FCC TEST REPORT

FCC ID	: ATL-ISM378
Ref. No.	: WT12010180R1-E-E-F
Applicant	: iLuv Creative Technology
Address	: 2 Harbor Park Drive, Port Washington NY11050, USA.

Equipment Under Test (EUT) :

Product Name	: Wireless Stereo Speaker Dock for Smartphones
Model No.	: iMM377,iMM378, iSM378

Rules	: FCC CFR47 Part 15 Section 15.247:2010
Date of Test	: Feb.1 ~ Feb.25, 2012
Date of Issue	: June 04, 2012
Test Engineer	: Hunk yan / Engineer
Reviewed By	: Philo zhong / Manager

Test Result	**: PASS**

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,
Shenzhen 518105, China

Tel :+86-755-27553488
Fax:+86-755-27553868

✧ 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
Radiated Spurious Emissions (26MHz to 25GHz)	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

Page

1 COVER PAGE 1

2 TEST SUMMARY 2

3 CONTENTS 3

4 GENERAL INFORMATION 4

4.1 CLIENT INFORMATION 4
4.2 GENERAL DESCRIPTION OF E.U.T. 4
4.3 DETAILS OF E.U.T. 4
4.4 DESCRIPTION OF SUPPORT UNITS 4
4.5 RULES APPLICABLE FOR TESTING 4
4.6 TEST FACILITY 5
4.7 TEST LOCATION 5

5 EQUIPMENT USED DURING TEST 6

6 EMISSION TEST RESULTS 7

6.1 MAINS TERMINALS DISTURBANCE VOLTAGE, 150KHZ TO 30MHZ 7
6.1.2 E.U.T. Operation 7
6.1.3 Block Diagram of Test Setup 7
6.1.4 Measurement Data 8
6.1.5 Mains Terminals Disturbance Voltage Test Data 8

7 RADIATED SPURIOUS EMISSIONS 11

8 RADIATED EMISSIONS WHICH FALL IN THE RESTRICTED BANDS 27

9 20 DB BANDWIDTH MEASUREMENT 32

10 MAXIMUM PEAK OUTPUT POWER 34

11 HOPPING CHANNEL SEPARATION 35

12 NUMBER OF HOPPING FREQUENCY 38

13 DWELL TIME 39

14 ANTENNA REQUIREMENT 46

15 RF EXPOSURE 47

16 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS 49

16.1 EUT – APPEARANCE VIEW(2) 49
16.2 EUT – APPEARANCE VIEW(2) 50
16.3 EUT – APPEARANCE VIEW(3) 51
16.4 EUT – OPEN VIEW 52
16.5 EUT – PCB1 REAR VIEW 52
16.6 EUT – PCB1 BACK VIEW 53
16.7 EUT – PCB2 REAR VIEW 53
16.8 EUT – PCB2 BACK VIEW 54
16.9 EUT – PCB3 REAR VIEW 54
16.10 EUT – PCB3 BACK VIEW 55

17 FCC LABEL 56

4 General Information

4.1 Client Information

Applicant	: iLuv Creative Technology
Address of Applicant	: 2 Harbor Park Drive, Port Washington NY11050, USA.
Manufacturer	: Modern Electronics Factory LTD.
Address of Manufacturer	: Flat J1~K1, 3/F.,Phase 1,Kwun Tong Ind. Centre, 472-482 Kwun Tong Rd., Kwun Tong, KLN, HK.
Factory	: Keng Fu Jia Electronics(Shenzhen) Co., Ltd
Address of Factory	: 1A & 2-5/F Building C, 175#Huasheng Rd, Langkou Community, Dalang Street, Bao'an District, Shenzhen, Guangdong Province, P.R.China

4.2 General Description of E.U.T.

Product Name	: Wireless Stereo Speaker Dock for Smartphones
Model No.	: iMM377,iMM378, iSM378
Difference Description	: All models have the same circuit and PCB, only the appearance and Model No. are different.

4.3 Details of E.U.T.

Technical Data	: Adapter Input: 100-240V~50/60Hz,0.3A. Adapter Output: 5.0VDC,2.0A.
Operation Frequency	: 2402MHz ~ 2480MHz
Antenna Gain	: 0 dBi

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Rules Applicable for Testing

The customer requested FCC tests for a Wireless Stereo Speaker Dock for Smartphones. The rules 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, August 3, 2010.

- **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	Aug. 2, 2011	Aug. 1, 2012	±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	SCHWARZBECK MESS-ELEKTROM / AK 9513	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Positioning Controller	C&C LAB/ CC-C-IF	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Color Monitor	SUNSPO/ SP-14C	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug. 2, 2011	Aug. 1, 2012	±10%
RF Generator	TESEQ GmbH/ NSG4070	25781	W2008008	Fraq-range : 9K-1GHz RF voltage : -60 dBm-+10dBm	Aug. 2, 2011	Aug. 1, 2012	Power_freq distinguish0.1Hz RFeletricity distinguish 0.1B
Active Loop Antenna	Beijing Dazhi / ZN30900A	-	-	-	Aug. 2, 2011	Aug. 1, 2012	±1Db
MP3 Player	Ipod Player/A1285	5K85004U3R0	-	-	Aug. 2, 2011	Aug. 1, 2012	±0.5dB

6 Emission Test Results

6.1 Mains Terminals Disturbance Voltage, 150kHz to 30MHz

Test Requirement..... : FCC PART 15, SUBPART B

Test Method..... : ANSI C63.4

Test Result..... : PASS

Test Limit..... : FCC PART 15, SUBPART B Section 15.207

Frequency Range..... : 150kHz to 30MHz

Class..... : Class B

6.1.2 E.U.T. Operation

Operating Environment:

Temperature ..... : 23°C

Humidity..... : 33%RH

Atmospheric Pressure..... : 101Kbar

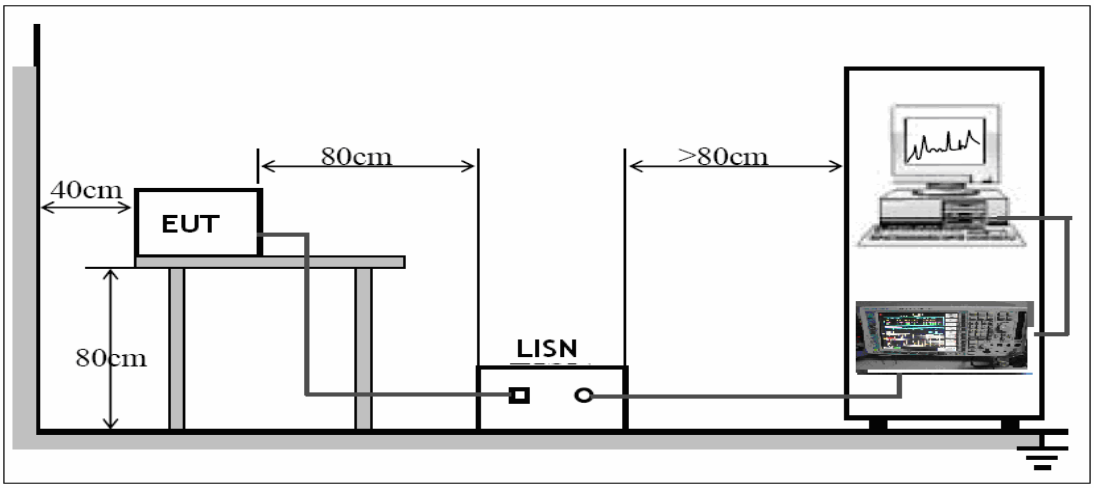
EUT Operation:

Input Voltage ..... : 60/Hz

Operating Mode..... : Normal Operation Mode

6.1.3 Block Diagram of Test Setup

The Mains Terminals Disturbance Voltage tests were performed in accordance with the FCC PART 15, SUBPART B .



6.1.4 Measurement Data

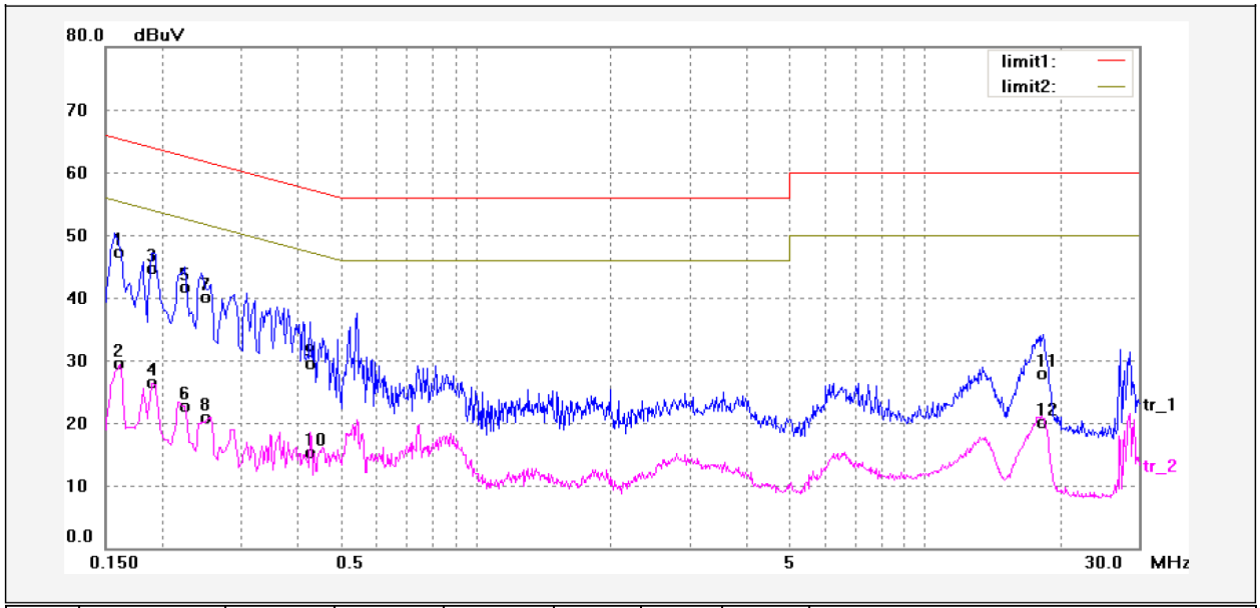
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line. According to the data in section 5.1.4, the EUT complied with the FCC PART 15, SUBPART B rules.

Remark: Test Limit

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

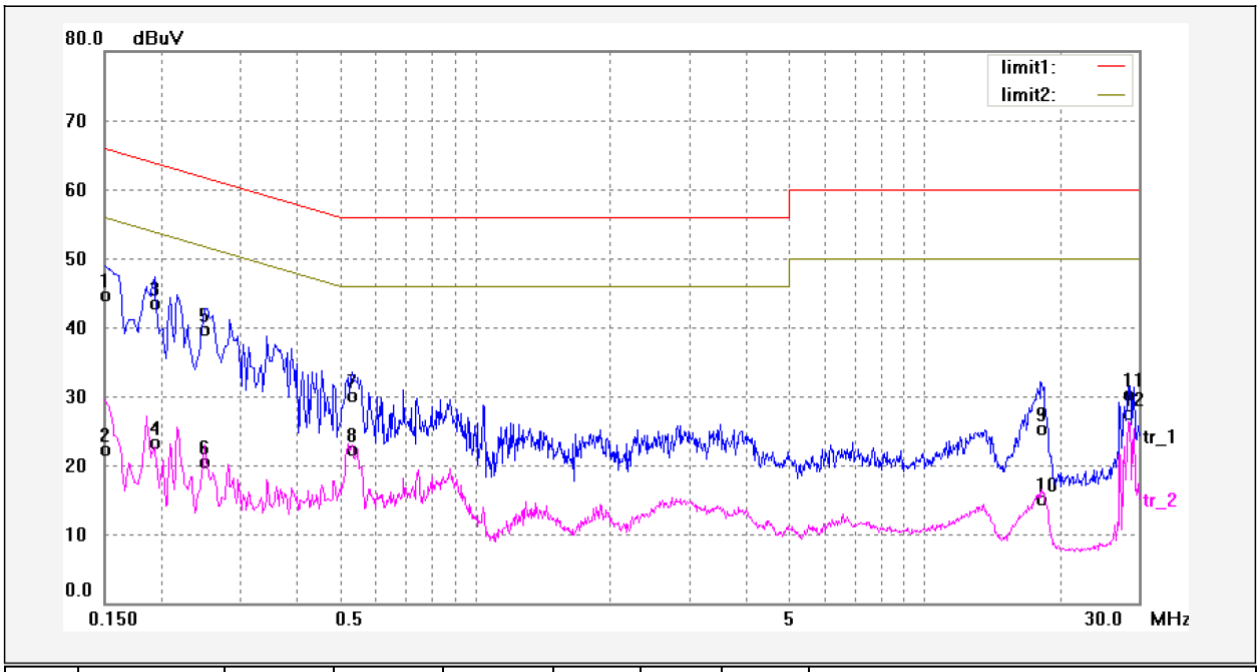
6.1.5 Mains Terminals Disturbance Voltage Test Data

Live Line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1580	36.25	10.35	46.60	65.56	-18.96	QP	
2	0.1580	18.32	10.35	28.67	55.56	-26.89	AVG	
3	0.1900	33.57	10.35	43.92	64.03	-20.11	QP	
4	0.1900	15.30	10.35	25.65	54.03	-28.38	AVG	
5	0.2260	30.55	10.35	40.90	62.59	-21.69	QP	
6	0.2260	11.48	10.35	21.83	52.59	-30.76	AVG	
7	0.2460	28.91	10.35	39.26	61.89	-22.63	QP	
8	0.2460	9.74	10.35	20.09	51.89	-31.80	AVG	
9	0.4300	18.41	10.35	28.76	57.25	-28.49	QP	
10	0.4300	4.24	10.35	14.59	47.25	-32.66	AVG	
11	18.3900	16.71	10.45	27.16	60.00	-32.84	QP	
12	18.3900	8.88	10.45	19.33	50.00	-30.67	AVG	

Neutral Line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	33.52	10.35	43.87	65.99	-22.12	QP	
2	0.1500	11.09	10.35	21.44	55.99	-34.55	AVG	
3	0.1940	32.35	10.35	42.70	63.86	-21.16	QP	
4	0.1940	12.08	10.35	22.43	53.86	-31.43	AVG	
5	0.2500	28.54	10.35	38.89	61.75	-22.86	QP	
6	0.2500	9.29	10.35	19.64	51.75	-32.11	AVG	
7	0.5340	19.05	10.35	29.40	56.00	-26.60	QP	
8	0.5340	11.15	10.35	21.50	46.00	-24.50	AVG	
9	18.1660	14.04	10.45	24.49	60.00	-35.51	QP	
10	18.1660	3.77	10.45	14.22	50.00	-35.78	AVG	
11	28.6900	19.16	10.43	29.59	60.00	-30.41	QP	
12	28.6900	16.23	10.43	26.66	50.00	-23.34	AVG	

Test Setup View

7 Radiated Spurious Emissions

Test Requirement:	FCC CFR47 Part 15 Section 15.209 & 15.247
Test Method:	DA 00-705
Test Result:	PASS
Frequency Range:	9kHz 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.

EUT Operation :

Operating Environment:

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

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.

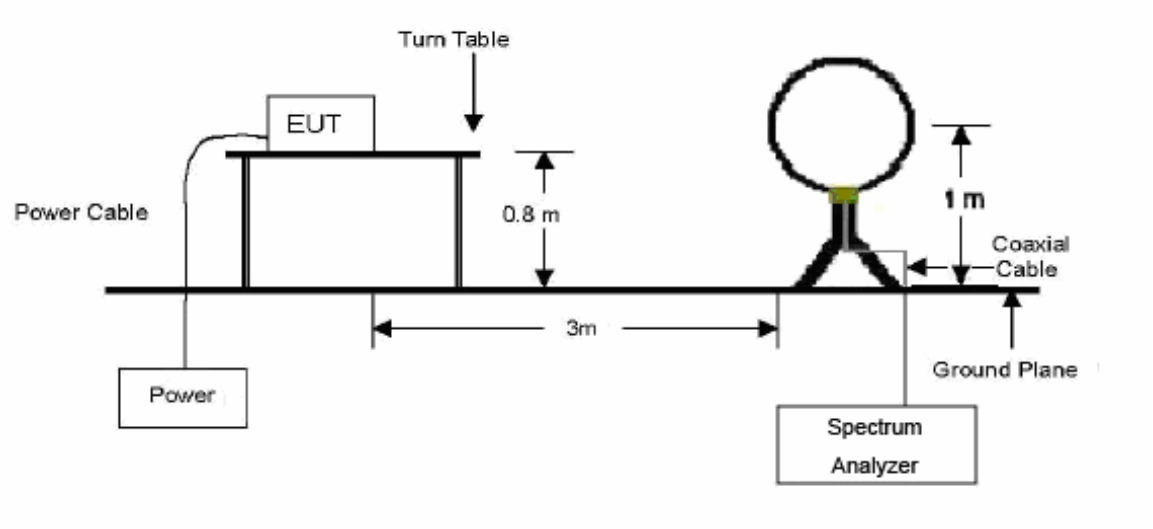
Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is $\pm$5.03dB.

Test Setup

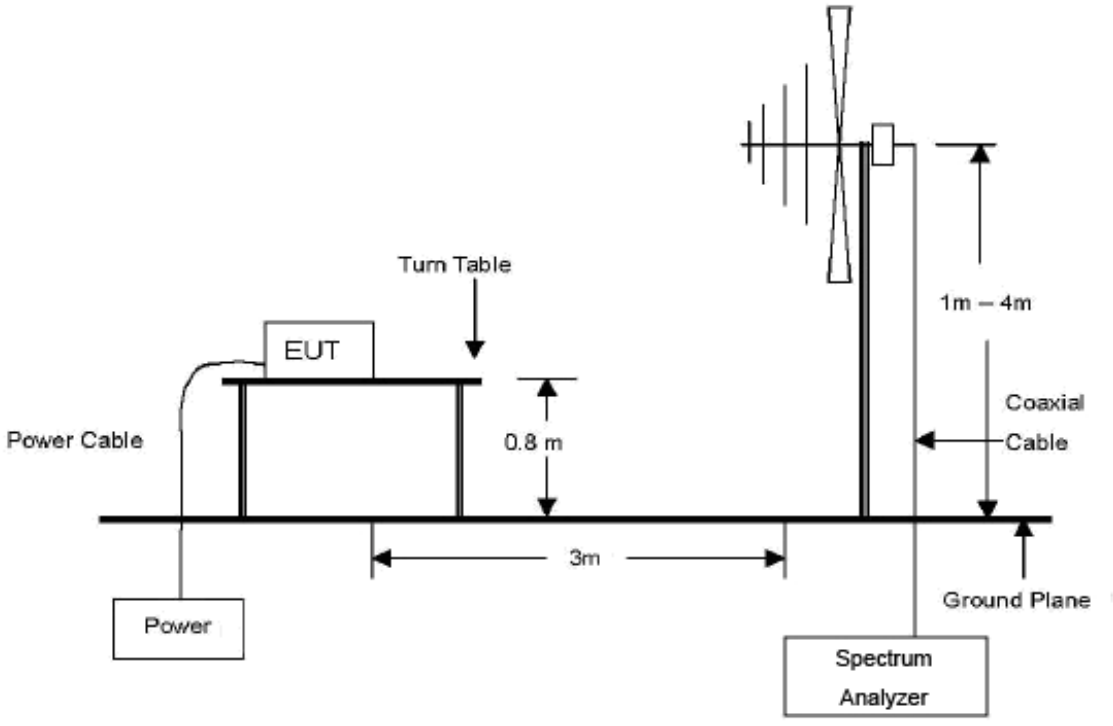
The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003.

According to blockdiagram,the lowest oscillator generated in the device is 26MHz, so the emission was tested from the lowest frequency.

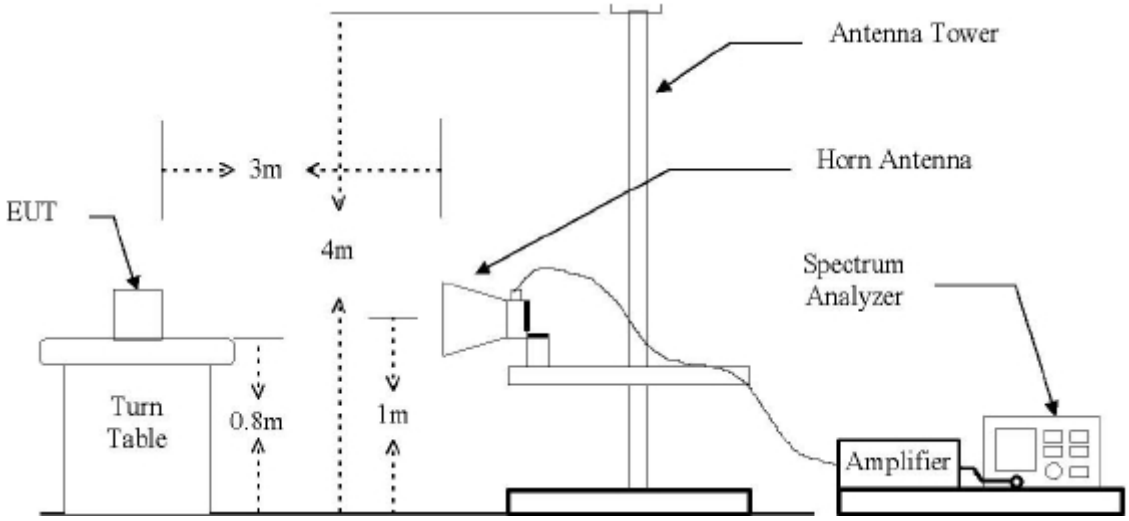
The diagram below shows the test setup that is utilized to make the measurements for emission from 26MHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 25 GHz Emissions.



Spectrum Analyzer Setup

According to FCC Part15 Rules, the system was tested 26MHz to 25000MHz.

Below 30MHz

Start Frequency	9kHz
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

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 performed in X(normal uses) axis positioning. And all the modes was tested in the report.Only the worst case is shown in the report.

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

Summary of Test Results

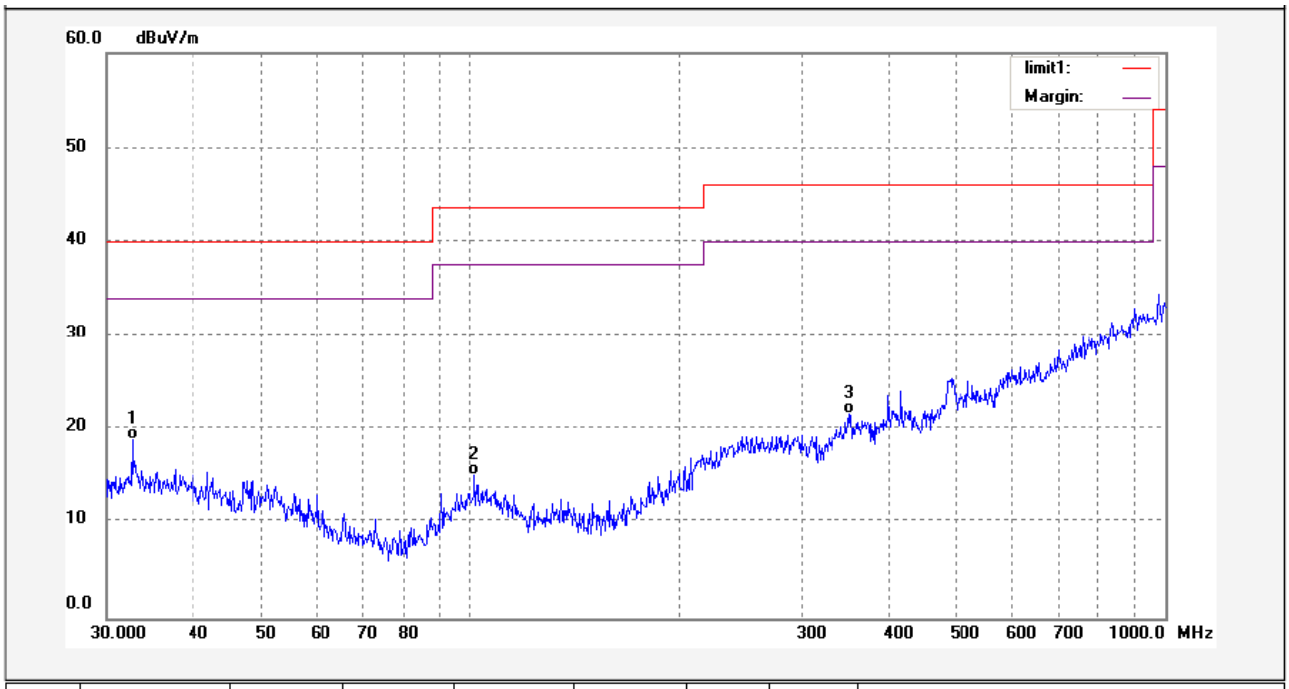
According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 rules.

Test mode: 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.

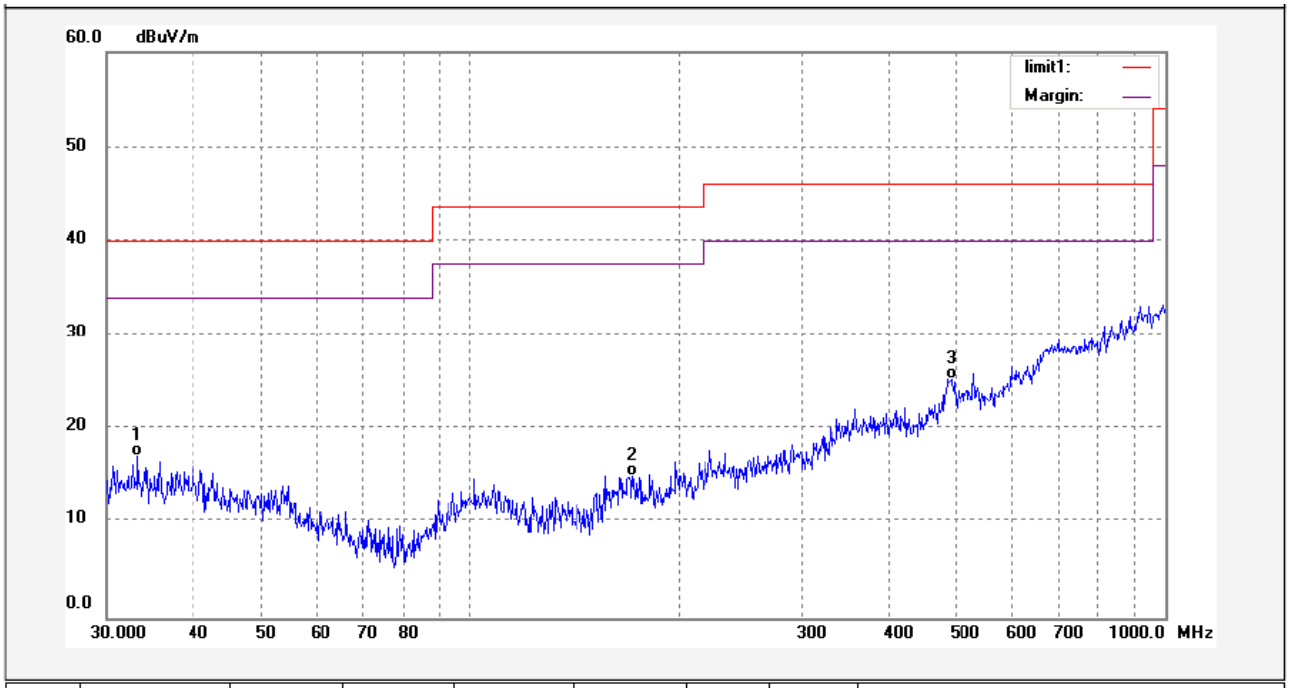
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	32.6395	2.35	16.58	18.93	40.00	-21.07	QP	
2	101.5358	1.12	14.06	15.18	43.50	-28.32	QP	
3	350.9722	1.48	20.19	21.67	46.00	-24.33	QP	

Antenna polarization: Horizontal

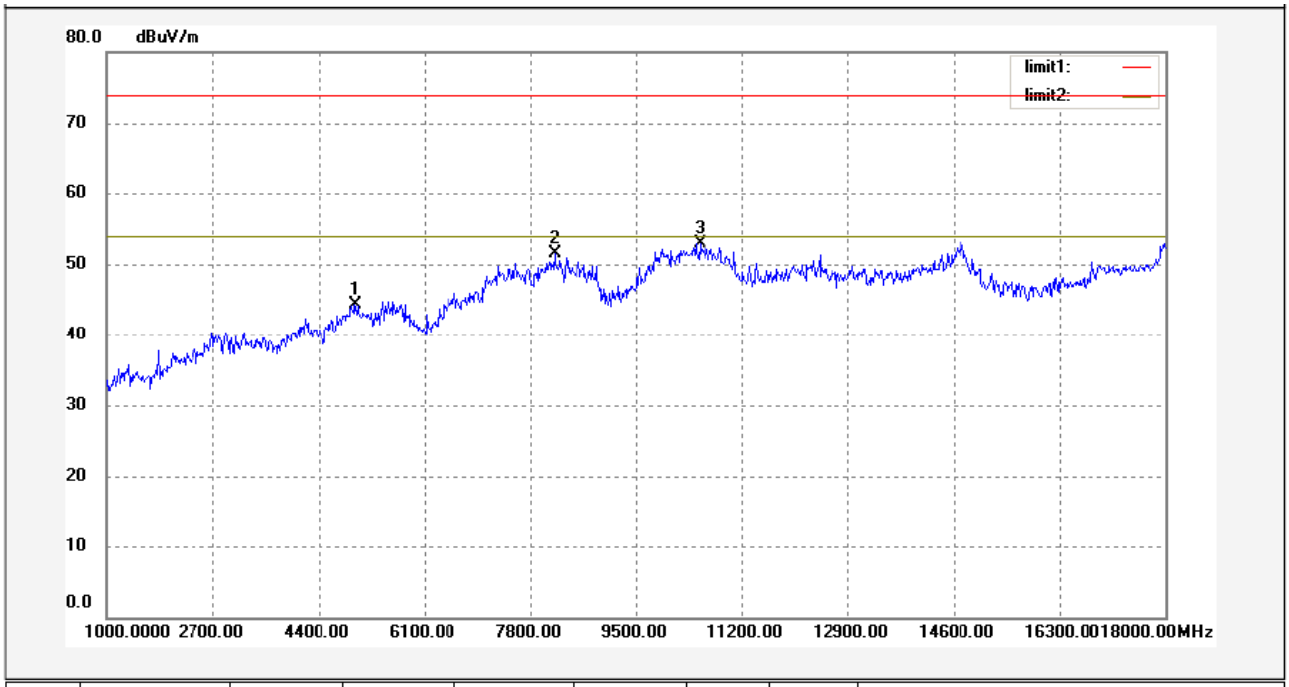


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2180	0.55	16.56	17.11	40.00	-22.89	QP	
2	171.3890	2.97	12.15	15.12	43.50	-28.38	QP	
3	491.7700	0.04	25.29	25.33	46.00	-20.67	QP	

Test Frequency: Above 1GHz radiation test data:

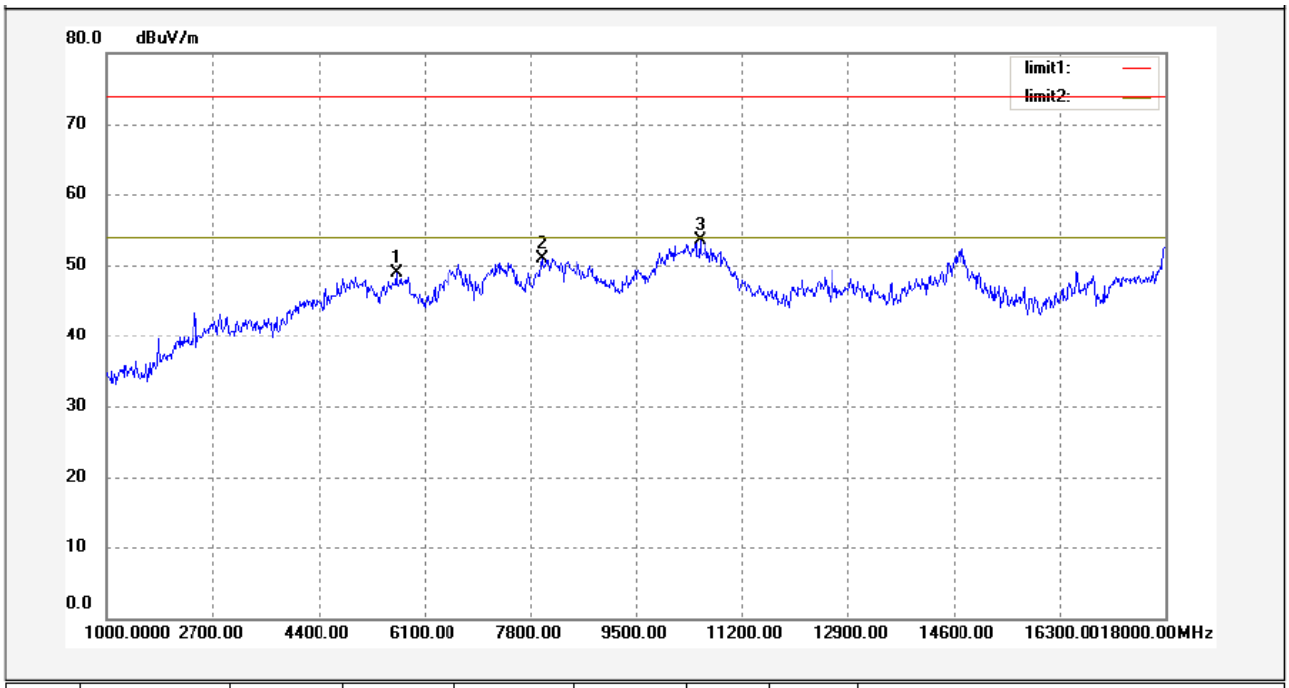
Remark: above 18GHz, the test signal below the noise level, so the data was not perfromed.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	4985.972	39.15	5.12	44.27	74.00	-29.73	peak	
2	8188.377	36.98	14.58	51.56	74.00	-22.44	peak	
3	10522.044	34.45	18.52	52.97	74.00	-21.03	peak	

Antenna polarization: Horizontal



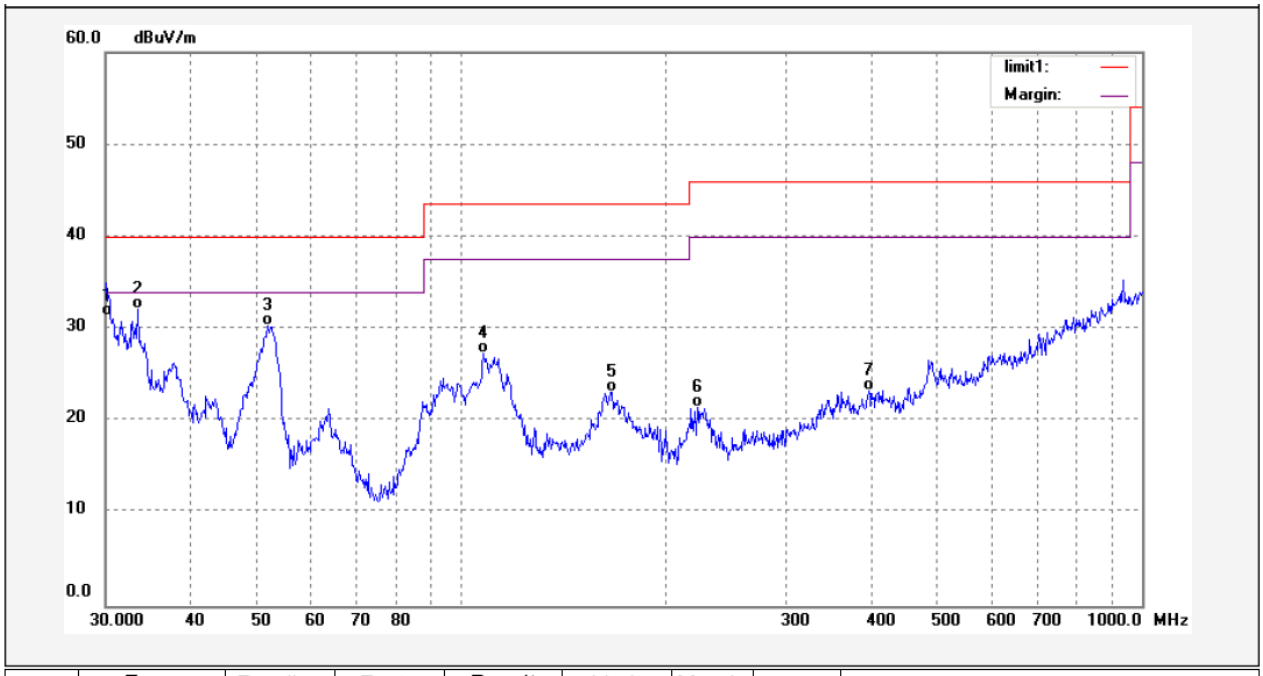
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5650.301	39.56	9.37	48.93	74.00	-25.07	peak	
2	7983.968	32.74	18.16	50.90	74.00	-23.10	peak	
3	10522.044	32.60	20.84	53.44	74.00	-20.56	peak	

Test mode: 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.

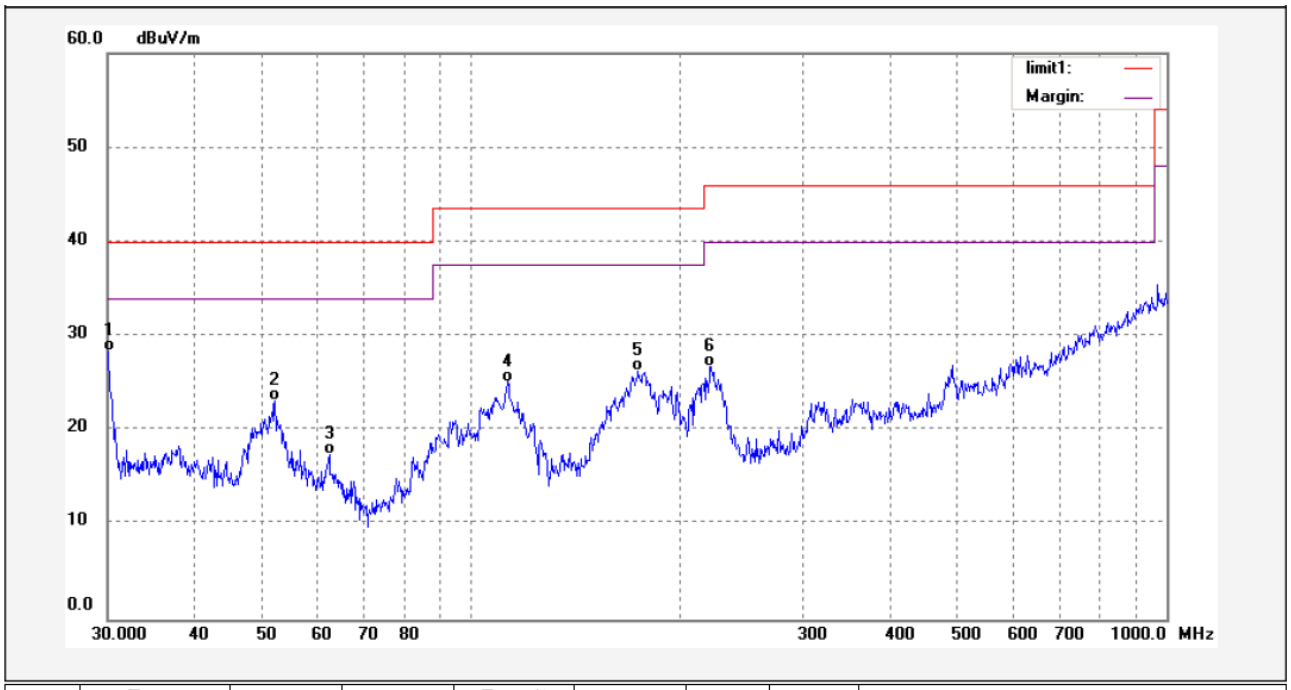
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.0000	15.20	16.15	31.35	40.00	-8.65	QP	
2	33.4522	15.58	16.56	32.14	40.00	-7.86	QP	
3	51.8998	15.88	14.50	30.38	40.00	-9.62	QP	
4	107.7854	13.47	13.97	27.44	43.50	-16.06	QP	
5	166.6385	11.18	11.99	23.17	43.50	-20.33	QP	
6	222.2806	5.24	16.23	21.47	46.00	-24.53	QP	
7	396.8992	2.50	20.81	23.31	46.00	-22.69	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.1056	12.28	16.17	28.45	40.00	-11.55	QP	
2	52.2659	8.76	14.43	23.19	40.00	-16.81	QP	
3	62.5230	5.65	11.77	17.42	40.00	-22.58	QP	
4	112.8229	12.10	13.10	25.20	43.50	-18.30	QP	
5	173.8146	14.03	12.27	26.30	43.50	-17.20	QP	
6	220.7241	10.57	16.17	26.74	46.00	-19.26	QP	

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

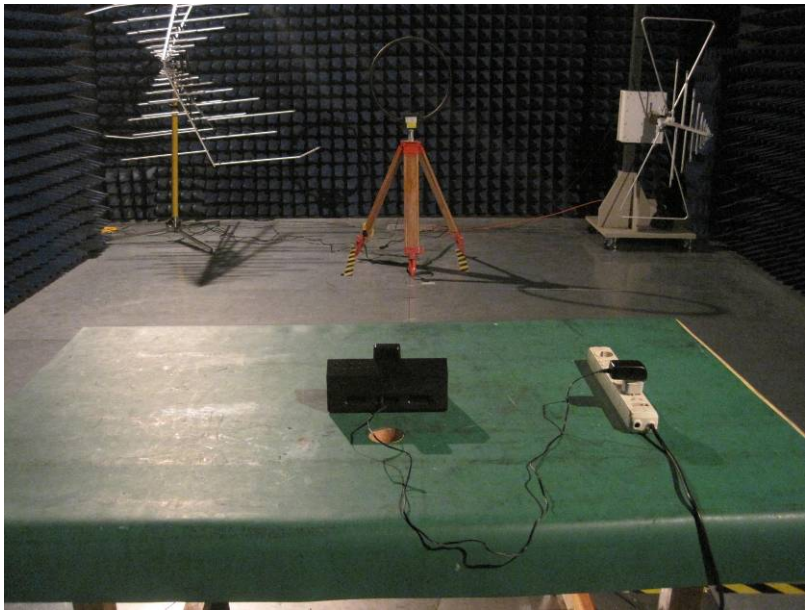
Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	95.20		(Fund.)	1.3	50
4804.00	AV	Vertical	38.59	54.00	-15.41	1.1	105
7206.00	AV	Vertical	39.38	54.00	-14.62	1.6	160
9608.00	AV	Vertical	35.80	54.00	-18.20	1.7	110
12010.00	AV	Vertical	33.39	54.00	-20.61	1.7	195
14412.00	AV	Vertical	35.40	54.00	-18.60	1.3	160
16814.00	AV	Vertical	34.65	54.00	-19.35	1.8	150
19216.00	AV	Vertical	29.57	54.00	-24.43	1.4	120
21618.00	AV	Vertical	26.81	54.00	-27.19	1.7	40
24020.00	AV	Vertical	29.89	54.00	-24.11	1.1	110
2402.00	AV	Horizontal	88.93		(Fund.)	1.3	60
4804.00	AV	Horizontal	35.48	54.00	-18.52	1.1	160
7206.00	AV	Horizontal	33.81	54.00	-20.19	1.6	110
9608.00	AV	Horizontal	36.36	54.00	-17.64	1.1	160
12010.00	AV	Horizontal	34.60	54.00	-19.40	1.6	100
14412.00	AV	Horizonta	31.45	54.00	-22.55	1.1	170
16814.00	AV	Horizontal	34.26	54.00	-19.74	1.6	160
19216.00	AV	Horizontal	26.77	54.00	-27.23	1.7	140
21618.00	AV	Horizontal	27.71	54.00	-26.29	1.3	150
24020.00	AV	Horizontal	26.33	54.00	-27.67	1.4	70
2402.00	PK	Vertical	103.08		(Fund.)	1.6	40
4804.00	PK	Vertical	57.44	74.00	-16.56	1.7	110
7206.00	PK	Vertical	58.38	74.00	-15.62	1.7	150
9608.00	PK	Vertical	55.11	74.00	-18.89	1.3	220
12010.00	PK	Vertical	51.47	74.00	-22.53	1.3	110
14412.00	PK	Vertical	52.76	74.00	-21.24	1.1	120
16814.00	PK	Vertical	49.57	74.00	-24.43	1.5	175
19216.00	PK	Vertical	47.85	74.00	-26.15	1.1	170
21618.00	PK	Vertical	45.63	74.00	-28.37	1.8	120
24020.00	PK	Vertical	46.78	74.00	-27.22	1.3	130
2402.00	PK	Horizontal	97.43		(Fund.)	1.9	110
4804.00	PK	Horizontal	55.75	74.00	-18.25	1.7	150
7206.00	PK	Horizontal	53.50	74.00	-20.50	1.9	100
9608.00	PK	Horizontal	50.61	74.00	-23.39	1.1	50
12010.00	PK	Horizontal	52.59	74.00	-21.41	1.3	195
14412.00	PK	Horizontal	47.50	74.00	-26.50	1.4	40
16814.00	PK	Horizontal	53.60	74.00	-20.40	1.9	230
19216.00	PK	Horizontal	45.45	74.00	-28.55	1.4	120

21618.00	PK	Horizontal	46.78	74.00	-27.22	1.3	160
24020.00	PK	Horizontal	48.55	74.00	-25.45	1.8	120
Middle frequency							
2441.00	AV	Vertical	94.55		(Fund.)	1.6	80
4882.00	AV	Vertical	41.11	54.00	-12.89	1.5	150
7323.00	AV	Vertical	39.32	54.00	-14.68	1.2	130
9764.00	AV	Vertical	35.23	54.00	-18.77	1.1	50
12205.00	AV	Vertical	39.82	54.00	-14.18	1.3	60
14646.00	AV	Vertical	33.64	54.00	-20.36	1.1	190
17087.00	AV	Vertical	35.44	54.00	-18.56	1.6	50
19528.00	AV	Vertical	32.23	54.00	-21.77	1.4	60
21969.00	AV	Vertical	30.36	54.00	-23.64	1.9	220
24410.00	AV	Vertical	34.45	54.00	-19.55	1.1	140
2441.00	AV	Horizontal	90.60		(Fund.)	1.2	180
4882.00	AV	Horizontal	37.58	54.00	-16.42	1.5	130
7323.00	AV	Horizontal	38.79	54.00	-15.21	1.6	320
9764.00	AV	Horizontal	33.70	54.00	-20.30	1.1	180
12205.00	AV	Horizontal	31.39	54.00	-22.61	1.3	190
14646.00	AV	Horizontal	35.29	54.00	-18.71	1.3	230
17087.00	AV	Horizontal	34.52	54.00	-19.48	1.7	195
19528.00	AV	Horizontal	29.20	54.00	-24.80	1.3	130
21969.00	AV	Horizontal	30.25	54.00	-23.75	1.3	200
24410.00	AV	Horizontal	28.43	54.00	-25.57	1.6	180
2441.00	PK	Vertical	102.81		(Fund.)	1.3	40
4882.00	PK	Vertical	62.34	74.00	-11.66	1.0	140
7323.00	PK	Vertical	60.45	74.00	-13.55	1.5	160
9764.00	PK	Vertical	56.31	74.00	-17.69	1.2	160
12205.00	PK	Vertical	59.55	74.00	-14.45	1.8	230
14646.00	PK	Vertical	52.22	74.00	-21.78	1.1	60
17087.00	PK	Vertical	55.47	74.00	-18.53	1.5	40
19528.00	PK	Vertical	50.28	74.00	-23.72	1.4	170
21969.00	PK	Vertical	54.27	74.00	-19.73	1.6	195
24410.00	PK	Vertical	47.33	74.00	-26.67	1.3	160
2441.00	PK	Horizontal	99.80		(Fund.)	1.7	50
4882.00	PK	Horizontal	57.41	74.00	-16.59	1.6	105
7323.00	PK	Horizontal	59.14	74.00	-14.86	1.7	130
9764.00	PK	Horizontal	53.25	74.00	-20.75	1.4	110
12205.00	PK	Horizontal	56.00	74.00	-18.00	1.5	210
14646.00	PK	Horizontal	51.40	74.00	-22.60	1.4	190
17087.00	PK	Horizontal	48.59	74.00	-25.41	1.2	170
19528.00	PK	Horizontal	51.28	74.00	-22.72	1.4	210
21969.00	PK	Horizontal	52.51	74.00	-21.49	1.2	40
24410.00	PK	Horizontal	47.19	74.00	-26.81	1.5	195
High frequency							

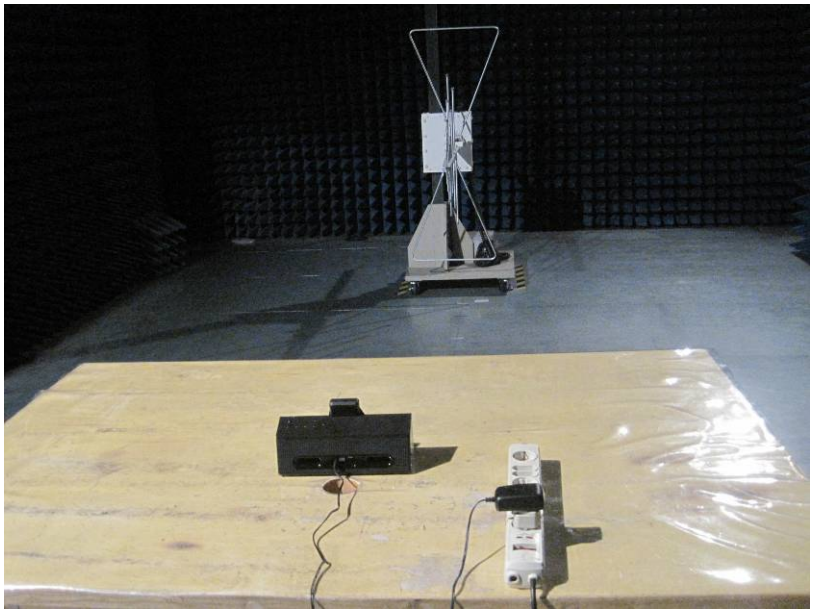
2480.00	AV	Vertical	95.54		(Fund.)	1.1	230
4960.00	AV	Vertical	41.38	54.00	-12.62	1.5	60
7440.00	AV	Vertical	40.34	54.00	-13.66	1.4	160
9920.00	AV	Vertical	38.82	54.00	-15.18	1.3	110
12400.00	AV	Vertical	37.38	54.00	-16.62	1.6	150
14880.00	AV	Vertical	40.92	54.00	-13.08	1.7	160
17360.00	AV	Vertical	34.31	54.00	-19.69	1.2	150
19840.00	AV	Vertical	31.60	54.00	-22.40	1.0	240
22320.00	AV	Vertical	38.37	54.00	-15.63	1.5	160
24800.00	AV	Vertical	30.33	54.00	-23.67	1.4	185
2480.00	AV	Horizontal	91.69		(Fund.)	1.2	180
4960.00	AV	Horizontal	39.67	54.00	-14.33	2.1	190
7440.00	AV	Horizontal	35.04	54.00	-18.96	1.3	170
9920.00	AV	Horizontal	35.61	54.00	-18.39	1.4	240
12400.00	AV	Horizontal	36.88	54.00	-17.12	1.3	175
14880.00	AV	Horizontal	33.43	54.00	-20.57	1.1	170
17360.00	AV	Horizontal	30.59	54.00	-23.41	1.5	240
19840.00	AV	Horizontal	33.22	54.00	-20.78	2.0	100
22320.00	AV	Horizontal	28.48	54.00	-25.52	1.4	140
24800.00	AV	Horizontal	29.33	54.00	-24.67	2.3	150
2480.00	PK	Vertical	103.51		(Fund.)	1.3	220
4960.00	PK	Vertical	60.91	74.00	-13.09	1.1	80
7440.00	PK	Vertical	57.34	74.00	-16.66	2.2	170
9920.00	PK	Vertical	59.80	74.00	-14.20	1.4	140
12400.00	PK	Vertical	54.90	74.00	-19.10	1.5	140
14880.00	PK	Vertical	61.45	74.00	-12.55	1.1	120
17360.00	PK	Vertical	55.48	74.00	-18.52	1.3	130
19840.00	PK	Vertical	56.35	74.00	-17.65	1.1	170
22320.00	PK	Vertical	54.67	74.00	-19.33	1.7	180
24800.00	PK	Vertical	48.29	74.00	-25.71	1.5	175
2480.00	PK	Horizontal	98.71		(Fund.)	1.8	230
4960.00	PK	Horizontal	57.30	74.00	-16.70	1.3	120
7440.00	PK	Horizontal	55.61	74.00	-18.39	1.6	160
9920.00	PK	Horizontal	56.43	74.00	-17.57	1.2	230
12400.00	PK	Horizontal	54.29	74.00	-19.71	1.3	150
14880.00	PK	Horizontal	48.48	74.00	-25.52	1.9	130
17360.00	PK	Horizontal	52.69	74.00	-21.31	2.0	200
19840.00	PK	Horizontal	47.36	74.00	-26.64	1.4	210
22320.00	PK	Horizontal	50.19	74.00	-23.81	2.4	160
24800.00	PK	Horizontal	45.57	74.00	-28.43	1.8	240

Photograph – Radiation Spurious Emission Test Setup

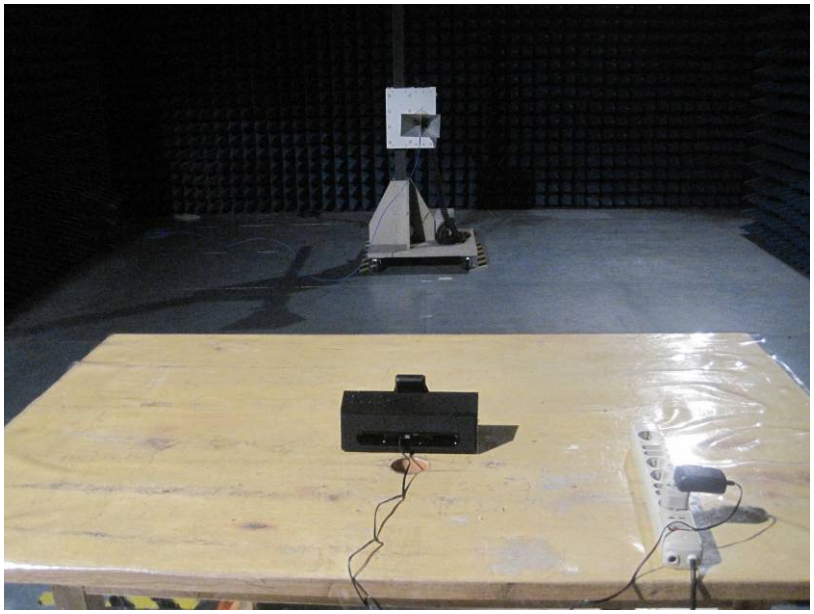
Below 30MHz



Below 1GHz



Above 1GHz

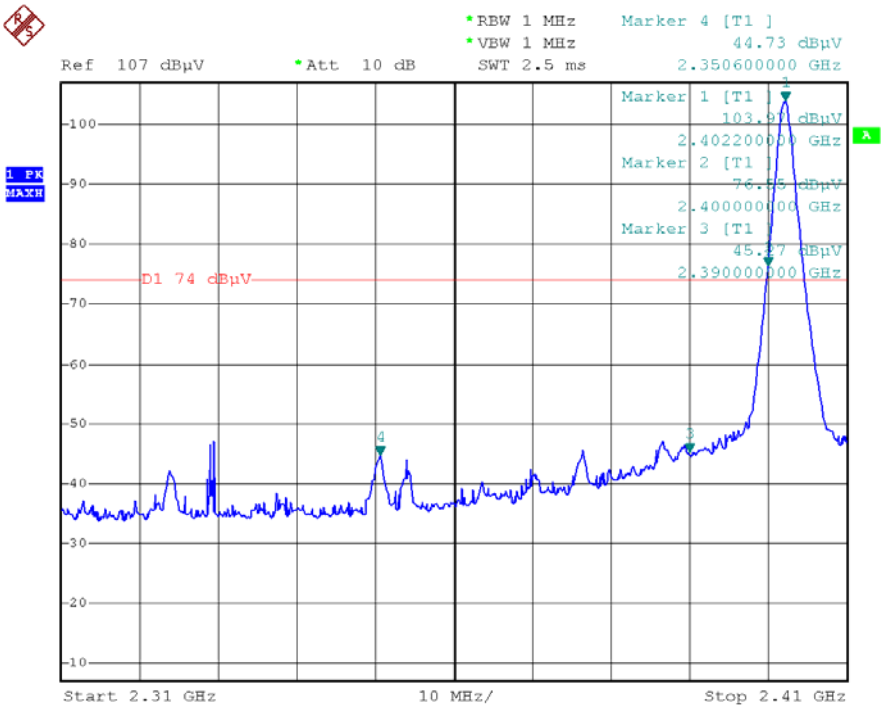


8 Radiated Emissions which fall in the restricted bands

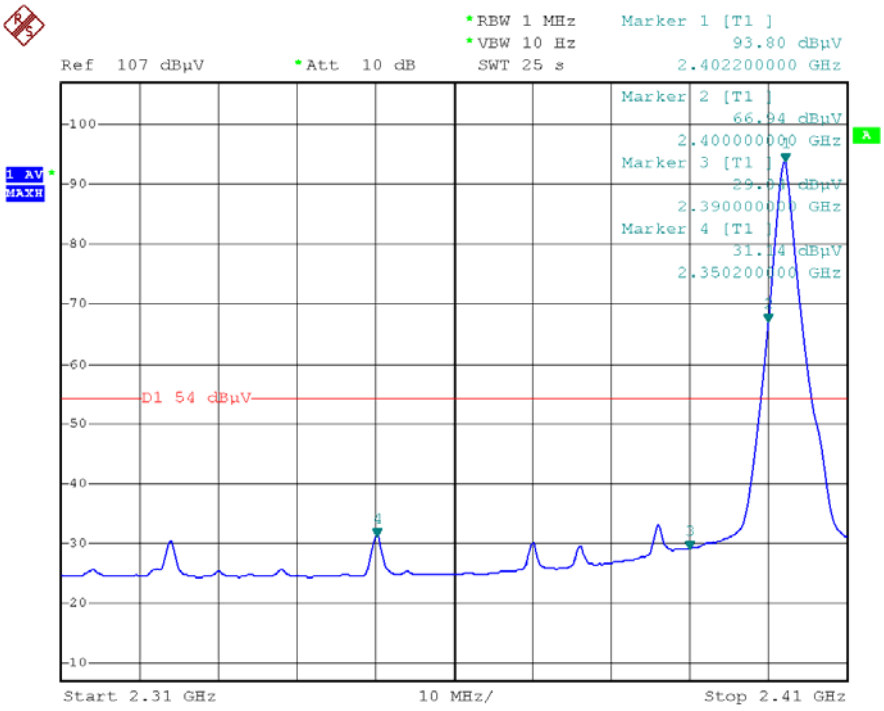
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	DA 00-705
Measurement Distance:	3m
Limit:	40.0 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

Test Result:

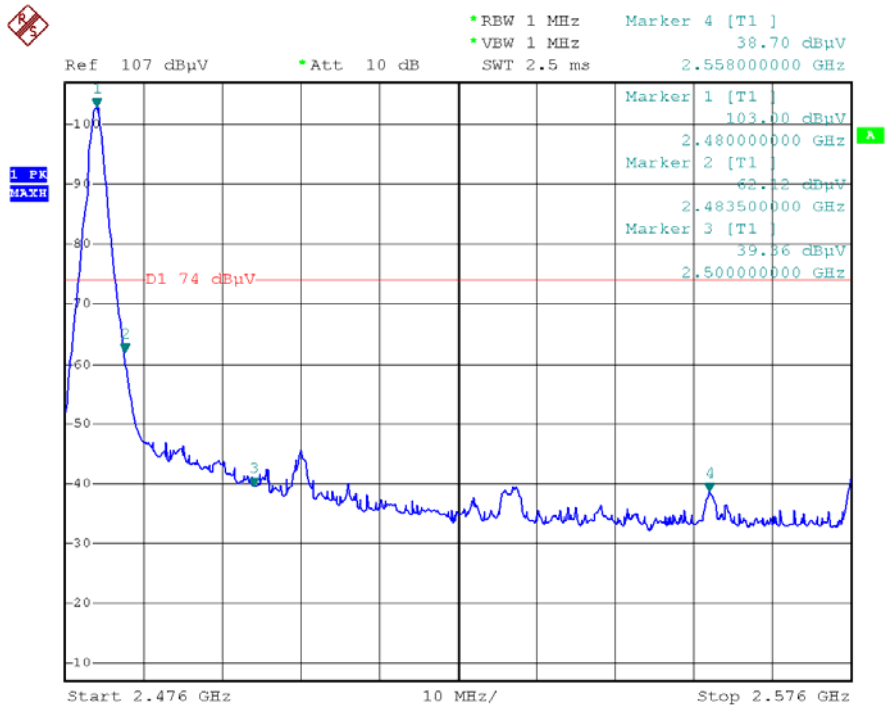
Low Channel – Peak



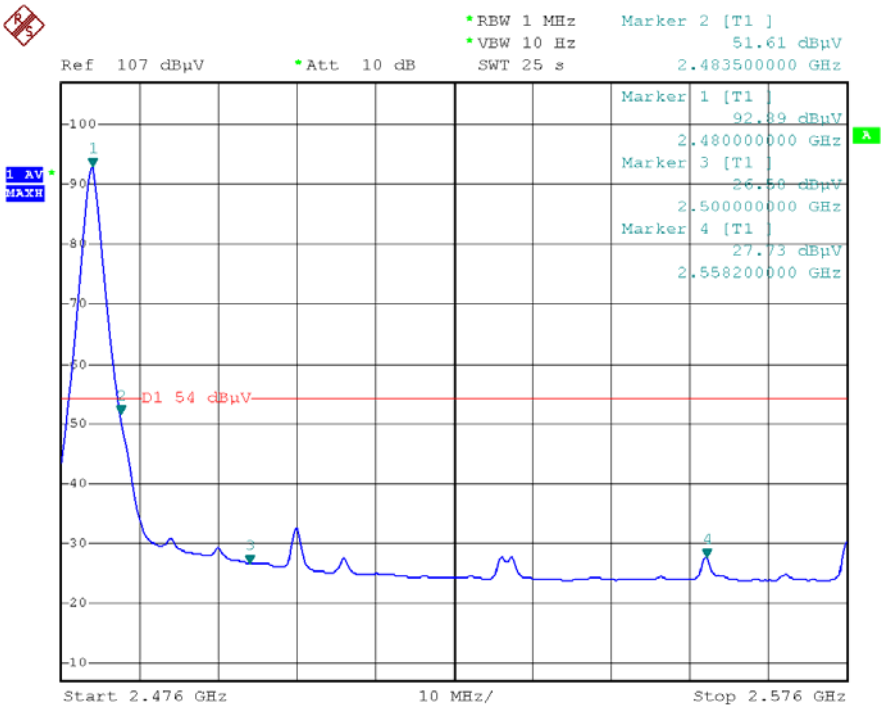
Low Channel – AV



High Channel – Peak



High Channel – AV



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.

Test Procedure:

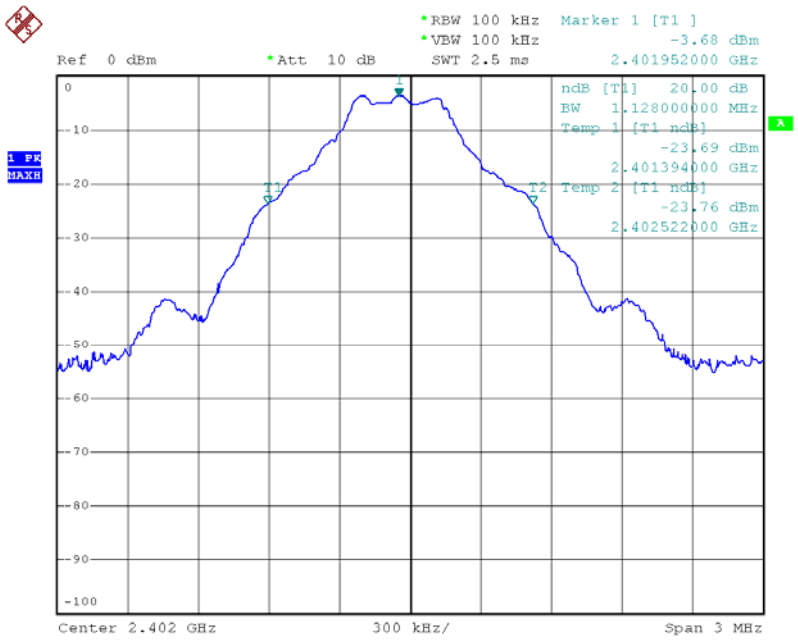
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = 3MHz, RBW = 100kHz, VBW = 100kHz

Test Result:

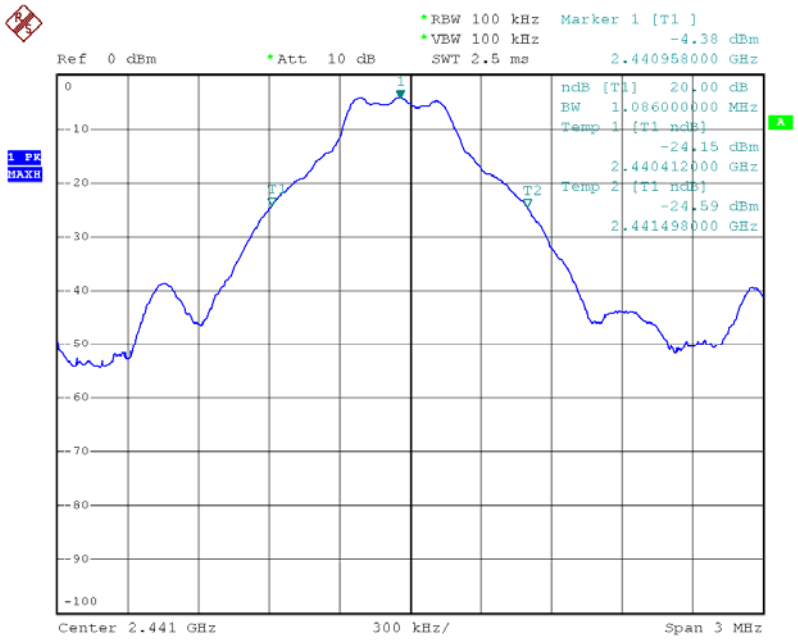
Test Channel	Bandwidth
Low	1.128MHz
Middle	1.086MHz
High	1.086MHz

Test result plot as follows:

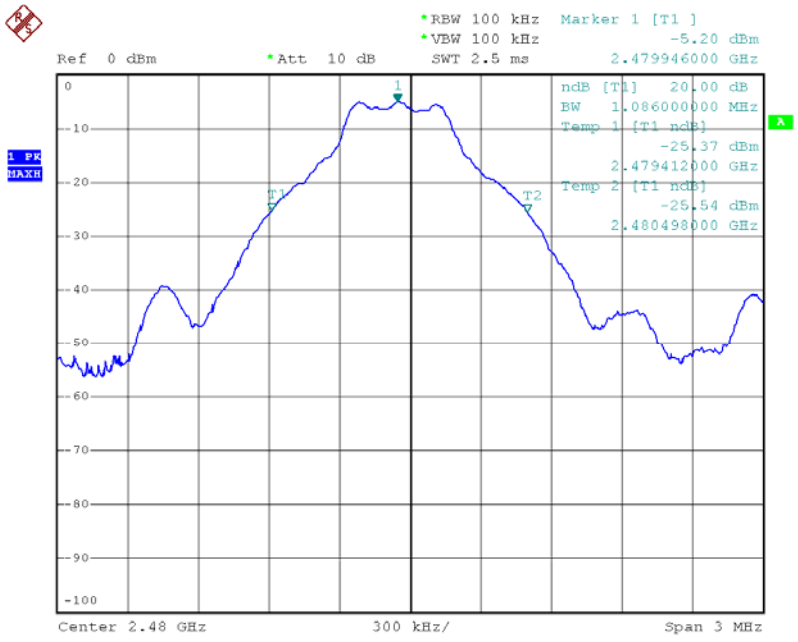
Low Channel



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.

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.

Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	-3.27	30
Middle	-4.08	30
High	-4.92	30

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.

Test Procedure:

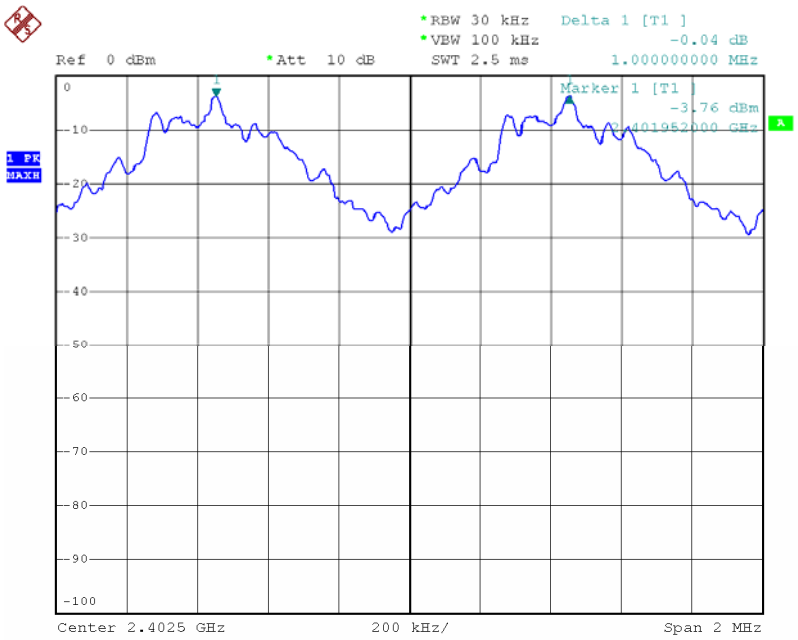
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 100kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to 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.

Test Result:

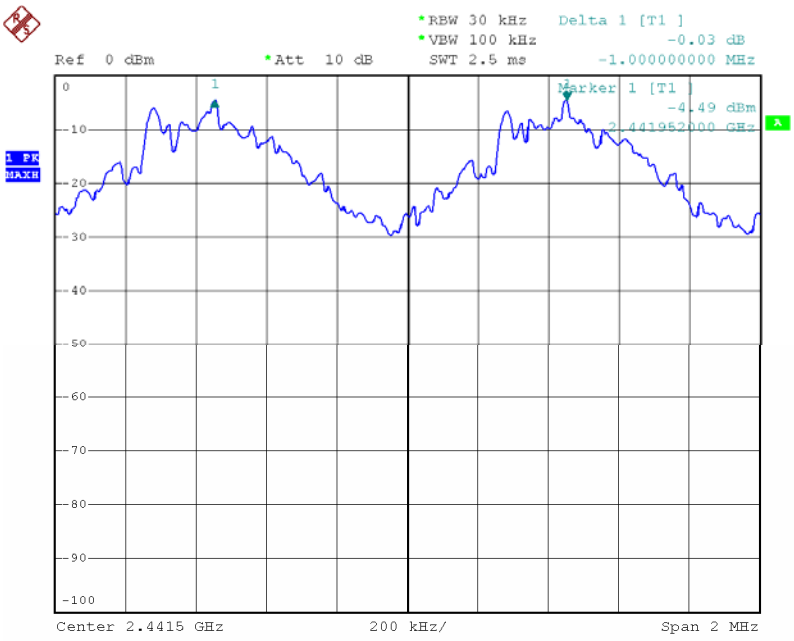
Test Channel	Separation (MHz)	Result
Low	1.000	PASS
Middle	1.000	PASS
High	1.000	PASS

Test result plot as follows:

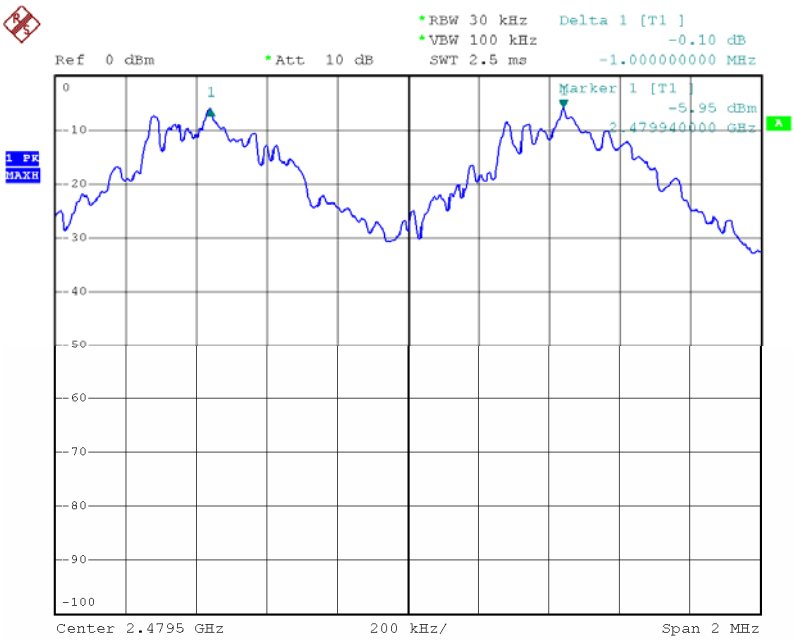
Low Channel:



Middle Channel



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.

Test Procedure:

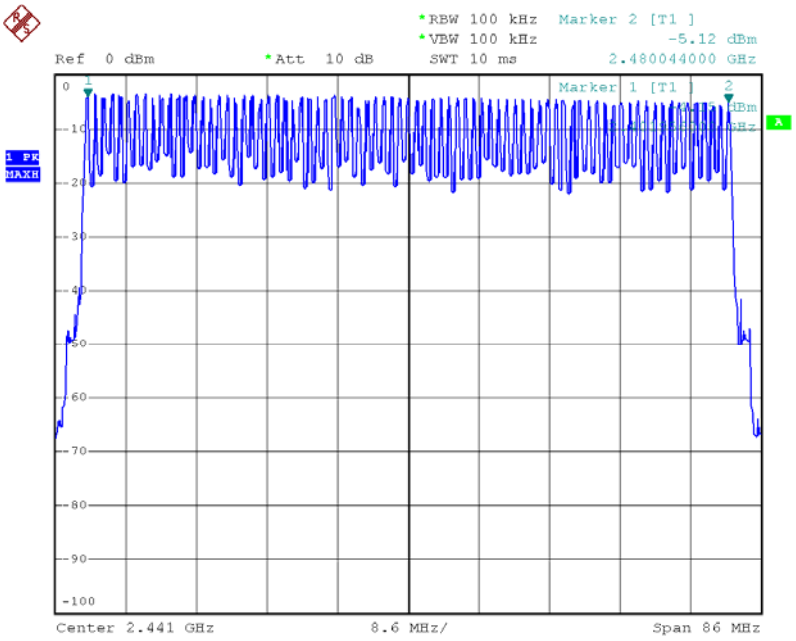
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.

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.

Test Result: Total Channels are 79 Channels.



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.

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).

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:

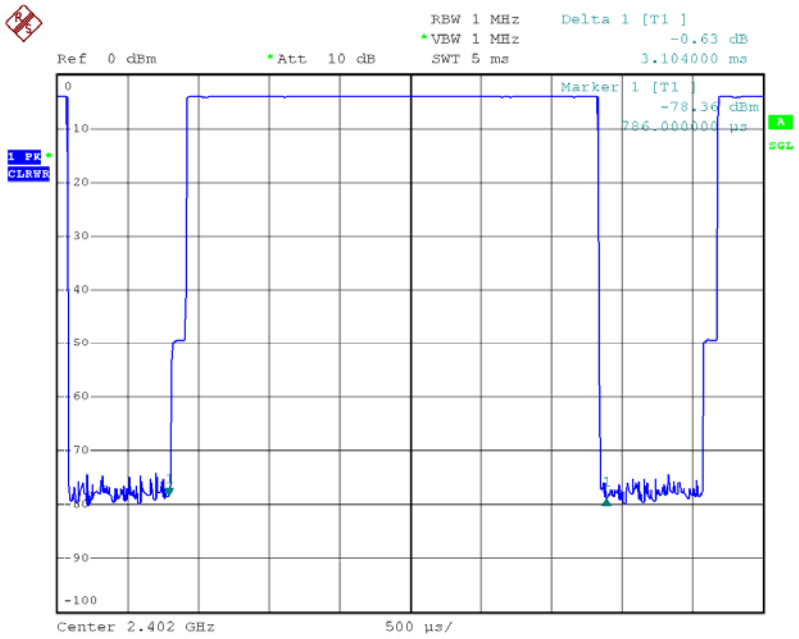
Data Packet	Dwell Time(s)
DH5	1600/79/6*31.6*(MkrDelta)/1000
DH3	1600/79/4*31.6*(MkrDelta)/1000
DH1	1600/79/2*31.6*(MkrDelta)/1000

Note : Mkr Delta is once pulse time .

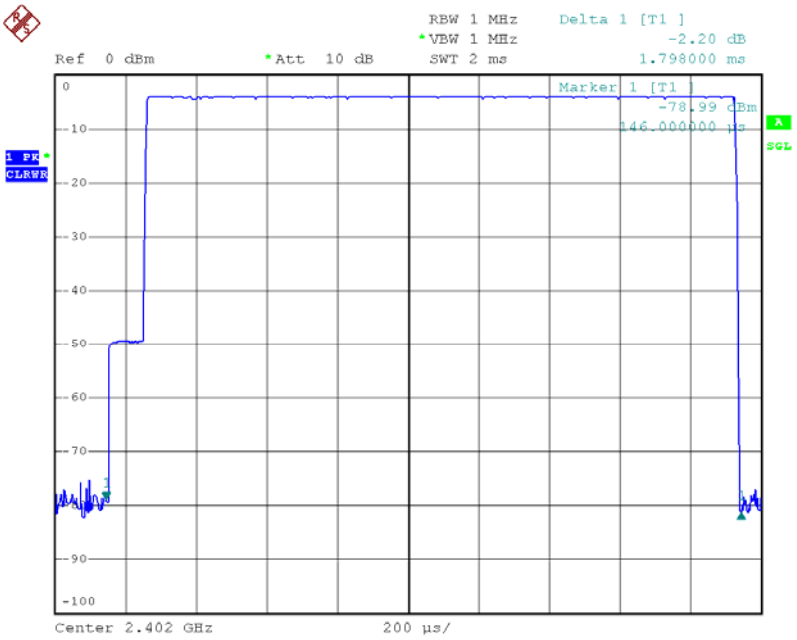
Low Channel: 2402MHz

Dwell time of each occupation in this channel as follows:

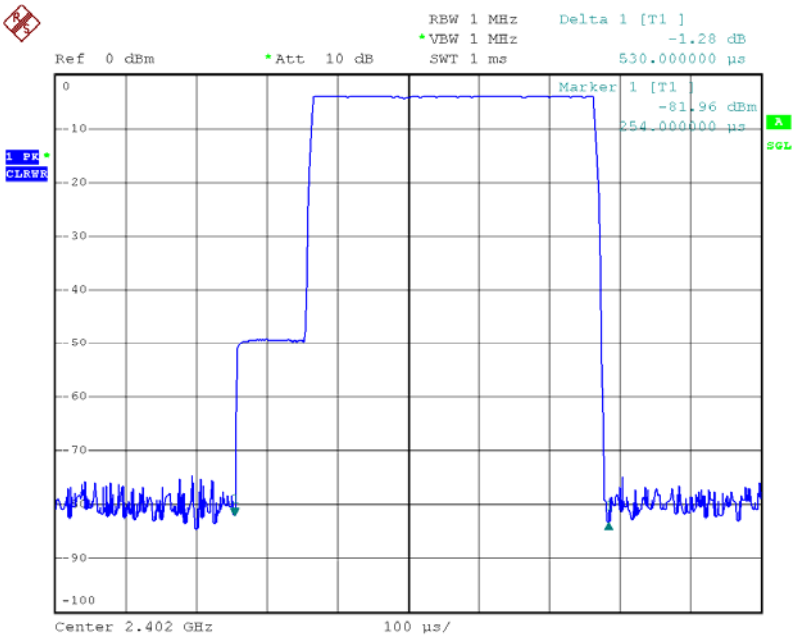
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	3.104	0.331	0.400	Pass
DH3	2402 MHz	1.798	0.288	0.400	Pass
DH1	2402 MHz	0.530	0.170	0.400	Pass



(DH5)



(DH3)

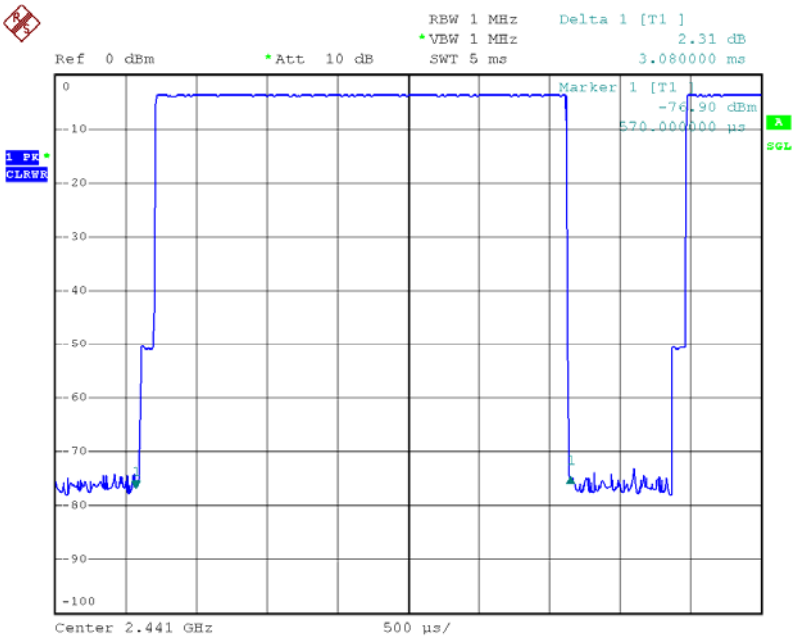


(DH1)

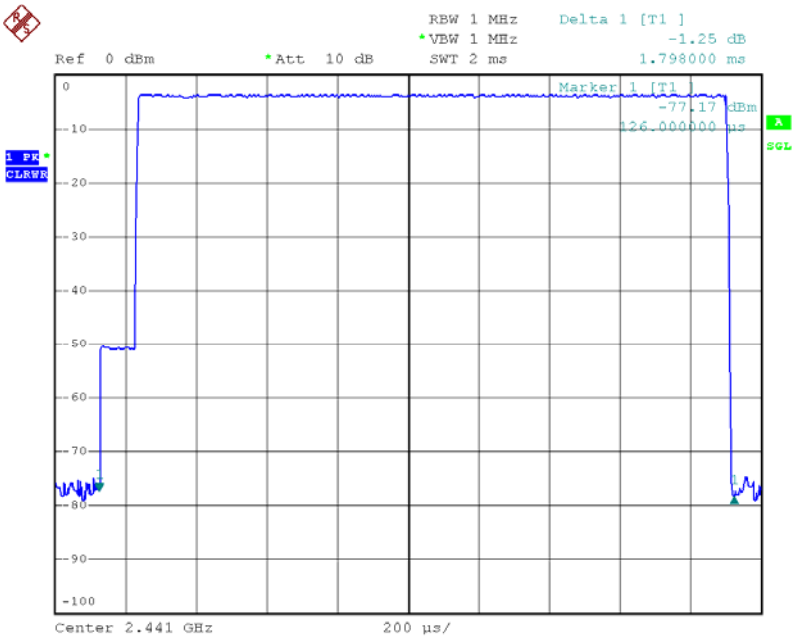
Middle Channel: 2441MHz

Dwell time of each occupation in this channel as follows:

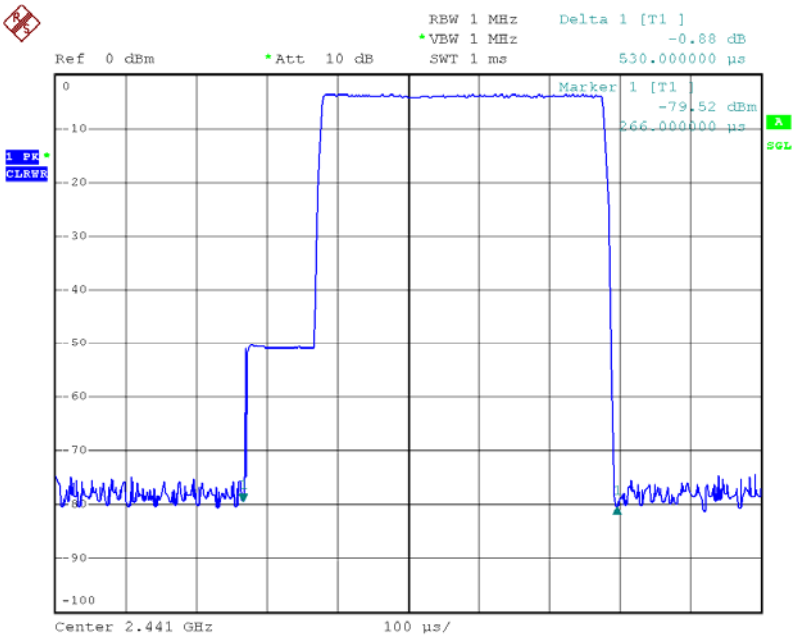
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2441 MHz	3.080	0.329	0.400	Pass
DH3	2441 MHz	1.798	0.288	0.400	Pass
DH1	2441 MHz	0.530	0.170	0.400	Pass



(DH5)



(DH3)

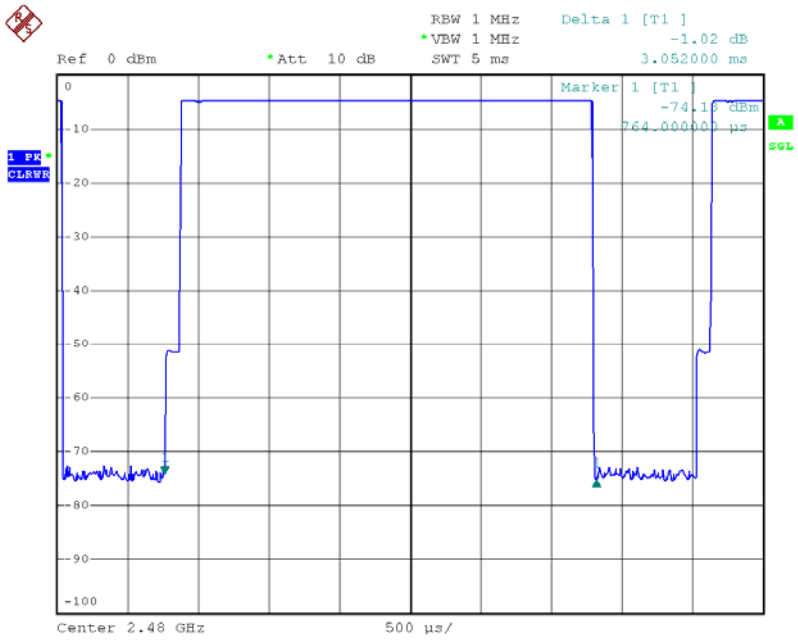


(DH1)

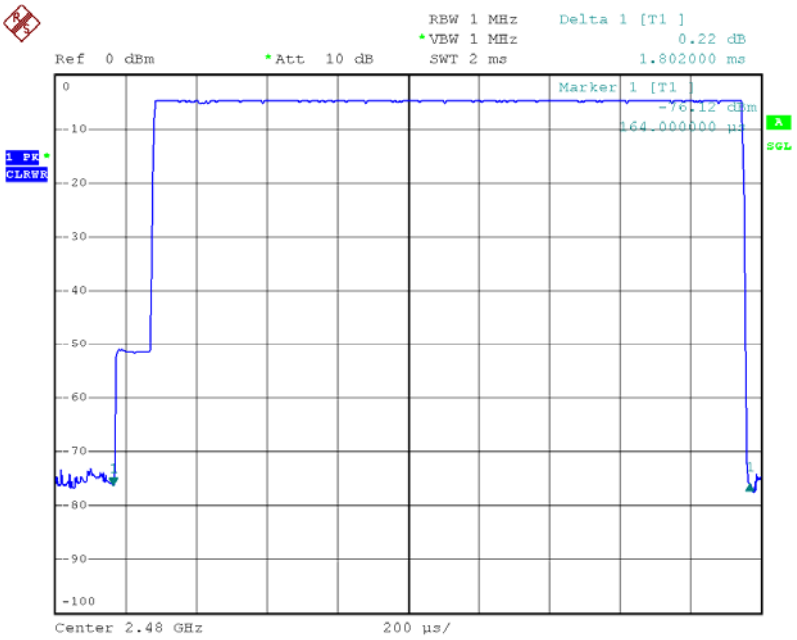
High Channel: 2480MHz

Dwell time of each occupation in this channel as follows:

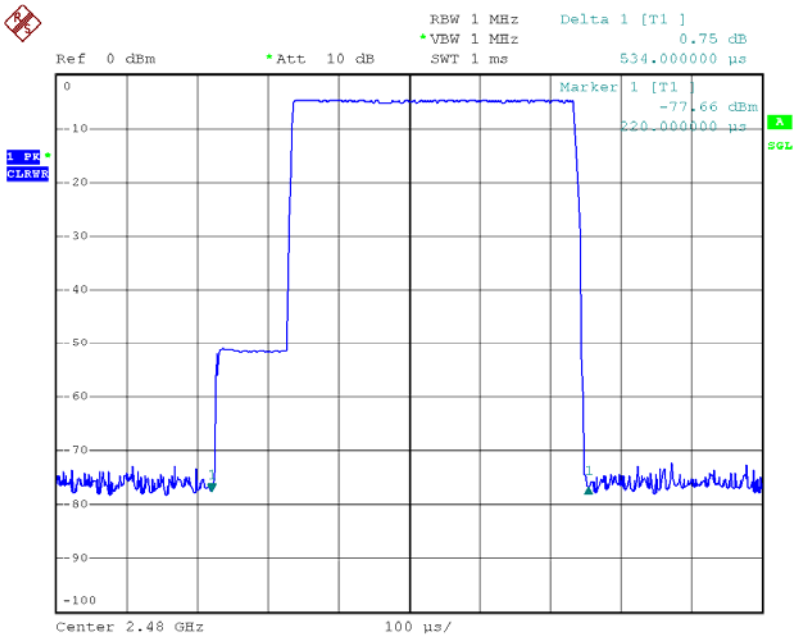
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	3.052	0.326	DH5	Pass
DH3	2480 MHz	1.802	0.288	DH3	Pass
DH1	2480 MHz	0.534	0.171	DH1	Pass



(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

Test Requirement: FCC Part 1.1307

Test Mode: The EUT work in test mode(Tx).

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 2.1093 this device has been defined as a portable 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

$$\text{E (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m²)} = \frac{E^2}{377}$$

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

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

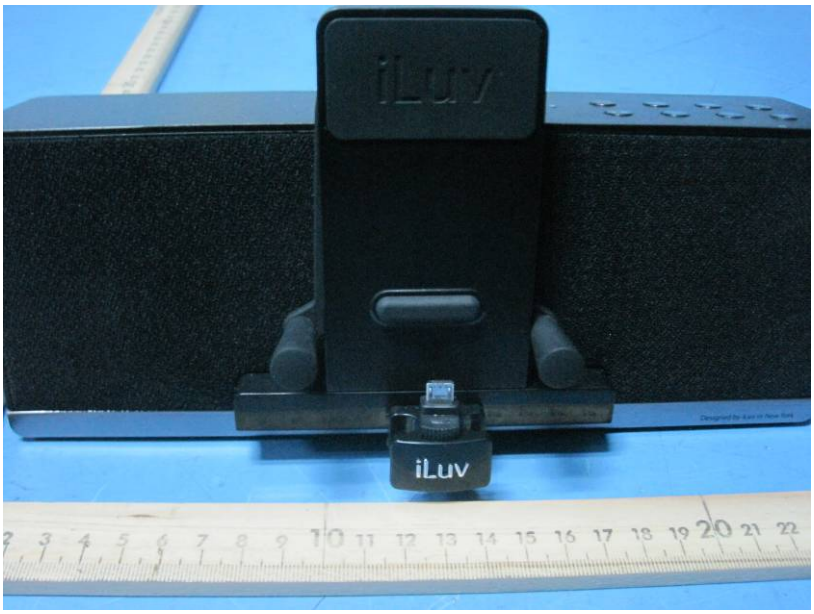
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

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
0	1	-3.27	0.4709	0.000094	1	Complies
0	1	-4.08	0.3908	0.000074	1	Complies
0	1	-4.92	0.3221	0.000064	1	Complies

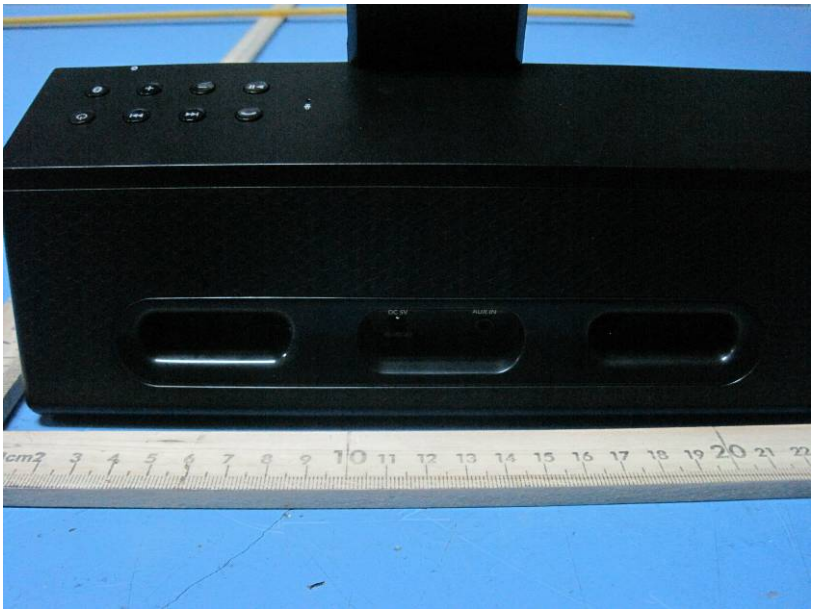
16 Photographs - Constructional Details

16.1 EUT – Appearance View(2)

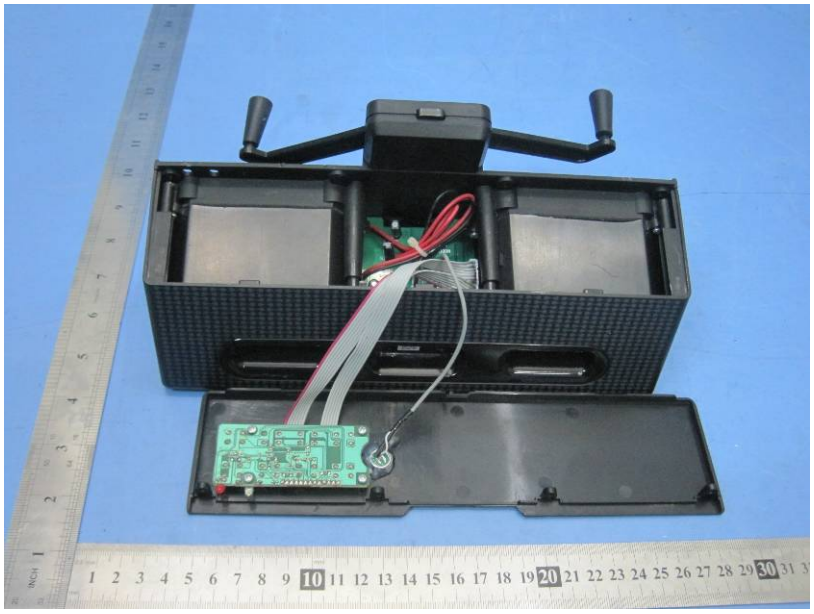
16.2 EUT – Appearance View(2)



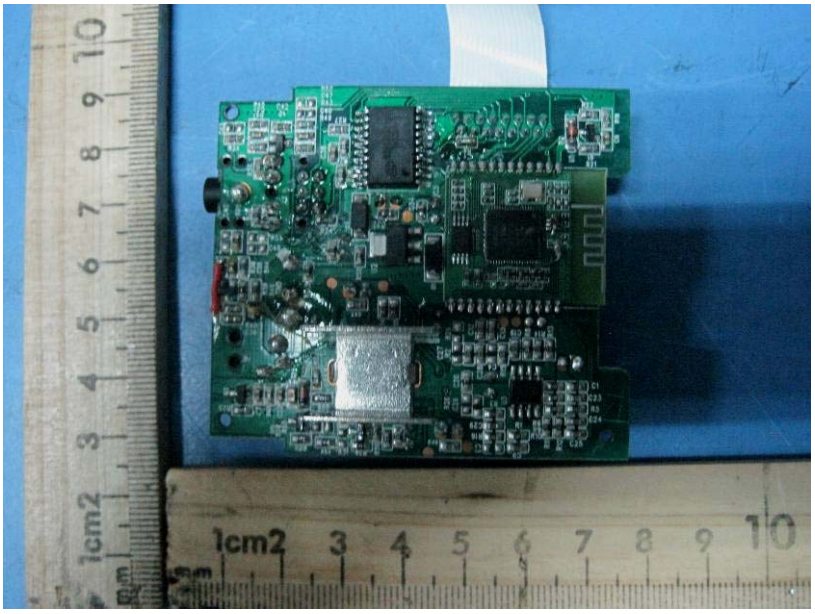
16.3 EUT – Appearance View(3)



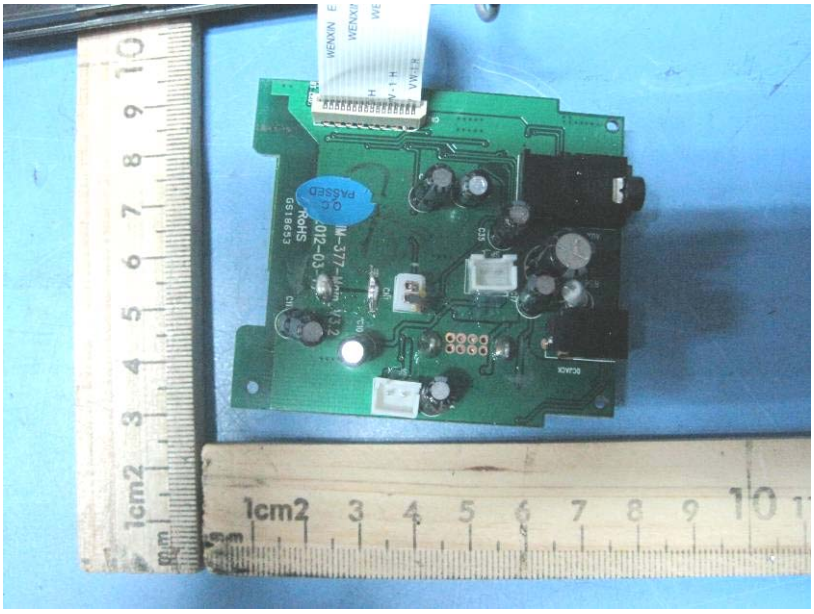
16.4 EUT – Open View



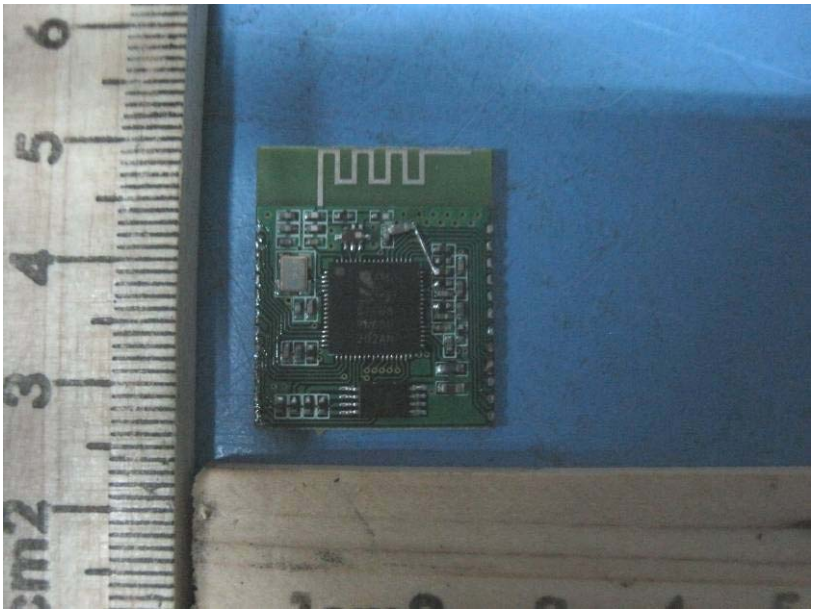
16.5 EUT – PCB1 Rear View



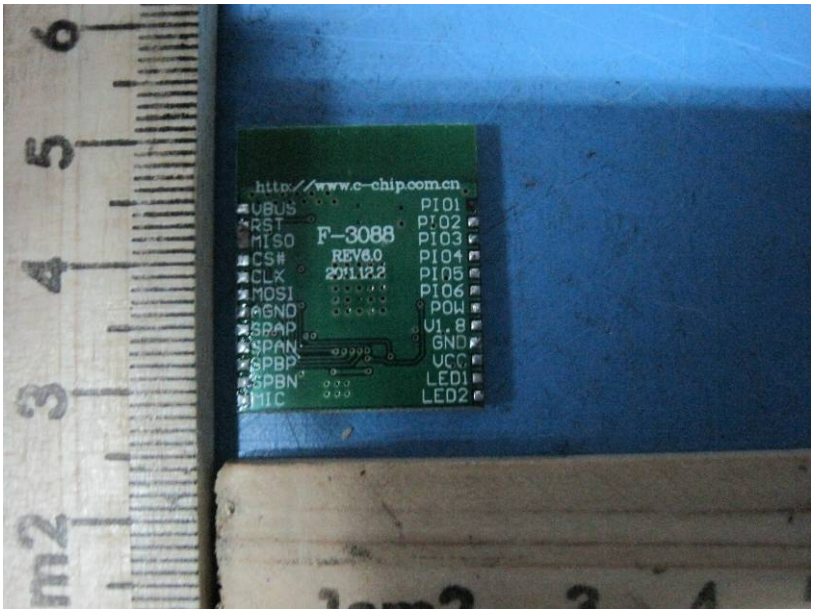
16.6 EUT – PCB1 Back View



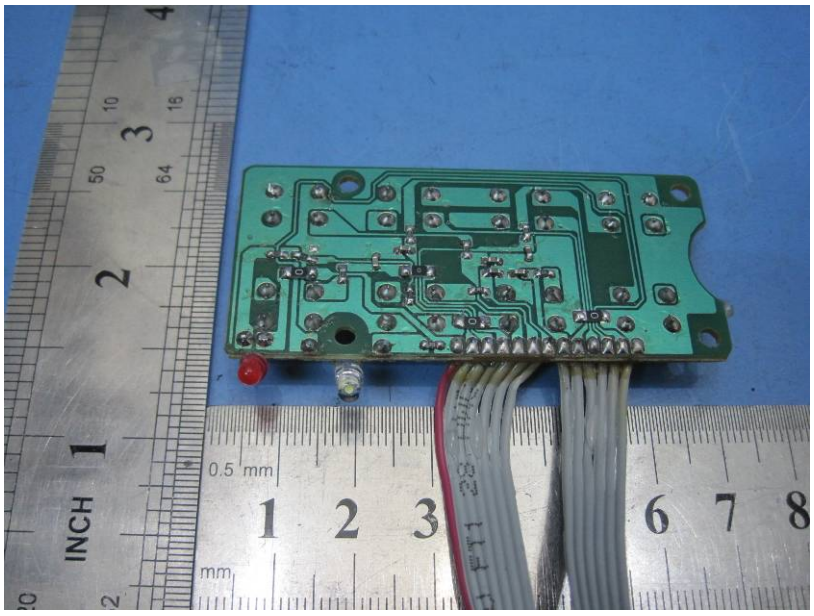
16.7 EUT – PCB2 Rear View



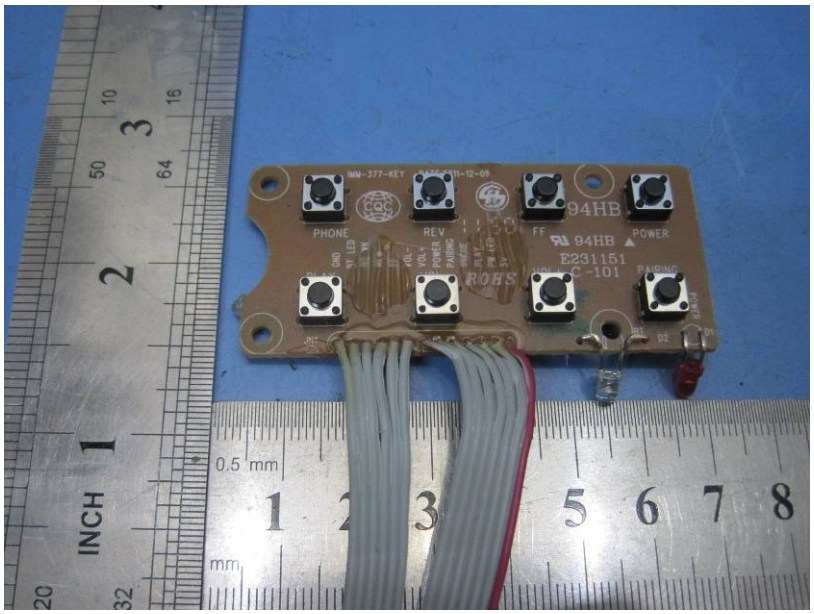
16.8 EUT – PCB2 Back View



16.9 EUT – PCB3 Rear View



16.10 EUT – PCB3 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 Side View/ proposed FCC Label Location