FCC TEST REPORT

FCC ID : PB4-MT453
Applicant : Imation Corp.
Address : 1 Imation Way, Oakdale, MN 55128 USA

Equipment Under Test (EUT) :
Product Name : Bluetooth Alarm Clock
Model No. : MW453,TW453,USB-453

Standards : FCC CFR47 Part 15 Section 15.247:2010

Date of Test : Dec.27,2012 ~ Jan. 07, 2013
Date of Issue : Jan. 07, 2013

Tested By : Olic huang / Engineer 

Reviewed By : Philo zhong / Manager 

Test Result	**: PASS**

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
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✧ The sample detailed above has been tested to the requirements of Council Directives ANSI C63.4:2003. The test results have been reviewed against the Directives above and found to meet their essential requirements.

2 Test Summary

Test Items	Test Requirement	Result
Conducted Emissions	15.207	PASS
Radiated Spurious Emissions	15.205(a) 15.209 15.247(d)	PASS
20Db Bandwidth	15.247(a)(1)	PASS
Maximum Peak Output Power	15.247(b)(1)	PASS
Frequency Separation	15.247(a)(1)	PASS
Number of Hopping Frequency	15.247(a)(1)(iii)	PASS
Dwell time	15.247(a)(1)(iii)	PASS
Maximum Permissible Exposure (Exposure of Humans to RF Fields)	1.1307(b)(1)	PASS

3 Contents

4 General Information

4.1 Client Information

Applicant	: Imation Corp.
Address of Applicant	: 1 Imation Way, Oakdale, MN 55128 USA
Manufacturer	: Imation Corp.
Address of Manufacturer	: 1 Imation Way, Oakdale, MN 55128 USA

4.2 General Description of E.U.T.

Product Name	: Bluetooth Alarm Clock
Model No.	: MW453,TW453,USB-453
Trade Mark	: Memorex for MW453, TDK Life on Record for TW453, XtremeMac for USB-453
Difference Description	: All models are same, except model No. and trademarks are different

4.3 Details of E.U.T.

Technical Data	: Adapter Input:100-240V AC,50-60Hz,0.35A. Output:DC 5.0V,2000mA.
Operation Frequency	: 2402MHz ~ 2480MHz
Crystal Frequency	: 32.768KHz
Antenna Gain	: 0 dBi(Peak)

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 Alarm Clock. The standards used were FCC CFR47 Part 15 Section 15.203, Section 15.207, Section 15.209 and Section 15.247.

4.6 Test Facility

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

- **IC – Registration No.: IC7760A**

  Waltek Services(Shenzhen) Co., Ltd. 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 7760A, July 12, 2012.

- **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.

4.7 Test Location

All the tests were performed at:
Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd.,Songgang Street, Baoan District, Shenzhen, China

5 Equipment Used during Test

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	July 12,2012	July 11,2013	±1dB
Trilog Broadband Antenne	SCHWARZBECK MESS-ELEKTROM / VULB9163	336	W2008002	25-3000 MHz	July 12,2012	July 11,2013	±1dB
Broad-band Horn Antenna	SCHWARZBECK MESS-ELEKTROM / BBHA 9120D(1201)	667	W2008003	1-18GHz	July 12,2012	July 11,2013	f < 10 GHz : ±1dB 10GHz < f < 18 GHz : ±1.5dB
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM / BBV 9719	9719-254	W2008006	18-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.2dB
Active Loop Antenna	Beijing Dazhi / ZN30900A	-	-	0.009-30MHz	July 12,2012	July 11,2013	±1Db
Broadband Preamplifier	SCHWARZBECK MESS-ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	July 12,2012	July 11,2013	±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZBECK MESS-ELEKTROM / AK 9515 H	-	-	-	July 12,2012	July 11,2013	-
10m 50 Ohm Coaxial Cable	SCHWARZBECK MESS-ELEKTROM / AK 9513	-	-	-	July 12,2012	July 11,2013	-
Positioning Controller	C&C LAB/ CC-C-IF	-	-	-	July 12,2012	July 11,2013	-
Color Monitor	SUNSPO/ SP-14C	-	-	-	July 12,2012	July 11,2013	-
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	July 12,2012	July 11,2013	±1dB
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	July 12,2012	July 11,2013	±10%
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range : 9K-1GHz RF voltage : -60 dBm-+10dBm	July 12,2012	July 11,2013	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1B
IPOD	Apple	A1367	W2008019	-	July 12,2012	July 11,2013	±0.5dB

6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 mbar

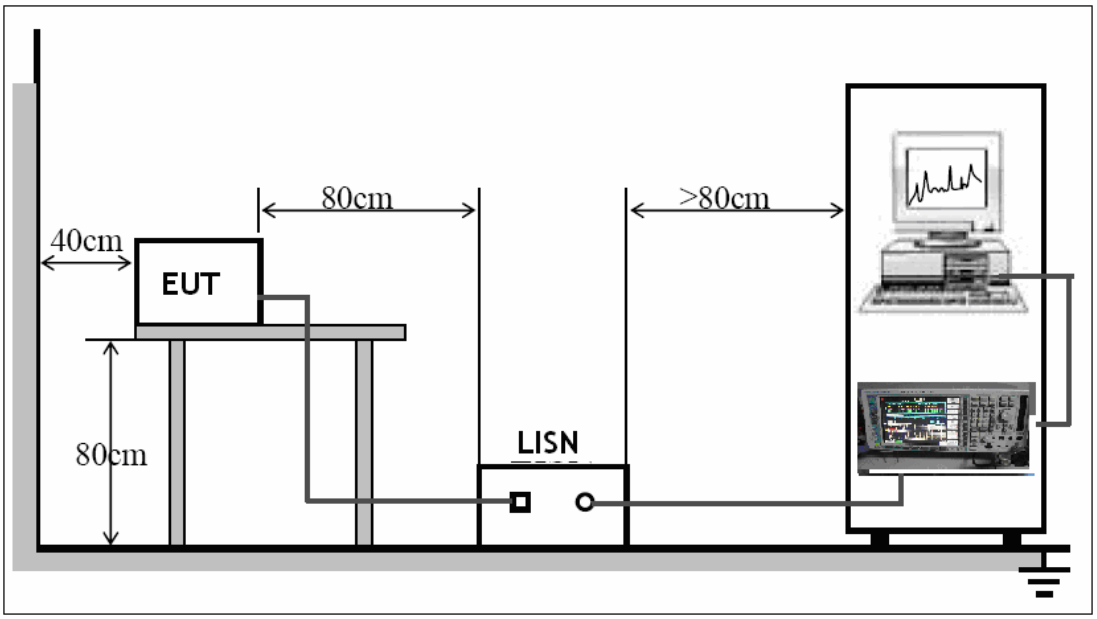
EUT Operation:

The EUT was tested FM mode,Line in mode and 1KHz audio playing by BT linked. And the worse case was the 1KHz audio playing by BT linked.so the data show was the worse case mode only in the report. According to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

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.

6.2 EUT 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 Part15.207 limits.

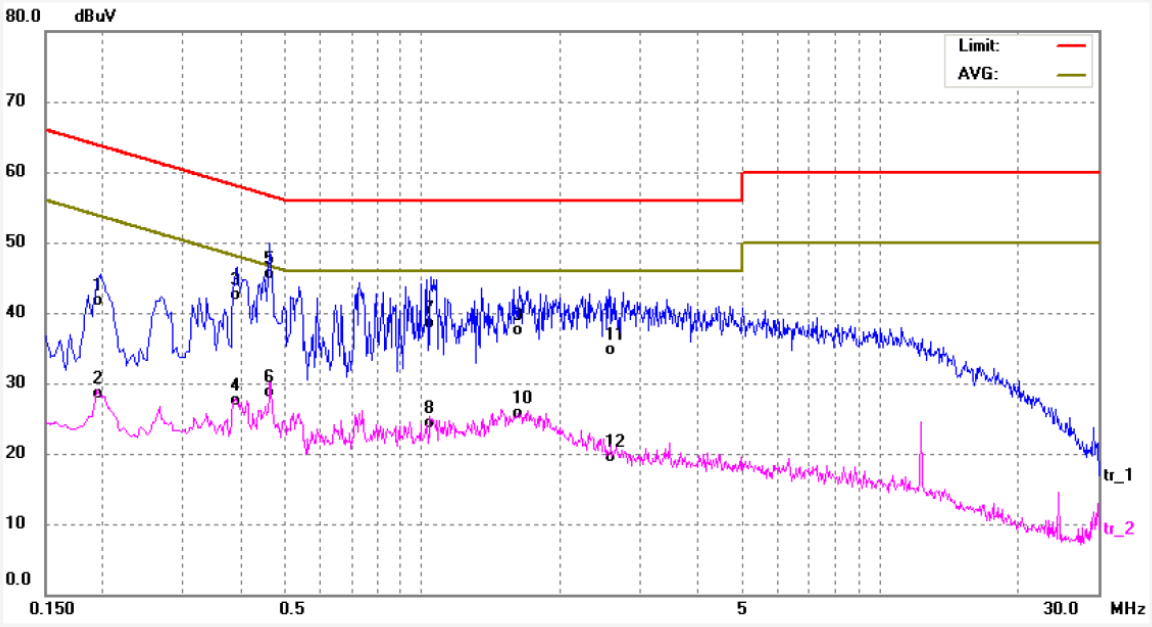


The EUT was placed on the test table in shielding room

6.3 Conducted Emission Test Result

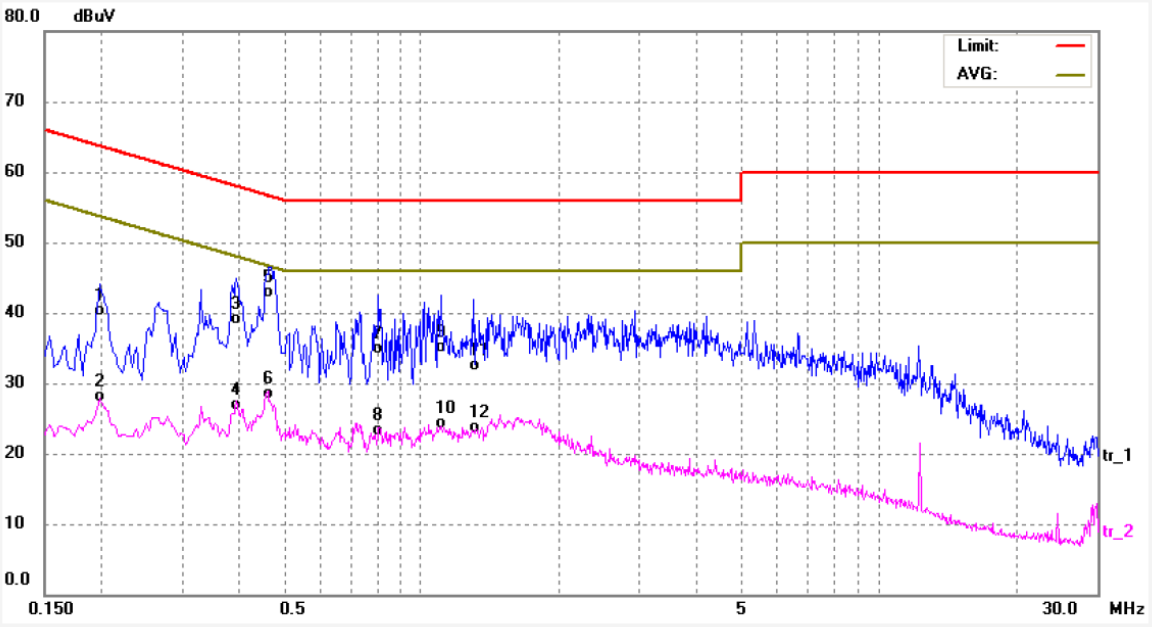
An initial pre-scan was performed on the live and neutral lines.

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1980	29.71	11.29	41.00	63.69	-22.69	QP	
2	0.1980	16.43	11.29	27.72	53.69	-25.97	AVG	
3	0.3940	30.45	11.31	41.76	57.98	-16.22	QP	
4	0.3940	15.34	11.31	26.65	47.98	-21.33	AVG	
5	0.4660	33.46	11.31	44.77	56.58	-11.81	QP	
6	0.4660	16.54	11.31	27.85	46.58	-18.73	AVG	
7	1.0460	26.47	11.18	37.65	56.00	-18.35	QP	
8	1.0460	12.39	11.18	23.57	46.00	-22.43	AVG	
9	1.6340	25.58	11.19	36.77	56.00	-19.23	QP	
10	1.6340	13.74	11.19	24.93	46.00	-21.07	AVG	
11	2.5579	22.69	11.21	33.90	56.00	-22.10	QP	
12	2.5579	7.57	11.21	18.78	46.00	-27.22	AVG	

Neutral line:



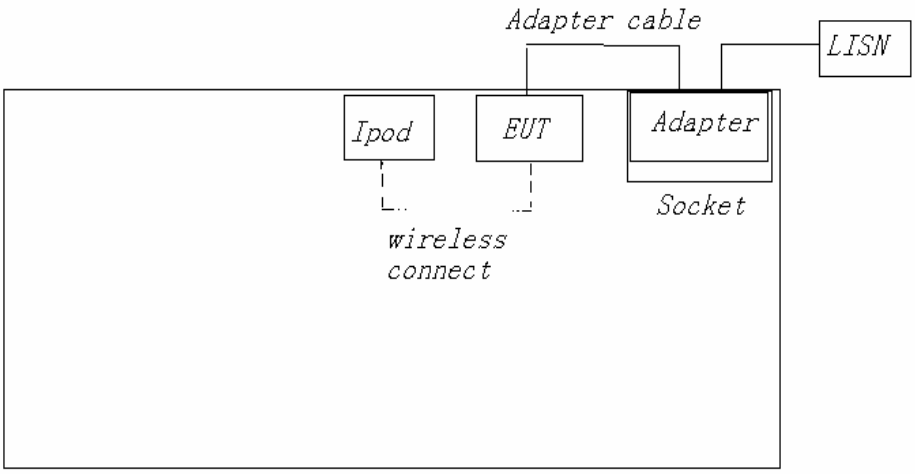
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1980	28.21	11.29	39.50	63.69	-24.19	QP	
2	0.1980	16.06	11.29	27.35	53.69	-26.34	AVG	
3	0.3940	27.08	11.31	38.39	57.98	-19.59	QP	
4	0.3940	14.71	11.31	26.02	47.98	-21.96	AVG	
5	0.4660	30.77	11.31	42.08	56.58	-14.50	QP	
6	0.4660	16.36	11.31	27.67	46.58	-18.91	AVG	
7	0.8059	22.74	11.28	34.02	56.00	-21.98	QP	
8	0.8059	11.32	11.28	22.60	46.00	-23.40	AVG	
9	1.1019	23.17	11.18	34.35	56.00	-21.65	QP	
10	1.1019	12.34	11.18	23.52	46.00	-22.48	AVG	
11	1.3020	20.50	11.19	31.69	56.00	-24.31	QP	
12	1.3020	11.72	11.19	22.91	46.00	-23.09	AVG	

6.4 Photograph – Conducted Emission Test Setup

Front View

Back View

6.5 Conducted Emission Test Setup Drawing



7 Radiated Spurious Emissions

Test Requirement:	FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method:	Based on DA 00-705
Test Result:	PASS
Frequency Range:	32.768KHz to 25GHz
Measurement Distance:	3m
15.209 Limit:	40.0 dBuV/m between 30MHz & 88MHz 43.5 dBuV/m between 88MHz & 216MHz 46.0 dBuV/m between 216MHz & 960MHz 54.0 dBuV/m above 960MHz
15.247 (d) Limit:	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating. The radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that Contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.
Test mode:	The EUT was tested in continuously Transmit mode.

7.1 EUT Operation :

Operating Environment:

Temperature: 25.5 °C
Humidity: 51 % RH
Atmospheric Pressure: 1012 mbar

7.2 Measurement Uncertainty

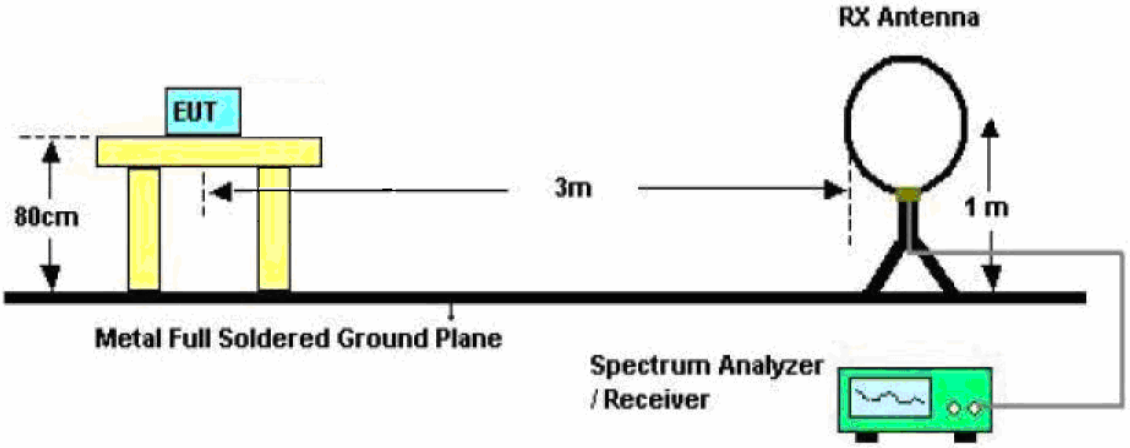
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor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

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is $\pm$5.03dB.

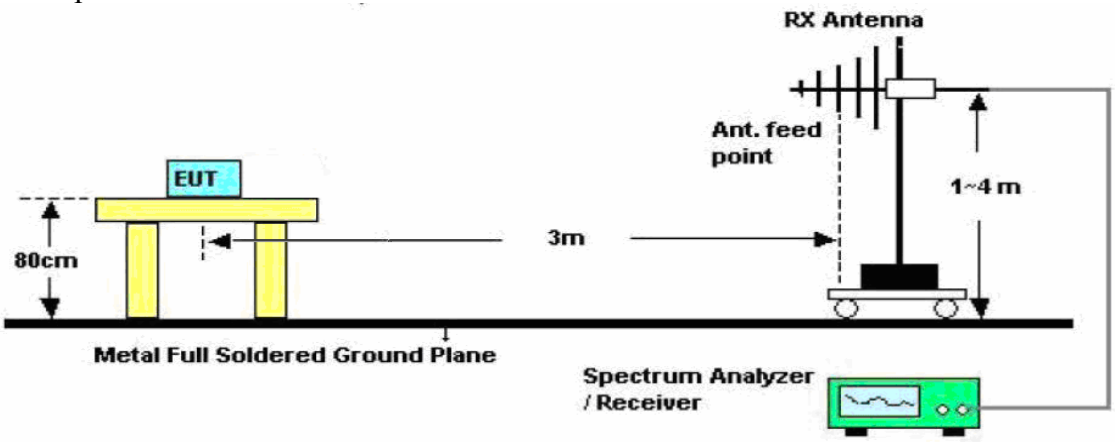
7.3 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003.

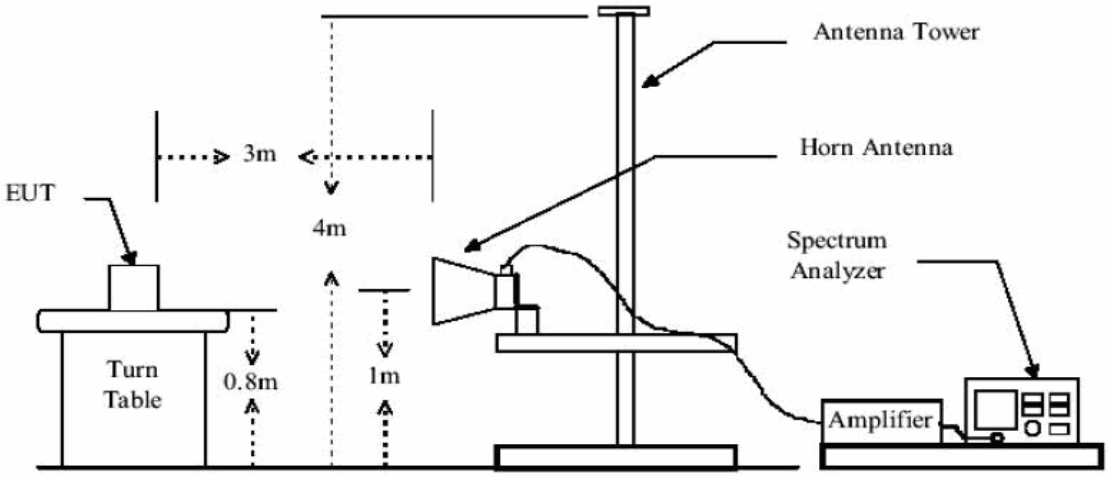
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.



7.4 Spectrum Analyzer Setup

According to FCC Part 15 Rules, the system was tested to 25000MHz.

Below 30MHz

Start Frequency	32.768KHz
Stop Frequency	30MHz
Sweep Speed	Auto
IF Bandwidth	10KHz
Video Bandwidth	10KHz
Resolution Bandwidth	10KHz

30MHz ~ 1GHz

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	3MHz
Quasi-Peak Adapter Bandwidth	120 KHz
Quasi-Peak Adapter Mode	Normal
Resolution Bandwidth	1MHz

7.5 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are 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.

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 -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Limit

7.7 Summary of Test Results

According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards. The EUT was tested in FM mode,Line in mode and 1KHz audio playing by BT linked mode. And the worse case was the 1KHz audio playing by BT linked mode,so the data show was the 1KHz audio playing by BT linked mode only.

Test mode :Below 30MHz

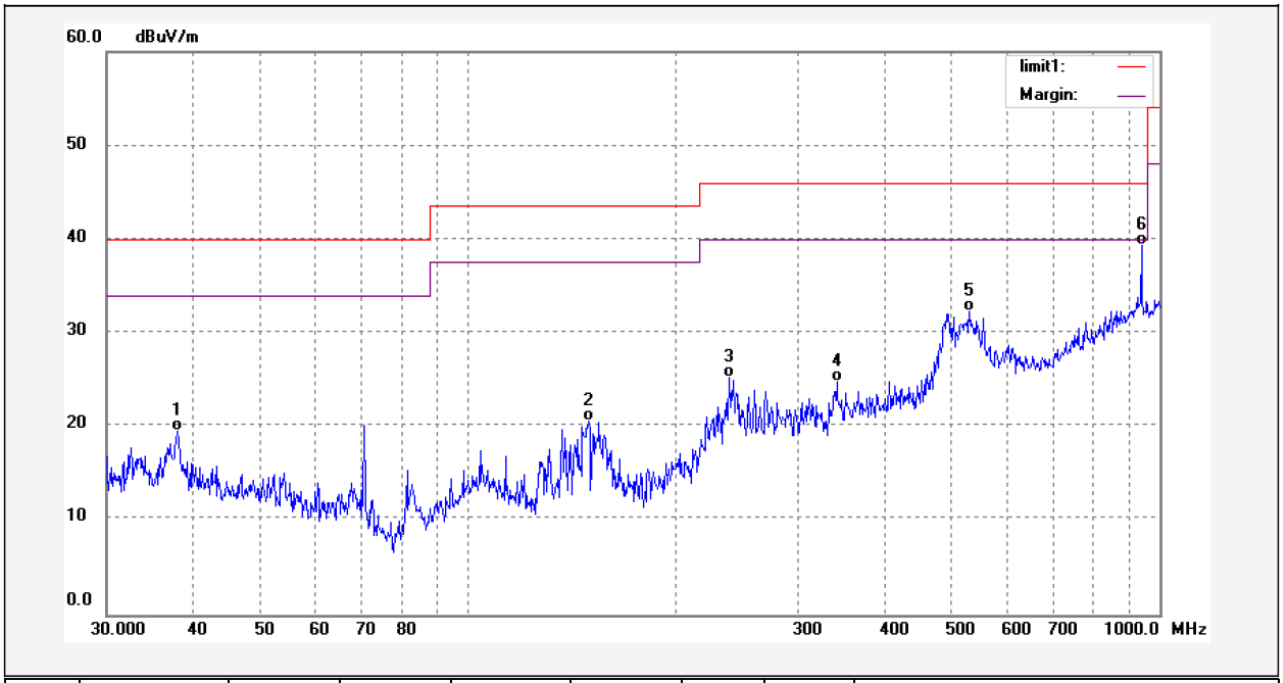
Rmark： the test frequency below 30MHz was lower 20dB than the limit,So the data was not showing in the report.

Test mode : BT continuously recevie mode

Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the middle 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.

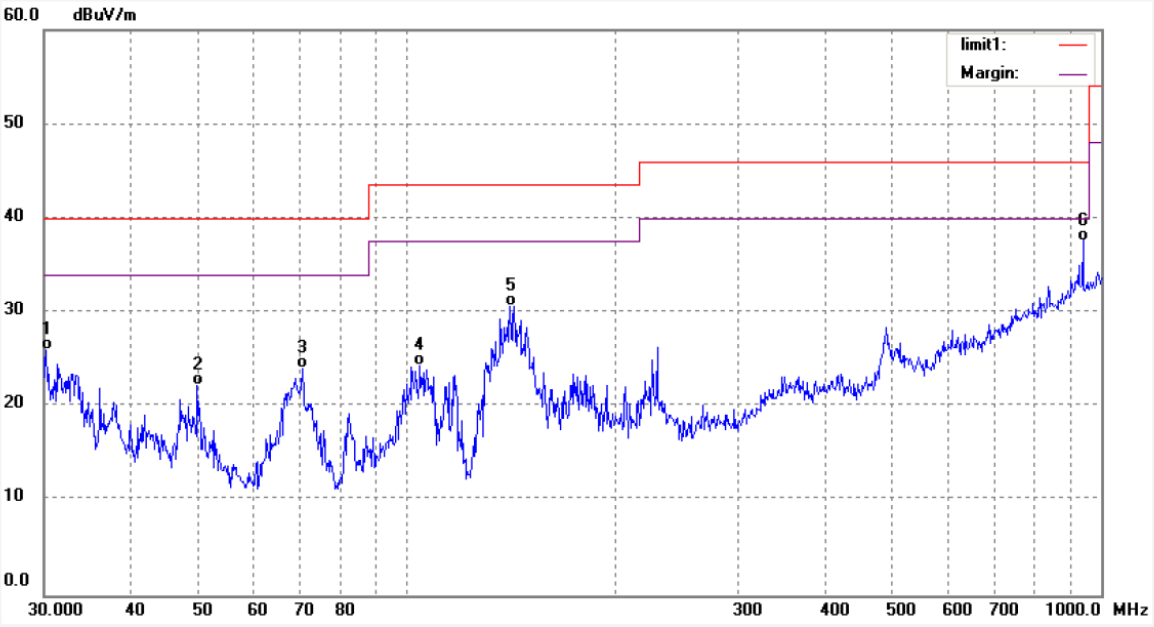
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.9628	2.82	16.70	19.52	40.00	-20.48	QP	
2	149.4416	9.51	11.09	20.60	43.50	-22.90	QP	
3	238.4626	9.63	15.58	25.21	46.00	-20.79	QP	
4	341.2442	4.68	20.22	24.90	46.00	-21.10	QP	
5	531.2910	8.52	23.82	32.34	46.00	-13.66	QP	
6	942.0180	7.65	31.77	39.42	46.00	-6.58	QP	

Antenna polarization: Horizontal

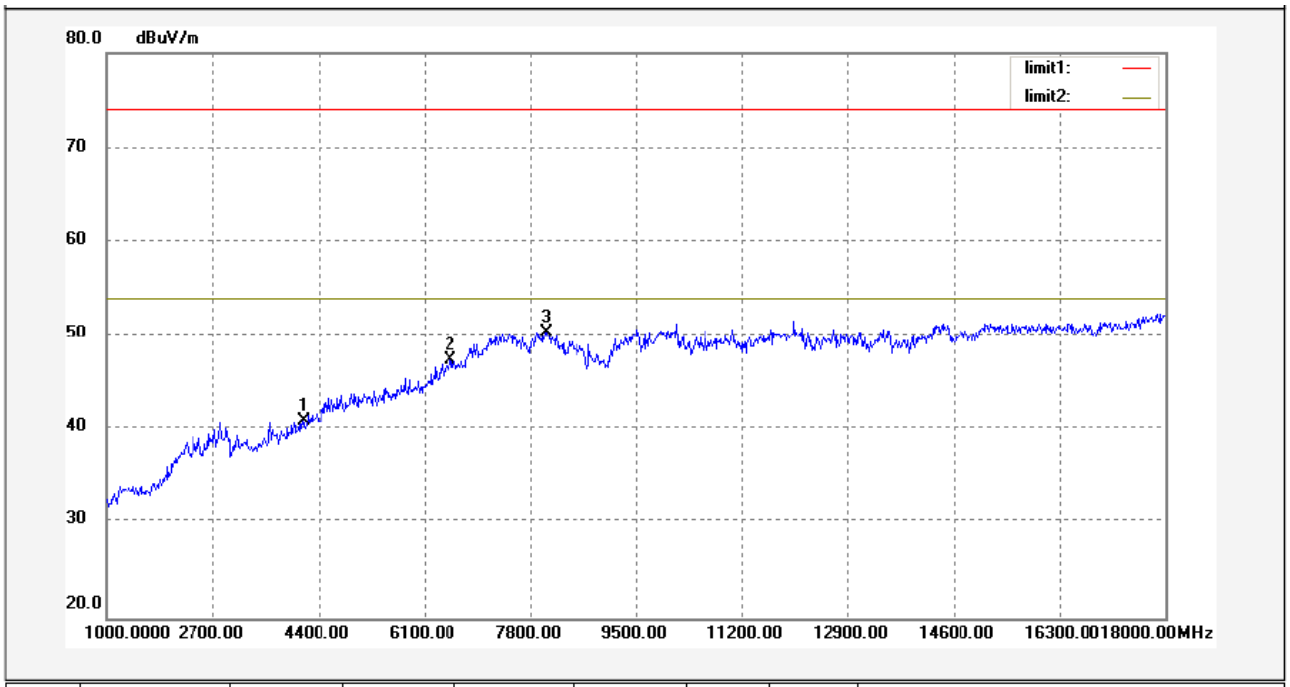


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.2116	9.77	16.19	25.96	40.00	-14.04	QP	
2	49.9323	7.63	14.58	22.21	40.00	-17.79	QP	
3	70.7047	14.33	9.81	24.14	40.00	-15.86	QP	
4	104.4303	10.08	14.23	24.31	43.50	-19.19	QP	
5	140.7767	19.05	11.61	30.66	43.50	-12.84	QP	
6	942.0180	5.88	31.77	37.65	46.00	-8.35	QP	

Test Frequency: Above 1GHz radiation test data:

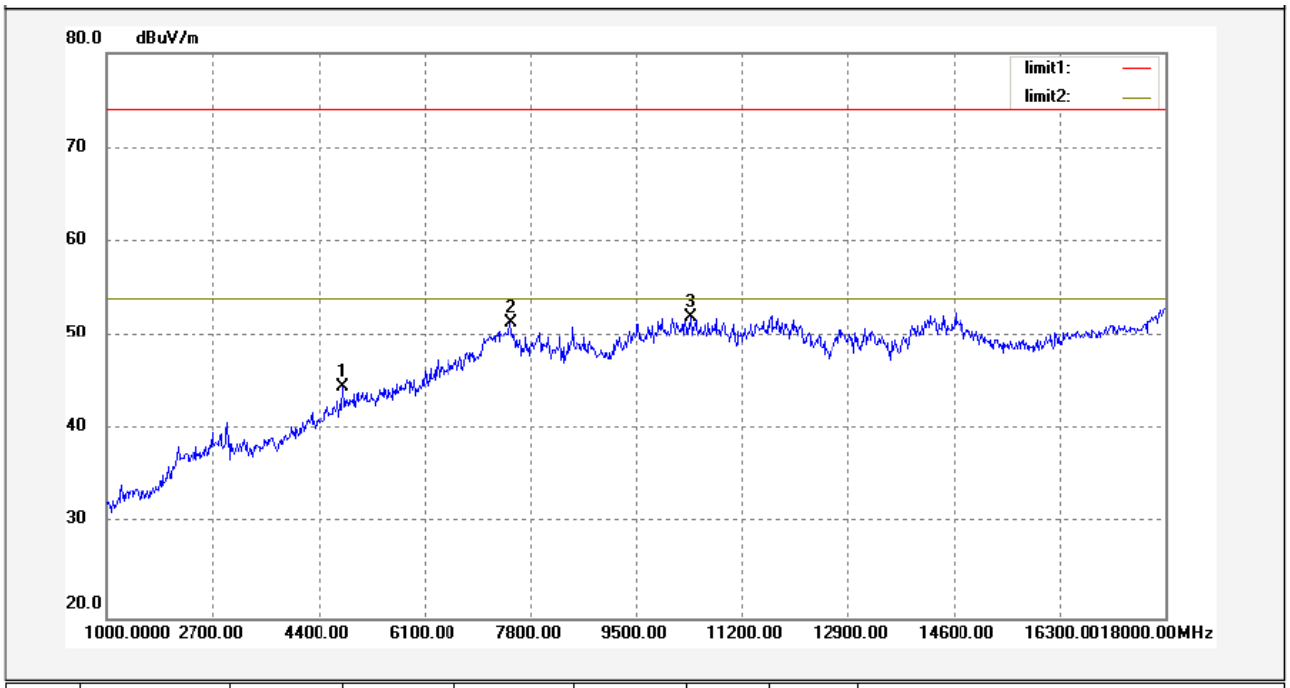
Remark: No any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4134.269	47.20	-6.21	40.99	74.00	-33.01	peak	
2	6519.038	47.18	0.20	47.38	74.00	-26.62	peak	
3	8052.104	46.02	4.42	50.44	74.00	-23.56	peak	

Antenna polarization: Horizontal



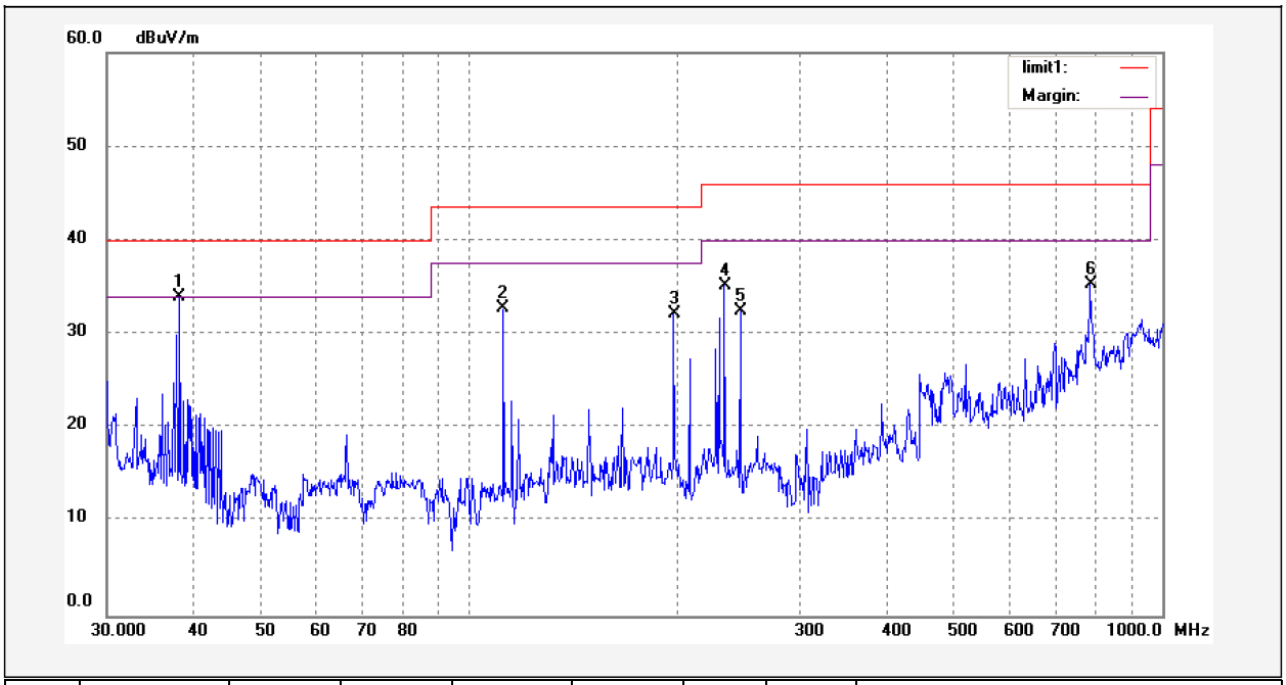
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4798.597	48.71	-4.23	44.48	74.00	-29.52	peak	
2	7472.946	48.10	3.25	51.35	74.00	-22.65	peak	
3	10368.737	43.48	8.61	52.09	74.00	-21.91	peak	

Test mode : BT continuously transmit mode

Remark: The pre-test was performaned in continuously transmit mode and normal link mode, and the continuously transmit mode was pretested at the high, middle and low channel. The worst mode is normal link mode, so the data show was that mode's only. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

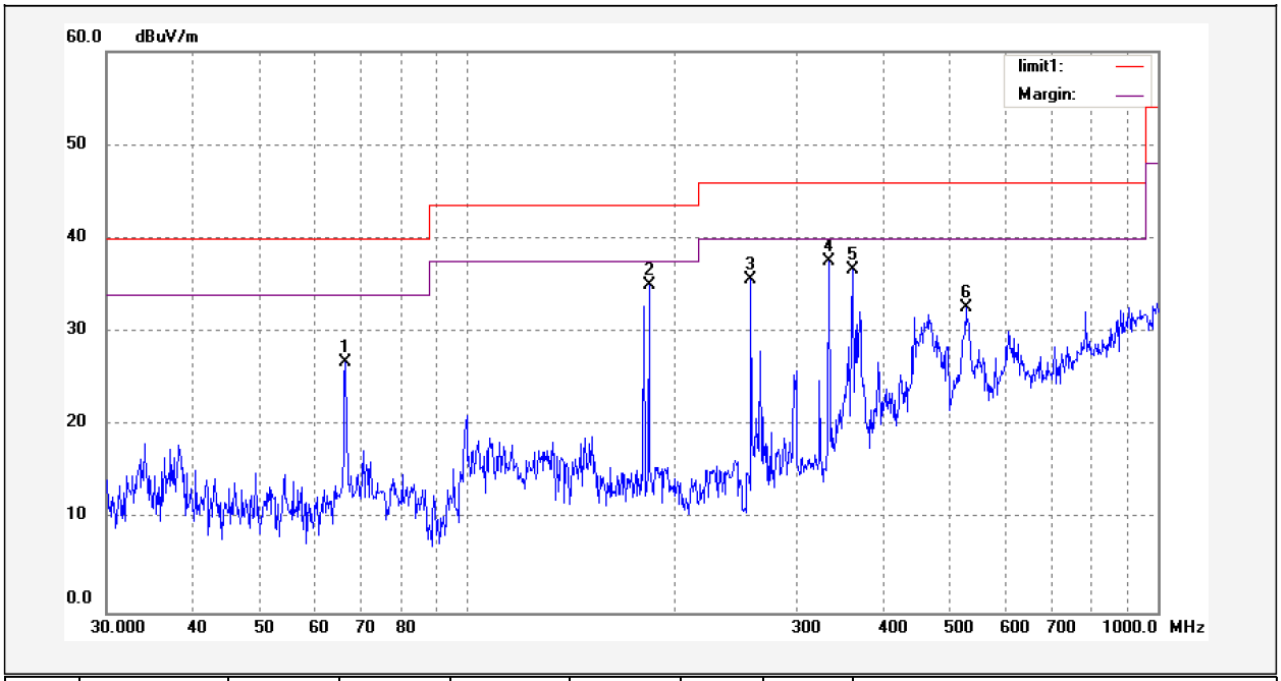
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	38.2305	17.37	16.63	34.00	40.00	-6.00	peak	
2	112.0328	19.42	13.28	32.70	43.50	-10.80	peak	
3	197.2514	17.07	15.12	32.19	43.50	-11.31	peak	
4	233.4881	19.31	15.89	35.20	46.00	-10.80	peak	
5	246.1238	17.25	15.17	32.42	46.00	-13.58	peak	
6	787.4749	6.23	29.16	35.39	46.00	-10.61	peak	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	66.6051	16.08	10.67	26.75	40.00	-13.25	peak	
2	183.2211	21.32	13.72	35.04	43.50	-8.46	peak	
3	257.6266	19.51	16.15	35.66	46.00	-10.34	peak	
4	334.1255	17.94	19.59	37.53	46.00	-8.47	peak	
5	360.9775	15.93	20.76	36.69	46.00	-9.31	peak	
6	527.5707	8.81	23.81	32.62	46.00	-13.38	peak	

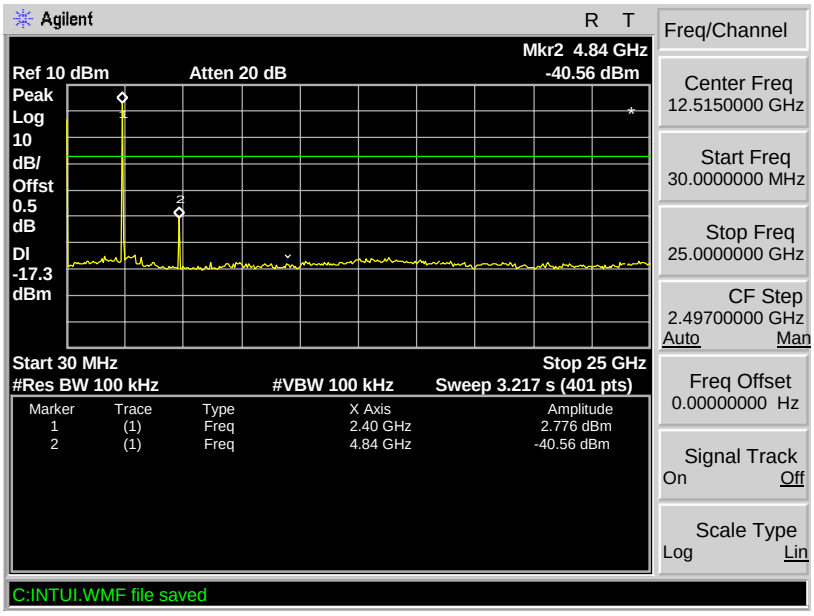
Down 20 dB outside bandwidth:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

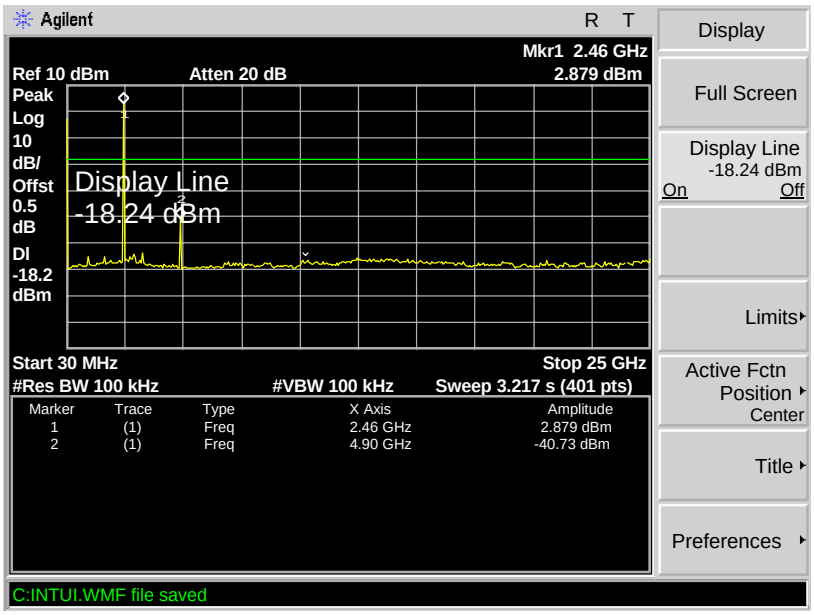
Results:

The data showing that all the emissions was lower more than 20dB .So it's complied with the FCC 15.247(d).

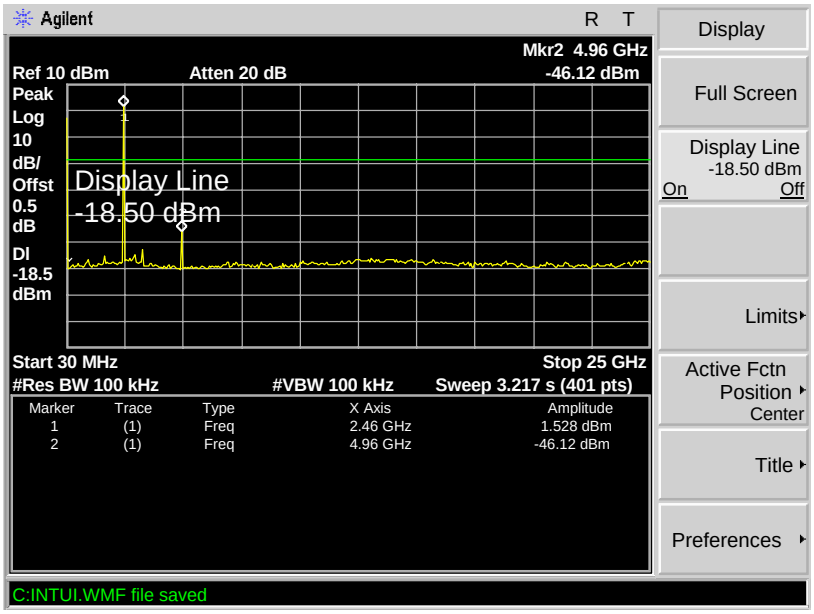
Lower channel data :



Middle channel data：



Higher channel data：



Test Frequency: 1GHz ~ 25GHz radiation test data
Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the worse case type of modulation was GFSK.so the data show was the GFSK only in the report as following
Fundamental and Harmonic:

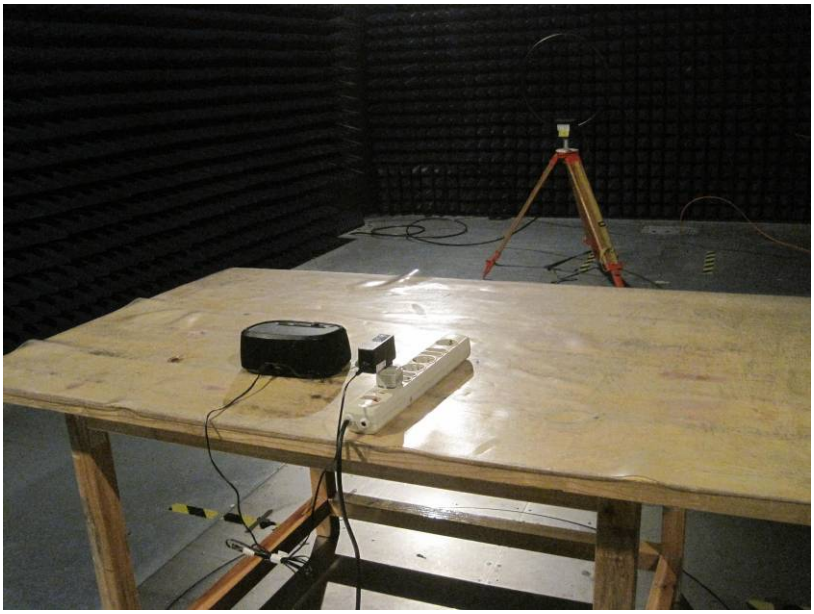
Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	95.41		(Fund.)	1.4	10
4804.00	AV	Vertical	43.65	54.00	-10.35	1.2	120
7206.00	AV	Vertical	40.26	54.00	-13.74	1.0	150
9608.00	AV	Vertical	38.62	54.00	-15.38	1.1	120
12010.00	AV	Vertical	35.63	54.00	-18.37	1.1	160
14412.00	AV	Vertical	35.36	54.00	-18.64	1.2	90
16814.00	AV	Vertical	34.67	54.00	-19.33	1.4	30
19216.00	AV	Vertical	29.67	54.00	-24.33	1.2	120
21618.00	AV	Vertical	31.36	54.00	-22.64	1.3	150
24020.00	AV	Vertical	31.02	54.00	-22.98	1.1	190
2402.00	AV	Horizontal	89.96		(Fund.)	1.1	150
4804.00	AV	Horizontal	42.31	54.00	-11.69	1.2	120
7206.00	AV	Horizontal	38.63	54.00	-15.37	1.2	160
9608.00	AV	Horizontal	36.34	54.00	-17.66	1.2	190
12010.00	AV	Horizontal	35.36	54.00	-17.64	1.1	110
14412.00	AV	Horizonta	34.36	54.00	-18.64	1.0	190
16814.00	AV	Horizontal	34.28	54.00	-19.72	1.2	150
19216.00	AV	Horizontal	26.87	54.00	-27.13	1.3	120
21618.00	AV	Horizontal	27.69	54.00	-26.31	1.1	160
24020.00	AV	Horizontal	27.62	54.00	-26.38	1.2	90
2402.00	PK	Vertical	106.35		(Fund.)	1.3	30
4804.00	PK	Vertical	61.05	74.00	-12.95	1.1	120
7206.00	PK	Vertical	58.48	74.00	-15.52	1.2	160
9608.00	PK	Vertical	55.09	74.00	-18.91	1.2	240
12010.00	PK	Vertical	51.58	74.00	-22.42	1.1	100
14412.00	PK	Vertical	52.72	74.00	-21.28	1.1	155
16814.00	PK	Vertical	49.59	74.00	-24.41	1.0	185
19216.00	PK	Vertical	47.95	74.00	-26.05	1.1	190
21618.00	PK	Vertical	45.61	74.00	-28.39	1.1	110
24020.00	PK	Vertical	44.63	74.00	-29.37	1.1	190
2402.00	PK	Horizontal	101.25		(Fund.)	1.2	150
4804.00	PK	Horizontal	58.96	74.00	-15.04	1.1	120
7206.00	PK	Horizontal	53.60	74.00	-20.40	1.0	160
9608.00	PK	Horizontal	50.59	74.00	-23.41	1.1	150
12010.00	PK	Horizontal	52.70	74.00	-21.30	1.1	120
14412.00	PK	Horizontal	51.36	74.00	-22.64	1.0	60
16814.00	PK	Horizontal	50.35	74.00	-23.65	1.1	220

19216.00	PK	Horizontal	48.96	74.00	-25.04	1.1	10
21618.00	PK	Horizontal	46.76	74.00	-27.24	1.2	110
24020.00	PK	Horizontal	44.63	74.00	-29.34	1.0	125
Middle frequency							
2441.00	AV	Vertical	96.25		(Fund.)	1.0	190
4882.00	AV	Vertical	43.69	54.00	-10.31	1.1	150
7323.00	AV	Vertical	39.42	54.00	-14.58	1.1	120
9764.00	AV	Vertical	39.65	54.00	-14.35	1.2	160
12205.00	AV	Vertical	39.93	54.00	-14.07	1.2	190
14646.00	AV	Vertical	38.53	54.00	-15.47	1.3	150
17087.00	AV	Vertical	35.46	54.00	-18.54	1.1	120
19528.00	AV	Vertical	32.33	54.00	-21.67	1.2	160
21969.00	AV	Vertical	30.34	54.00	-23.66	1.2	210
24410.00	AV	Vertical	29.66	54.00	-24.34	1.0	20
2441.00	AV	Horizontal	93.21		(Fund.)	1.2	190
4882.00	AV	Horizontal	40.32	54.00	-13.68	1.3	150
7323.00	AV	Horizontal	38.89	54.00	-15.11	1.1	310
9764.00	AV	Horizontal	35.63	54.00	-18.37	1.2	20
12205.00	AV	Horizontal	35.63	54.00	-18.37	1.2	190
14646.00	AV	Horizontal	35.25	54.00	-18.75	1.1	20
17087.00	AV	Horizontal	34.54	54.00	-19.46	1.2	190
19528.00	AV	Horizontal	33.65	54.00	-20.35	1.1	150
21969.00	AV	Horizontal	30.23	54.00	-23.77	1.1	310
24410.00	AV	Horizontal	29.99	54.00	-24.01	1.1	200
2441.00	PK	Vertical	106.11		(Fund.)	1.2	30
4882.00	PK	Vertical	61.88	74.00	-12.12	1.1	30
7323.00	PK	Vertical	60.55	74.00	-13.45	1.1	20
9764.00	PK	Vertical	59.99	74.00	-14.01	1.1	190
12205.00	PK	Vertical	59.66	74.00	-14.34	1.0	150
14646.00	PK	Vertical	52.18	74.00	-21.82	1.0	310
17087.00	PK	Vertical	55.49	74.00	-18.51	1.1	20
19528.00	PK	Vertical	50.38	74.00	-23.62	1.2	20
21969.00	PK	Vertical	50.38	74.00	-23.62	1.1	190
24410.00	PK	Vertical	47.45	74.00	-26.55	1.4	120
2441.00	PK	Horizontal	103.65		(Fund.)	1.1	60
4882.00	PK	Horizontal	58.65	74.00	-15.35	1.1	20
7323.00	PK	Horizontal	56.11	74.00	-17.89	1.0	120
9764.00	PK	Horizontal	53.23	74.00	-20.77	1.3	30
12205.00	PK	Horizontal	52.11	74.00	-22.89	1.1	220
14646.00	PK	Horizontal	51.36	74.00	-22.64	1.0	210
17087.00	PK	Horizontal	50.36	74.00	-23.64	1.3	160
19528.00	PK	Horizontal	51.38	74.00	-22.62	1.1	120
21969.00	PK	Horizontal	50.36	74.00	-23.64	1.2	50
24410.00	PK	Horizontal	47.38	74.00	-26.62	1.1	20

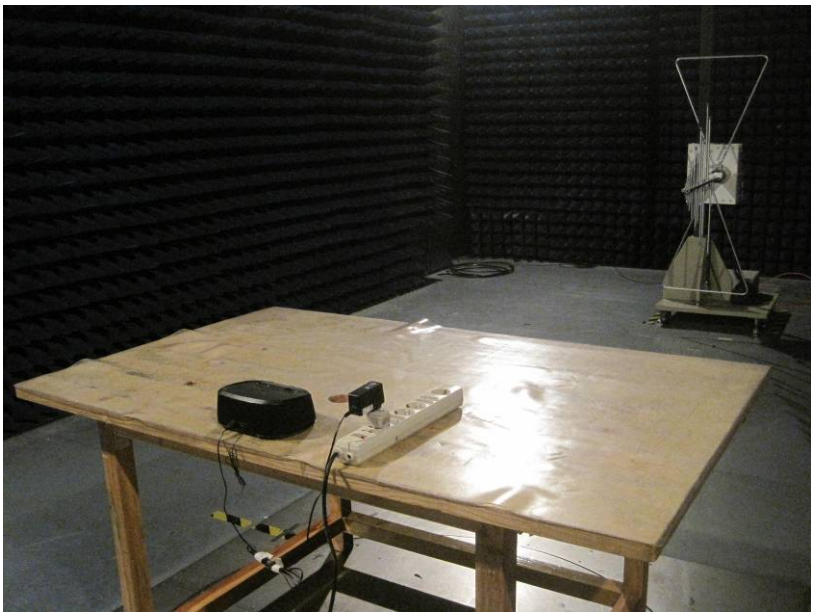
High frequency							
2480.00	AV	Vertical	95.36		(Fund.)	1.0	20
4960.00	AV	Vertical	43.65	54.00	-10.35	1.3	190
7440.00	AV	Vertical	42.15	54.00	-11.85	1.1	190
9920.00	AV	Vertical	40.36	54.00	-13.64	1.2	230
12400.00	AV	Vertical	40.13	54.00	-13.87	1.1	30
14880.00	AV	Vertical	40.88	54.00	-13.12	1.1	150
17360.00	AV	Vertical	38.96	54.00	-15.04	1.2	170
19840.00	AV	Vertical	38.66	54.00	-15.34	1.1	260
22320.00	AV	Vertical	38.35	54.00	-15.65	1.1	150
24800.00	AV	Vertical	35.44	54.00	-19.56	1.4	220
2480.00	AV	Horizontal	93.66		(Fund.)	1.3	190
4960.00	AV	Horizontal	39.61	54.00	-14.39	1.1	210
7440.00	AV	Horizontal	35.17	54.00	-18.83	1.0	160
9920.00	AV	Horizontal	35.59	54.00	-18.41	1.3	120
12400.00	AV	Horizontal	36.99	54.00	-17.01	1.1	180
14880.00	AV	Horizontal	33.39	54.00	-20.61	1.2	190
17360.00	AV	Horizontal	30.61	54.00	-23.39	1.1	230
19840.00	AV	Horizontal	33.32	54.00	-20.68	1.3	135
22320.00	AV	Horizontal	28.48	54.00	-25.52	1.1	150
24800.00	AV	Horizontal	29.45	54.00	-24.55	1.2	170
2480.00	PK	Vertical	105.63		(Fund.)	1.1	210
4960.00	PK	Vertical	63.58	74.00	-10.42	1.1	120
7440.00	PK	Vertical	58.69	74.00	-15.31	1.1	190
9920.00	PK	Vertical	55.78	74.00	-18.22	1.3	230
12400.00	PK	Vertical	56.36	74.00	-17.64	1.1	135
14880.00	PK	Vertical	56.36	74.00	-17.64	1.2	150
17360.00	PK	Vertical	55.50	74.00	-18.50	1.1	170
19840.00	PK	Vertical	56.45	74.00	-17.55	1.1	210
22320.00	PK	Vertical	54.65	74.00	-19.35	1.1	170
24800.00	PK	Vertical	50.33	74.00	-23.67	1.0	210
2480.00	PK	Horizontal	103.64		(Fund.)	1.3	130
4960.00	PK	Horizontal	58.69	74.00	-15.31	1.1	140
7440.00	PK	Horizontal	57.65	74.00	-16.35	1.2	190
9920.00	PK	Horizontal	56.41	74.00	-17.59	1.1	230
12400.00	PK	Horizontal	54.40	74.00	-19.60	1.4	135
14880.00	PK	Horizontal	53.63	74.00	-20.37	1.3	150
17360.00	PK	Horizontal	52.71	74.00	-21.29	1.1	170
19840.00	PK	Horizontal	47.41	74.00	-26.59	1.2	210
22320.00	PK	Horizontal	49.37	74.00	-24.63	1.1	170
24800.00	PK	Horizontal	48.36	74.00	-25.64	1.1	240

7.8 Photograph – Radiation Spurious Emission Test Setup

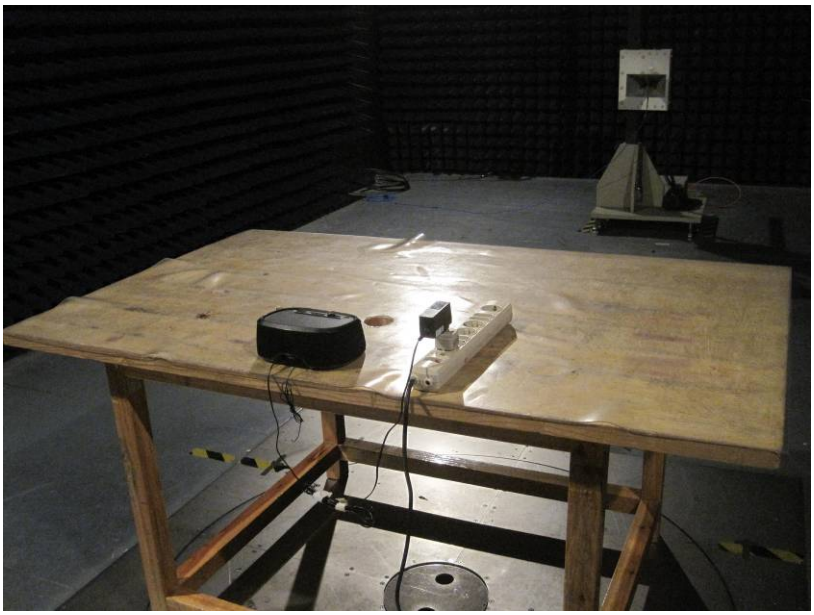
Below 30MHz



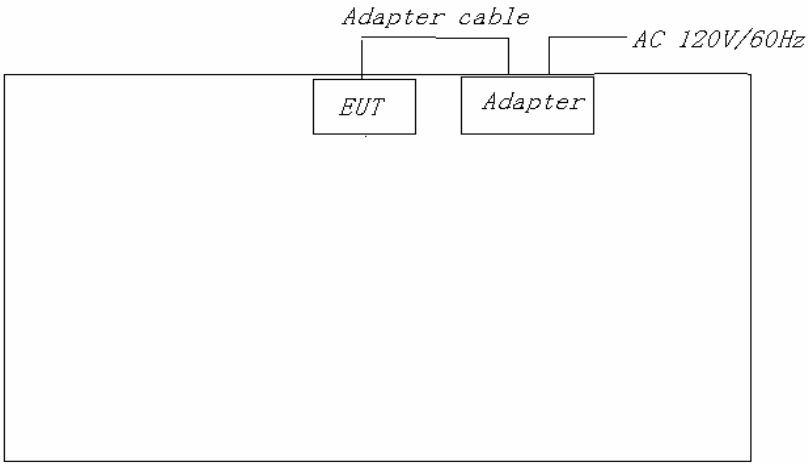
From 30-1000MHz



Above 1GHz



7.9 Radiation Emission Test Setup Drawing



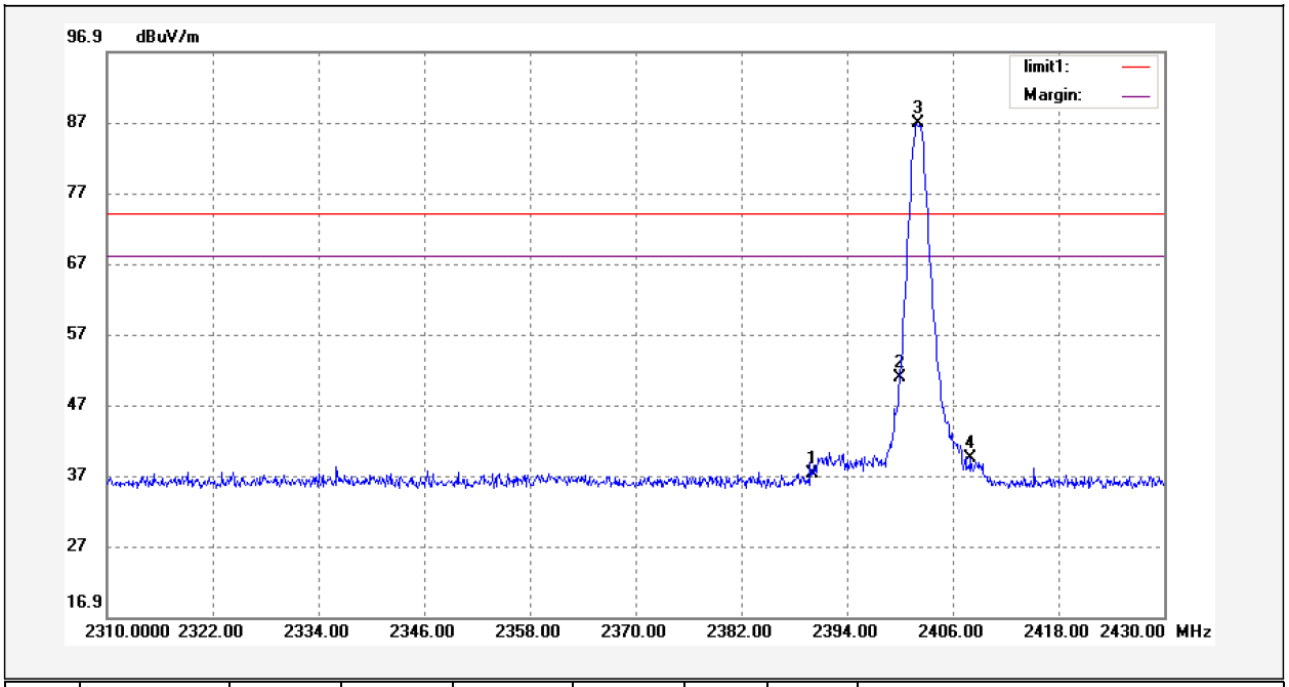
8 Band Edge Measurements

Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 dBuV/m between 30MHz & 88MHz; 43.5 dBuV/m between 88MHz & 216MHz; 46.0 dBuV/m between 216MHz & 960MHz; 54.0 dBuV/m above 960MHz. 74.0 dBuV/m for peak above 1GHz 54.0 dBuV/m for AVG above 1GHz
Detector:	For Peak value: RBW = 1 MHz for f ≥ 1 GHz VBW ≥ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for f ≥ 1 GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the worse case type of modulation was GFSK.so the data show was the GFSK only in the report as following:

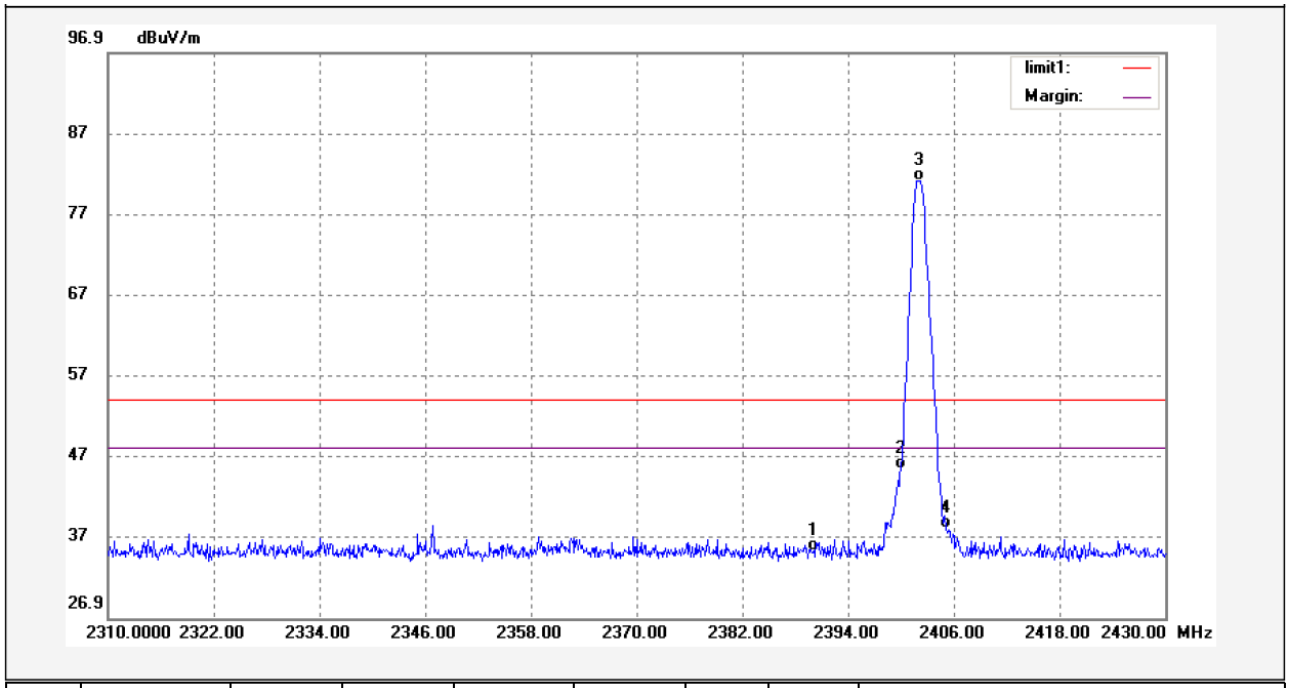
Test Result:

Low Channel – Peak



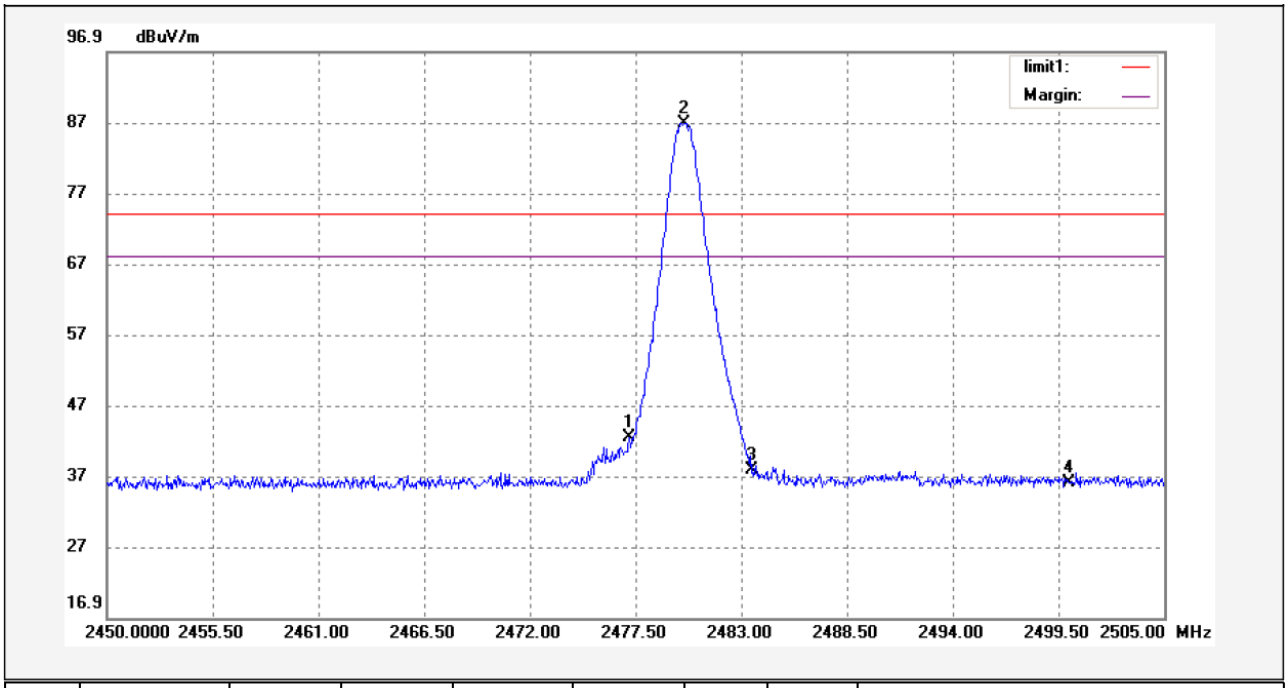
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2390.000	46.45	-9.27	37.18	74.00	-36.82	peak	
2	2400.000	60.17	-9.28	50.89	74.00	-23.11	peak	
3	2402.000	96.12	-9.28	86.84	74.00	12.84	peak	
4	2408.040	48.73	-9.28	39.45	74.00	-34.55	peak	

Low Channel – AV



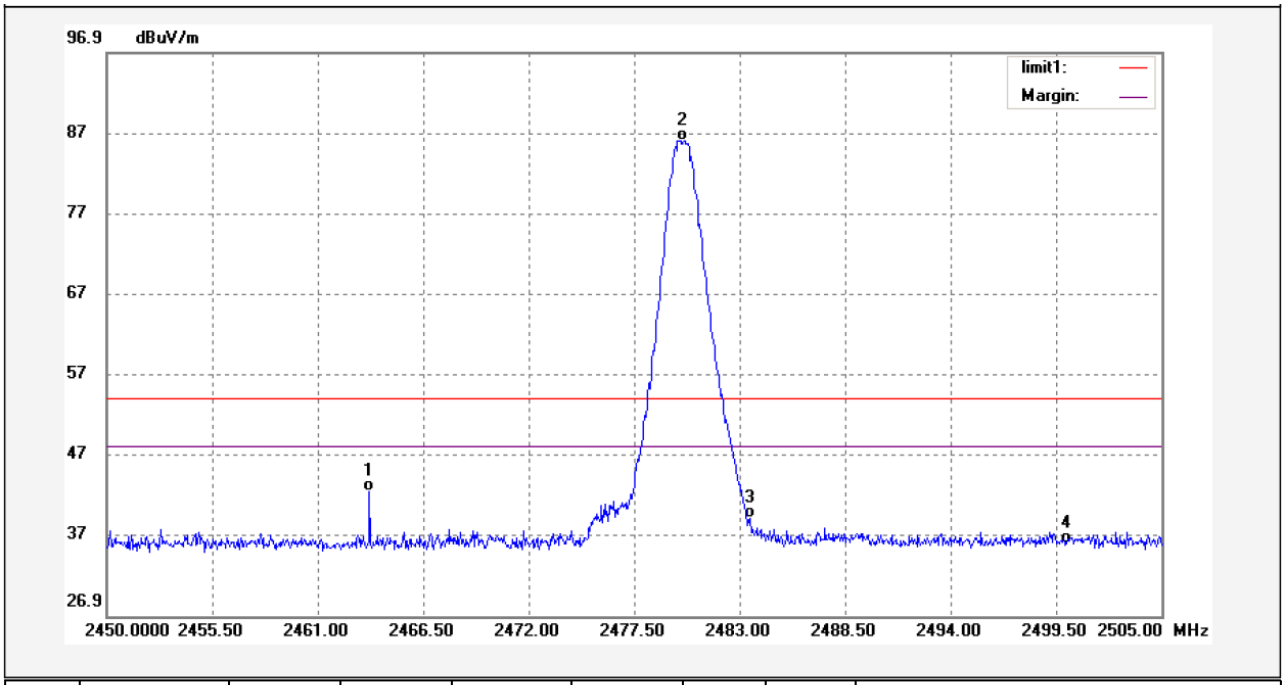
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2390.000	44.50	-9.27	35.23	54.00	-18.77	AVG	
2	2400.000	54.62	-9.28	45.34	54.00	-8.66	AVG	
3	2402.000	90.34	-9.28	81.06	54.00	27.06	AVG	
4	2405.160	47.24	-9.28	37.96	54.00	-16.04	AVG	

High Channel – Peak



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2477.170	51.72	-9.23	42.49	74.00	-31.51	peak	
2	2480.000	96.07	-9.22	86.85	74.00	12.85	peak	
3	2483.500	47.06	-9.20	37.86	74.00	-36.14	peak	
4	2500.000	45.16	-9.15	36.01	74.00	-37.99	peak	

High Channel – AV



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	2463.695	51.70	-9.28	42.42	54.00	-11.58	AVG	
2	2480.000	95.25	-9.22	86.03	54.00	32.03	AVG	
3	2483.500	48.21	-9.20	39.01	54.00	-14.99	AVG	
4	2500.000	45.05	-9.15	35.90	54.00	-18.10	AVG	

9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Mode: Test in fixing operating frequency at low, Middle, high channel.

9.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;

2. Set the spectrum analyzer: Span = 4MHz, RBW = 100kHz, VBW = 100kHz

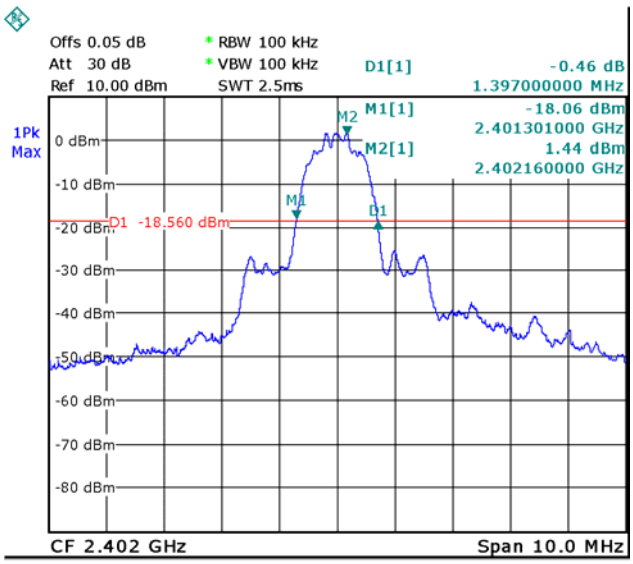
9.2 Test Result:

Test Channel	Bandwidth
Low	1.397MHz
Middle	1.437MHz
High	1.417MHz

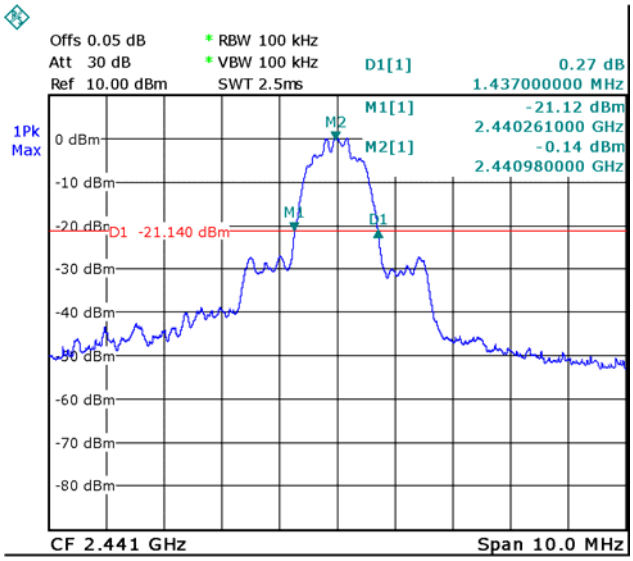
Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the more lager type of modulation was 8DPSK.so the data show was the 8DPSK only in the report as following :

Test result plot as follows:

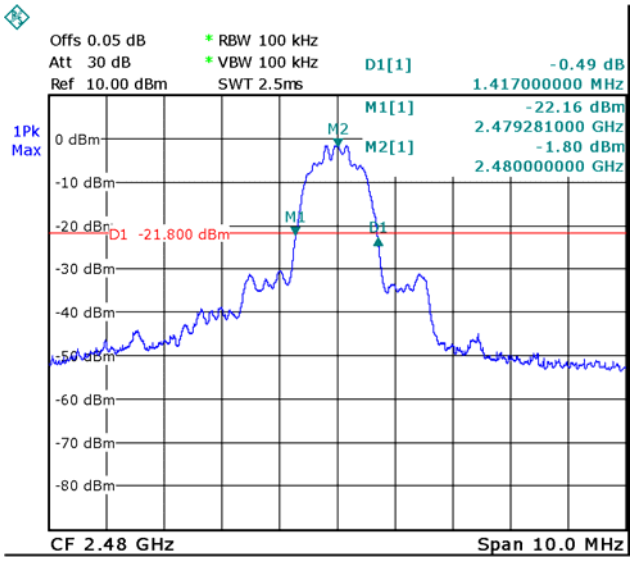
Low Channel



Middle Channel



High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (b)(1)For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts. Refer to the result "Number of Hopping Frequency" of this document. The 1watts (30 dBm) limit applies.
Test mode:	Test in fixing frequency transmitting mode.

10.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 3 MHz. VBW = 10 MHz. Sweep = auto; Detector Function = Peak.

3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

10.2 Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	1.25	30
Middle	1.36	30
High	1.36	30

Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the max. type of modulation was GFSK.so the data show was the GFSK only in the report.

11 Hopping Channel Separation

Test Requirement: FCC CFR47 Part 15 Section 15.247

Test Method: DA 00-705

Test Limit: Regulation 15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Mode: Test in hopping transmitting operating mode.

11.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

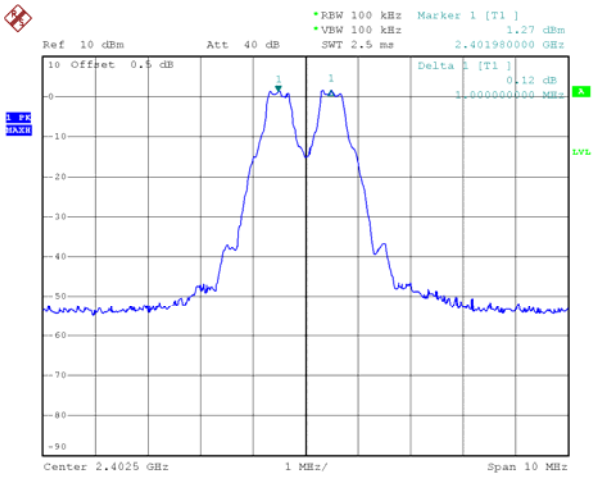
11.2 Test Result:

Test Channel	Separation (MHz)	Result
Low	1.000	PASS
Middle	1.000	PASS
High	1.000	PASS

Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the worse case. type of modulation was GFSK.so the data show was the GFSK only in the report.

Test result plot as follows:

Low Channel:



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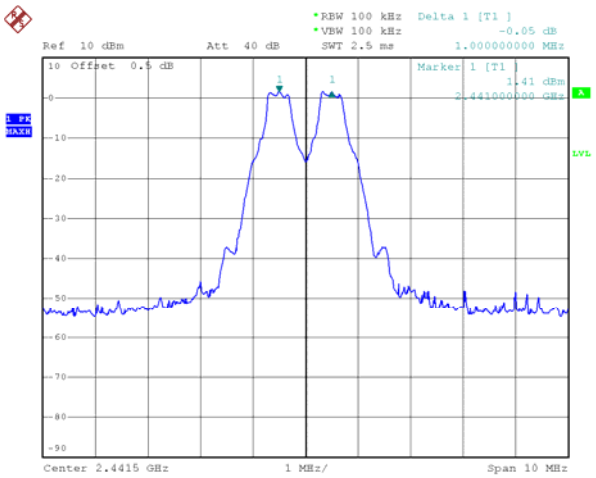
Date: 6.JAN.2013 14:21:02

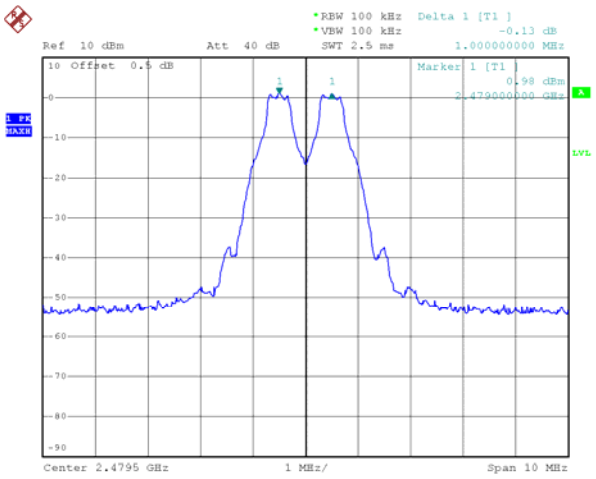
Middle Channel



1

Date: 6.JAN.2013 14:23:00

High Channel



12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

12.1 Test Procedure:

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

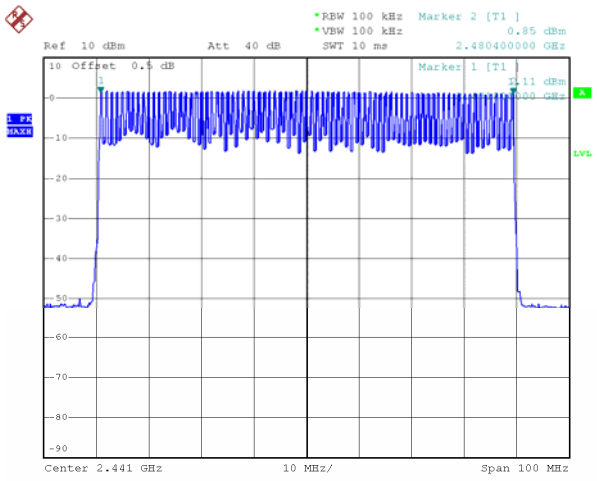
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

3. Allow the trace to stabilize. It may prove necessary to break the span up to sections. in order to clearly show all of the hopping frequencies. The limit is specified in one of the subparagraphs of this Section.

4. Set the spectrum analyzer: Center Frequency = 2441MHz, Span = 86MHz. Submit the test result graph.

12.2 Test Result:

Total Channels are 79 Channels (showing the GFSK Type modulation only)



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	DA 00-705
Test Limit:	Regulation 15.247(a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
Test Mode:	Test in hopping transmitting operating mode.

13.1 Test Procedure:

1.Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

2.Set spectrum analyzer span = 0. centered on a hopping channel;

3.Set RBW = 1MHz and VBW = 1MHz.Sweep = as necessary to capture the entire dwell time per hopping channel.

4.Use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g.. data rate. modulation format. etc.). repeat this test for each variation. The limit is specified in one of the subparagraphs of this Section. Submit this plot(s).

13.2 Test Result:

Dwell time = Pulse wide x (Hopping rate / Number of channels) x Period

The test period: T= 0.4(s) * 79 = 31.6 (s)

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

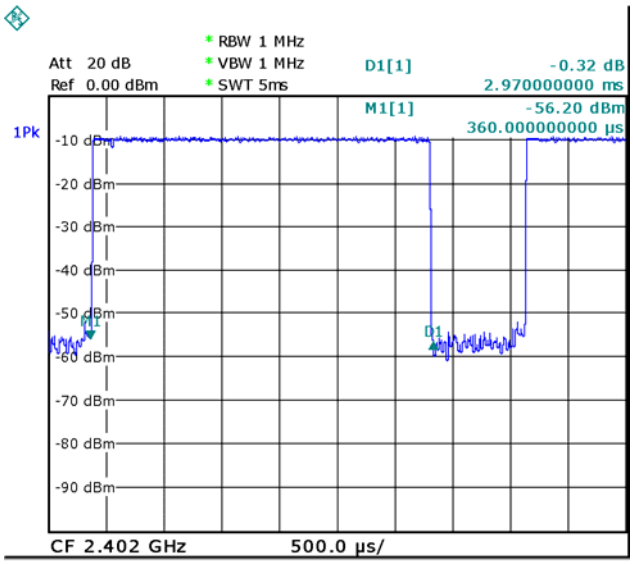
Note : Mkr Delta is once pulse time .

Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the worse case. type of modulation was GFSK.so the data show was the GFSK only in the report.

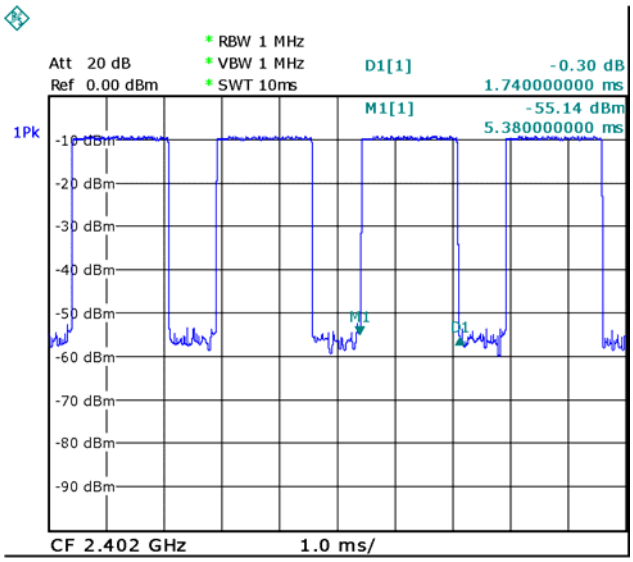
Low Channel: 2402MHz

Dwell time of each occupation in this channel as follows:

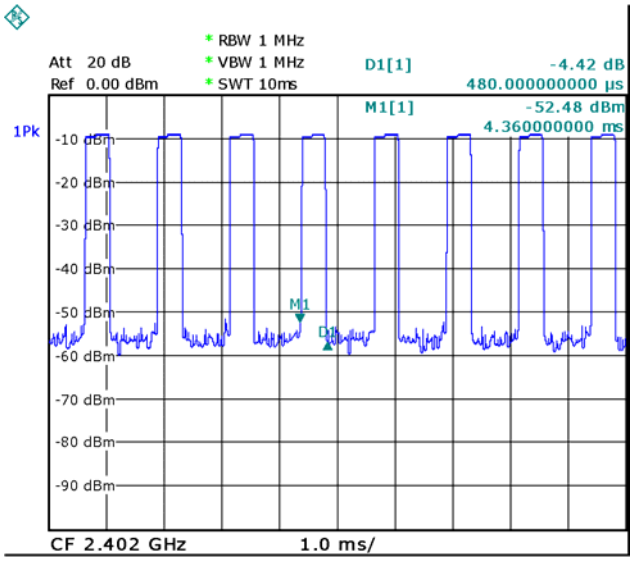
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	2.970	0.318	0.400	Pass
DH3	2402 MHz	1.740	0.286	0.400	Pass
DH1	2402 MHz	0.480	0.152	0.400	Pass



(DH5)



(DH3)

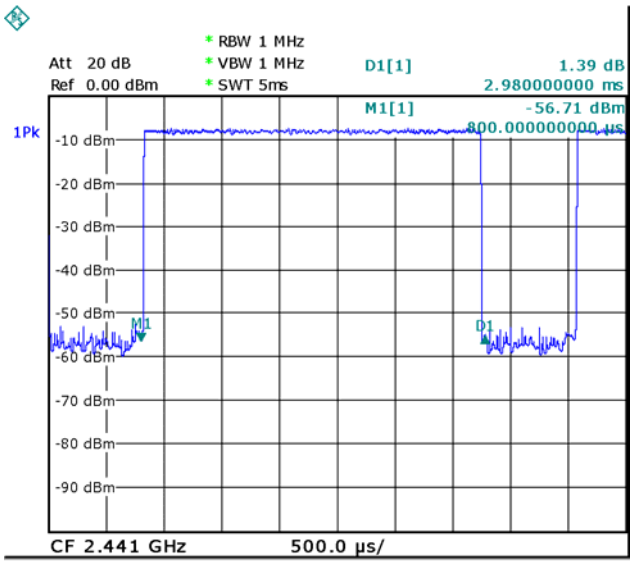


(DH1)

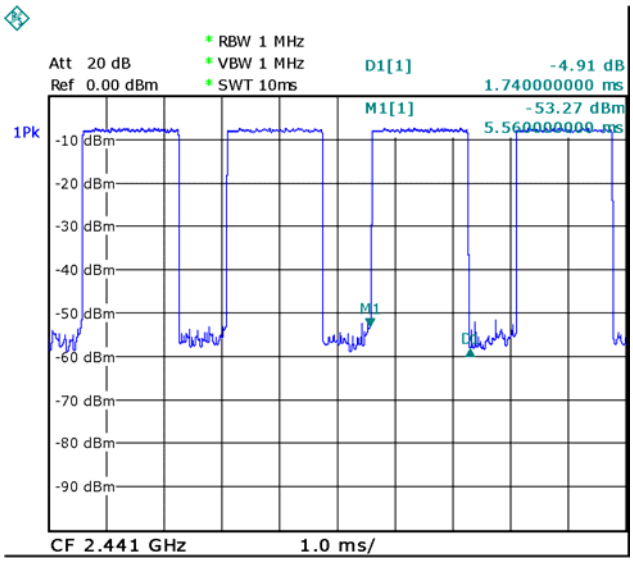
Middle Channel: 2441MHz

Dwell time of each occupation in this channel as follows:

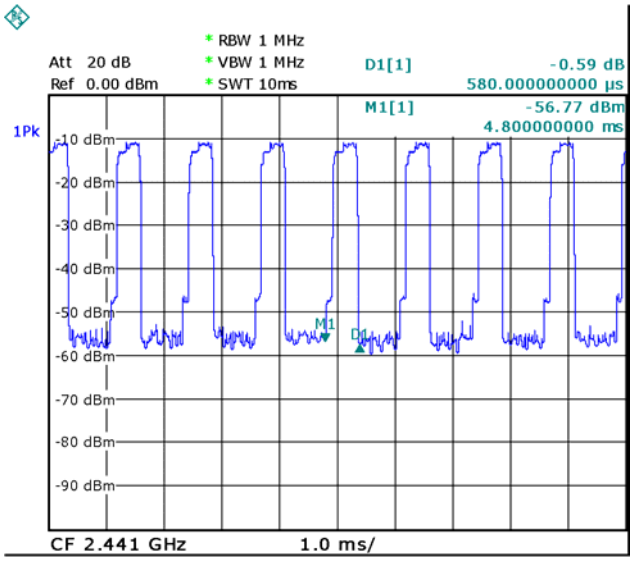
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2441 MHz	2.980	0.316	0.400	Pass
DH3	2441 MHz	1.740	0.286	0.400	Pass
DH1	2441 MHz	0.580	0.184	0.400	Pass



(DH5)



(DH3)

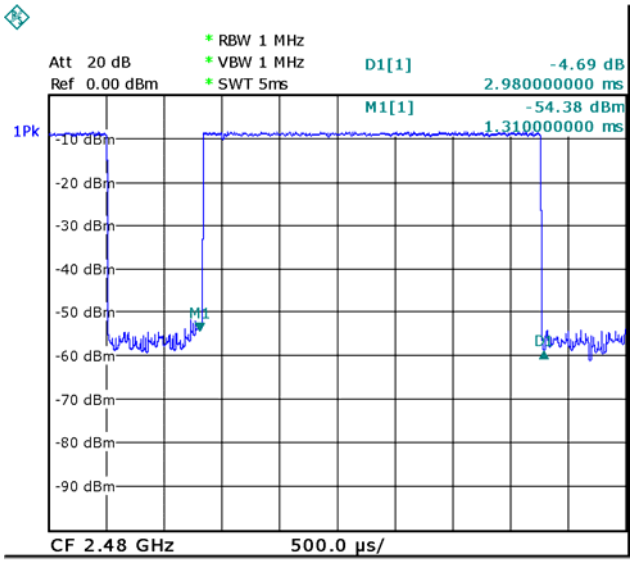


(DH1)

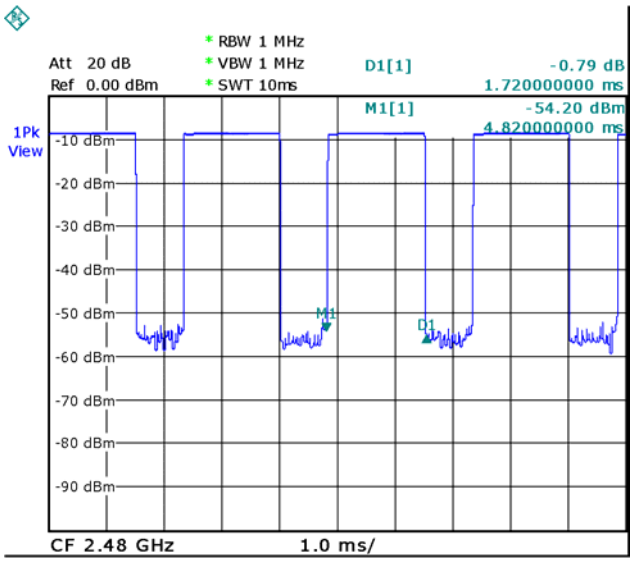
High Channel: 2480MHz

Dwell time of each occupation in this channel as follows:

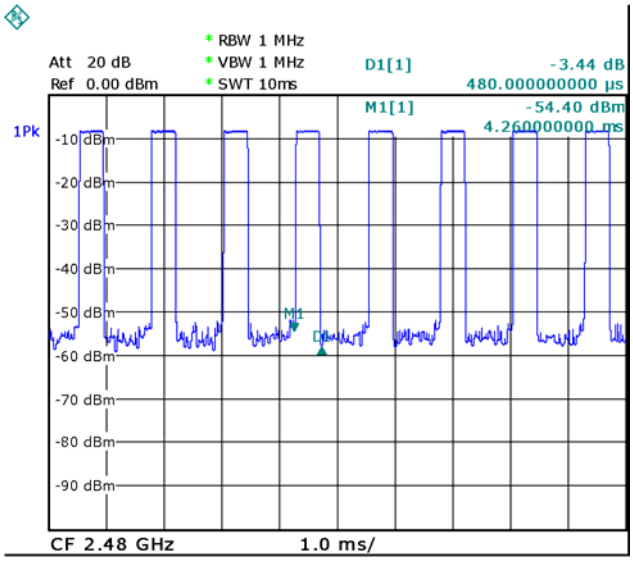
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	2.980	0.316	0.400	Pass
DH3	2480 MHz	1.720	0.284	0.400	Pass
DH1	2480 MHz	0.480	0.152	0.400	Pass



(DH5)



(DH3)



(DH1)

14 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 or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. This product has a permanent PCB antenna, fulfill the requirement of this section.

15 RF Exposure

15.1 Requiments:

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a portable device.

15.2 Measurement Result:

Antenna Gain (dBi)	Antenna Gain (numeric)	Conducted Power (dBm)	Conducted Power (mW)	Radiated Power (e.i.r.p) (mW)
0	1	1.25	1.33	2.58
0	1	1.36	1.37	2.63
0	1	1.36	1.37	2.63

According to the KDB 447498，and the EUT works on the 2.4G ISM band, and the max output power (conducted) of which is 1.37mW, and the min. test distance 1mm(from the antenna and the surfance of the EUT,as the internal photo and EUT open photo),so the test result ≤ 3.0 in the report. the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)],And [√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

f(GHz) is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation17

The result is rounded to one decimal place for comparison

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.

For the final result ≤ 3.0,so the SAR evaluation is not required.

Remark: the three type of modulations:GFSK,Pi/4-DQPSK,8DPSK was tested,and the worse case. type of modulation was GFSK.so the data show was the GFSK only in the report.

16 Photographs - Constructional Details

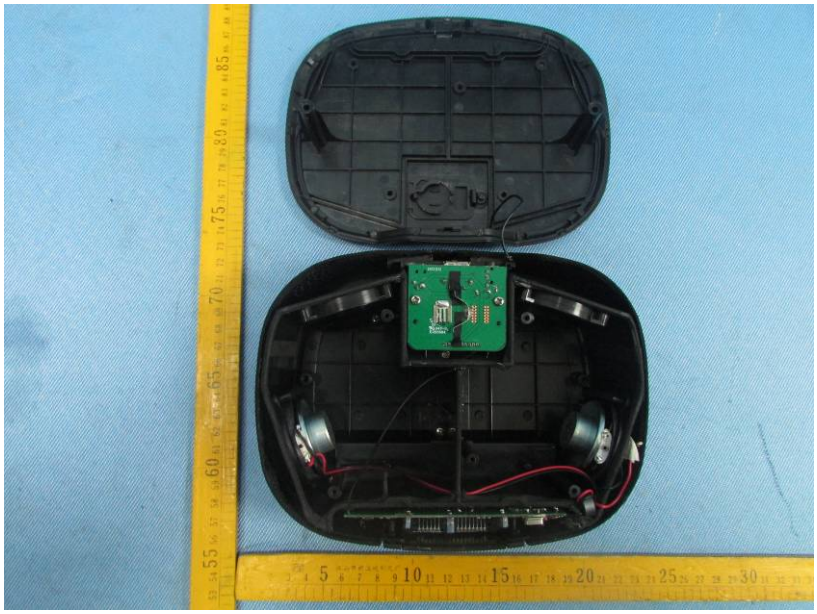
16.1 EUT – Appearance View

16.2 EUT – Appearance View

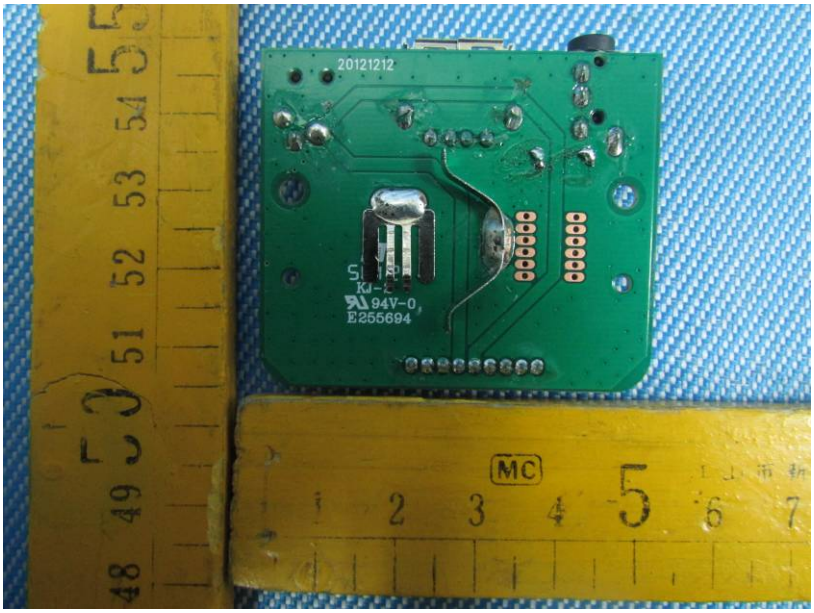
16.3 EUT – Appearance View

16.4 EUT – Appearance View

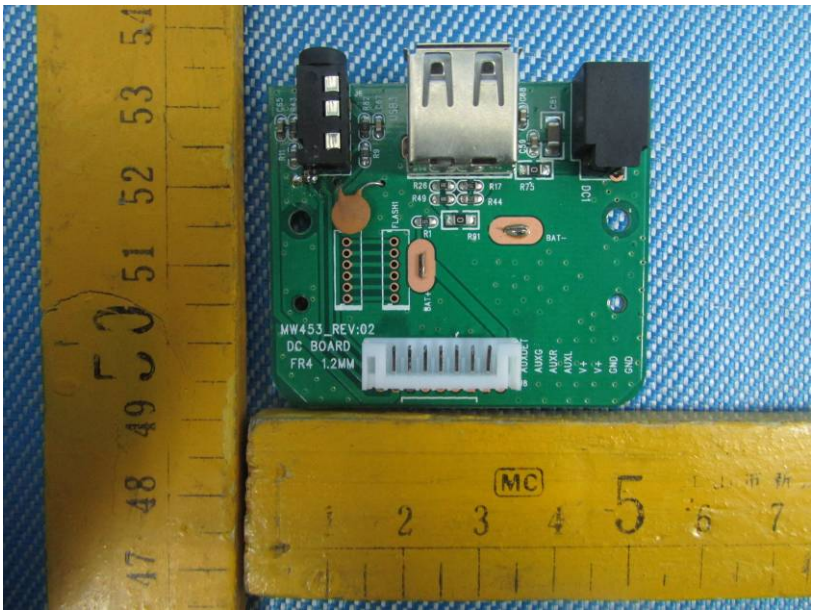
16.5 EUT – Open View



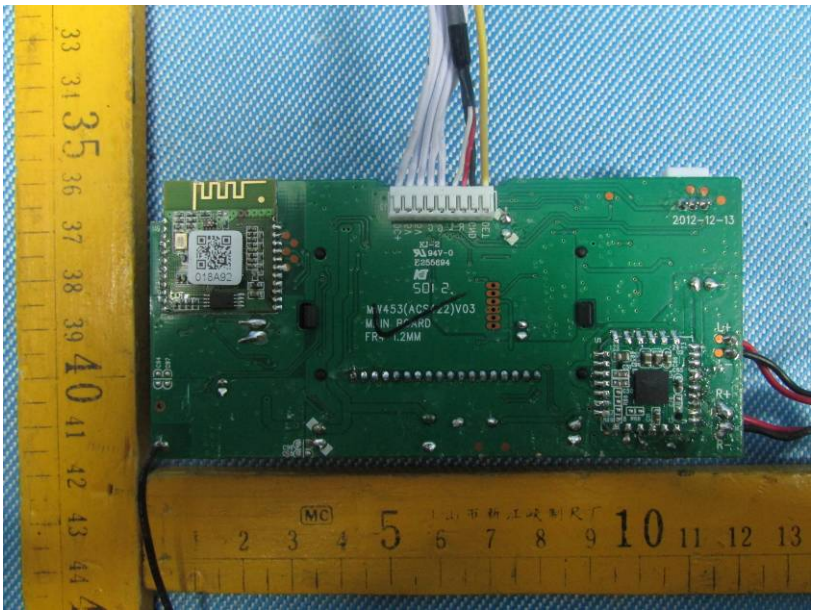
16.6 EUT – PCB(1) Front View



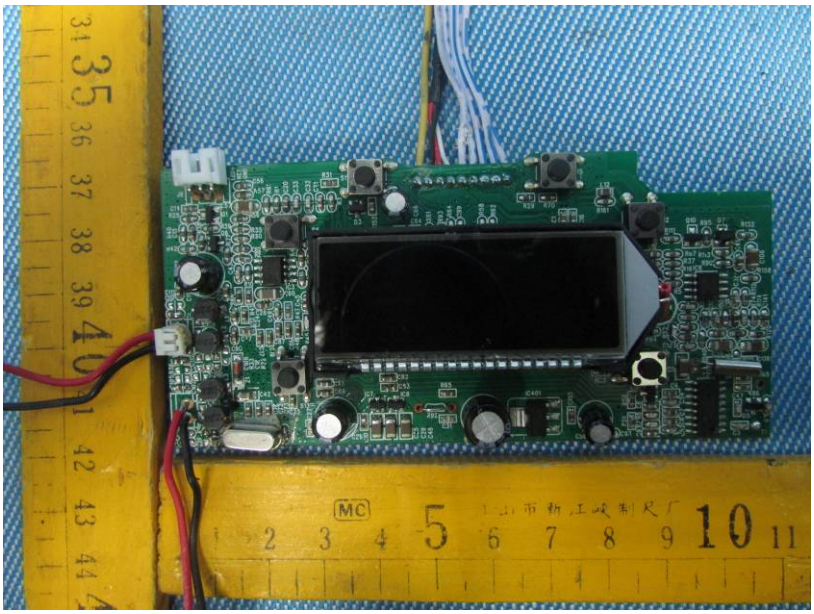
16.7 EUT –PCB(1) Back View



16.8 EUT – PCB(2) Front View

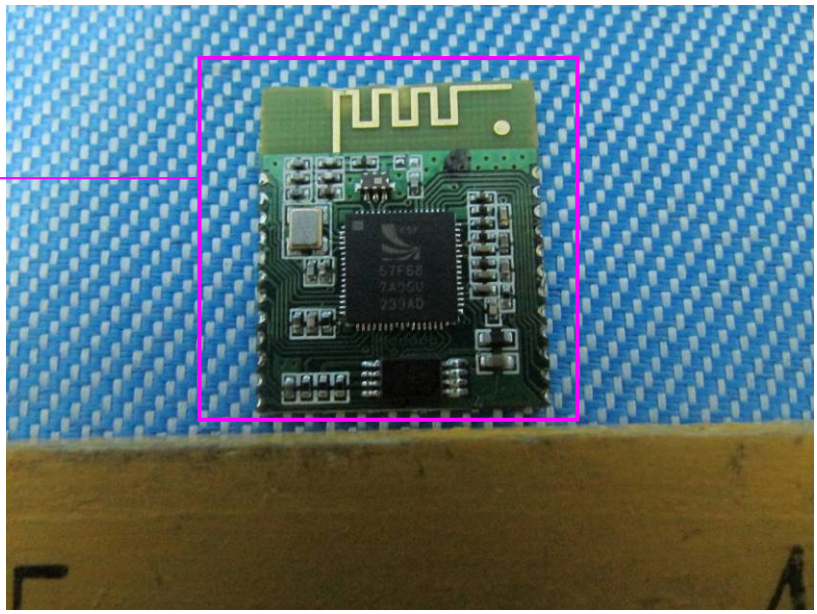


16.9 EUT –PCB(2) Back View



16.10 EUT – PCB(3) Front View

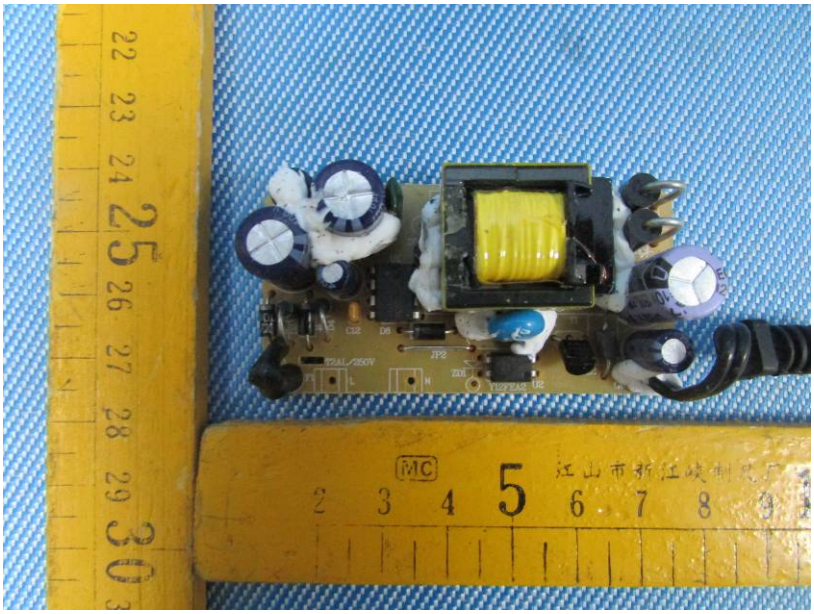
BT Module



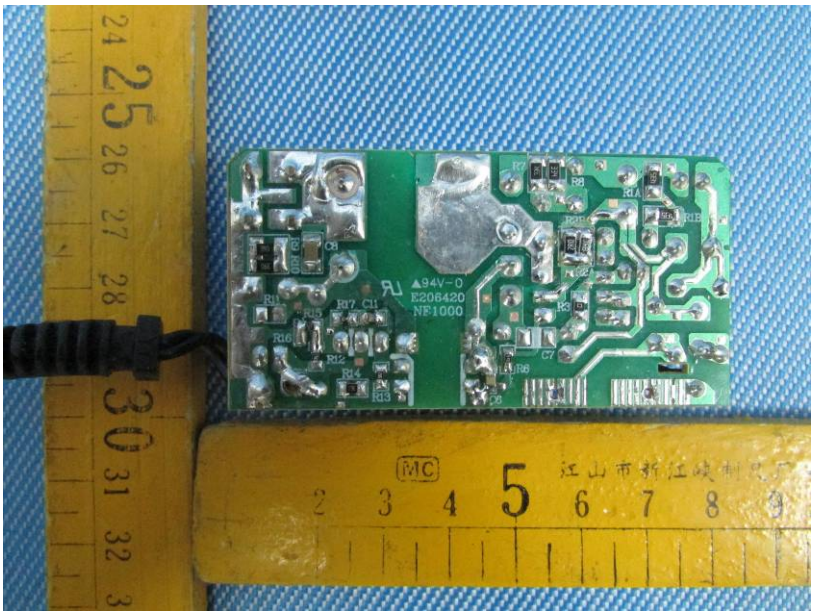
16.11 EUT –PCB(3) Back View

16.12 Adapter Appearance View

16.13 Adapter PCB Front View



16.14 Adapter PCB Back View



17 FCC 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 Back View/ proposed FCC Label Location