FCC TEST REPORT

FCC ID : WU9ET-DM24

Applicant : E-TECS LIMITED
Address of Applicant : Suites 2208-11, 22/F., Tower 1, Times Square,
1 Matheson Street, Causeway Bay, Hong Kong

Equipment Under Test (EUT) :

Product description : 2.4Ghz wireless H.264 digital monitor with 2.4" screen
Model No. : ET-DM24

Standards : FCC 15 Paragraph 15.247

Date of Test : July 17 ~ July 20, 2011

Date of Issue : August 10, 2011

Test Engineer : Hunk yan/Engineer

Reviewed By : Philo zhong/Manager

PERPARED BY:
Waltek Services (Shenzhen) Co., Ltd.
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Ref. No.: WT11031370-S-E-F

2 Contents

3 Test Summary

Test Items	Test Requirement	Test Method	Limit / Severity	Result
Maximum peak output power	FCC Part 15:2008	ANSI C63.4: 2003	20dBm	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	As the test data	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, 9kHz 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:	E-TECS LIMITED
Address of Applicant:	Suites 2208-11, 22/F., Tower 1, Times Square, 1 Matheson Street, Causeway Bay, Hong Kong
Manufacturer:	SHENZHEN CALEB TECHNOLOGY LIMITED
Address of Manufacturer:	Room 2710-2711,27/F., Block A, FengLin International Building, Jixiang Road, Longgang District, Shenzhen, China

4.2 General Description of E.U.T.

Product description:	2.4Ghz wireless H.264 digital monitor with 2.4” screen
Model No.:	ET-DM24
Freuqency Range:	2414.250MHz to 2461.500MHz

4.3 Details of E.U.T.

Power Supply:	Battery 3.7V DC Adapter Input : AC 100~240V,50/60Hz,0.25A Max. Output : DC 5.0V,1.0A

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 2.4Ghz wireless H.264 digital monitor with 2.4” screen. 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, May 26, 2011.

- **IC – Registration No.: 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, Aug. 03,2010.

4.7 Test Location

All Emissions testswere performed at:-
1/F, Fukangtai Building,West Baima Rd.,Songgang Street, Baoan District, Shenzhen 518105, Guangdong,China.

5 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. 2, 2011	Aug. 1, 2012	Wws20081596	±1dB
Trilog Broadband Antenne	SCHWARZBECK MESS-ELEKTROM/ VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	-	±1dB
Broad-band Horn Antenna	SCHWARZBECK MESS-ELEKTROM/ BBHA 9120D(1201)	667	W2008003	1-18GHz	Aug. 2, 2011	Aug. 1, 2012	-	f＜10 GHz：±1dB 10GHz＜f＜18 GHz：±1.5dB
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM/ BBV 9718	9718-148	W2008004	0.5-18GHz	Aug. 2, 2011	Aug. 1, 2012	-	±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZBECK MESS-ELEKTROM/ AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
10m 50 Ohm Coaxial Cable with N-plug, individual length,	SCHWARZBECK MESS-ELEKTROM/ AK 9513	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-	-
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. 2, 2011	Aug. 1, 2012	Wws20080942	±1dB
EMI Receiver	Beijingkehuan	KH3931		9k-1GHz	Aug. 2, 2011	Aug. 1, 2012		
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	Wws20080941	±10%
Absorbing Clamp	ROHDE&SCHWARZ/ MDS-21	100205	W2005003	impandance50 Ω loss ： 17 dB	Aug. 2, 2011	Aug. 1, 2012	Wws20080943	±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. 2, 2011	Aug. 1, 2012	-	-
Digital Power Analyzer	Em Test AG/Switzerland/ DPA 500	V07451 03095	W2008012	Power：2000VA Vol-range：0-300V Freq_range：10-80Hz	Aug. 2, 2011	Aug. 1, 2012	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 diacharge：500V-16.5KV	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82400	7.5A current will be changed in V_m=1.5V
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range：9K-1GHz RF voltage：-60 dBm-+10dBm	Aug. 2, 2011	Aug. 1, 2012	Wws200 81890	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1 B
CDN M-Type	TESEQ GmbH/ CDN M016	25112	W2008009	Voltage correct factor 9.5 dB	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82396	150K-80MHz：±1dB 80-230MHz:-2-+3dB
EM-Clamp	TESEQ GmbH/ KEMZ 801	25453	W2008010	Freq_range：0.15-1000 MHz	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82397	0.3-400 MHz：±4dB Other freq：±5dB
Attenuator 6dB	TESEQ GmbH/ ATN6050	25365	-	-	Aug. 2, 2011	Aug. 1, 2012	Wws200 81597	-
All Modules Generator	SCHAFFNER /6150	34579	W2008006	voltage:200V-4.4KV Pulse current：100A-2.2KA	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82401	voltage: ±10% Pulse current：±10%

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Cert. No	Uncertainty
Capacitive Coupling Clamp	SCHAFFNER / CDN 8014	25311	-	-	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82398	-
Signal and Data Line Coupling Network	SCHAFFNER / CDN 117	25627	W2008011	1.2/50μS	Aug. 2, 2011	Aug. 1, 2012	Wwc200 82399	-
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	Wws200 80944	-
Exposure Level Tester ELT-400	Narda Safety TEST Solutions/230 4/03	M-0155	w2008022	Test freq range：1—400kHz	Aug. 2, 2011	Aug. 1, 2012	Wwd200 81191	Test uncertainly: 1—120kHz:±1.83%, 120 kHz-400 kHz: ±4.06%
Magnetic Field Probe 100cm^2	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 10kHz-30MHz	Beijing Dazhi / ZN30900A	-	-	10kHz-30MHz	Aug. 2, 2011	Aug. 1, 2012	-	±1dB

6 Conducted Emission Test

Test Requirement:	FCC Part15 Paragraph 15.207
Test Method:	Based on FCC Part15 Paragraph 15.207
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

6.1 Test Equipment

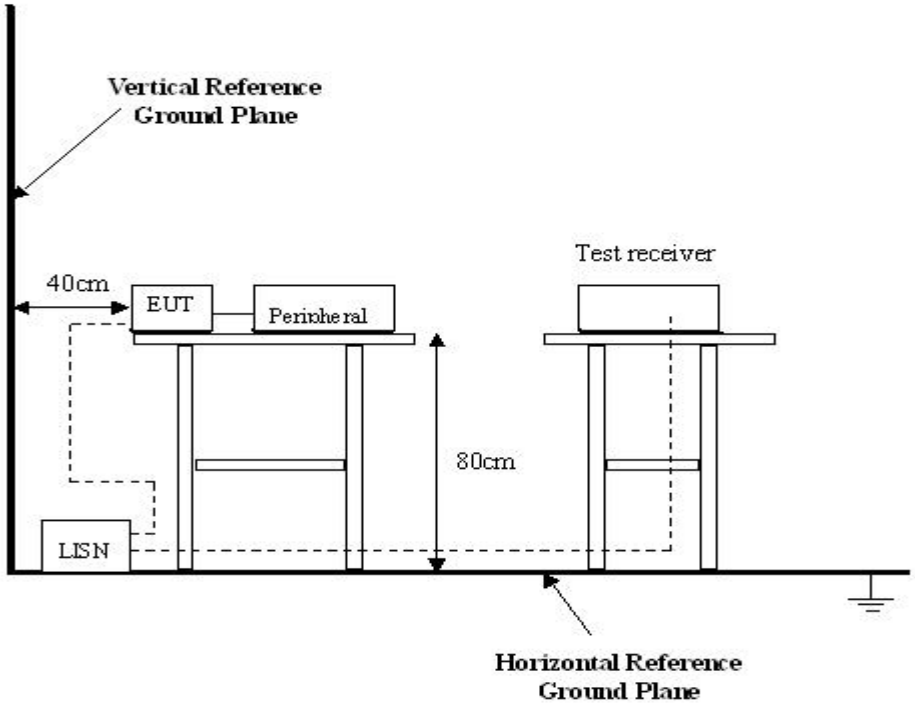
Please refer to Section 5 this report.

6.2 Test Procedure

1. The EUT was connected with signal generator and placed on a table.
2. The EUT was tested according to ANSI C63.4:2003. 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.

6.3 Conducted Test Setup

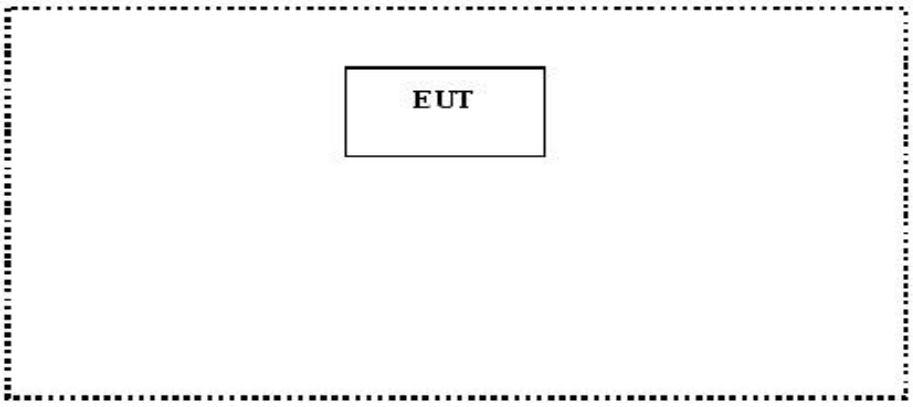
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



6.4 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.



6.5 Conducted Emission Limits

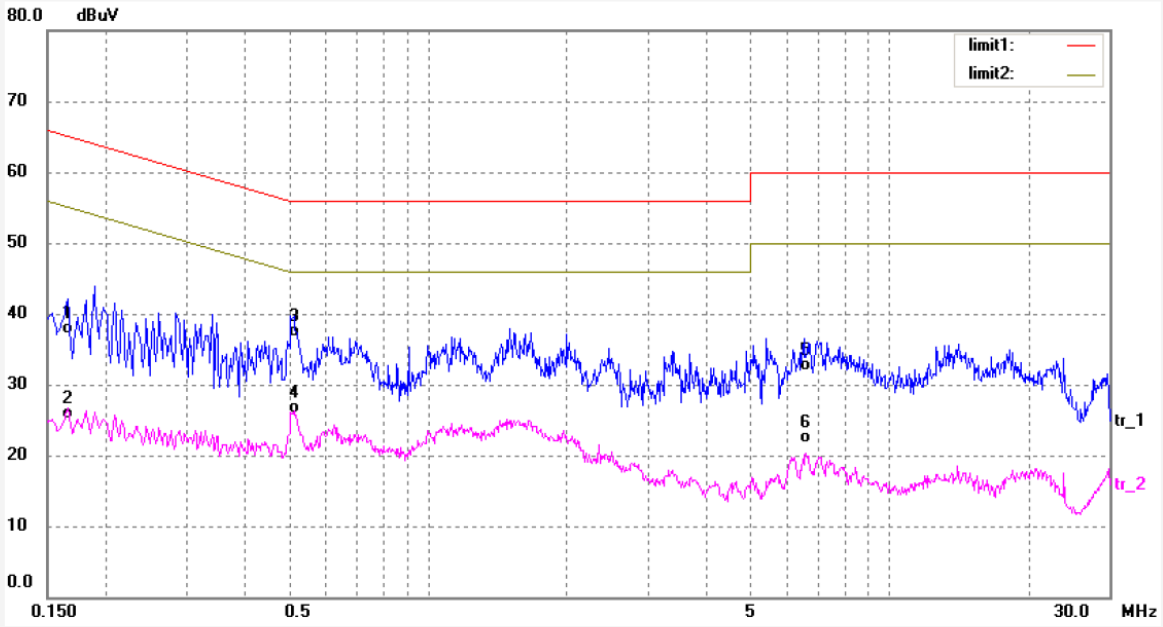
66-56 dBμV between 0.15MHz & 0.5MHz
56 dBμV between 0.5MHz & 5MHz
60 dBμV between 5MHz & 30MHz

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

6.6 Conducted Emission Test Data

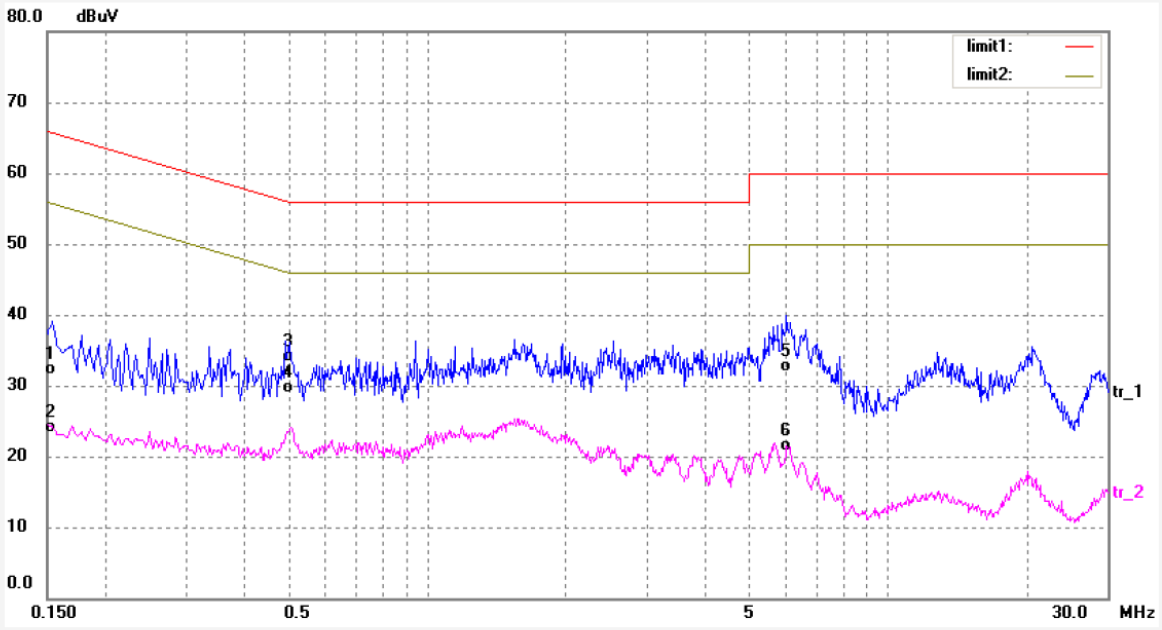
For more details , please refer to the test data as below :
Remark: the EUT was working in the normal link mode.

Live Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	26.43	10.65	37.08	65.15	-28.07	QP	
2	0.1660	14.52	10.65	25.17	55.15	-29.98	AVG	
3	0.5060	24.95	11.79	36.74	56.00	-19.26	QP	
4	0.5060	14.13	11.79	25.92	46.00	-20.08	AVG	
5	6.5540	20.06	11.80	31.86	60.00	-28.14	QP	
6	6.5540	9.90	11.80	21.70	50.00	-28.30	AVG	

Neutral Line



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	20.78	10.64	31.42	65.78	-34.36	QP	
2	0.1539	12.65	10.64	23.29	55.78	-32.49	AVG	
3	0.4940	21.61	11.70	33.31	56.10	-22.79	QP	
4	0.4940	17.21	11.70	28.91	46.10	-17.19	AVG	
5	6.0500	20.33	11.61	31.94	60.00	-28.06	QP	
6	6.0500	9.04	11.61	20.65	50.00	-29.35	AVG	

7 Radiation Emission Test

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
Frequency Range:	9kHz to 25GHz
Measurement Distance:	3m
Detector:	Peak for pre-scan (120kHz resolution bandwidth)
	Quasi-Peak if maximised peak within 6dB of limit

7.1 Test Equipment

Please refer to Section 5 this report.

7.2 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 +/- 5.03 dB.

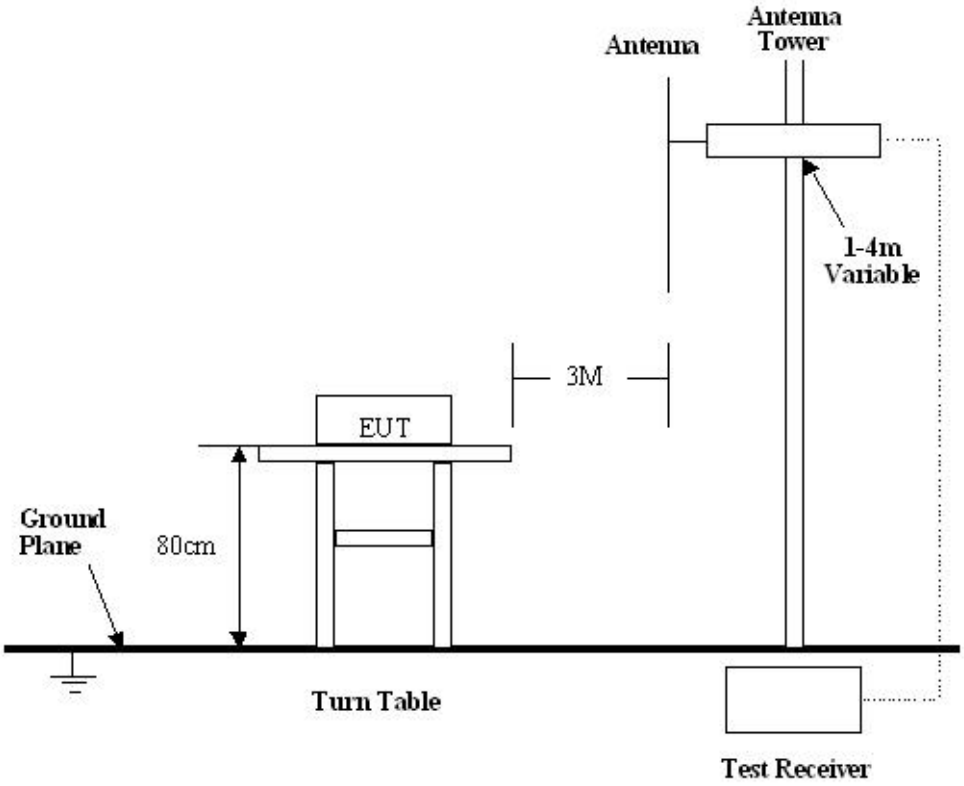
7.3 Test Procedure

1. The adapter was used in the equipment under test for radiated emissions test.
2. This is a handhold 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.
6. The EUT was tested in three(low/middle/high) channel ,and the channel list as below :

Channel List		
Channel Number	Frequency point	Note
1	2414.250MHz	Test point(Low channel)
2	2417.625MHz	
3	2421.000MHz	
4	2424.375MHz	
5	2427.750MHz	
6	2431.125MHz	
7	2434.500MHz	
8	2437.875MHz	Test point(Mid. channel)
9	2441.250MHz	
10	2444.625MHz	
11	2448.000MHz	
12	2451.375MHz	
13	2454.750MHz	
14	2458.125MHz	
15	2461.500MHz	Test point(High channel)

7.4 Radiated 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.



7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.247 Rules, the system was tested from 9kHz to 25000 MHz.

9kHz ~ 30MHz

Start Frequency 9kHz
Stop Frequency 30MHz
Sweep Speed .....Auto
IF Bandwidth 10KHz
Video Bandwidth 10KHz
Resolution Bandwidth 10KHz

30MHz ~ 1000MHz

Start Frequency .....30 MHz
Stop Frequency 1000MHz
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

7.6 Corrected 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

7.7 Summary of Test Results

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

7.8EUT Operating Condition

The same as section 6.4 of this report.

Let the EUT work in test mode and test it.

7.9 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) RF Voltage(dBuV)=20 log 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 instrumentaion employing an average detector.Measurement using instrumentation with a peak detector function,corresponding to 20dB above the maximum permitted average limit.

(5)Above 1GHz, mark a Peak and average measurements for all emissions,Limit for peak is 74dBuV/m,According to Part15.35(b) and average is 54BuV/m.

7.10 Radiated Emissions Test Result

Formula of conversion factors:the field strength at 3m was egtablished 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 stared 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

7.11 Radiated Emission Data

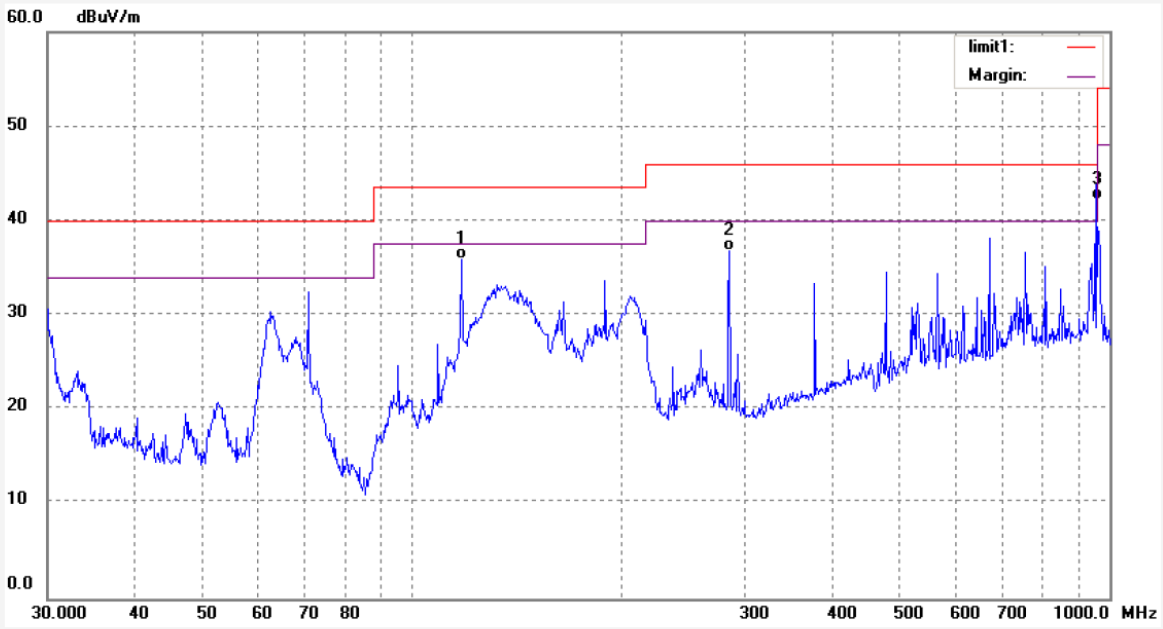
A. Test Item:	Radiated Emission Data
Test Voltage:	AC 120V
Test Mode:	CRX and CTX On
Temperature:	25.5 °C
Humidity:	51%RH
Test Result:	PASS

7.11.1 Test mode: continuously recevie 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. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

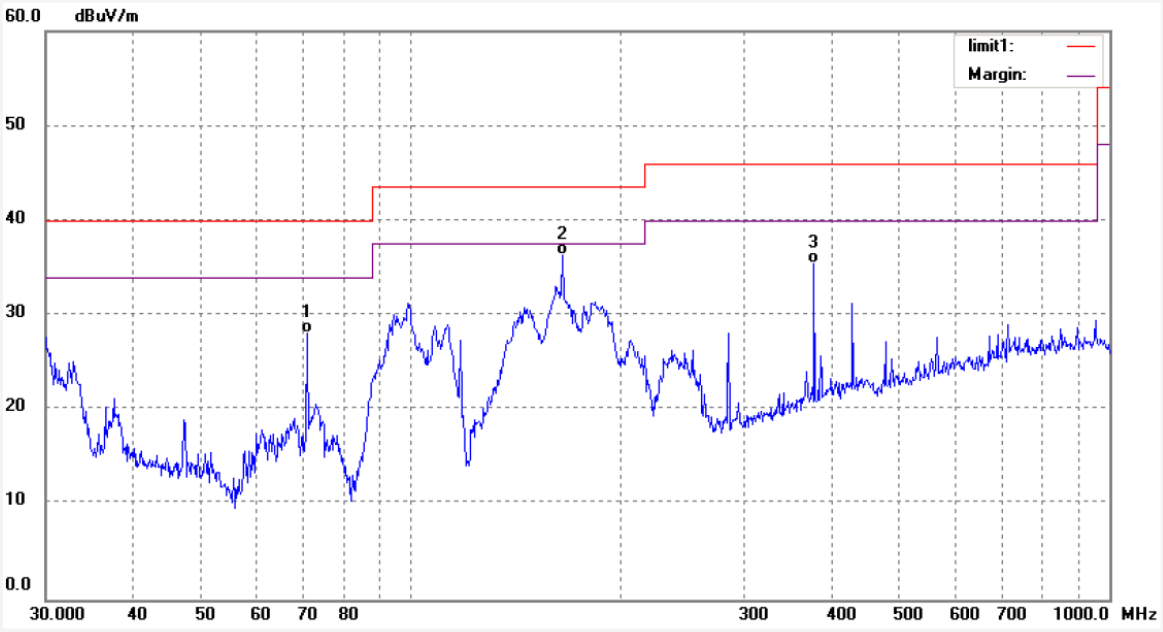
Test frequency : 30-1000MHz radiation test data:

Vertical



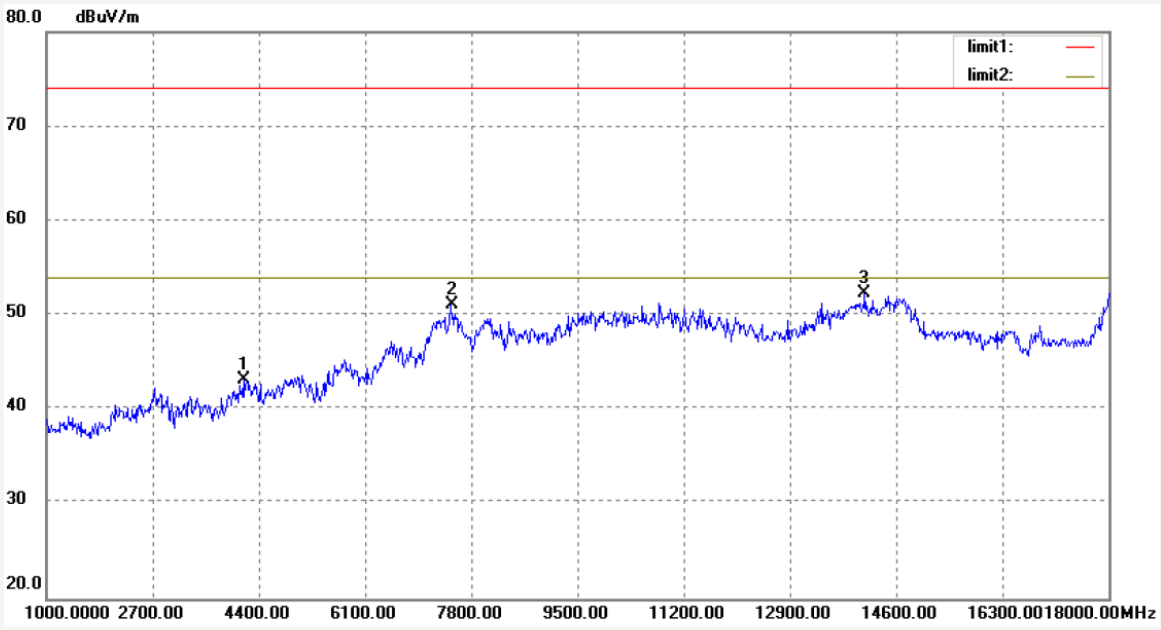
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	117.6815	23.13	12.86	35.99	43.50	-7.51	QP	
2	285.2611	18.74	18.04	36.78	46.00	-9.22	QP	
3	960.0000	16.07	26.17	42.24	46.00	-3.76	QP	

Horizontal



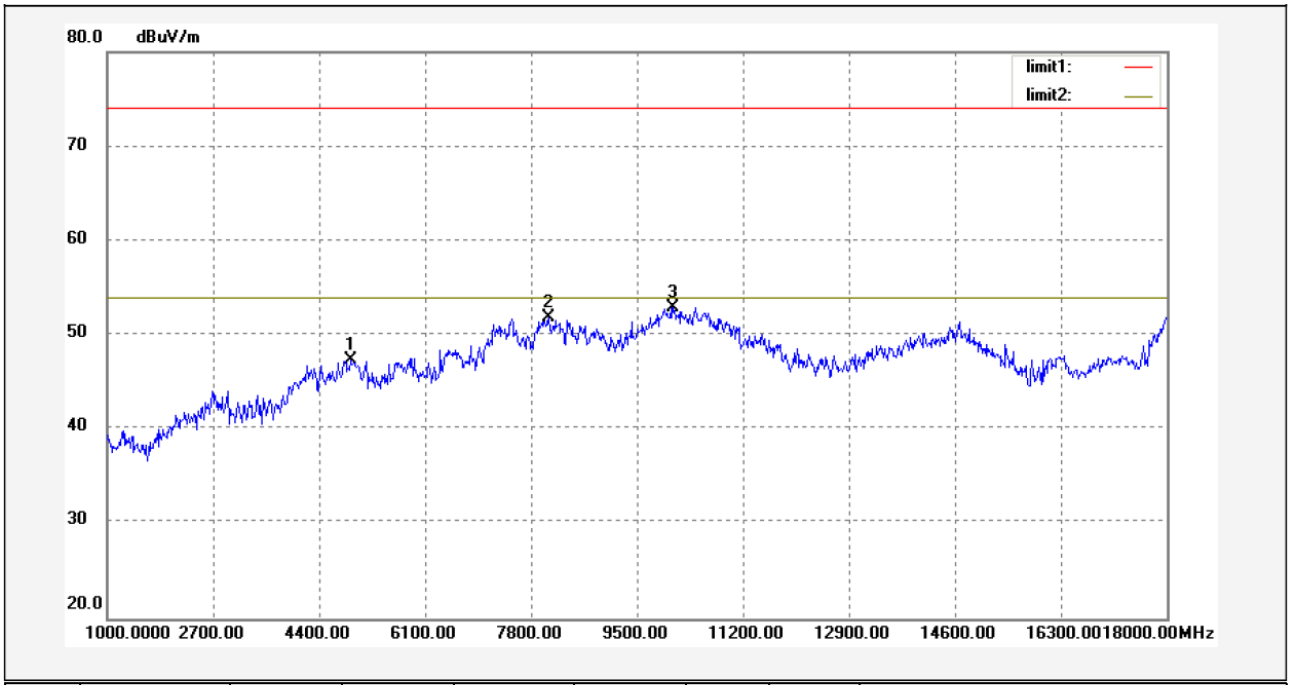
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	70.9536	17.91	10.15	28.06	40.00	-11.94	QP	
2	164.8912	23.18	13.16	36.34	43.50	-7.16	QP	
3	377.8481	15.12	20.35	35.47	46.00	-10.53	QP	

Test frequency: Above 1GHz radiation test data:
Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4151.303	40.37	2.87	43.24	74.00	-30.76	peak	
2	7472.946	38.03	13.07	51.10	74.00	-22.90	peak	
3	14099.198	29.24	23.07	52.31	74.00	-21.69	peak	

Horizontal



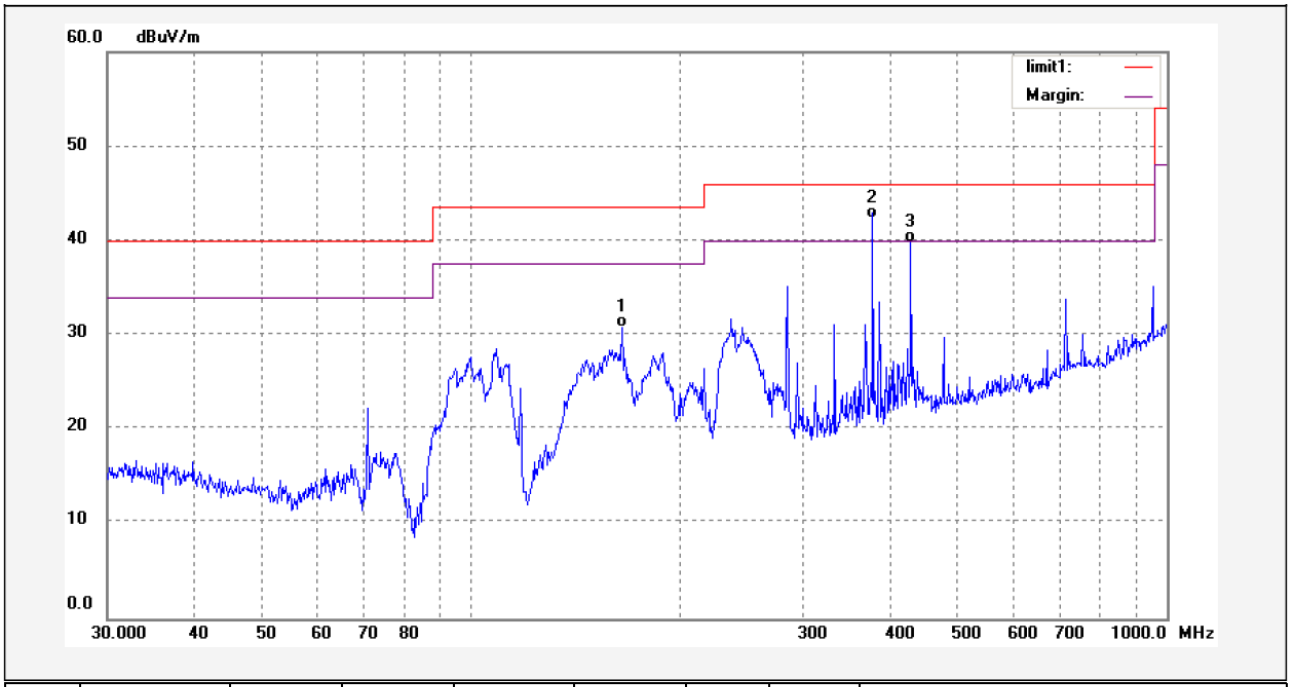
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4900.802	38.71	8.62	47.33	74.00	-26.67	peak	
2	8086.172	33.74	18.19	51.93	74.00	-22.07	peak	
3	10079.158	32.38	20.58	52.96	74.00	-21.04	peak	

7.11.2 Test mode: continuously transmit mode.

Remark: the EUT was tested in the mode:wireless normal link. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

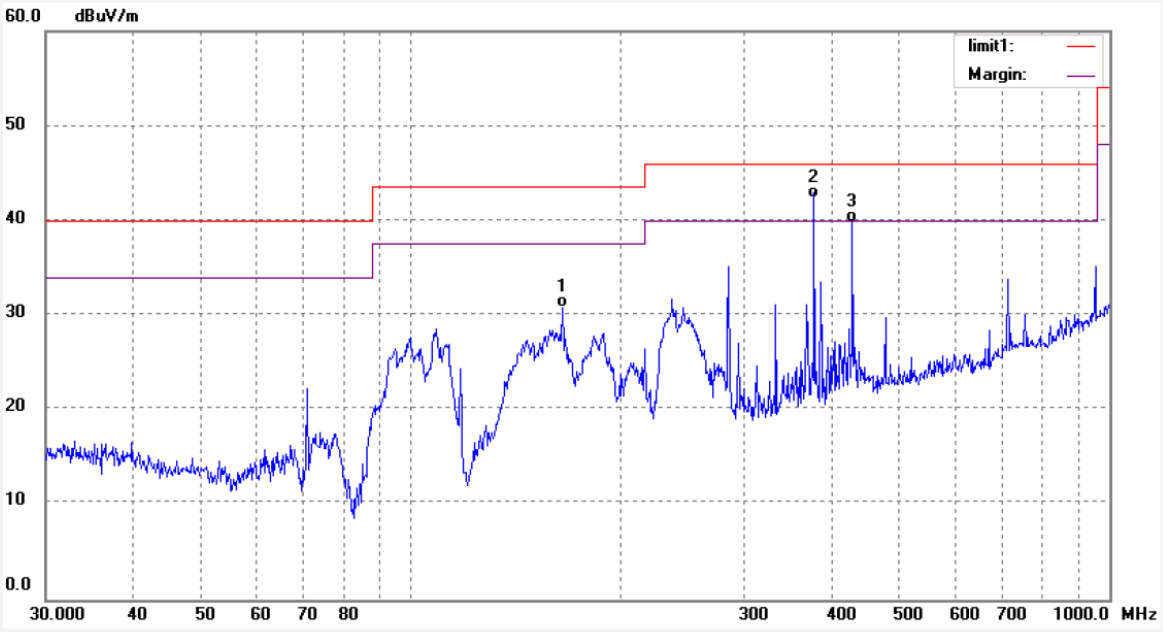
Test frequency : 30-1000MHz radiation test data:

Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	164.8912	17.71	13.12	30.83	43.50	-12.67	QP	
2	377.8481	22.07	20.33	42.40	46.00	-3.60	QP	
3	428.7960	18.24	21.65	39.89	46.00	-6.11	QP	

Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	164.8912	17.71	13.12	30.83	43.50	-12.67	QP	
2	377.8481	22.07	20.33	42.40	46.00	-3.60	QP	
3	428.7960	18.24	21.65	39.89	46.00	-6.11	QP	

And the above 1GHz is the Fundamental and Harmonic .

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2414.25	AV	Vertical	93.25		(Fund.)	1.0	10
4848.50	AV	Vertical	43.01	54.00	10.99	1.1	50
7242.75	AV	Vertical	32.03	54.00	21.97	1.2	60
9657.00	AV	Vertical	34.21	54.00	19.79	1.1	10
12071.25	AV	Vertical	30.36	54.00	23.64	1.0	140
14485.50	AV	Vertical	30.74	54.00	23.26	1.1	120
16899.75	AV	Vertical	31.22	54.00	22.78	1.2	20
19314.00	AV	Vertical	32.03	54.00	21.97	1.1	10
21728.25	AV	Vertical	30.59	54.00	23.41	1.0	90
24142.50	AV	Vertical	30.24	54.00	23.76	1.0	60
2414.25	AV	Horizontal	93.54		(Fund.)	1.2	100
4848.50	AV	Horizontal	42.21	54.00	11.79	1.1	25
7242.75	AV	Horizontal	34.21	54.00	19.79	1.1	120
9657.00	AV	Horizontal	30.36	54.00	23.64	1.2	20
12071.25	AV	Horizontal	30.74	54.00	23.26	1.0	45
14485.50	AV	Horizonta	34.21	54.00	19.79	1.0	110
16899.75	AV	Horizontal	31.25	54.00	22.75	1.1	50
19314.00	AV	Horizontal	31.22	54.00	22.78	1.0	10
21728.25	AV	Horizontal	31.53	54.00	22.47	1.1	50
24142.50	AV	Horizontal	30.14	54.00	23.86	1.0	60
2414.25	PK	Vertical	11064		(Fund.)	1.1	10
4848.50	PK	Vertical	64.85	74.00	9.15	1.0	140
7242.75	PK	Vertical	52.36	74.00	21.61	1.0	120
9657.00	PK	Vertical	42.25	74.00	31.75	1.2	20
12071.25	PK	Vertical	38.67	74.00	35.33	1.1	10
14485.50	PK	Vertical	38.78	74.00	35.22	1.1	90
16899.75	PK	Vertical	35.89	74.00	38.11	1.0	60
19314.00	PK	Vertical	38.61	74.00	35.39	1.0	100
21728.25	PK	Vertical	35.21	74.00	38.79	1.2	110

24142.50	PK	Vertical	32.36	74.00	41.64	1.0	10
2414.25	PK	Horizontal	108.78		(Fund.)	1.1	50
4848.50	PK	Horizontal	59.66	74.00	14.34	1.2	60
7242.75	PK	Horizontal	45.55	74.00	28.45	1.1	10
9657.00	PK	Horizontal	37.33	74.00	36.67	1.0	140
12071.25	PK	Horizontal	33.19	74.00	40.81	1.0	10
14485.50	PK	Horizontal	33.62	74.00	40.38	1.0	60
16899.75	PK	Horizontal	30.73	74.00	43.27	1.1	100
19314.00	PK	Horizontal	33.57	74.00	40.43	1.2	120
21728.25	PK	Horizontal	33.59	74.00	40.41	1.1	180
24142.50	PK	Horizontal	32.36	74.00	41.64	1.0	120
Middle frequency							
2437.875	AV	Vertical	90.21		(Fund.)	1.1	10
4875.750	AV	Vertical	42.58	54.00	11.42	1.1	50
7313.625	AV	Vertical	35.36	54.00	18.64	1.1	60
9751.500	AV	Vertical	32.52	54.00	21.48	1.0	10
12189.375	AV	Vertical	31.45	54.00	22.55	1.1	140
14627.250	AV	Vertical	33.65	54.00	20.35	1.1	120
17065.12	AV	Vertical	32.12	54.00	21.88	1.1	20
19503.00	AV	Vertical	30.17	54.00	23.83	1.1	10
21940.87	AV	Vertical	33.65	54.00	20.35	1.1	90
2437.875	AV	Vertical	31.25	54.00	23.75	1.0	60
2437.875	AV	Horizontal	94.52		(Fund.)	1.1	20
4875.750	AV	Horizontal	45.62	54.00	8.38	1.2	30
7313.625	AV	Horizontal	35.36	54.00	18.64	1.0	90
9751.500	AV	Horizontal	32.52	54.00	21.48	1.0	100
12189.375	AV	Horizontal	31.45	54.00	22.55	1.2	120
14627.250	AV	Horizontal	30.63	54.00	23.37	1.1	90
17065.12	AV	Horizontal	30.21	54.00	23.79	1.1	150
19503.00	AV	Horizontal	31.45	54.00	22.55	1.1	120
21940.87	AV	Horizontal	30.67	54.00	23.33	1.0	10
2437.875	AV	Horizontal	30.24	54.00	23.76	1.0	30
2437.875	PK	Vertical	108.99		(Fund.)	1.2	180
4875.750	PK	Vertical	64.56	74.00	9.44	1.0	90

7313.625	PK	Vertical	53.66	74.00	20.34	1.1	10
9751.500	PK	Vertical	42.25	74.00	31.75	1.1	50
12189.375	PK	Vertical	40.14	74.00	33.86	1.1	60
14627.250	PK	Vertical	39.36	74.00	34.64	1.0	10
17065.12	PK	Vertical	38.74	74.00	35.26	1.1	140
19503.00	PK	Vertical	40.14	74.00	33.86	1.1	120
21940.87	PK	Vertical	36.68	74.00	37.32	1.1	20
2437.875	PK	Vertical	40.32	74.00	23.68	1.1	30
2437.875	PK	Horizontal	106.35		(Fund.)	1.0	35
4875.750	PK	Horizontal	56.99	74.00	27.01	1.2	130
7313.625	PK	Horizontal	42.36	74.00	31.64	1.1	20
9751.500	PK	Horizontal	40.15	74.00	33.85	1.2	90
12189.375	PK	Horizontal	39.36	74.00	34.64	1.1	30
14627.250	PK	Horizontal	38.54	74.00	35.46	1.0	25
17065.12	PK	Horizontal	34.44	74.00	39.56	1.1	70
19503.00	PK	Horizontal	39.36	74.00	34.64	1.1	35
21940.87	PK	Horizontal	38.74	74.00	35.26	1.1	20
2437.875	PK	Horizontal	34.21	74.00	39.79	1.2	135
High frequency							
2461.50	AV	Vertical	92.86		(Fund.)	1.0	30
4923.00	AV	Vertical	42.36	54.00	11.64	1.1	35
7384.50	AV	Vertical	38.62	54.00	15.38	1.1	130
9846.00	AV	Vertical	33.36	54.00	20.64	1.1	20
12307.5	AV	Vertical	31.89	54.00	22.11	1.1	90
14769.0	AV	Vertical	38.62	54.00	15.38	1.0	30
17230.5	AV	Vertical	30.64	54.00	23.36	1.1	25
19692.0	AV	Vertical	30.13	54.00	23.87	1.1	90
22153.5	AV	Vertical	30.27	54.00	23.73	1.0	30
24615.0	AV	Vertical	28.27	54.00	25.73	1.1	25
2461.50	AV	Horizontal	91.34		(Fund.)	1.1	70
4923.00	AV	Horizontal	41.01	54.00	12.99	1.1	80
7384.50	AV	Horizontal	37.65	54.00	16.35	1.1	30
9846.00	AV	Horizontal	33.36	54.00	20.64	1.0	60
12307.5	AV	Horizontal	32.35	54.00	21.65	1.2	90

14769.0	AV	Horizontal	33.66	54.00	20.34	1.1	30
17230.5	AV	Horizontal	38.62	54.00	15.38	1.1	35
19692.0	AV	Horizontal	33.36	54.00	20.64	1.1	130
22153.5	AV	Horizontal	33.31	54.00	20.69	1.0	20
24615.0	AV	Horizontal	32.24	54.00	21.76	1.1	90
2461.50	PK	Vertical	109.87		(Fund.)	1.1	30
4923.00	PK	Vertical	64.25	74.00	9.75	1.1	25
7384.50	PK	Vertical	52.24	74.00	21.76	1.1	70
9846.00	PK	Vertical	42.52	74.00	31.48	1.0	80
12307.5	PK	Vertical	37.56	74.00	36.44	1.0	30
14769.0	PK	Vertical	37.14	74.00	36.86	1.2	35
17230.5	PK	Vertical	36.87	74.00	37.13	1.1	130
19692.0	PK	Vertical	36.26	74.00	37.74	1.2	20
22153.5	PK	Vertical	36.75	74.00	37.25	1.2	90
24615.0	PK	Vertical	36.23	74.00	37.77	1.1	30
2461.50	PK	Vertical	106.54		(Fund.)	1.1	40
4923.00	PK	Vertical	59.88	74.00	14.12	1.2	90
7384.50	PK	Vertical	52.36	74.00	21.64	1.1	30
9846.00	PK	Vertical	41.26	74.00	32.64	1.2	35
12307.5	PK	Vertical	35.52	74.00	38.48	1.1	130
14769.0	PK	Vertical	35.26	74.00	38.74	1.2	20
17230.5	PK	Vertical	34.41	74.00	39.59	1.1	90
19692.0	PK	Vertical	33.25	74.00	30.75	1.2	30
22153.5	PK	Vertical	32.25	74.00	41.75	1.1	40
24615.0	PK	Vertical	31.44	74.00	32.56	1.2	90

8 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.

9 Maximum Peak Output Power

Test Requirement:	FCC Part15 Paragraph 15.247
Test Method:	Based on ANSI 63.4:2003
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.

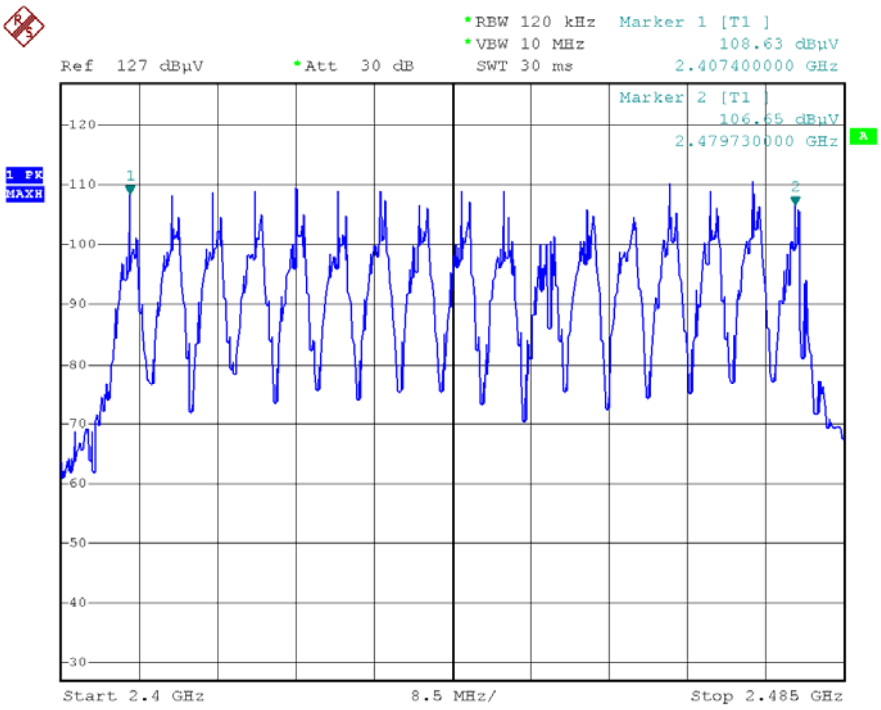
Test Result: The unit does meet the FCC requirements.

Test Channel	Fundamental Frequency(MHz)	Output Power (mW)	Limit (W)	Power output level
Lower	2414.250	31.87	0.125	conducted
Middle	2437.875	31.87	0.125	conducted
Upper	2461.500	30.69	0.125	conducted

10 Hopping Channel Number

Test Requirement:	FCC Part15 C
Test Method:	Based on FCC Part15 Paragraph 15.247
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 15 channels. The unit does meet the FCC requirements.

Please refer the graph as below:



11 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: 22.0 °C

Humidity: 55 % RH

Barometric Pressure: 1012 mbar

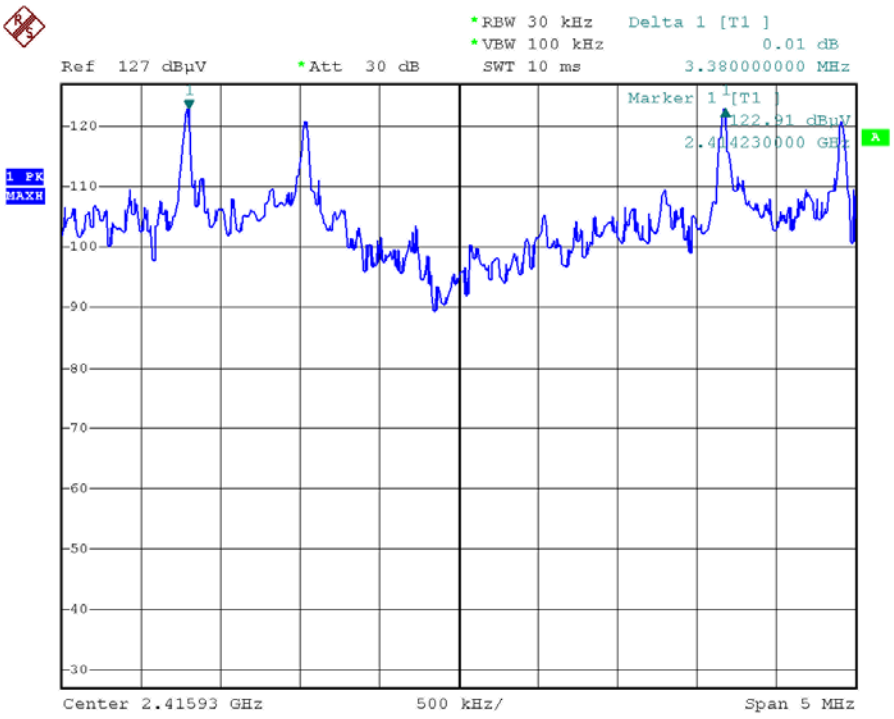
EUT Operation Condition:

The EUT was programmed to be in continuously transmitting mode.

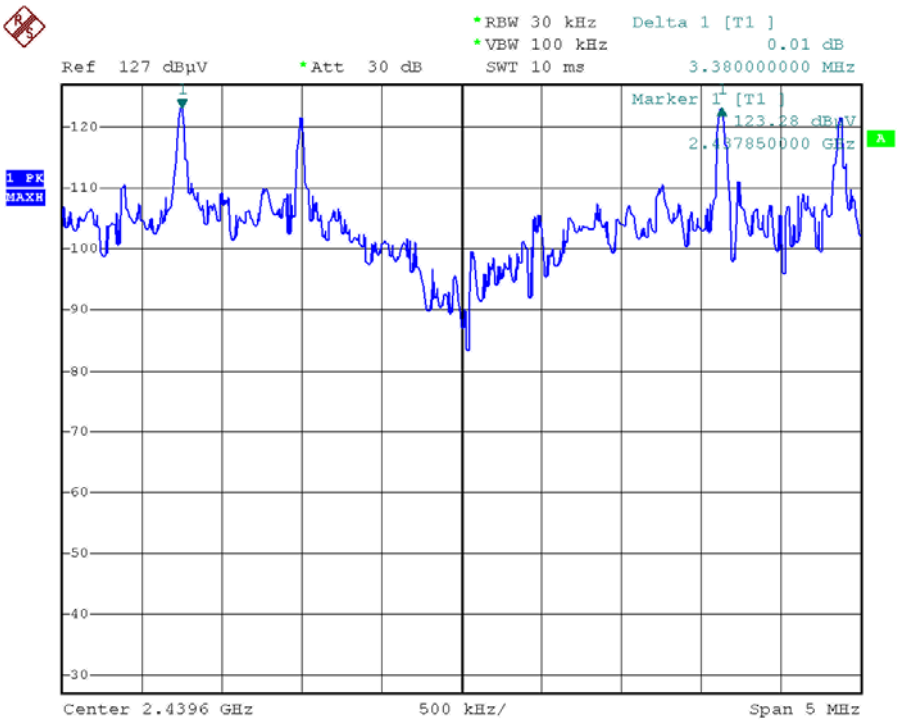
Test Result: PASS

Please refer to the below photos for more details

Lower Channel

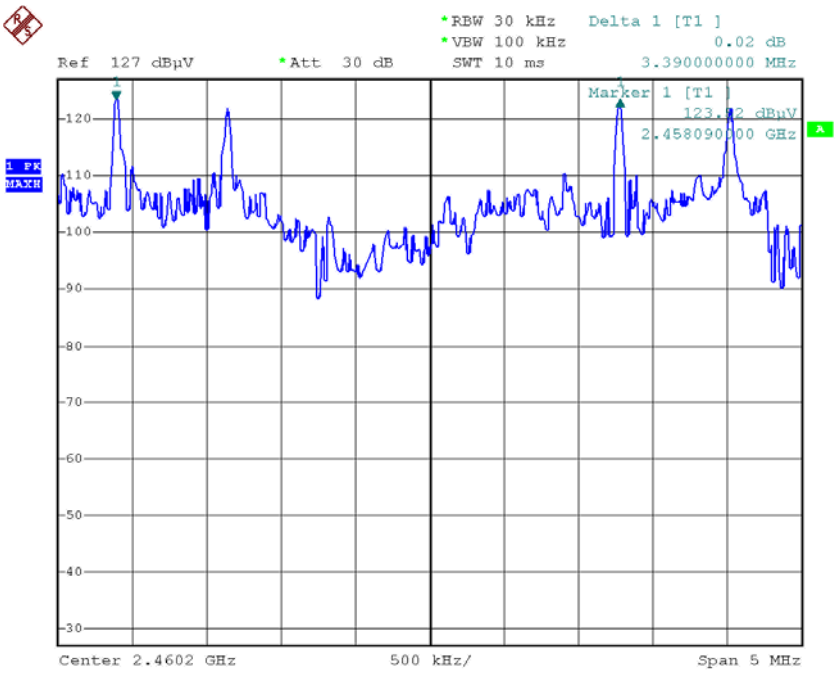


Middle Channel



Ref. No.: WT11031370-S-E-F

Upper Channel



12 Dwell time

11.1 Definition:

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: 22.0 °C

Humidity: 55 % 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=Ton-time*Ntimes/1S*0.4*15≤0.4S.

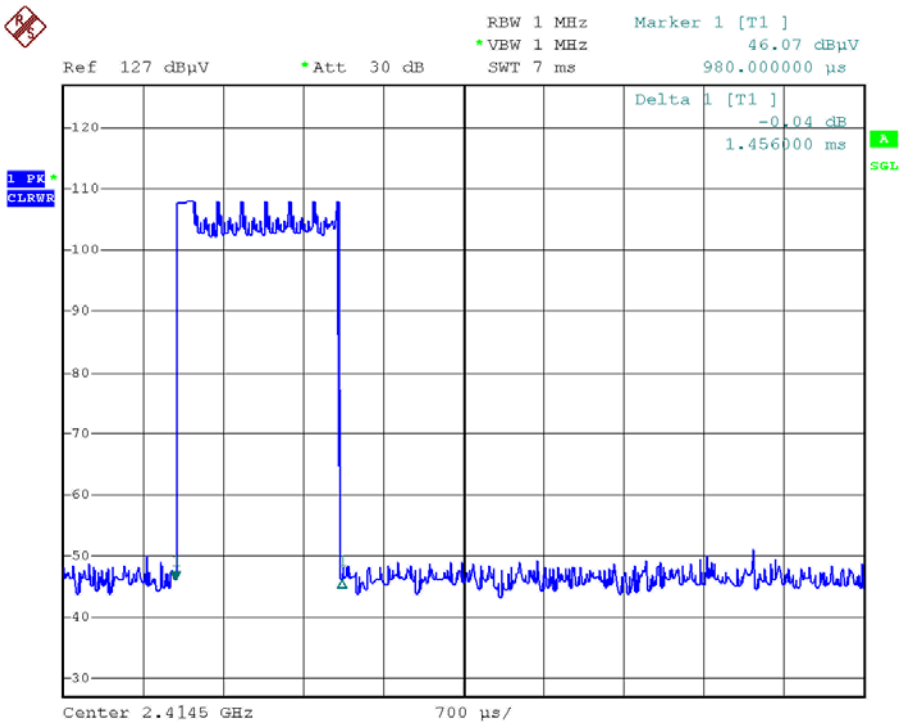
11.3 Test Result: PASS

Please refer to the below photos for more details.

Channel Low

Dwell time of each occupation in this channel as follows:
0.001456*18/1S*0.4*15=0.157<0.4S

Test Result: PASS
The Results are not be greater than 0.4 seconds.

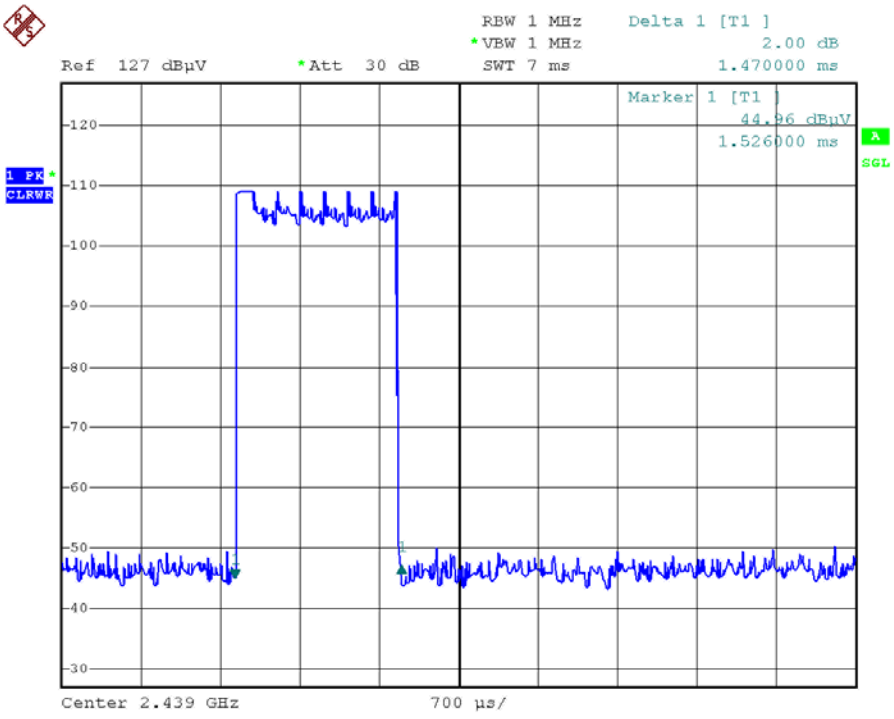


Channel Middle

Dwell time of each occupation in this channel as follows:
0.00147*18/1S*0.4*15=0.159<0.4S.

Test Result: PASS

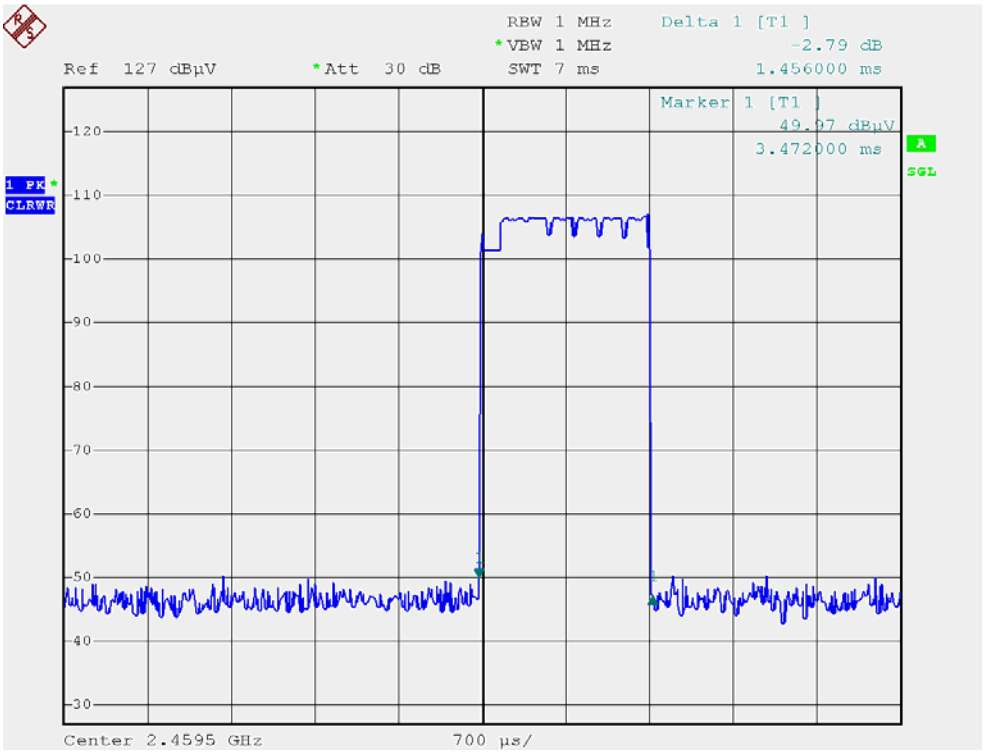
The Results are not be greater than 0.4 seconds.



Channel High

Dwell time of each occupation in this channel as follows:
0.001456*18/1S*0.4*15=0.157<0.4S

Test Result: PASS
The Results are not be greater than 0.4 seconds.



13 20-dB Bandwidth

Test Requirement: FCC Part15 C

Test Method: Based on FCC Part15 Paragraph 15.247

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

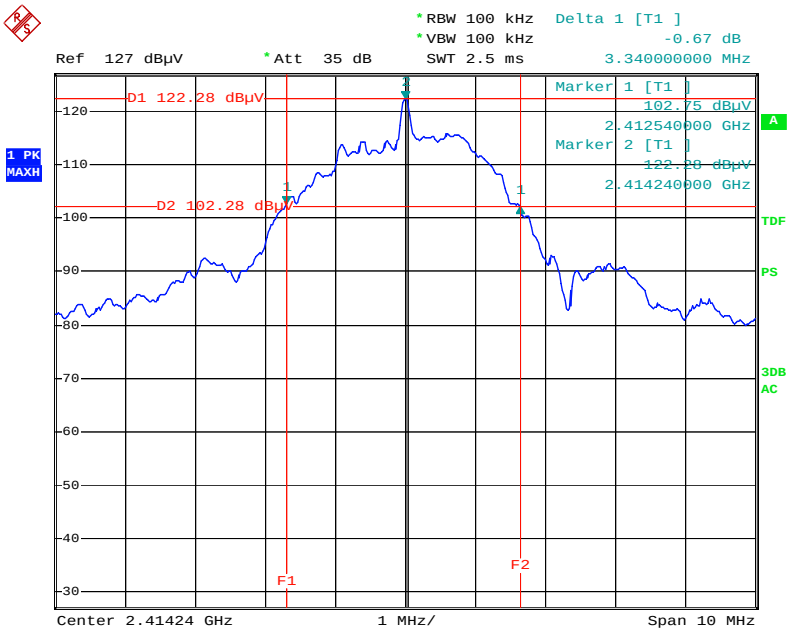
Test Procedure

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.

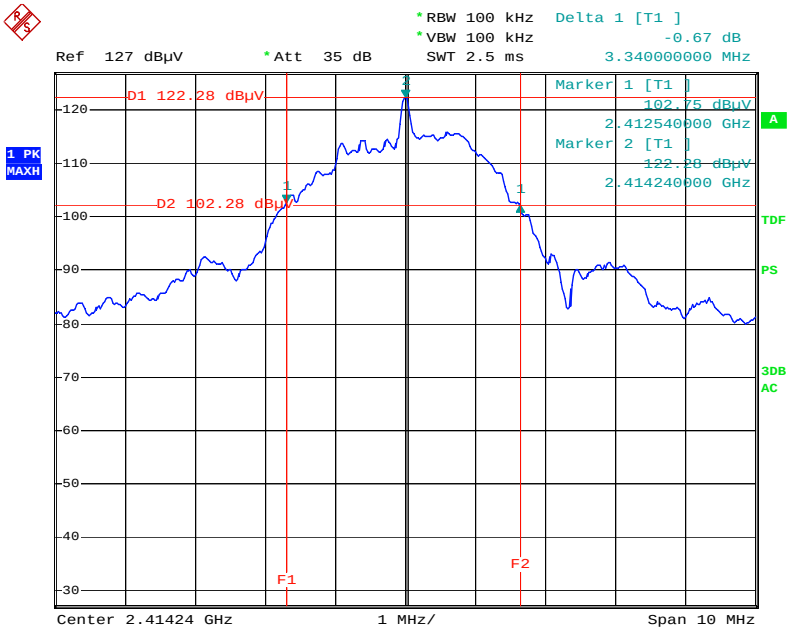
Test Result

Please refer the graph as below:

Lower Channel

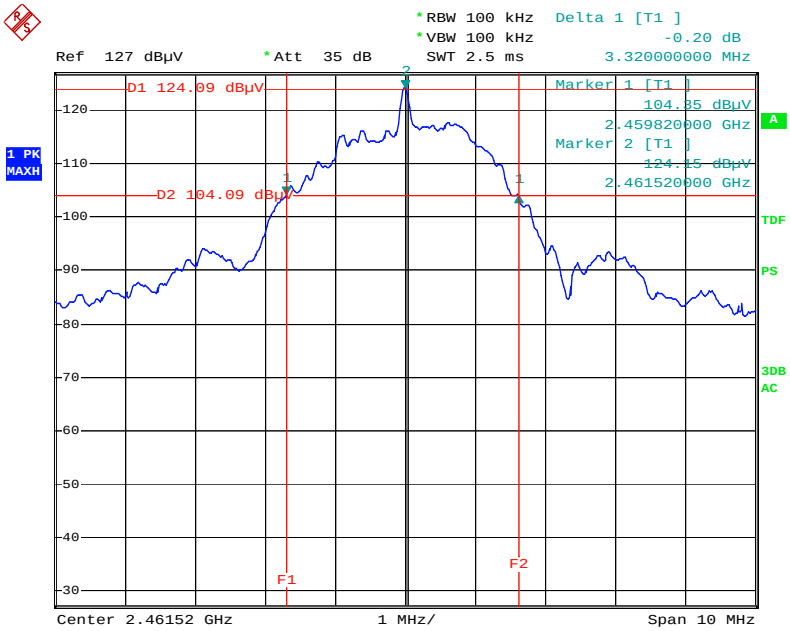


Middle Channel



Date: 9.MAY.2011 14:18:24

Upper Channel



Date: 9.MAY.2011 14:01:24

14 Radiated spurious emissions into adjacent restricted band

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

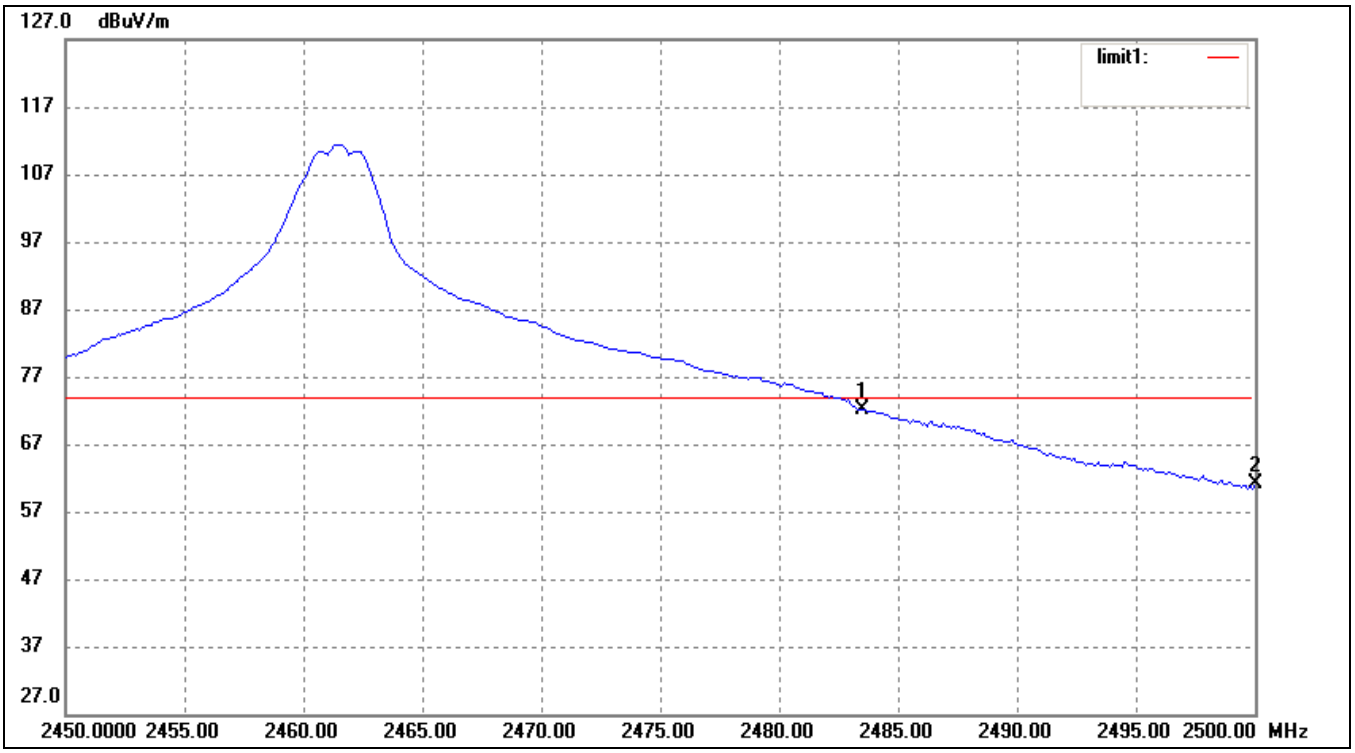
Requiments:

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:

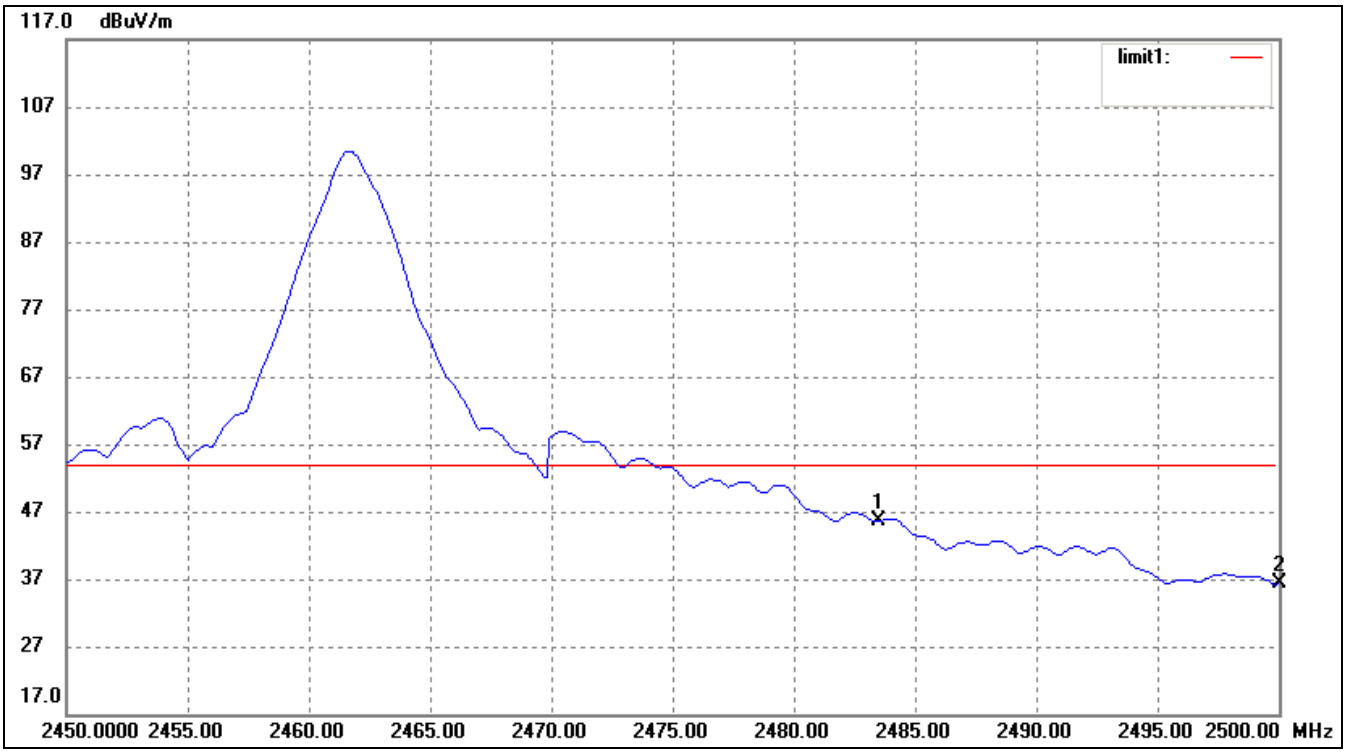
An in band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4-2003 and FCC Rules.The procedure was repeated with an average detector and a plot made.The calculated field strength in the adjacent restricted band is presented below.

Upper bandedge/ restricted band (Peak Value)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	2483.500	79.25	-7.13	72.12	74.00	-1.88			peak
2	2500.000	68.25	-7.08	61.17	74.00	-12.83			peak

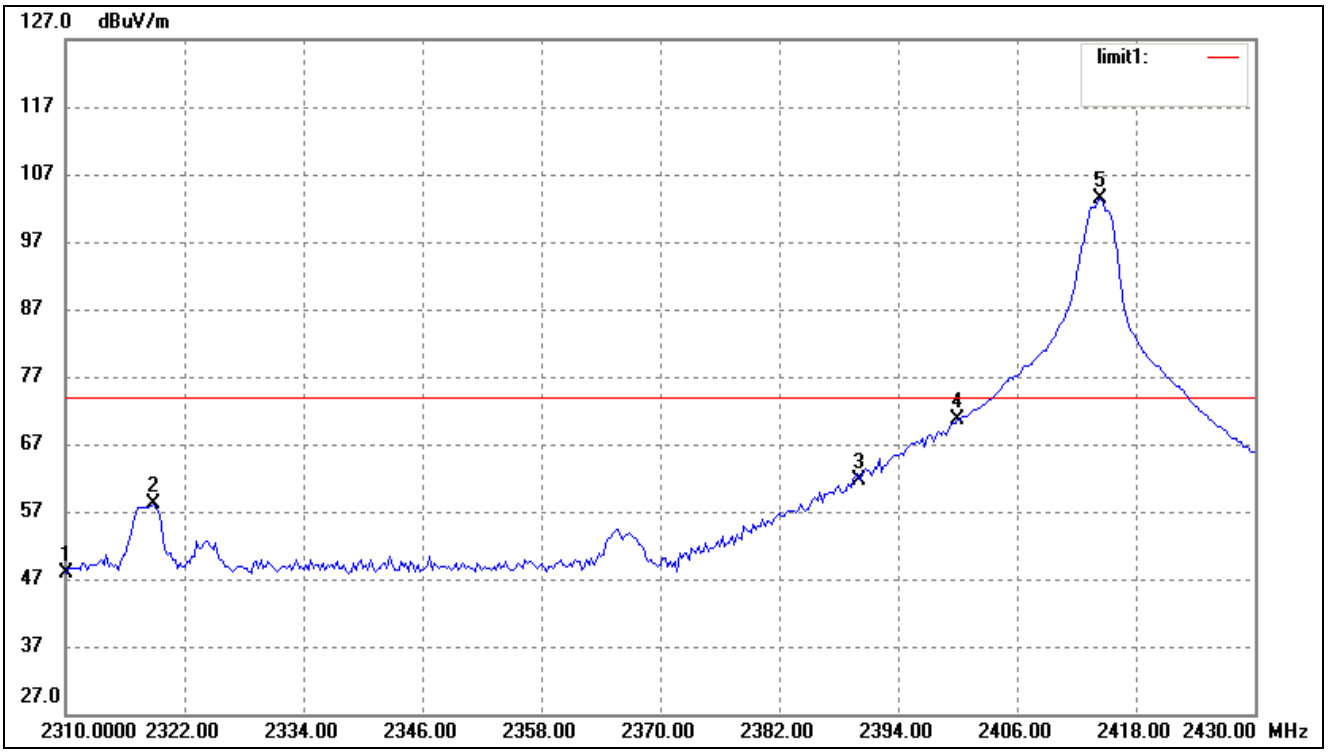
Upper bandedge/ restricted band (Average Value)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	2483.500	52.74	-7.13	45.61	54.00	-8.39			AV
2	2500.000	43.36	-7.08	36.28	54.00	-17.72			AV

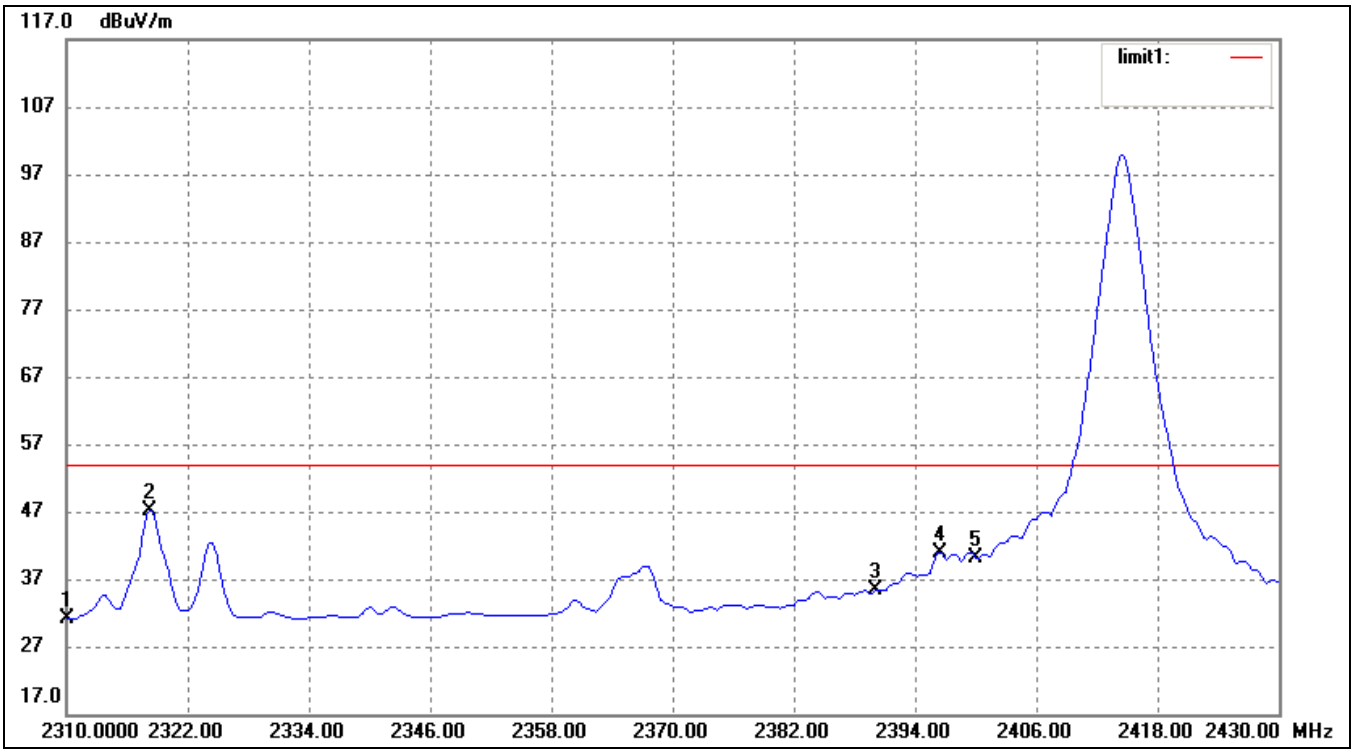
F:\Waltek\2011-05-05\Waltek.db #13

Lower Bandedge/ Restricted Band (Peak Value)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( )	(cm)	
1	2310.000	55.45	-7.51	47.94	74.00	-26.06			peak
2	2318.880	65.53	-7.49	58.04	74.00	-15.96			peak
3	2390.000	68.97	-7.34	61.63	74.00	-12.37			peak
4	2400.000	77.83	-7.31	70.52	74.00	-3.48			peak
5	2414.400	110.65	-7.28	103.37	Fund.	----			peak

Lower Bandedge/ Restricted Band (Average Value)



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ( )	Height (cm)	Remark
1	2310.000	38.65	-7.51	31.14	54.00	-22.86			AV
2	2318.160	54.68	-7.49	47.19	54.00	-6.81			AV
3	2390.000	42.64	-7.34	35.30	54.00	-18.70			AV
4	2396.400	48.28	-7.32	40.96	54.00	-13.04			AV
5	2400.000	47.36	-7.31	40.05	54.00	-13.95			AV

15 RF Exposure Test

Test Requirement: FCC Part 2 Subpart J

Test Method: Based on FCC Part 15 Paragraph 15.247

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

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

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

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

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/cm2)	Limit of Power Density (S) (mW/cm2)	Test Result
-2.15	0.610	15.03	31.87	0.0040	1	Complies
-2.15	0.610	15.03	31.87	0.0040	1	Complies
-2.15	0.610	14.87	30.69	0.0039	1	Complies

Duty cycle and Average power Calculation:

Tc: Time of One cycle

Ton: Time of On time in One cycle

Duty cycle = Ton / Tc

Average power factory = $10 \log_{10}^{(\text{Duty cycle})}$

Average power (dBm) = Peak output power (dBm) + average power factory (dB)

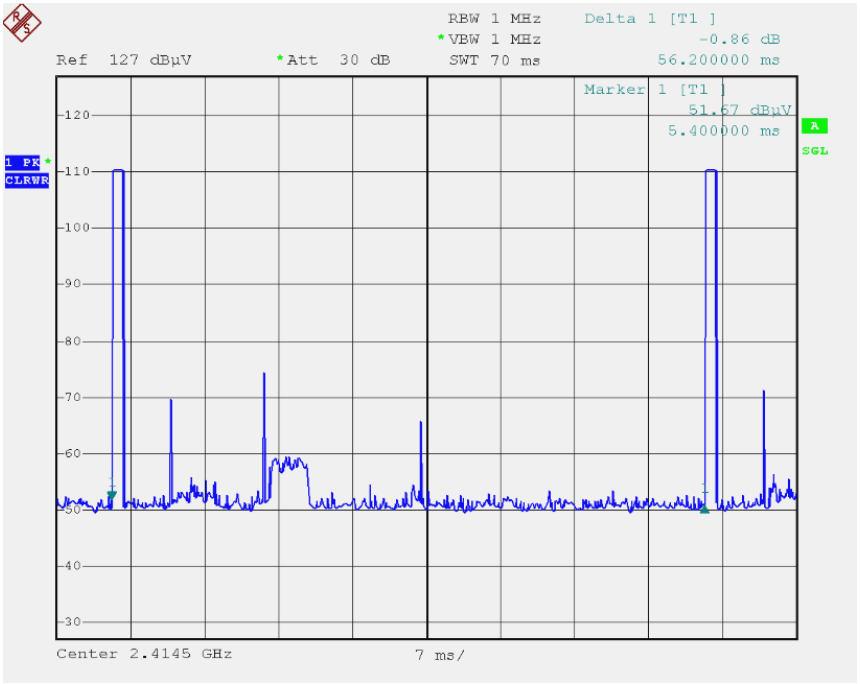
Result:

Ton (ms)	Tc (ms)	Duty Cycle	Average Power Factory (dB)	Average Power (dBm)	Average Power (mW)
1.456	56.20	0.025907	-15.87	-0.84	0.8241
1.470	56.20	0.026157	-15.87	-0.84	0.8241
1.456	56.20	0.025907	-15.87	-1.00	0.7943

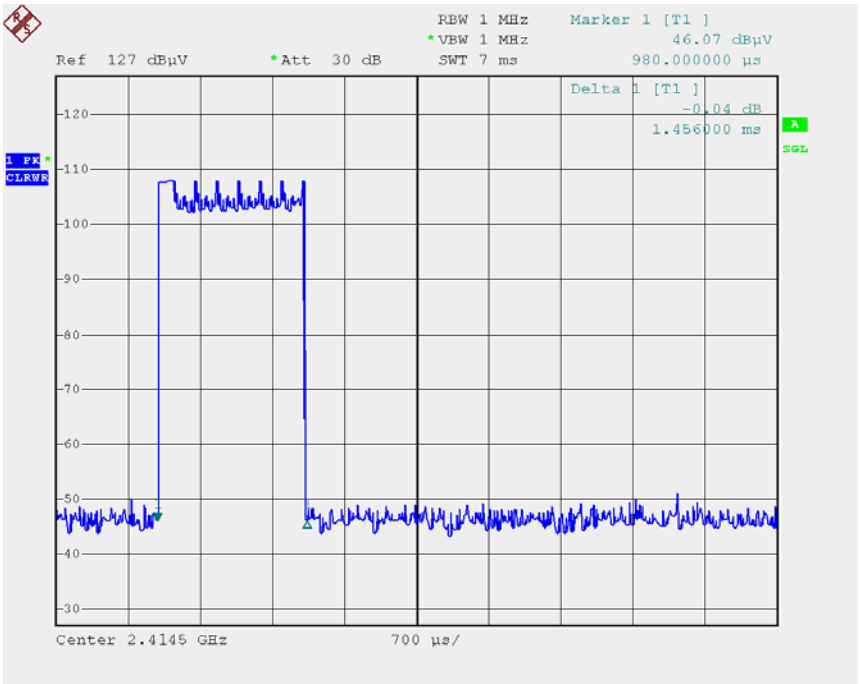
Test plot:

Remark: Three point had been tested and the graph show the low frequency's only.

Tc:



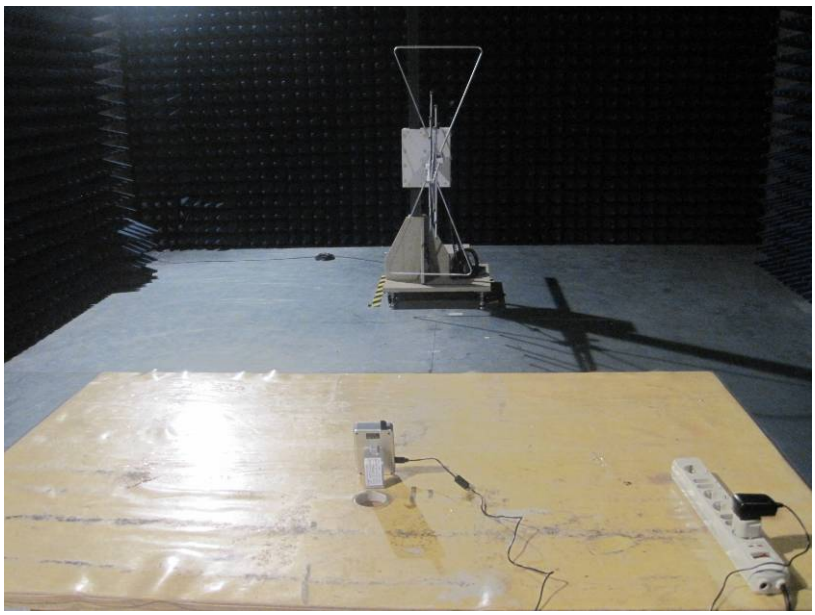
Ton:



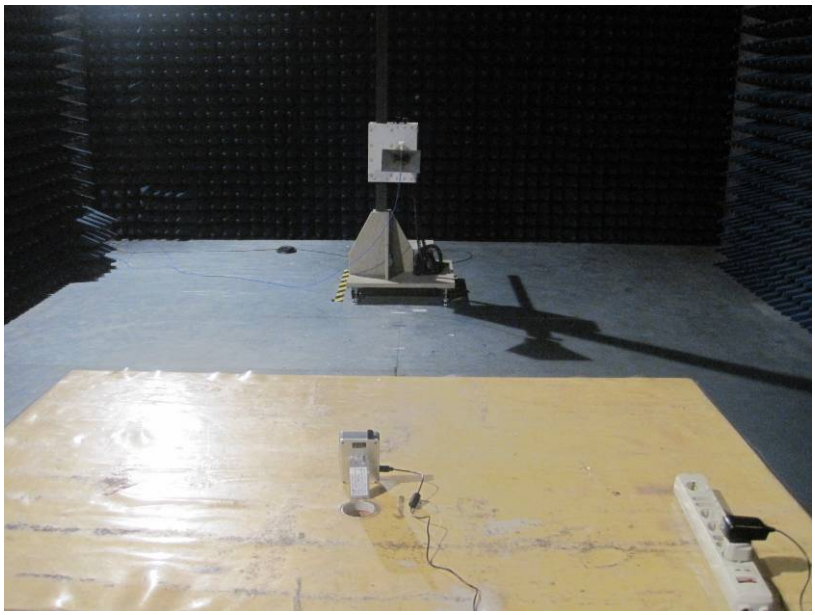
Ref. No.: WT11031370-S-E-F

16 Photographs of Testing

Radiation Emission Test View For 30MHz-1000MHz



Radiation Emission Test View For 1GHz-25GHz

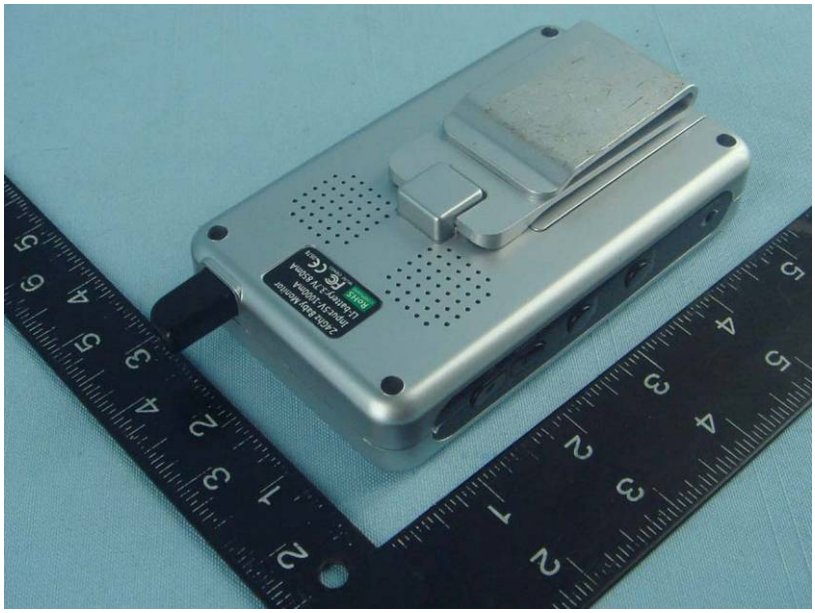


Conduction Emission Test View

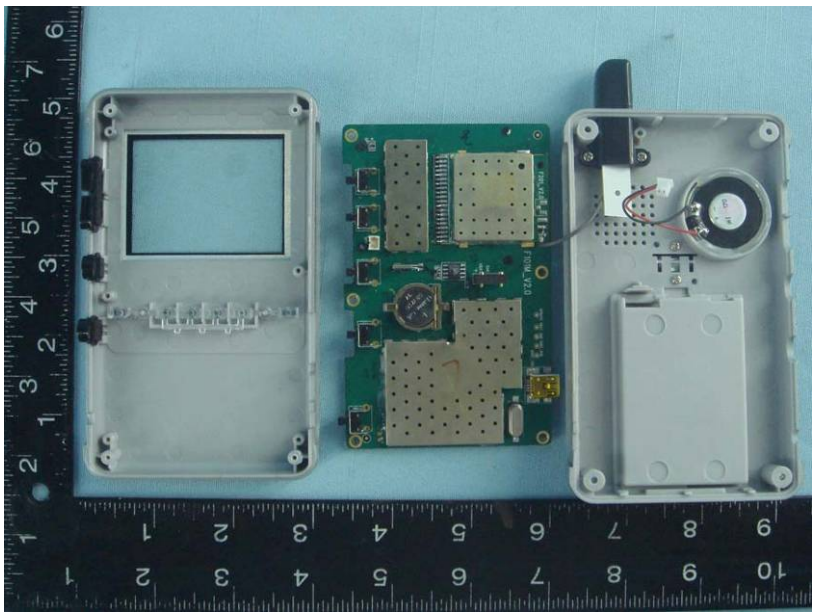
17 Photographs - Constructional Details

17.1 EUT - Front View

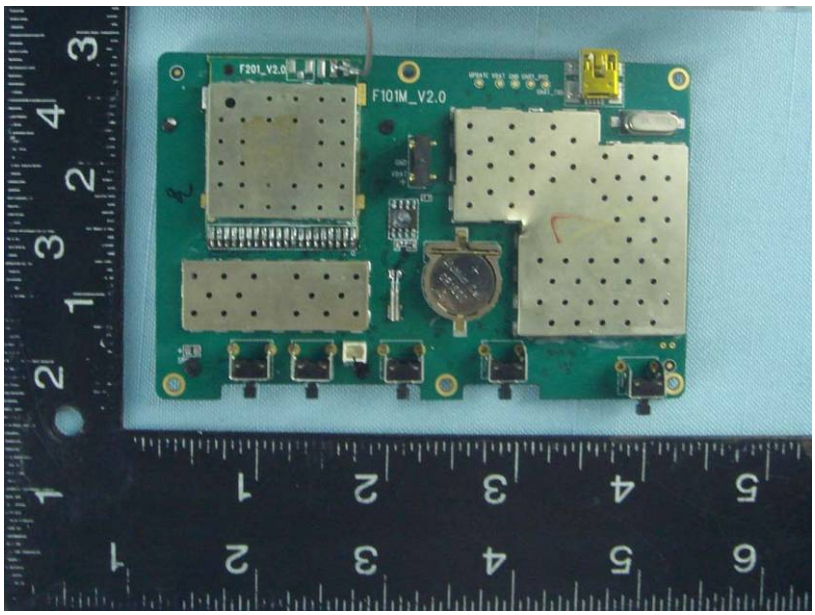
17.2 EUT - Back View



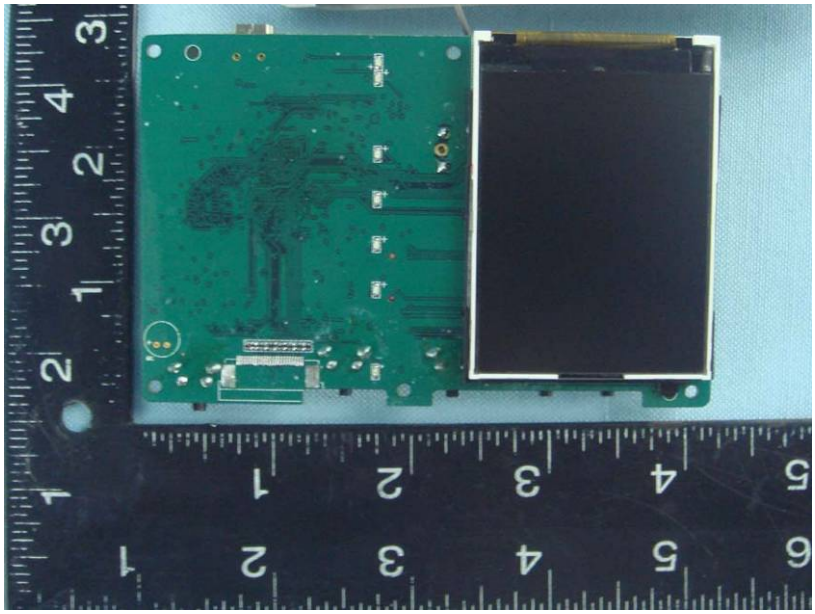
17.3 EUT - Open View



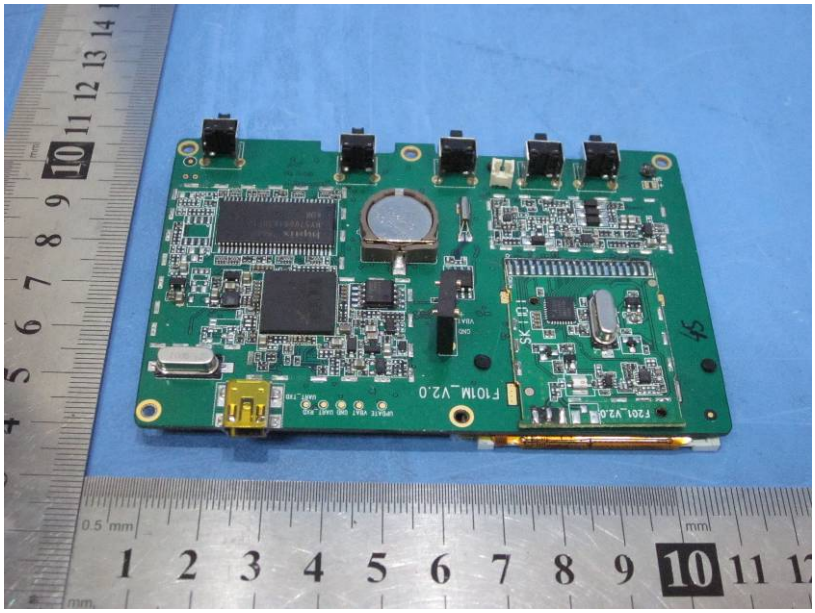
17.4 PCB 1 - Front View



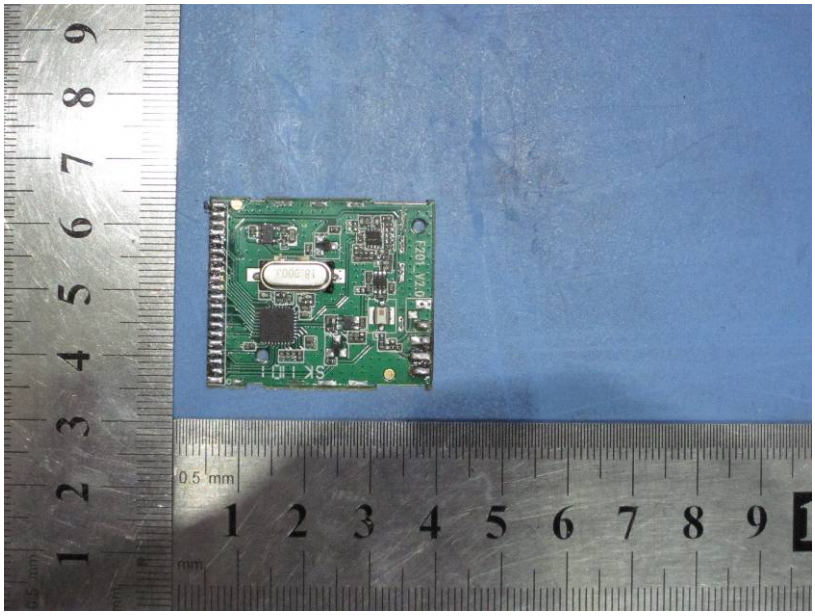
17.5 PCB 1 - Back View



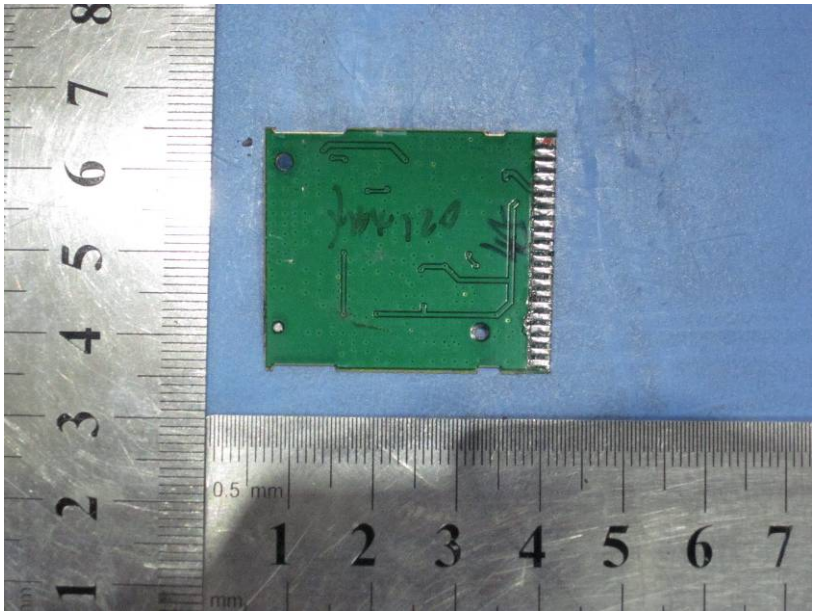
17.6 PCB - Module Open View



17.7 PCB 2 - Front View



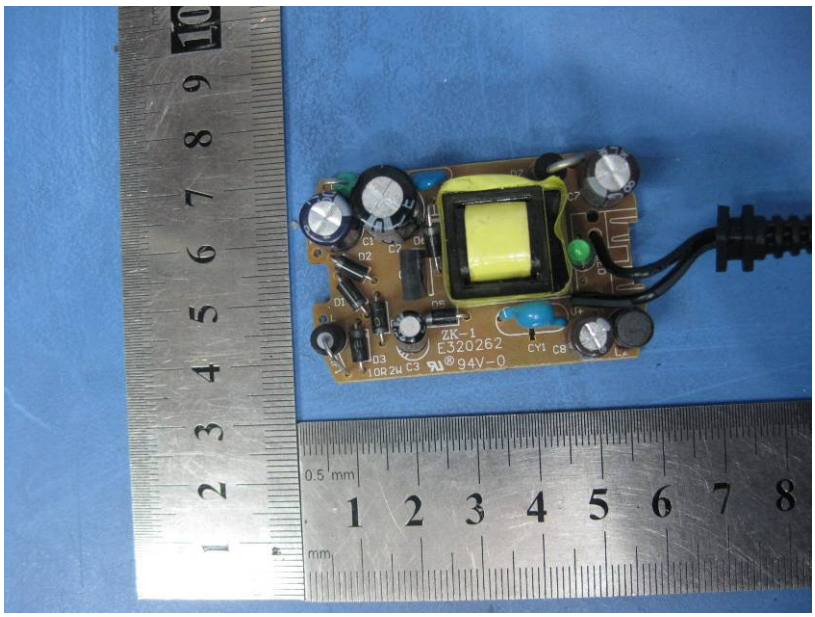
17.8 PCB 2 - Back View



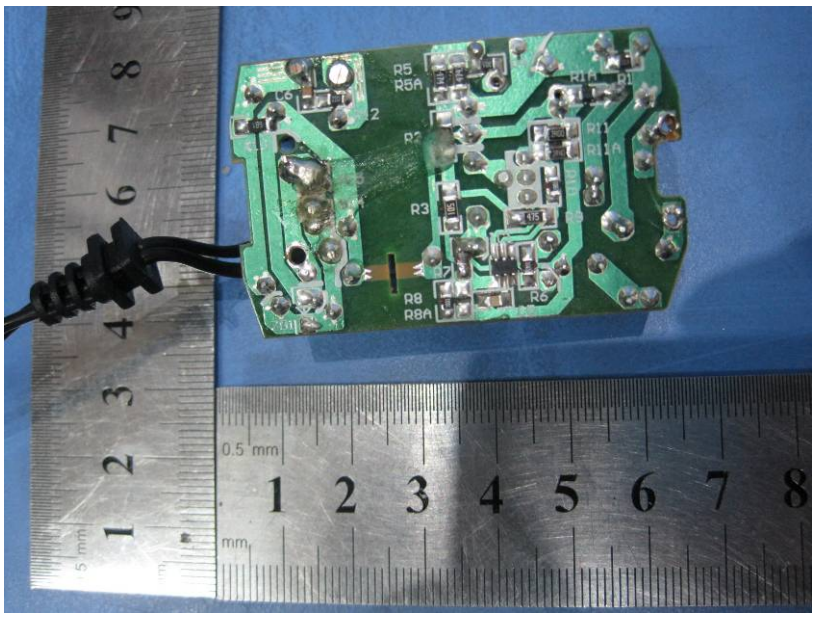
17.9 Adapter - Front View

17.10 Adapter - Back View

17.11 PCB(Adapter) - Front View



17.12 PCB(Adapter) - Back View



18 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