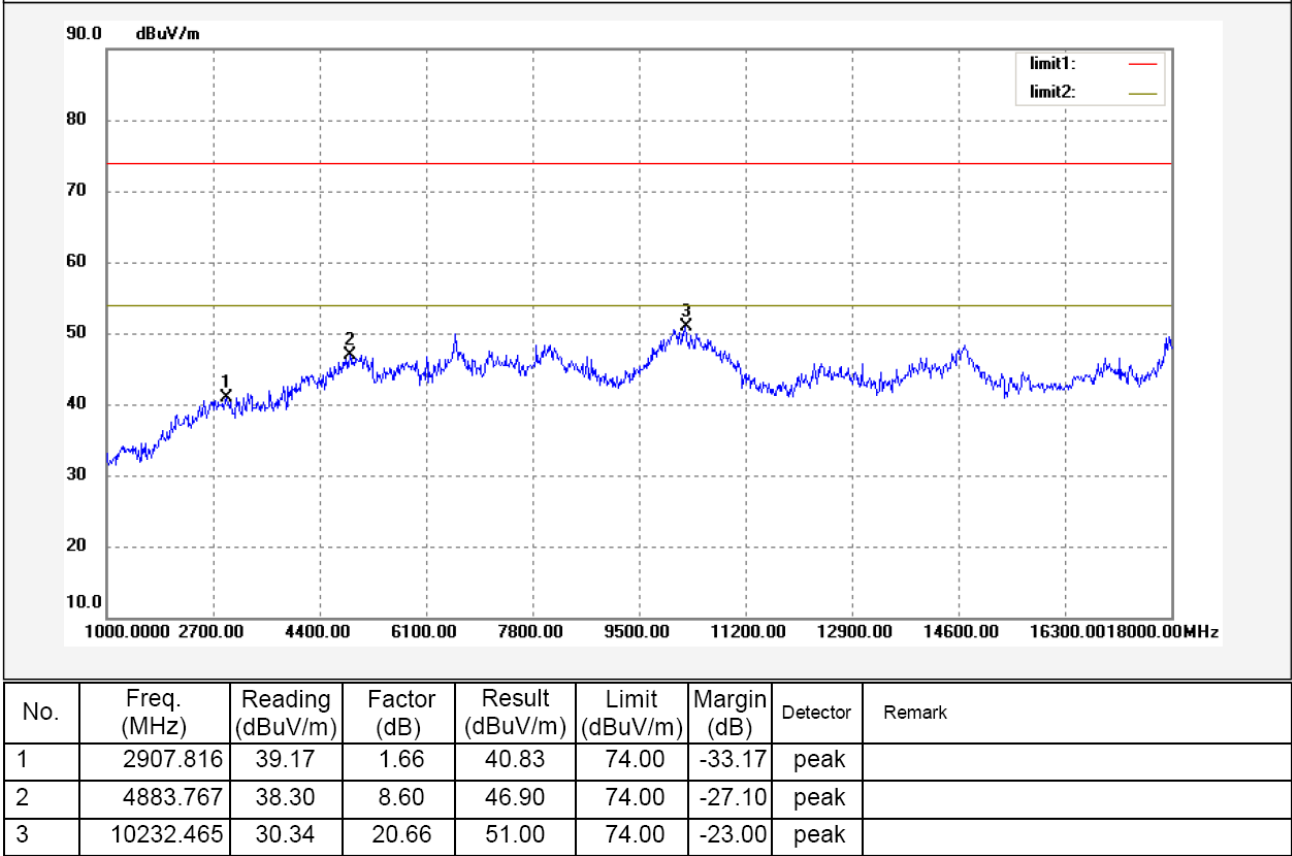
Horizontal



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



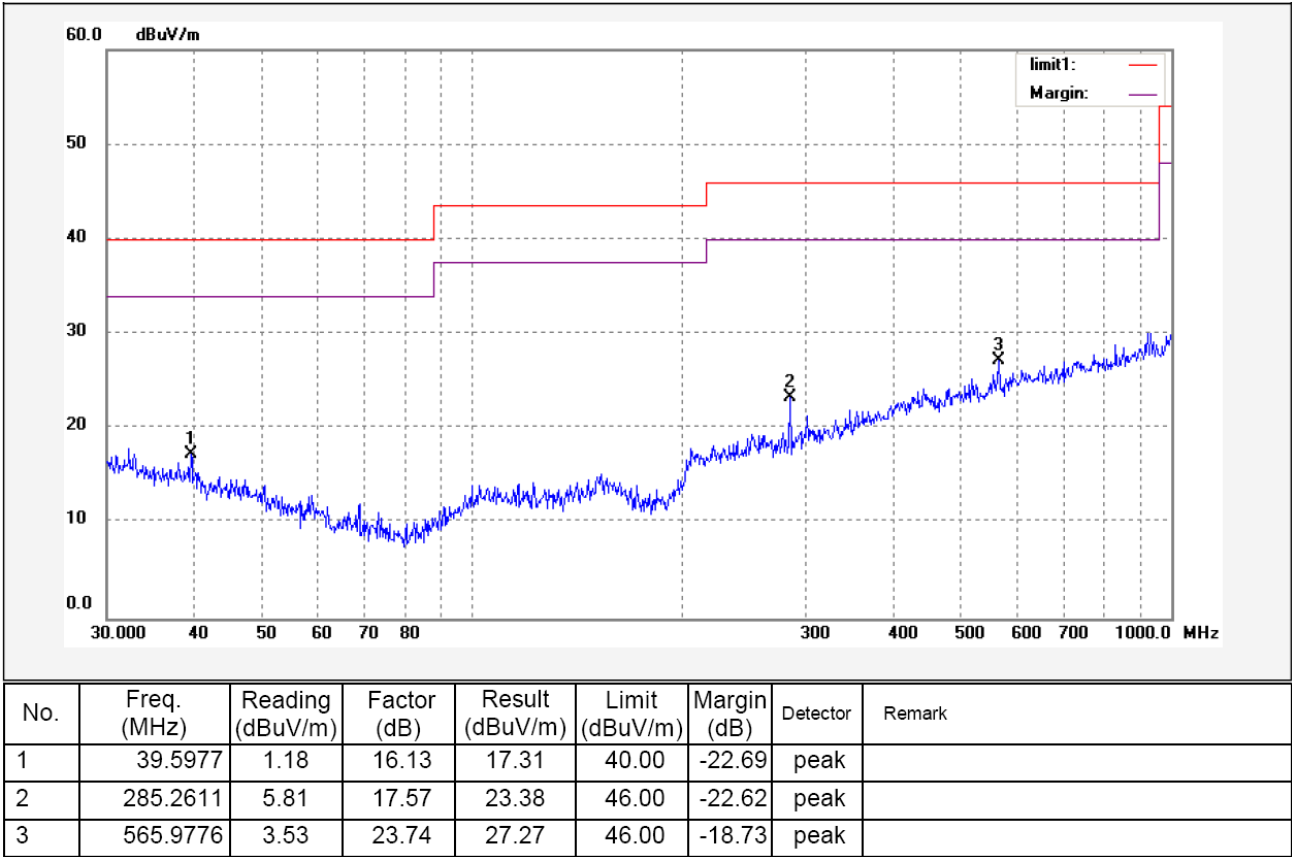
Horizontal



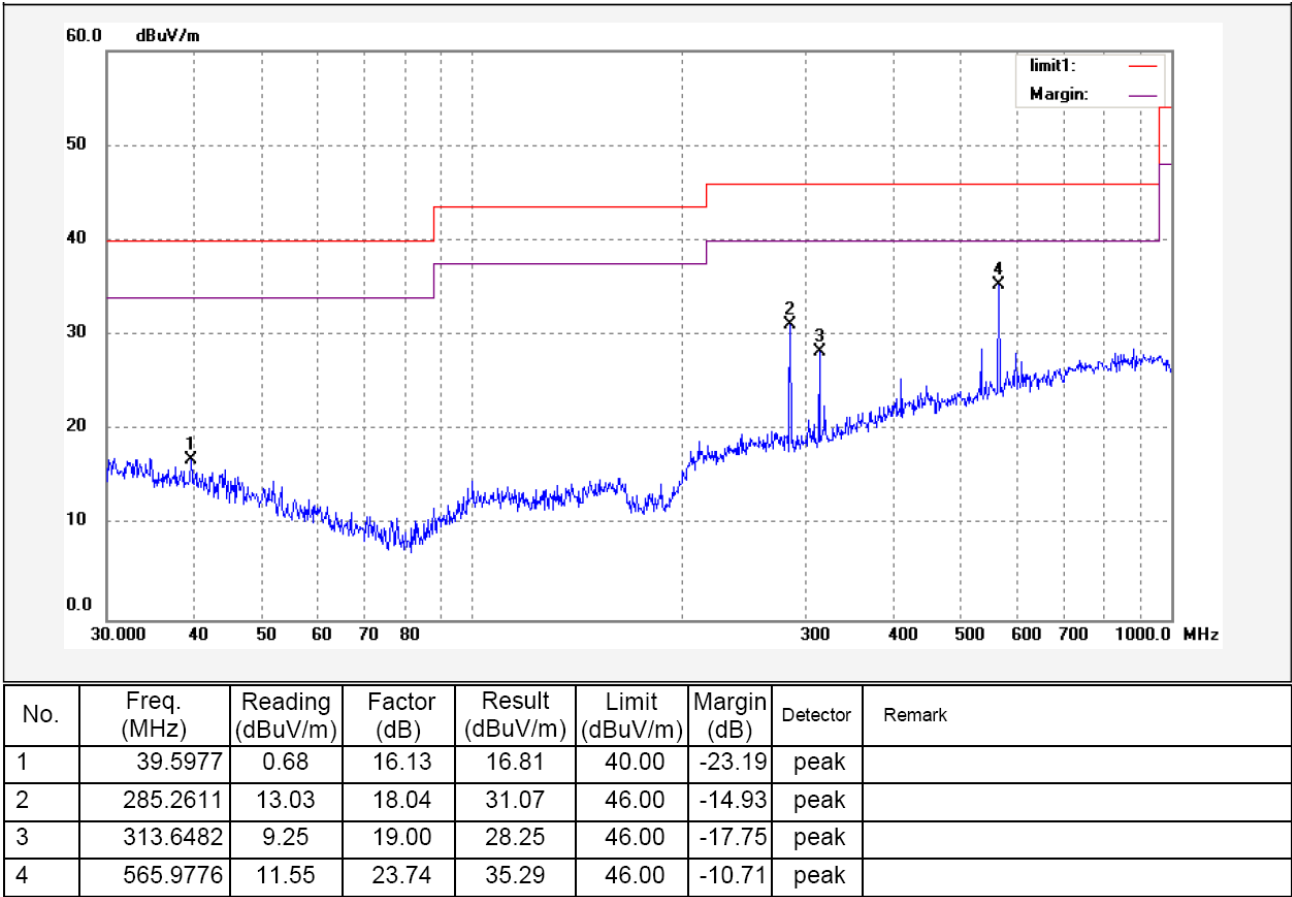
6.11.2 Test mode: continuously transmit mode.

Test frequency :30-1000MHz radiation test data:

Vertical



Horizontal



Test frequency above 1GHz test data record:

And the below is the Fundamental and Harmonic .

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC Part15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	92.36		(Fund.)	1.0	50
4804.00	AV	Vertical	37.96	54.00	16.04	1.1	150
7206.00	AV	Vertical	35.36	54.00	18.64	1.1	120
9608.00	AV	Vertical	32.26	54.00	21.74	1.1	220
12010.00	AV	Vertical	31.55	54.00	22.45	1.1	10
14412.00	AV	Vertical	30.12	54.00	23.88	1.0	150
16814.00	AV	Vertical	30.61	54.00	23.39	1.1	100
19216.00	AV	Vertical	30.13	54.00	23.87	1.0	160
21618.00	AV	Vertical	30.24	54.00	23.76	1.1	110
24020.00	AV	Vertical	28.21	54.00	25.79	1.1	130
2402.00	AV	Horizontal	90.99		(Fund.)	1.1	60
4804.00	AV	Horizontal	36.39	54.00	17.61	1.0	60
7206.00	AV	Horizontal	35.22	54.00	18.78	1.0	160
9608.00	AV	Horizontal	32.34	54.00	21.66	1.1	10
12010.00	AV	Horizontal	33.00	54.00	21.00	1.1	160
14412.00	AV	Horizontal	32.42	54.00	21.58	1.0	90
16814.00	AV	Horizontal	31.17	54.00	22.83	1.2	10
19216.00	AV	Horizontal	30.30	54.00	23.70	1.0	10
21618.00	AV	Horizontal	32.77	54.00	21.23	1.1	90
24020.00	AV	Horizontal	30.22	54.00	23.78	1.1	30
2402.00	PK	Vertical	105.69		(Fund.)	1.0	90
4804.00	PK	Vertical	46.36	74.00	27.64	1.0	160
7206.00	PK	Vertical	42.33	74.00	31.67	1.1	190
9608.00	PK	Vertical	39.65	74.00	34.35	1.0	10
12010.00	PK	Vertical	35.56	74.00	38.44	1.1	50
14412.00	PK	Vertical	34.45	74.00	39.55	1.2	50
16814.00	PK	Vertical	33.54	74.00	40.46	1.0	45
19216.00	PK	Vertical	33.00	74.00	41.00	1.1	20

21618.00	PK	Vertical	31.52	74.00	42.48	1.0	160
24020.00	PK	Vertical	30.21	74.00	43.99	1.0	10
2402.00	PK	Horizontal	100.36		(Fund.)	1.0	40
4804.00	PK	Horizontal	45.36	74.00	28.64	1.2	10
7206.00	PK	Horizontal	42.33	74.00	31.67	1.1	60
9608.00	PK	Horizontal	39.65	74.00	35.35	1.0	30
12010.00	PK	Horizontal	35.52	74.00	38.48	1.0	20
14412.00	PK	Horizontal	35.26	74.00	38.74	1.1	10
16814.00	PK	Horizontal	33.66	74.00	30.34	1.0	10
19216.00	PK	Horizontal	32.41	74.00	41.59	1.1	30
21618.00	PK	Horizontal	31.55	74.00	42.45	1.1	10
24020.00	PK	Horizontal	29.89	74.00	44.11	1.0	40
Middle frequency							
2441.00	AV	Vertical	91.88		(Fund.)	1.1	10
4882.00	AV	Vertical	36.32	54.00	17.68	1.1	20
7323.00	AV	Vertical	36.31	54.00	17.69	1.0	40
9764.00	AV	Vertical	34.55	54.00	19.45	1.0	20
12205.00	AV	Vertical	33.21	54.00	20.79	1.1	20
14646.00	AV	Vertical	32.01	54.00	21.99	1.2	120
17087.00	AV	Vertical	31.22	54.00	22.78	1.0	30
19528.00	AV	Vertical	30.25	54.00	23.75	1.1	10
21969.00	AV	Vertical	30.23	54.00	23.77	1.1	70
24410.00	AV	Vertical	29.97	54.00	25.03	1.1	90
2441.00	AV	Horizontal	89.54		(Fund.)	1.1	50
4882.00	AV	Horizontal	35.69	54.00	18.31	1.0	160
7323.00	AV	Horizontal	34.13	54.00	19.87	1.0	10
9764.00	AV	Horizontal	33.52	54.00	20.48	1.1	40
12205.00	AV	Horizontal	31.10	54.00	22.90	1.2	80
14646.00	AV	Horizontal	30.25	54.00	23.75	1.1	180
17087.00	AV	Horizontal	29.25	54.00	24.75	1.1	40
19528.00	AV	Horizontal	28.36	54.00	25.64	1.0	90
21969.00	AV	Horizontal	29.36	54.00	24.64	1.1	150
24410.00	AV	Horizontal	28.65	54.00	25.35	1.1	40
2441.00	PK	Vertical	104.68		(Fund.)	1.0	110

4882.00	PK	Vertical	46.96	74.00	27.04	1.1	90
7323.00	PK	Vertical	43.66	74.00	30.34	1.0	100
9764.00	PK	Vertical	38.99	74.00	35.01	1.1	10
12205.00	PK	Vertical	36.98	74.00	37.02	1.0	40
14646.00	PK	Vertical	36.10	74.00	38.90	1.2	90
17087.00	PK	Vertical	32.03	74.00	41.97	1.0	80
19528.00	PK	Vertical	31.25	74.00	43.75	1.0	120
21969.00	PK	Vertical	30.85	74.00	43.15	1.0	45
24410.00	PK	Vertical	30.25	74.00	43.75	1.0	120
2441.00	PK	Horizontal	101.23		(Fund.)	1.0	10
4882.00	PK	Horizontal	45.63	74.00	28.37	1.1	70
7323.00	PK	Horizontal	42.66	74.00	31.34	1.1	90
9764.00	PK	Horizontal	41.25	74.00	32.75	1.0	160
12205.00	PK	Horizontal	39.36	74.00	34.64	1.4	10
14646.00	PK	Horizontal	37.44	74.00	36.56	1.2	40
17087.00	PK	Horizontal	34.47	74.00	39.53	1.2	10
19528.00	PK	Horizontal	38.54	74.00	35.46	1.0	40
21969.00	PK	Horizontal	34.21	74.00	39.79	1.1	40
24410.00	PK	Horizontal	30.33	74.00	43.67	1.1	150
High frequency							
2480.00	AV	Vertical	94.58		(Fund.)	1.0	50
4960.00	AV	Vertical	38.99	54.00	15.01	1.2	100
7440.00	AV	Vertical	36.55	54.00	17.45	1.0	60
9920.00	AV	Vertical	33.85	54.00	20.15	1.1	160
12400.00	AV	Vertical	31.25	54.00	22.75	1.0	90
14880.00	AV	Vertical	31.01	54.00	22.99	1.0	120
17360.00	AV	Vertical	31.00	54.00	24.00	1.1	50
19840.00	AV	Vertical	30.67	54.00	23.33	1.0	180
22320.00	AV	Vertical	29.63	54.00	24.34	1.0	120
24800.00	AV	Vertical	28.69	54.00	25.31	1.1	135
2480.00	AV	Horizontal	90.63		(Fund.)	1.1	120
4960.00	AV	Horizontal	37.89	54.00	16.11	1.2	150
7440.00	AV	Horizontal	36.21	54.00	17.79	1.1	120
9920.00	AV	Horizontal	34.25	54.00	19.75	1.2	180

12400.00	AV	Horizontal	32.02	54.00	21.98	1.1	45
14880.00	AV	Horizontal	31.25	54.00	22.75	1.0	120
17360.00	AV	Horizontal	30.74	54.00	23.26	1.1	80
19840.00	AV	Horizontal	32.01	54.00	21.99	1.1	80
22320.00	AV	Horizontal	31.53	54.00	22.47	1.0	60
24800.00	AV	Horizontal	30.87	54.00	23.13	1.0	90
2480.00	PK	Vertical	105.85		(Fund.)	1.1	80
4960.00	PK	Vertical	48.98	74.00	25.02	1.1	130
7440.00	PK	Vertical	46.31	74.00	28.69	1.0	160
9920.00	PK	Vertical	42.36	74.00	36.58	1.1	150
12400.00	PK	Vertical	40.36	74.00	33.64	1.1	90
14880.00	PK	Vertical	36.98	74.00	37.02	1.1	460
17360.00	PK	Vertical	33.21	74.00	40.79	1.0	90
19840.00	PK	Vertical	33.00	74.00	44.00	1.1	120
22320.00	PK	Vertical	32.02	74.00	41.98	1.0	140
24800.00	PK	Vertical	30.12	74.00	43.88	1.0	135
2480.00	PK	Horizontal	93.25		(Fund.)	1.1	40
4960.00	PK	Horizontal	46.87	74.00	27.13	1.0	90
7440.00	PK	Horizontal	42.36	74.00	31.64	1.1	20
9920.00	PK	Horizontal	38.96	74.00	35.04	1.0	50
12400.00	PK	Horizontal	37.25	74.00	36.75	1.0	70
14880.00	PK	Horizontal	35.62	74.00	38.38	1.0	80
17360.00	PK	Horizontal	33.35	74.00	40.65	1.1	70
19840.00	PK	Horizontal	33.01	74.00	40.99	1.1	40
22320.00	PK	Horizontal	32.22	74.00	41.78	1.1	20
24800.00	PK	Horizontal	31.02	74.00	42.98	1.1	50

7 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, fulfill the requirement of this section

8 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI C63.4: 2003
Test Date:	July 05,2010
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 1W(30dBm)

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)	Output Power (mW)	Limit (W)	Power output level
Lower	2402	11.85	1	conducted
Middle	2441	11.85	1	conducted
Upper	2480	10.29	1	conducted

9 Hopping Channel Number

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 Paragraph 15.247

Test Date: July 05,2010

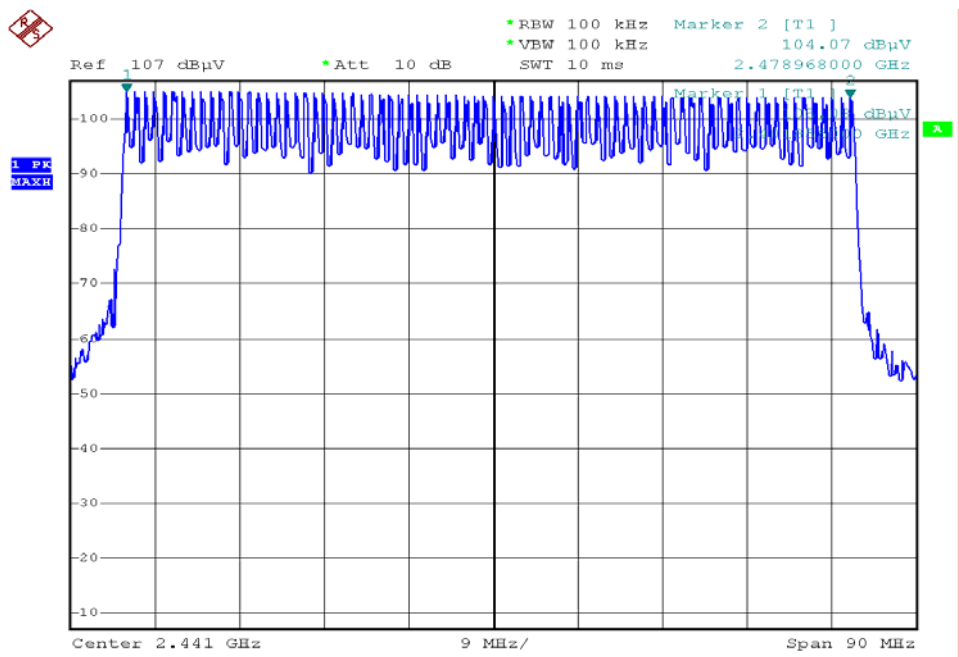
Test mode: The EUT work in test mode(Tx) and test it

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 79 channels.

The unit does meet the FCC requirements.

Please refer the graph as below:



10 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.

The hopping channels defined within a hopping sequence shall be at least 1MHz apart(channel separation)

Operating Environment:

Temperature: 25.50 °C

Humidity: 51 % RH

Barometric Pressure: 1012 mbar

EUT Operation Condition:

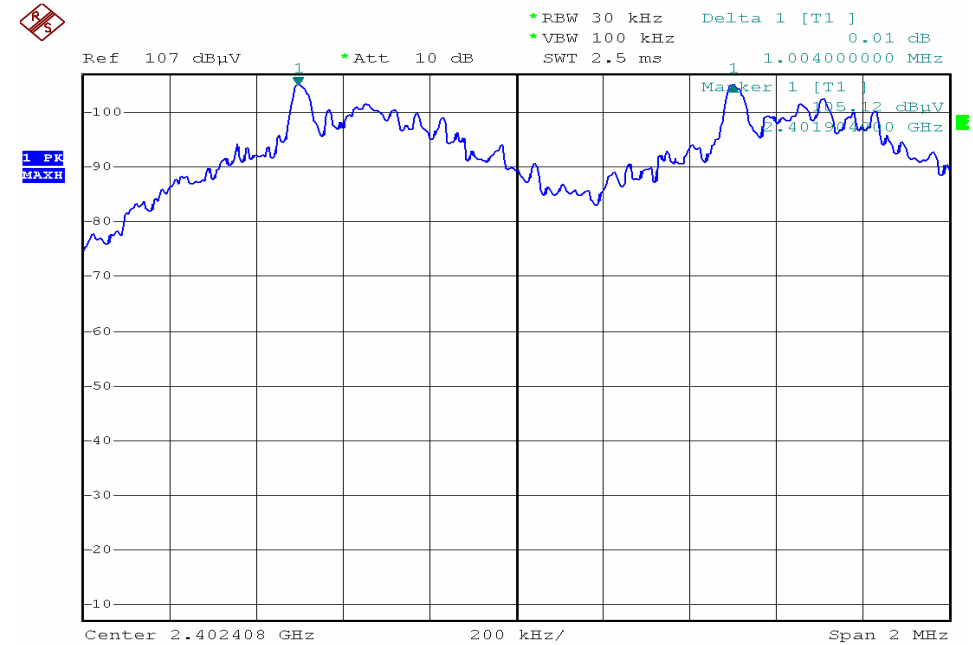
The EUT was programmed to be in continuously transmitting mode.

Test Result: PASS

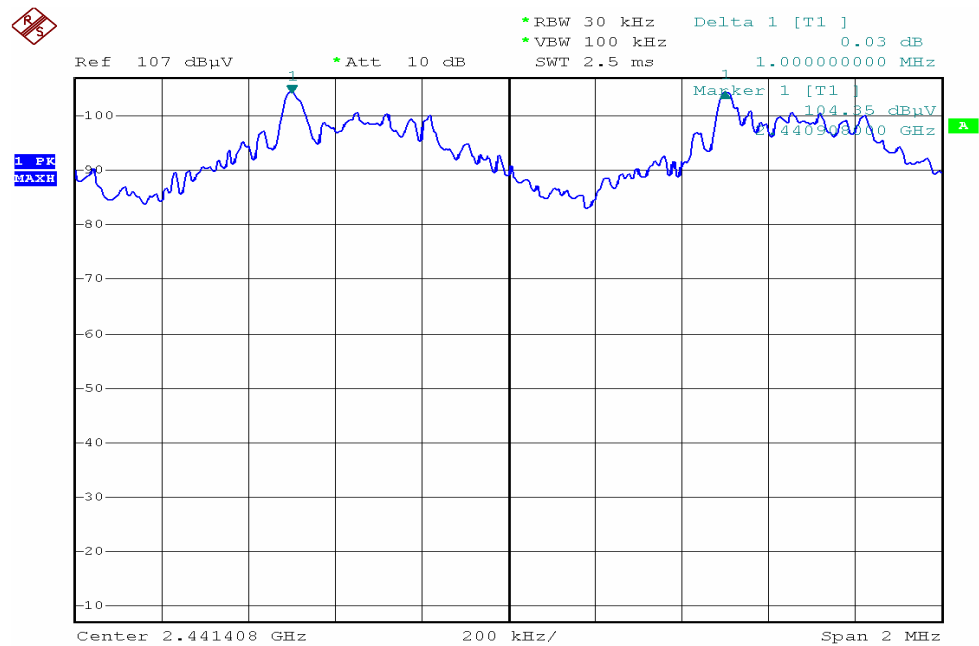
Test Channel	Channel Separation	PASS/FAIL
Lower Channels (channel 00 and channel 01)	1MHz	Pass
Middle Channels (channel 39 and channel 40)	1MHz	Pass
Upper Channels (channel 77 and channel 78)	1MHz	Pass

Please refer to the below photos for more details

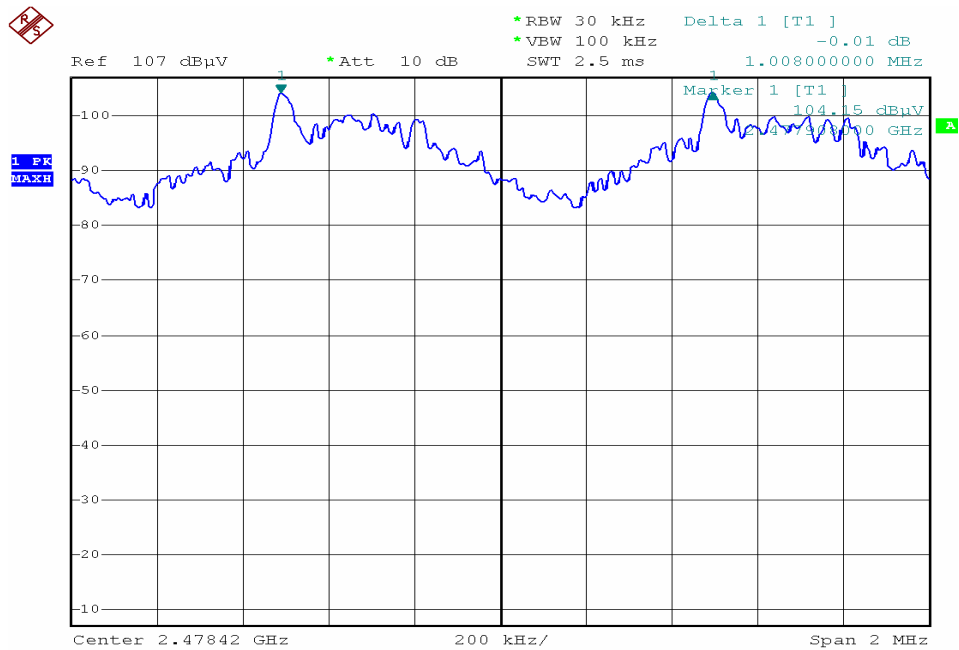
Lower Channel



Middle Channel



Upper Channel



11 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 0 Hz, measure the maximum time duration of one single pulse. Set the EUT for DH5, DH3 and DH1 packet transmitting.

DH5 Packet permit maximum $1600 / 79 / 6$ hops per second in each channel (5 time slots RX, 1 time slot TX).

DH3 Packet permit maximum $1600 / 79 / 4$ hops per second in each channel (3 time slots RX, 1 time slot TX).

DH1 Packet permit maximum $1600 / 79 / 2$ hops per second in each channel (1 time slot RX, 1 time slot TX). So, the Dwell Time can be calculated as follows:

Data Packet	Dwell Time(s)
DH5	$1600/79/6*31.6*(MkrDelta)/1000$
DH3	$1600/79/4*31.6*(MkrDelta)/1000$
DH1	$1600/79/2*31.6*(MkrDelta)/1000$

Note : Mkr Delta is once pulse time .

11.3 Test Result: PASS

Please refer to the below photos for more details.

Channel 00 2402MHz

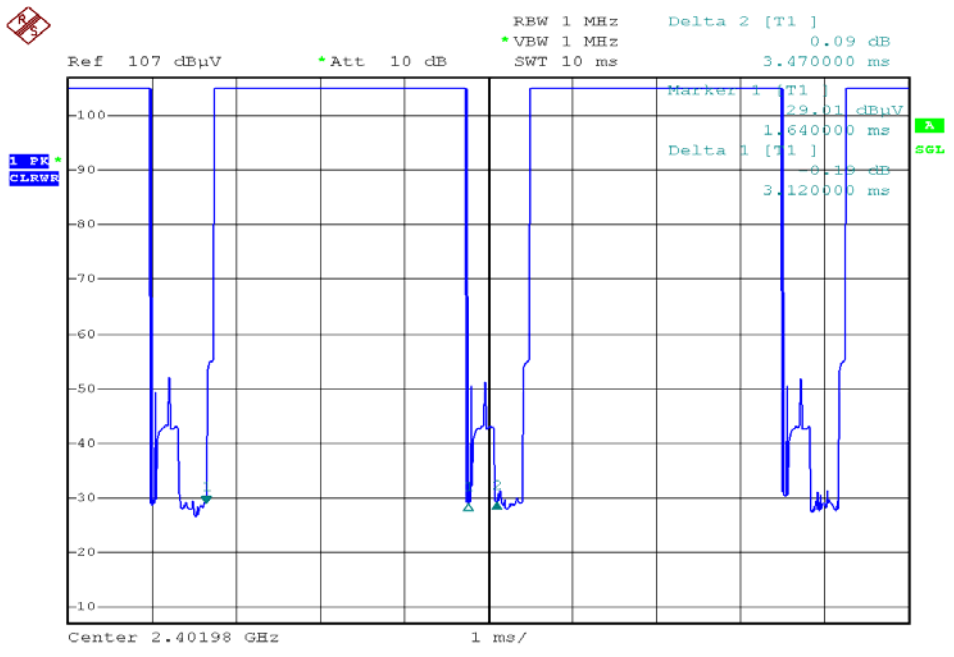
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2402 MHz	3.470	0.368	0.400
DH3	2402 MHz	2.188	0.351	0.400
DH1	2402 MHz	0.940	0.301	0.400

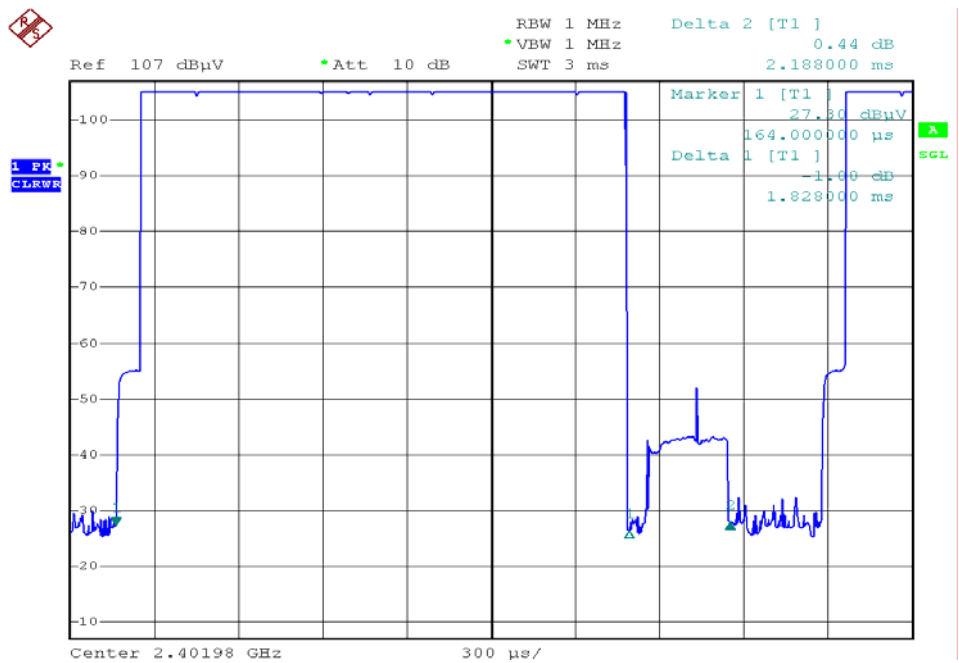
Test Result: PASS

The Results are not be greater than 0.4 seconds.

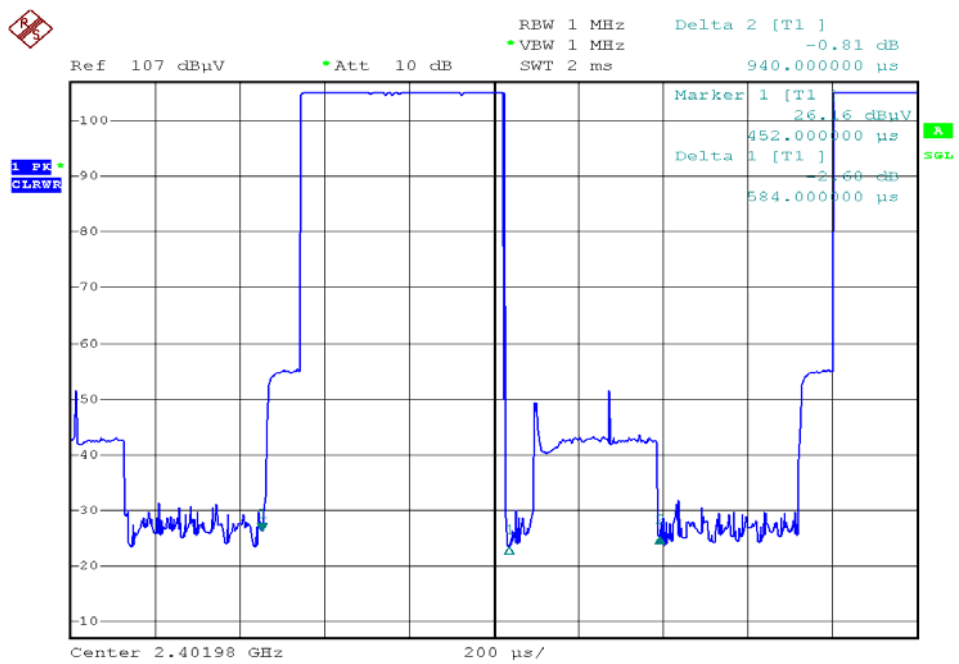
Channel 00 2402 MHz DH5



Channel 00 2402 MHz DH3



Channel 00 2402 MHz DH1



Channel 39 2441MHz

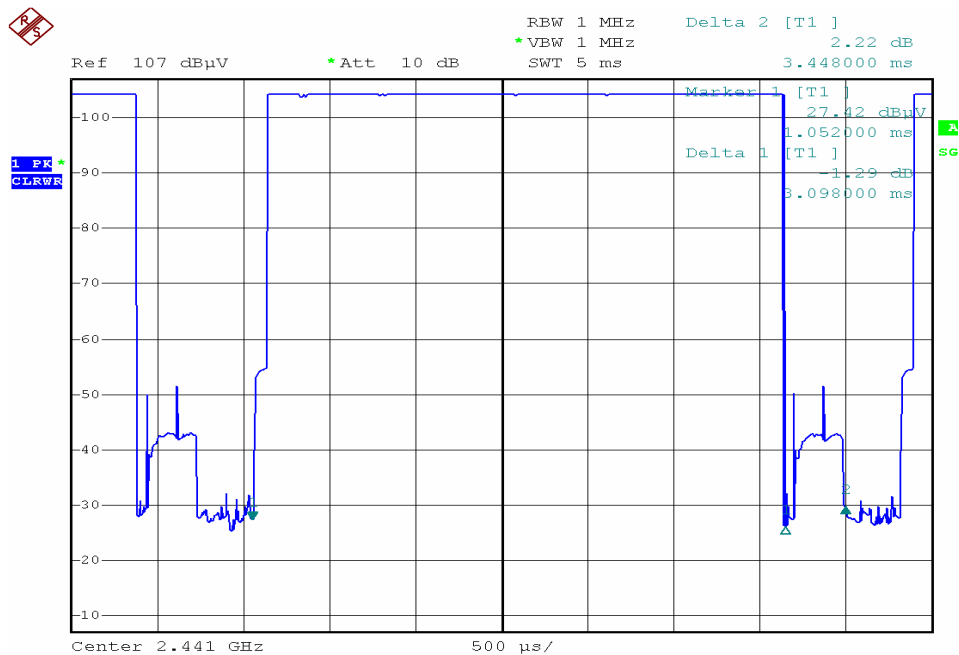
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2441 MHz	3.448	0.378	0.400
DH3	2441 MHz	2.192	0.351	0.400
DH1	2441 MHz	0.932	0.298	0.400

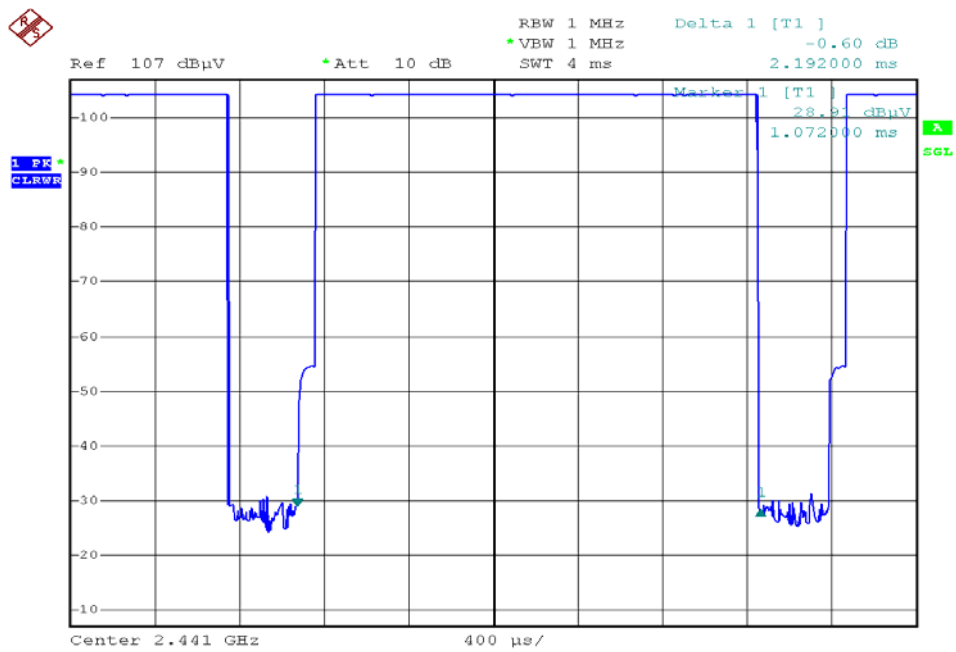
Test Result: PASS

The Results are not be greater than 0.4 seconds.

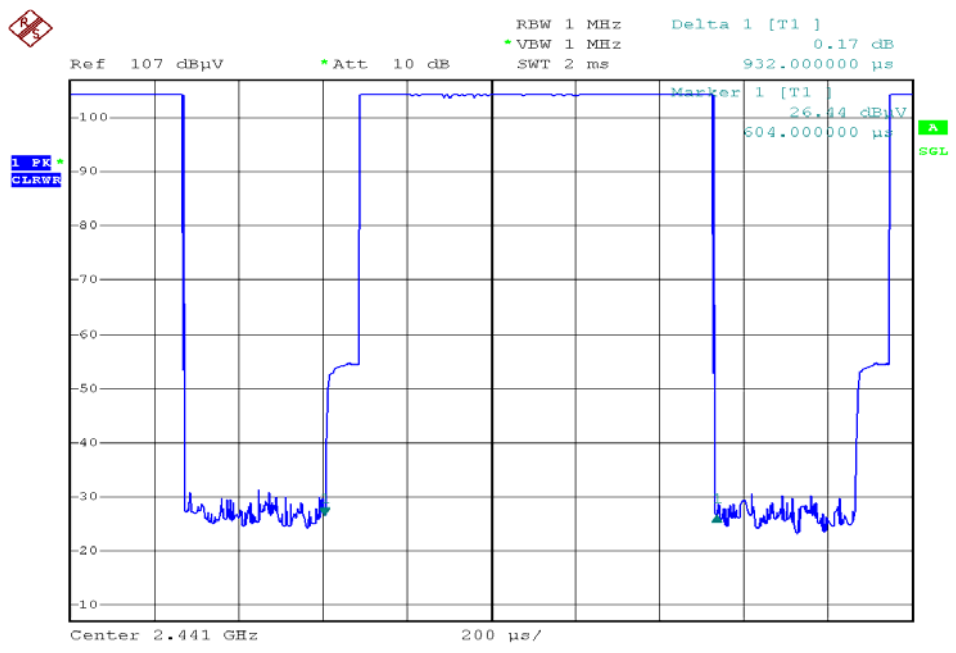
Channel 39 2441 MHz DH5



Channel 39 2441 MHz DH3



Channel 39 2441 MHz DH1



Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)
DH5	2480 MHz	3.446	0.366	0.400
DH3	2480 MHz	2.216	0.355	0.400
DH1	2480 MHz	0.932	0.298	0.400

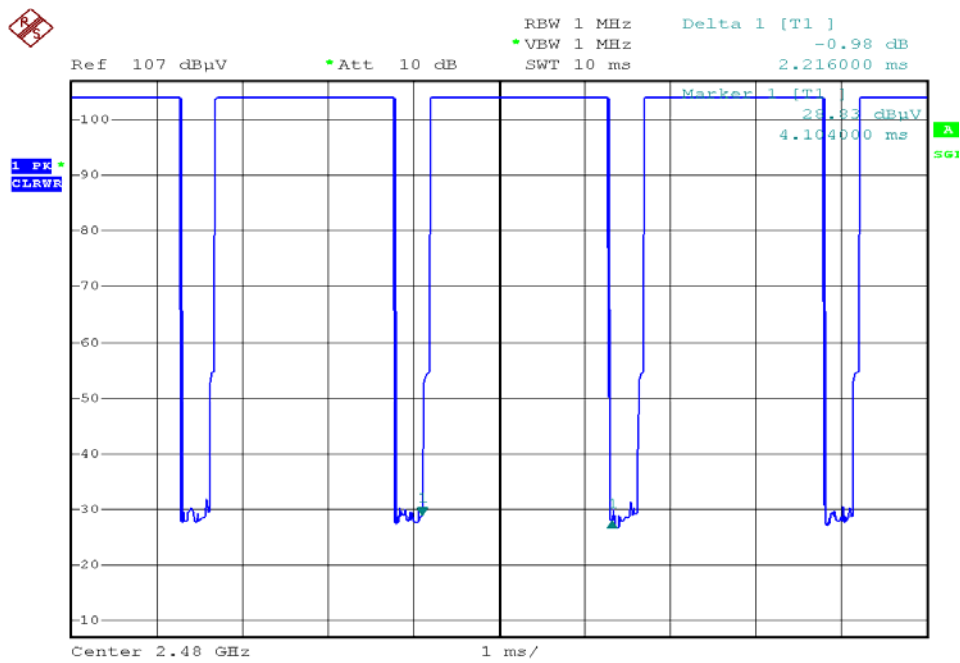
The Results are not be greater than 0.4 seconds.

Ref 107 dBuV *Att 10 dB RBW 1 MHz Delta 2 [T1] -0.59 dB
 *VEW 1 MHz SWT 5 ms Delta 1 [T1] 3.446000 ms

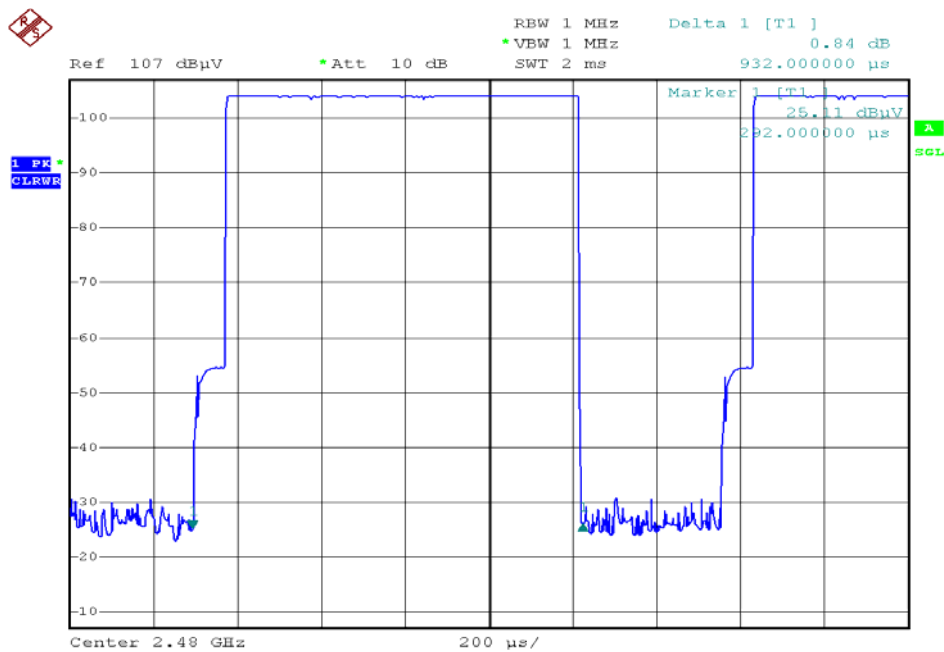
1 PK * Marker 1 [T1] 28.83 dBm
 CLRWR Delta 1 [T1] 1.194000 ms
 Delta 2 [T1] 0.60 dB
 Delta 1 [T1] 3.096000 ms

Center 2.48 GHz 500 us/

Channel 78 2480 MHz DH3



Channel 78 2480 MHz DH1



12 20-dB Bandwidth

Test Requirement: FCC Part15 C
Test Method: Based on FCC Part15 Paragraph 15.247
Test Date: July 05,2010
Test mode: The EUT work in test mode(Tx) and test it

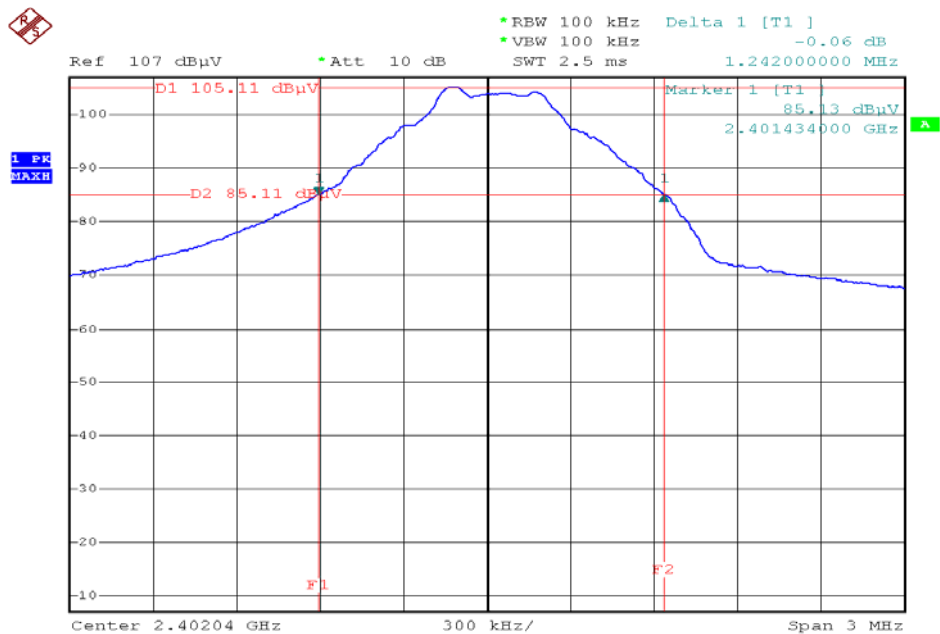
Test Procedure

- 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 2402MHz



Ref 107 dBμV *Att 10 dB RBW 100 kHz Delta 1 [T1] -0.04 dB
 *VBW 100 kHz SWT 2.5 ms 1.290000000 MHz

D1 104.35 dBμV Marker 1 [T1] 84.34 dBμV
 2.440406000 GHz

D2 84.35 dBμV F1 F2

Center 2.441 GHz 300 kHz/ Span 3 MHz

The screenshot displays a spectrum analyzer interface. The main plot shows a signal with a peak at 2.48 GHz. Two markers, D1 and D2, are placed on the signal. D1 is at 104.09 dBμV and D2 is at 84.09 dBμV. The peak is labeled with a value of 84.13 dBμV. The frequency is 2.479424000 GHz. The center frequency is 2.48 GHz, the span is 3 MHz, and the resolution bandwidth (RBW) is 100 kHz. The video bandwidth (VBW) is 100 kHz and the sweep time (SWT) is 2.5 ms. The attenuation (Att) is 10 dB. The reference level is 107 dBμV. The delta is 1 [T1]. The peak is labeled with a value of 84.13 dBμV. The frequency is 2.479424000 GHz. The center frequency is 2.48 GHz, the span is 3 MHz, and the resolution bandwidth (RBW) is 100 kHz. The video bandwidth (VBW) is 100 kHz and the sweep time (SWT) is 2.5 ms. The attenuation (Att) is 10 dB. The reference level is 107 dBμV. The delta is 1 [T1].

13 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 Date: July 05,2010
Requirements: The EUT work in test mode(Tx) and test it

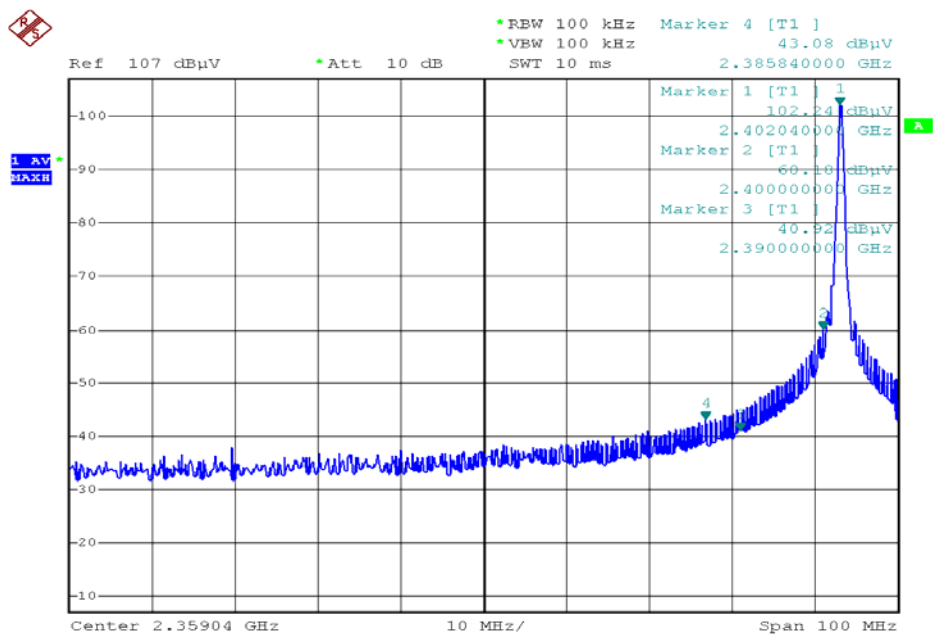
Requiments:

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.

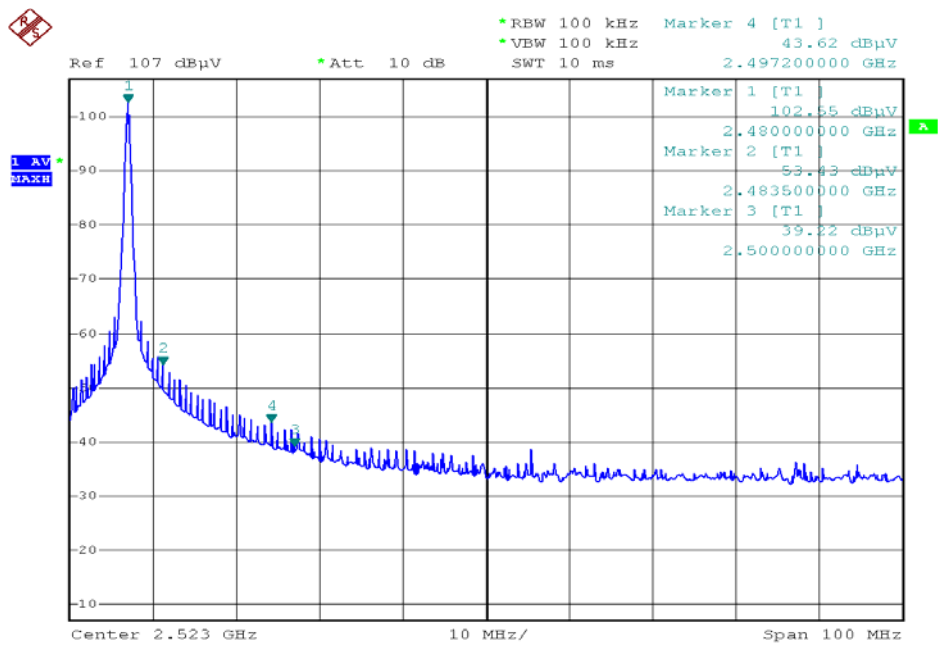
Test procedure:

An in band field strength measurement of the fundamental emission using the RBW and detector function required by 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)



14 RF Exposure Test

Test Requirement:	FCC Part 2 Subpart J
Test Method:	Based on FCC Part 15 Paragraph 15.247
Test Date:	July 05,2010
Requirements:	The EUT work in test mode(Tx) and test it

Requiments:

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2 m normally can be maintained between the user and the device.

The procedures / limit

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

Note: f = frequency in MHz ; *Plane-wave equivalent power density

MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

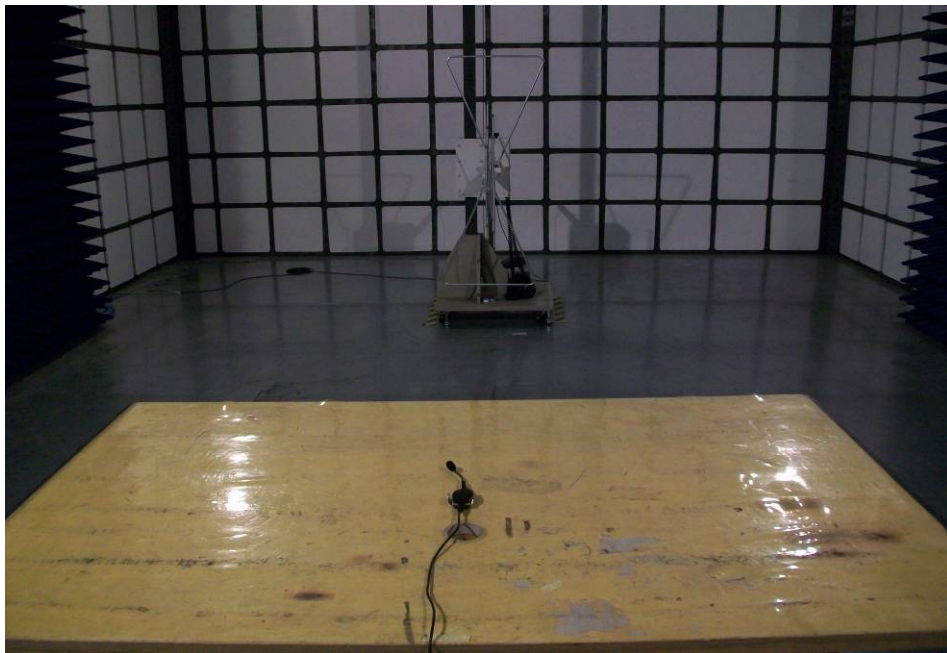
$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

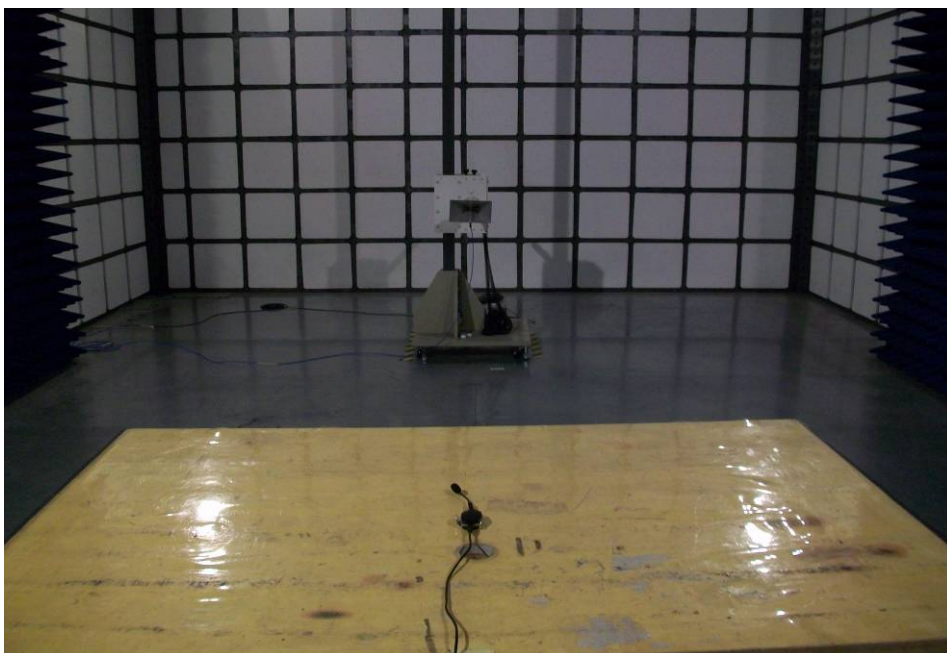
Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
-1.25	0.75	10.74	11.85	0.00177	1	Complies
-1.25	0.75	10.74	11.85	0.00177	1	Complies
-1.25	0.75	10.11	10.29	0.00154	1	Complies

15 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz



16 Photographs - Constructional Details

16.1 EUT - Front View



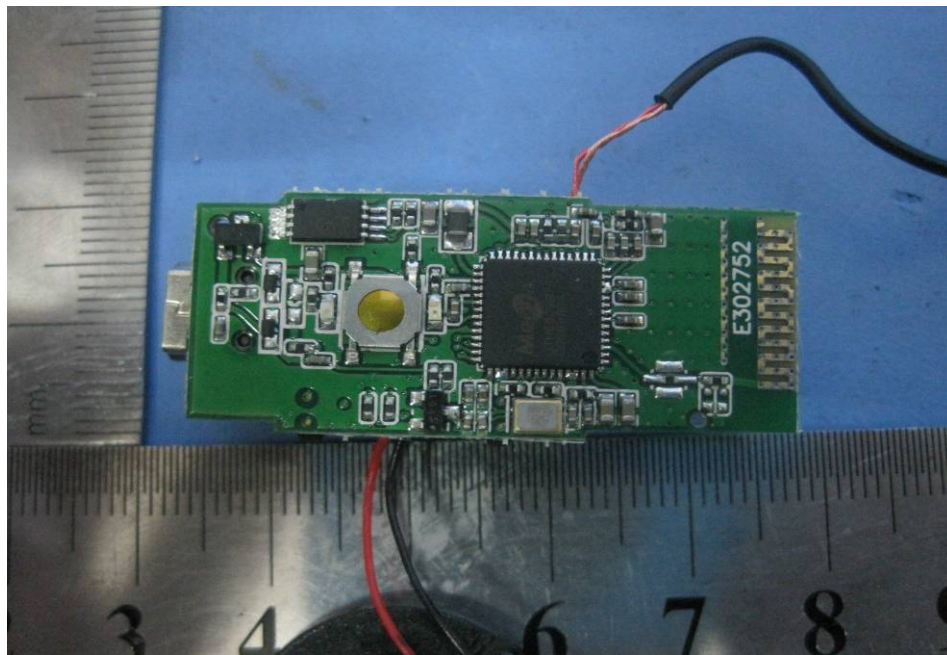
16.2 EUT - Back View



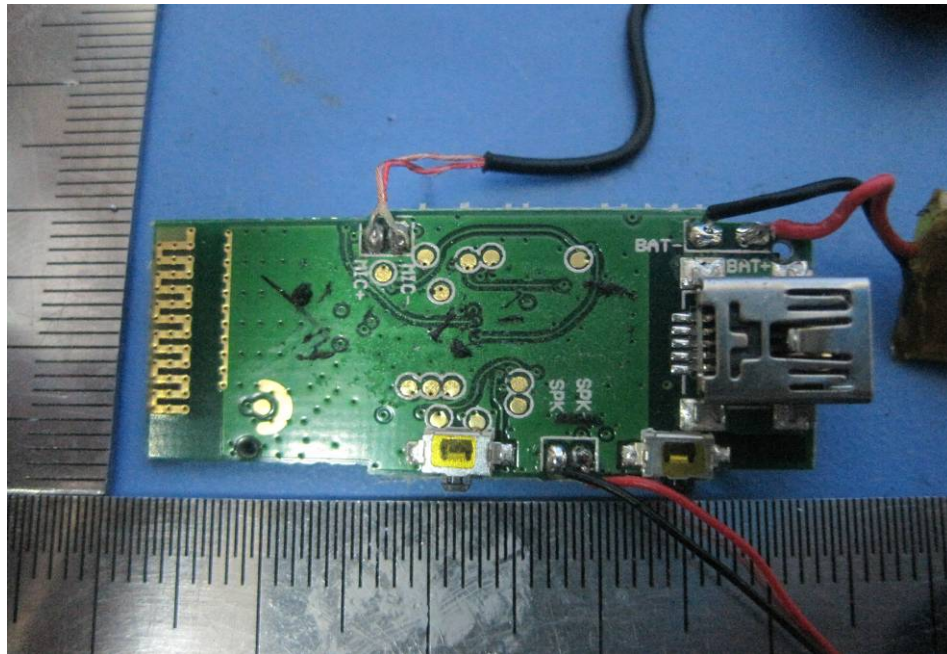
16.3 EUT - Open View



16.4 PCB1 - Front View



16.5 PCB1 - Back View



17 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

