FCC TEST REPORT

FCC ID	: WC2DS-1060
Applicant	: Wonders Technology Co., Ltd.
Address	: Doss Industrial Zone, Qiping Kengdu Industrial ARE Guihua Village, Guanlan Town, Baoan District, Shenzhen, China

Equipment Under Test (EUT) :

Product Name	: Bluetooth Clock radio with Dual Alarm
Model No.	: DS-1060, ICB352B

Standards	: FCC CFR47 Part 15 Section 15.247:2010
Date of Test	: March 15 ~ March 21, 2012
Date of Issue	: March 27, 2012
Test Engineer	: Hunk yan / 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 (150kHz to 30MHz)	15.207	PASS
Radiated Spurious Emissions (9kHz 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

4 General Information

4.1 Client Information

Applicant	: Wonders Technology Co., Ltd.
Address of Applicant	: Doss Industrial Zone, Qiping Kengdu Industrial ARE Guihua Village, Guanlan Town, Baoan District, Shenzhen, China
Manufacturer	: Wonders Technology Co., Ltd.
Address of Manufacturer	: Doss Industrial Zone, Qiping Kengdu Industrial ARE Guihua Village, Guanlan Town, Baoan District, Shenzhen, China

4.2 General Description of E.U.T.

Product Name	: Bluetooth Clock radio with Dual Alarm
Model No.	: DS-1060, ICB352B
Difference Description	: Both models are exactly the same except for different color and appearance.
Operation Frequency	: 2402MHz ~ 2480MHz
Antenna Gain	: 0dBi

4.3 Details of E.U.T.

Technical Data	: DC 5.0V By Adapter Adapter input: 100 ~ 240VAC, 60Hz, 0.25A Adapter output: 5.0VDC, 1.5A

4.4 Description of Support Units

The EUT has been tested as an independent unit. All the test was performed in the condition of AC 120V/60Hz input.

4.5 Standards Applicable for Testing

The customer requested FCC tests for a Bluetooth Clock radio with Dual Alarm. 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, 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 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:

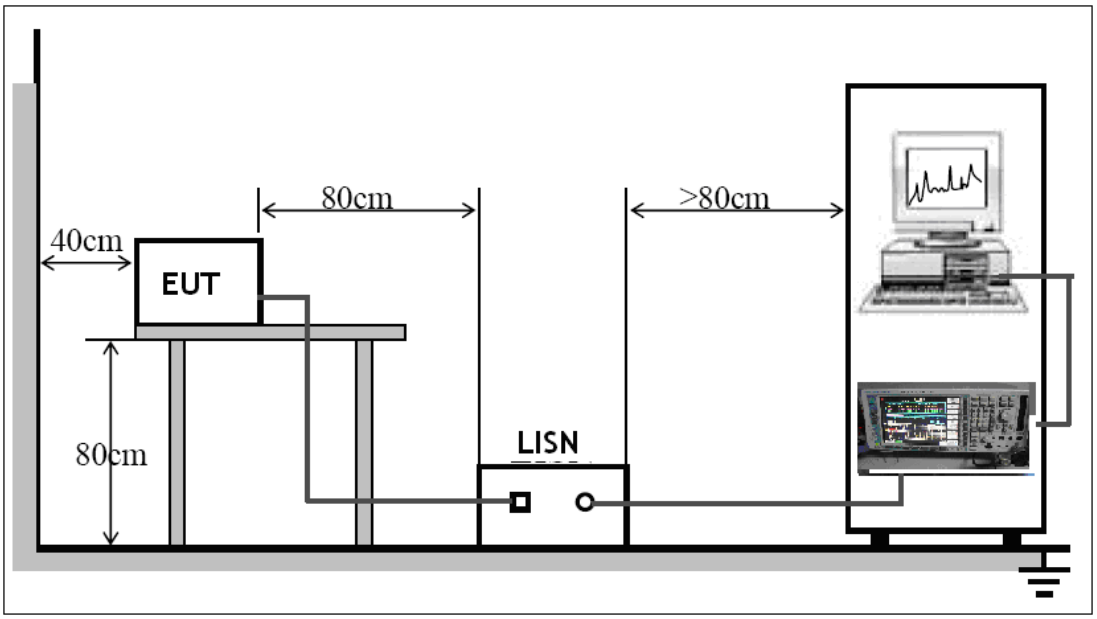
The EUT was tested in Bluetooth normal link mode.

The EUT was tested 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.

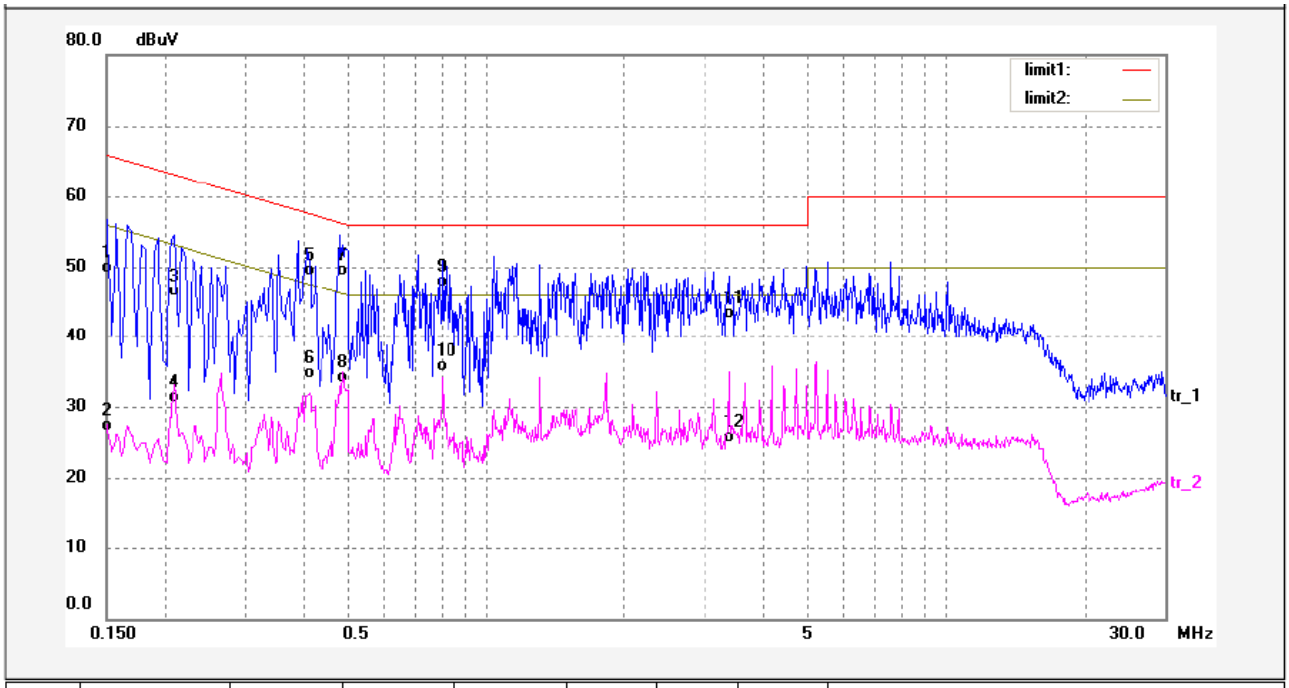


The EUT was placed on the test table in shielding room

6.3 Conducted Emission Test Result

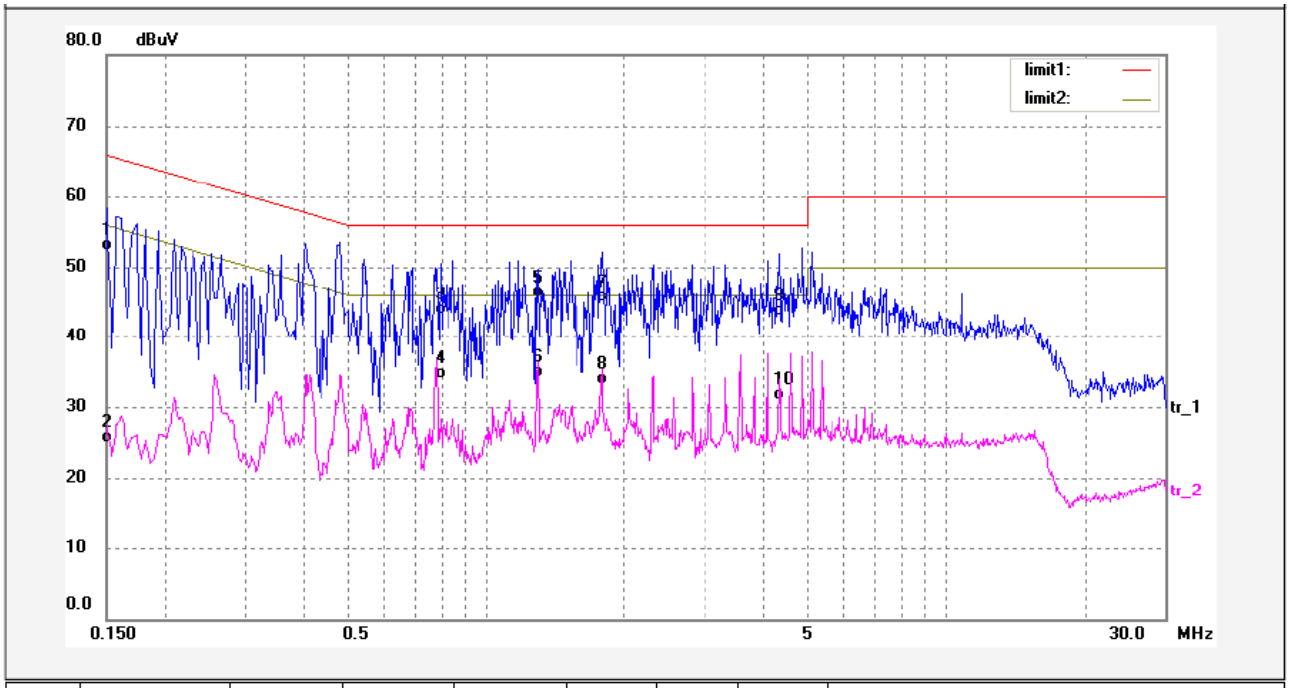
An initial pre-scan was performed on the live and neutral lines.

Live line:



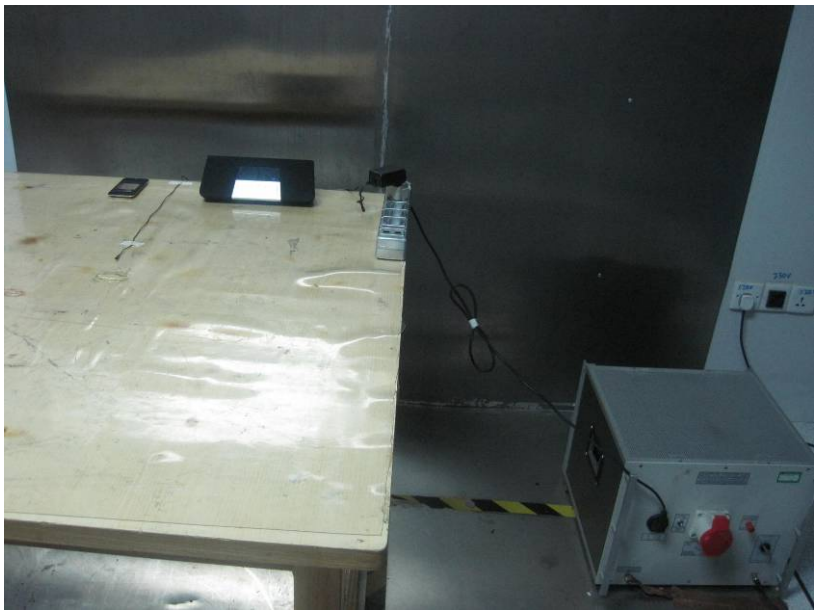
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	38.42	10.67	49.09	65.99	-16.90	QP	
2	0.1500	15.87	10.67	26.54	55.99	-29.45	AVG	
3	0.2100	34.95	10.66	45.61	63.20	-17.59	QP	
4	0.2100	19.79	10.66	30.45	53.20	-22.75	AVG	
5	0.4100	38.04	10.70	48.74	57.65	-8.91	QP	
6	0.4100	23.22	10.70	33.92	47.65	-13.73	AVG	
7	0.4820	37.33	11.45	48.78	56.30	-7.52	QP	
8	0.4820	21.88	11.45	33.33	46.30	-12.97	AVG	
9	0.8059	35.08	12.11	47.19	56.00	-8.81	QP	
10	0.8059	22.87	12.11	34.98	46.00	-11.02	AVG	
11	3.3940	30.00	12.53	42.53	56.00	-13.47	QP	
12	3.3940	12.38	12.53	24.91	46.00	-21.09	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1500	41.64	10.67	52.31	65.99	-13.68	QP	
2	0.1500	14.19	10.67	24.86	55.99	-31.13	AVG	
3	0.7980	31.01	12.17	43.18	56.00	-12.82	QP	
4	0.7980	21.80	12.17	33.97	46.00	-12.03	AVG	
5	1.2980	33.30	12.19	45.49	56.00	-10.51	QP	
6	1.2980	21.84	12.19	34.03	46.00	-11.97	AVG	
7	1.7940	32.73	12.23	44.96	56.00	-11.04	QP	
8	1.7940	20.82	12.23	33.05	46.00	-12.95	AVG	
9	4.3500	30.43	12.54	42.97	56.00	-13.03	QP	
10	4.3500	18.46	12.54	31.00	46.00	-15.00	AVG	

6.4 Photograph – Conducted Emission Test Setup



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:	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.

7.1 EUT Operation :

Operating Environment:

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

7.2 Measurement Uncertainty

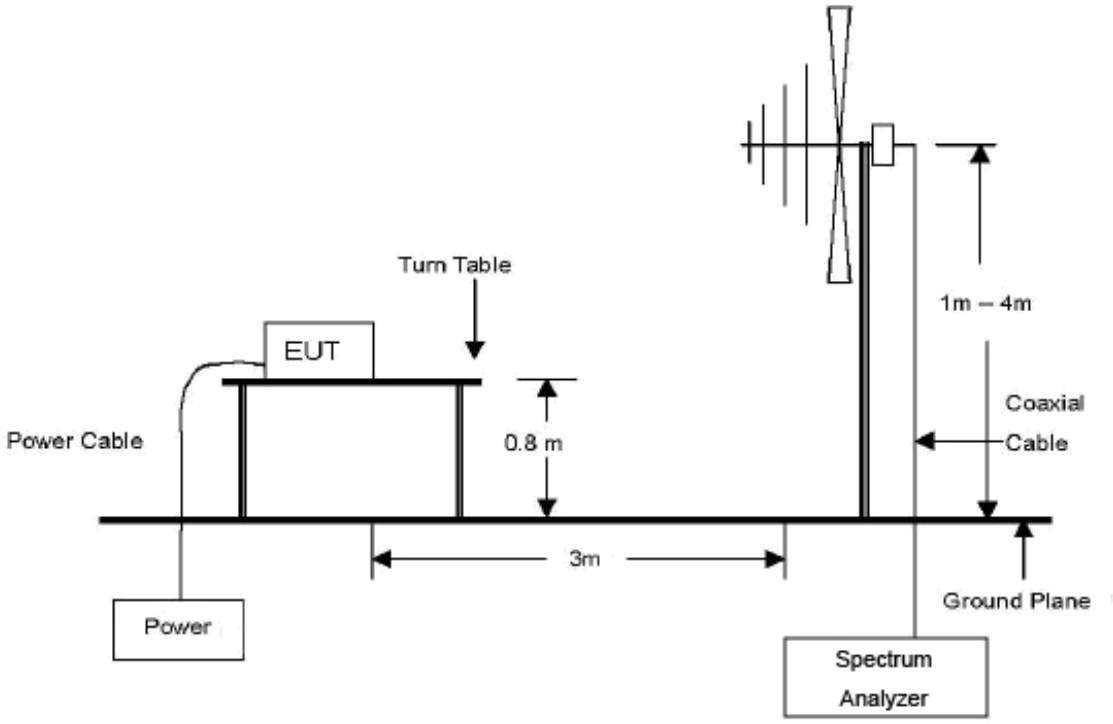
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor 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.

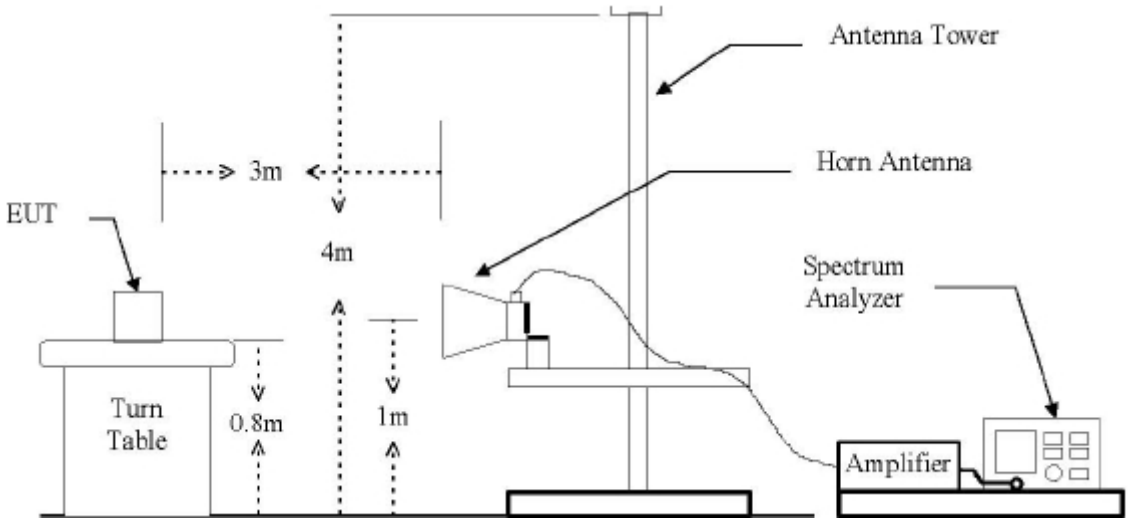
7.3 Test Setup

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 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.



7.4 Spectrum Analyzer Setup

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

9kHz ~ 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

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

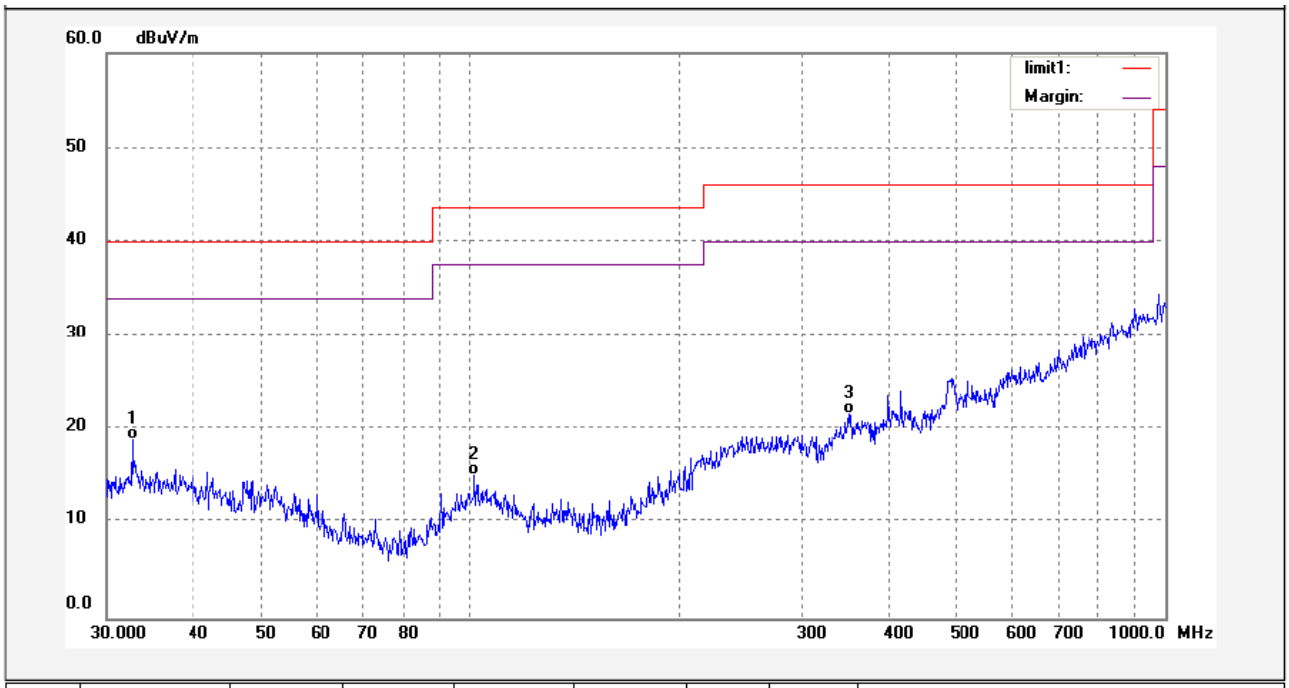
According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards.

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.

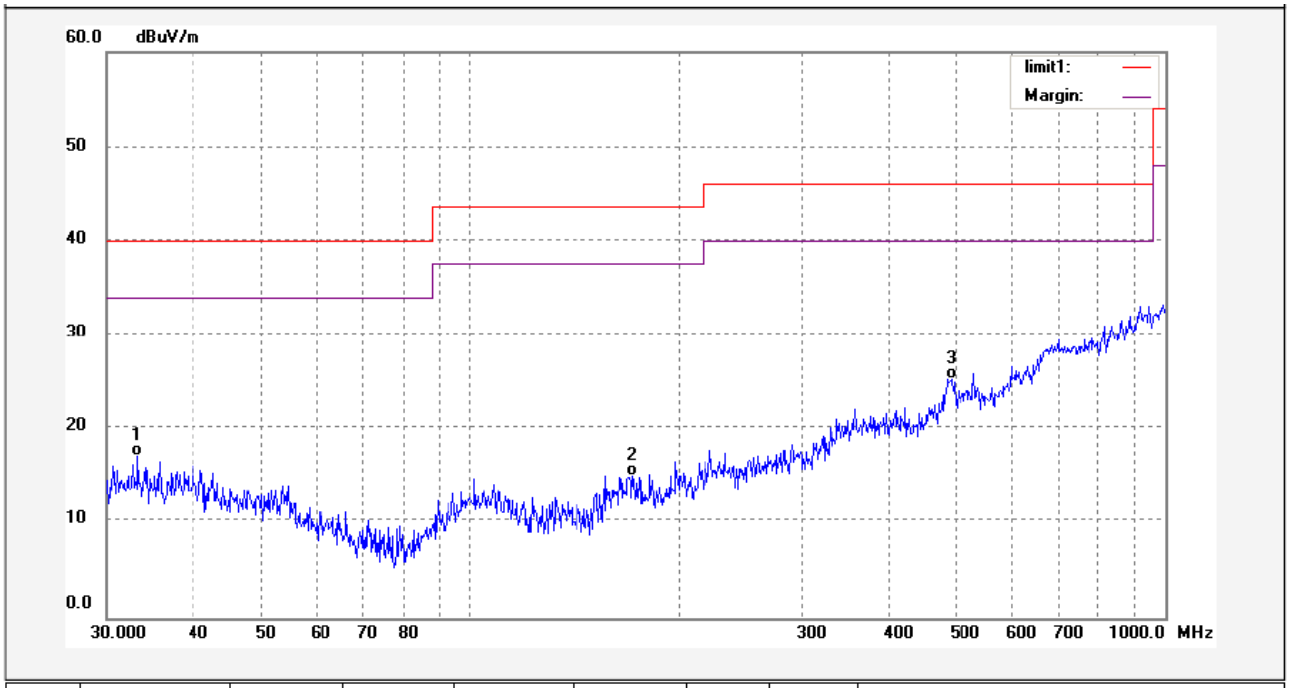
Test Frequency : 30MHz ~ 1000MHz

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

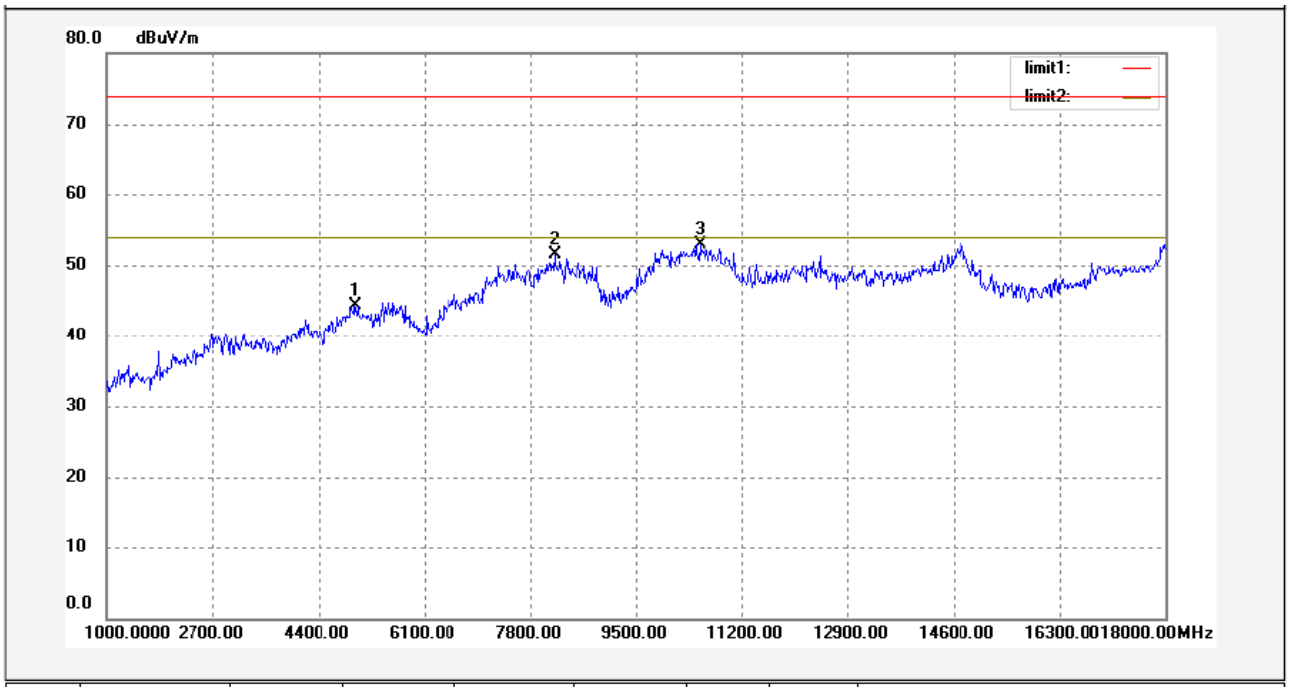


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2180	0.55	16.56	17.11	40.00	-22.89	QP	
2	171.3890	2.97	12.15	15.12	43.50	-28.38	QP	
3	491.7700	0.04	25.29	25.33	46.00	-20.67	QP	

Test Frequency: Above 1GHz radiation test data:

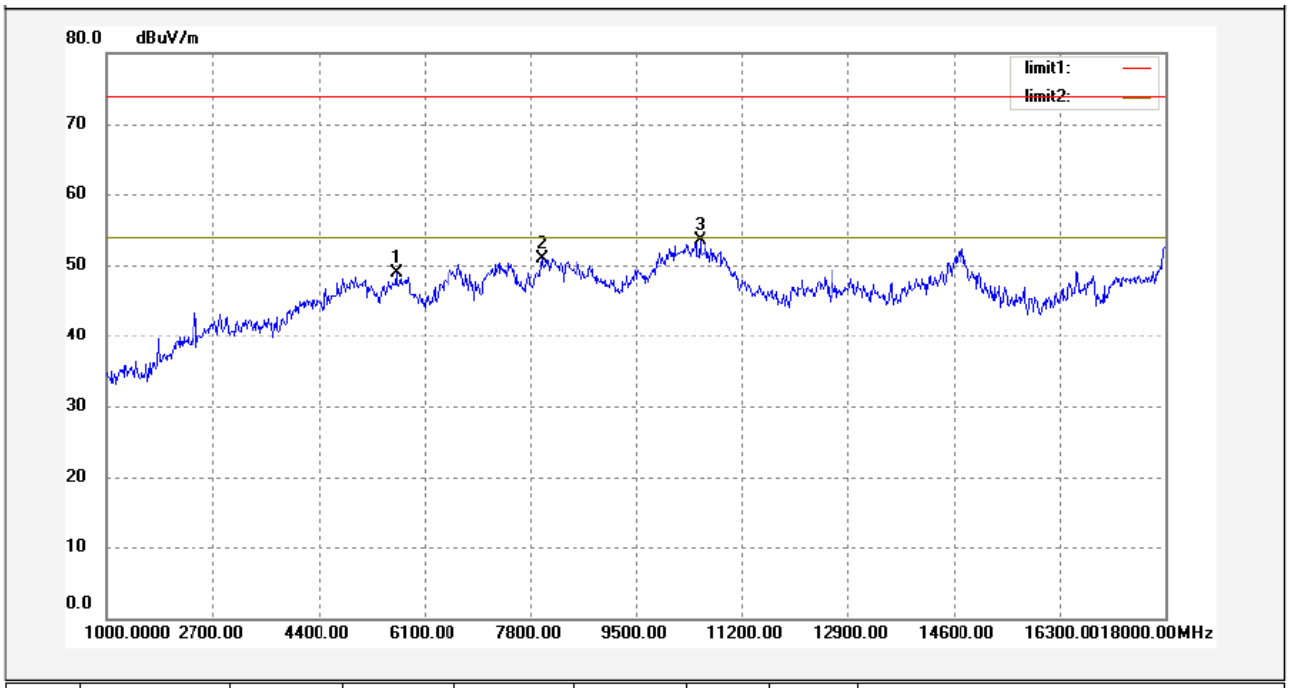
Remark: No any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	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



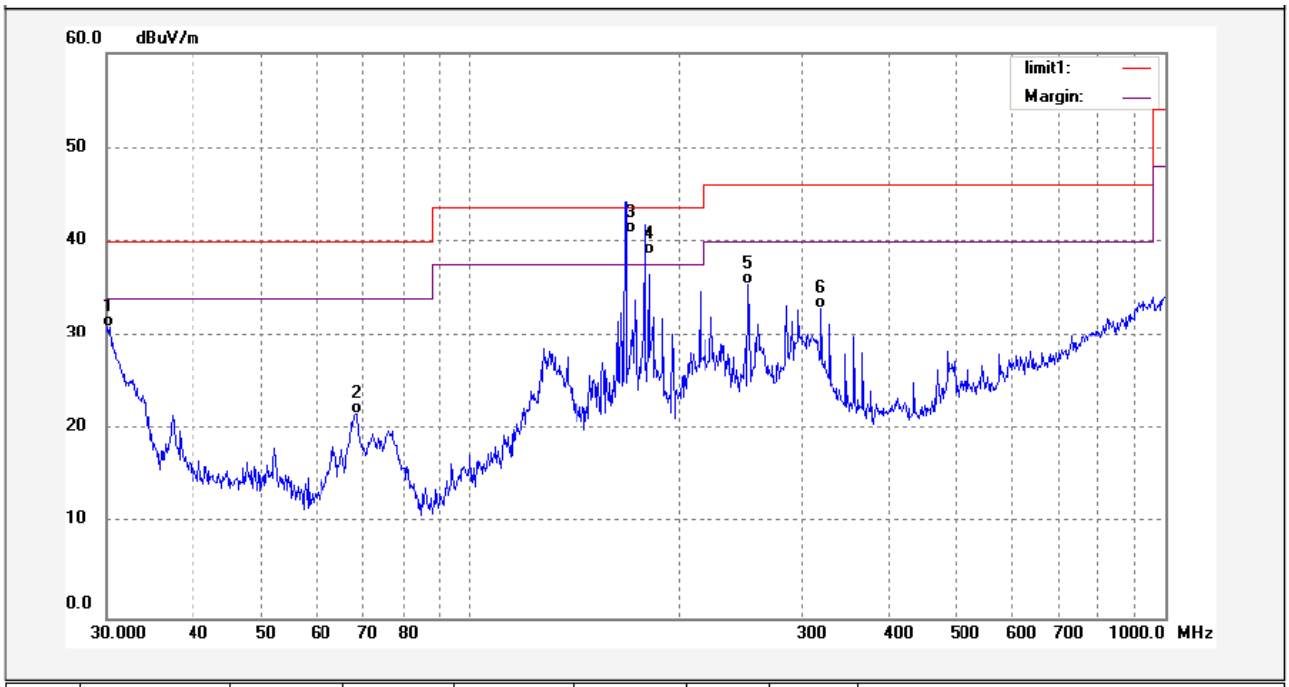
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	5650.301	39.56	9.37	48.93	74.00	-25.07	peak	
2	7983.968	32.74	18.16	50.90	74.00	-23.10	peak	
3	10522.044	32.60	20.84	53.44	74.00	-20.56	peak	

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.

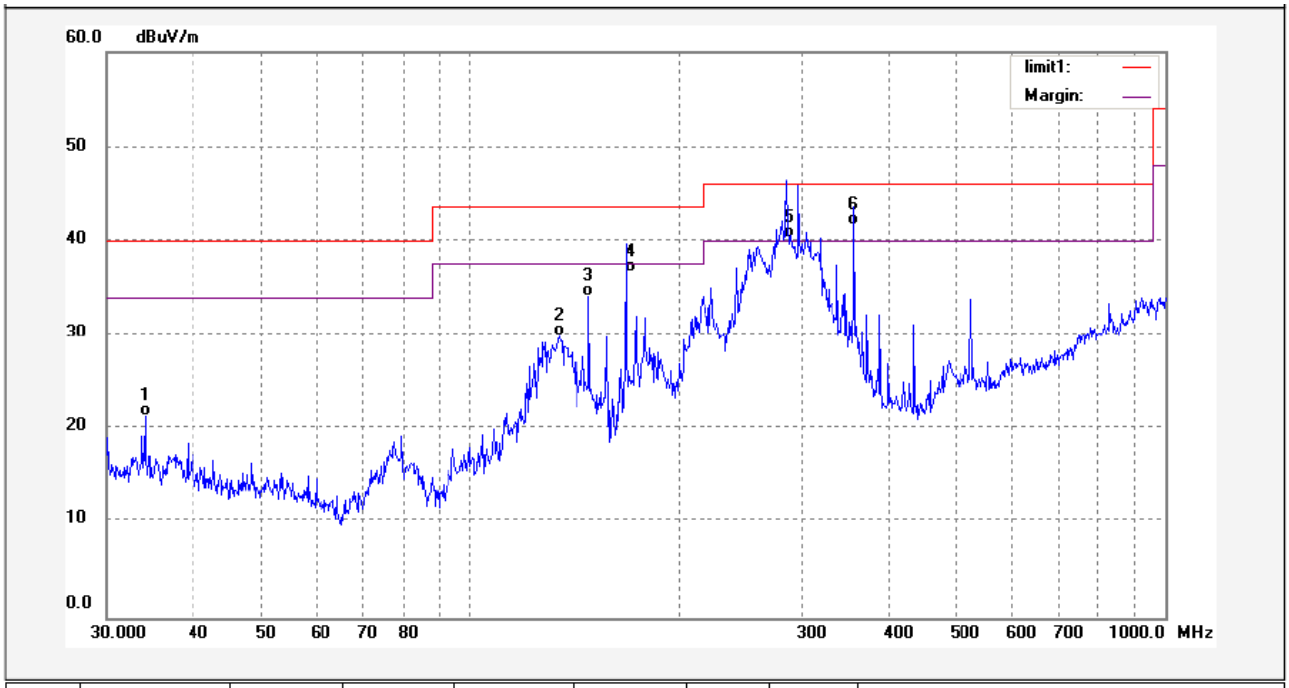
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.1056	14.80	16.17	30.97	40.00	-9.03	QP	
2	68.7450	11.47	10.19	21.66	40.00	-18.34	QP	
3	170.6000	28.77	12.10	40.87	43.50	-2.63	QP	
4	181.2000	25.26	13.30	38.56	43.50	-4.94	QP	
5	251.3676	19.80	15.75	35.55	46.00	-10.45	QP	
6	319.2071	14.24	18.62	32.86	46.00	-13.14	QP	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.0449	4.89	16.53	21.42	40.00	-18.58	QP	
2	134.4910	17.88	12.11	29.99	43.50	-13.51	QP	
3	148.3951	22.99	11.15	34.14	43.50	-9.36	QP	
4	170.0000	24.53	12.07	36.60	43.50	-6.90	QP	
5	288.0000	23.58	16.63	40.21	46.00	-5.79	QP	
6	357.1925	21.00	20.59	41.59	46.00	-4.41	QP	

Test Frequency: 1GHz ~ 25GHz

And the below is the Fundamental and Harmonic

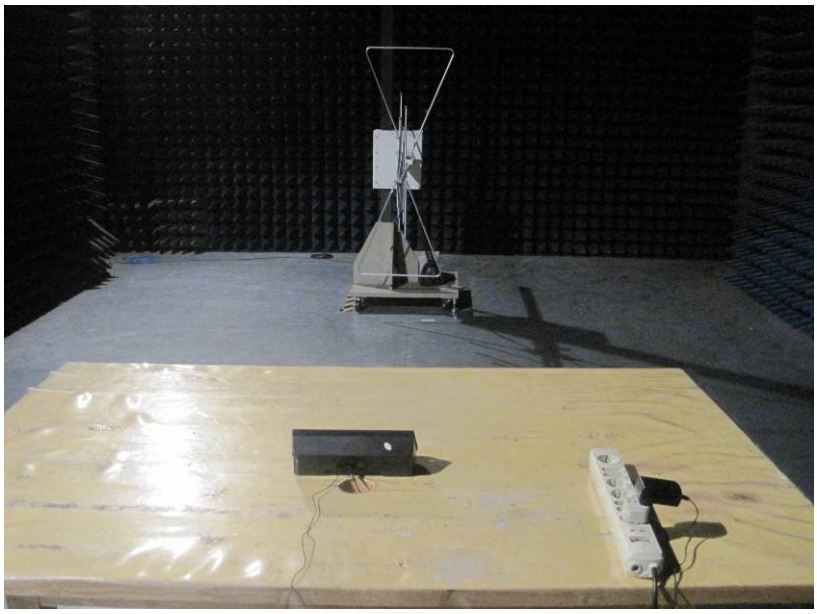
Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
Low frequency							
2402.00	AV	Vertical	97.28		(Fund.)	1.1	20
4804.00	AV	Vertical	39.17	54.00	-14.83	1.2	125
7206.00	AV	Vertical	39.96	54.00	-14.04	1.3	120
9608.00	AV	Vertical	36.38	54.00	-17.62	1.9	140
12010.00	AV	Vertical	33.97	54.00	-20.03	1.5	165
14412.00	AV	Vertical	35.98	54.00	-18.02	1.4	180
16814.00	AV	Vertical	35.23	54.00	-18.77	1.5	110
19216.00	AV	Vertical	30.15	54.00	-23.85	1.6	150
21618.00	AV	Vertical	27.39	54.00	-26.61	1.5	10
24020.00	AV	Vertical	30.47	54.00	-23.53	1.2	130
2402.00	AV	Horizontal	90.87		(Fund.)	1.0	20
4804.00	AV	Horizontal	36.11	54.00	-17.89	1.3	190
7206.00	AV	Horizontal	34.44	54.00	-19.56	1.4	80
9608.00	AV	Horizontal	36.99	54.00	-17.01	1.2	180
12010.00	AV	Horizontal	35.23	54.00	-18.77	1.3	60
14412.00	AV	Horizonta	32.08	54.00	-21.92	1.3	200
16814.00	AV	Horizontal	34.89	54.00	-19.11	1.4	130
19216.00	AV	Horizontal	27.40	54.00	-26.60	1.8	160
21618.00	AV	Horizontal	28.34	54.00	-25.66	1.0	110
24020.00	AV	Horizontal	26.96	54.00	-27.04	1.6	100
2402.00	PK	Vertical	105.23		(Fund.)	1.4	10
4804.00	PK	Vertical	58.20	74.00	-15.80	1.8	130
7206.00	PK	Vertical	59.14	74.00	-14.86	2.1	110
9608.00	PK	Vertical	55.87	74.00	-18.13	1.5	250
12010.00	PK	Vertical	52.23	74.00	-21.77	1.1	80
14412.00	PK	Vertical	53.52	74.00	-20.48	1.2	140
16814.00	PK	Vertical	50.33	74.00	-23.67	1.2	135
19216.00	PK	Vertical	48.61	74.00	-25.39	1.3	200
21618.00	PK	Vertical	46.39	74.00	-27.61	1.6	90
24020.00	PK	Vertical	47.54	74.00	-26.46	2.0	150
2402.00	PK	Horizontal	99.30		(Fund.)	1.6	70
4804.00	PK	Horizontal	56.59	74.00	-17.41	1.9	180
7206.00	PK	Horizontal	54.34	74.00	-19.66	2.2	70
9608.00	PK	Horizontal	51.45	74.00	-22.55	1.2	70
12010.00	PK	Horizontal	53.43	74.00	-20.57	1.0	155
14412.00	PK	Horizontal	48.34	74.00	-25.66	1.6	70
16814.00	PK	Horizontal	54.44	74.00	-19.56	1.7	200
19216.00	PK	Horizontal	46.29	74.00	-27.71	1.5	140

21618.00	PK	Horizontal	47.62	74.00	-26.38	1.0	120
24020.00	PK	Horizontal	49.39	74.00	-24.61	2.0	150
Middle frequency							
2441.00	AV	Vertical	98.63		(Fund.)	1.4	50
4882.00	AV	Vertical	41.69	54.00	-12.31	1.6	170
7323.00	AV	Vertical	39.90	54.00	-14.10	1.6	90
9764.00	AV	Vertical	35.81	54.00	-18.19	1.3	80
12205.00	AV	Vertical	40.40	54.00	-13.60	1.1	30
14646.00	AV	Vertical	34.22	54.00	-19.78	1.2	210
17087.00	AV	Vertical	36.02	54.00	-17.98	1.3	10
19528.00	AV	Vertical	32.81	54.00	-21.19	1.6	90
21969.00	AV	Vertical	30.94	54.00	-23.06	1.7	190
24410.00	AV	Vertical	35.03	54.00	-18.97	1.2	160
2441.00	AV	Horizontal	92.54		(Fund.)	2.1	140
4882.00	AV	Horizontal	38.21	54.00	-15.79	1.7	160
7323.00	AV	Horizontal	39.42	54.00	-14.58	1.4	290
9764.00	AV	Horizontal	34.33	54.00	-19.67	1.2	200
12205.00	AV	Horizontal	32.02	54.00	-21.98	1.0	150
14646.00	AV	Horizontal	35.92	54.00	-18.08	1.5	260
17087.00	AV	Horizontal	35.15	54.00	-18.85	1.5	165
19528.00	AV	Horizontal	29.83	54.00	-24.17	1.4	150
21969.00	AV	Horizontal	30.88	54.00	-23.12	1.0	160
24410.00	AV	Horizontal	29.06	54.00	-24.94	1.8	210
2441.00	PK	Vertical	107.24		(Fund.)	1.1	10
4882.00	PK	Vertical	63.10	74.00	-10.90	1.1	160
7323.00	PK	Vertical	61.21	74.00	-12.79	1.2	120
9764.00	PK	Vertical	57.07	74.00	-16.93	1.4	190
12205.00	PK	Vertical	60.31	74.00	-13.69	1.6	200
14646.00	PK	Vertical	52.98	74.00	-21.02	1.2	80
17087.00	PK	Vertical	56.23	74.00	-17.77	1.2	0
19528.00	PK	Vertical	51.04	74.00	-22.96	1.6	200
21969.00	PK	Vertical	55.03	74.00	-18.97	1.4	165
24410.00	PK	Vertical	48.09	74.00	-25.91	1.4	180
2441.00	PK	Horizontal	101.67		(Fund.)	1.4	10
4882.00	PK	Horizontal	58.25	74.00	-15.75	1.8	135
7323.00	PK	Horizontal	59.98	74.00	-14.02	1.5	100
9764.00	PK	Horizontal	54.09	74.00	-19.91	1.5	130
12205.00	PK	Horizontal	56.84	74.00	-17.16	1.2	170
14646.00	PK	Horizontal	52.24	74.00	-21.76	1.6	220
17087.00	PK	Horizontal	49.43	74.00	-24.57	1.0	140
19528.00	PK	Horizontal	52.12	74.00	-21.88	1.5	230
21969.00	PK	Horizontal	53.35	74.00	-20.65	1.7	0
24410.00	PK	Horizontal	48.03	74.00	-25.97	1.7	225
High frequency							

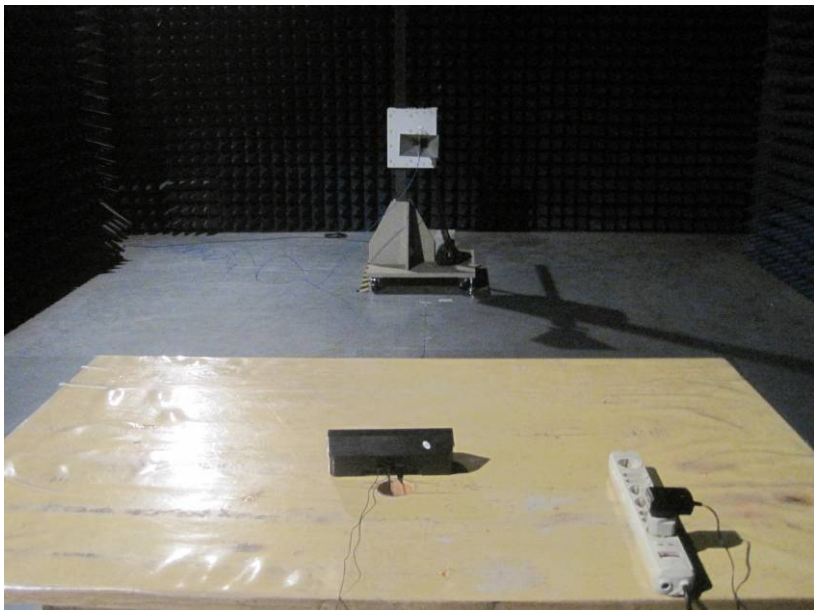
2480.00	AV	Vertical	97.62		(Fund.)	1.3	200
4960.00	AV	Vertical	41.96	54.00	-12.04	1.6	80
7440.00	AV	Vertical	40.92	54.00	-13.08	1.1	120
9920.00	AV	Vertical	39.40	54.00	-14.60	1.5	140
12400.00	AV	Vertical	37.96	54.00	-16.04	1.4	120
14880.00	AV	Vertical	41.50	54.00	-12.50	1.8	180
17360.00	AV	Vertical	34.89	54.00	-19.11	1.5	110
19840.00	AV	Vertical	32.18	54.00	-21.82	1.2	270
22320.00	AV	Vertical	38.95	54.00	-15.05	1.3	130
24800.00	AV	Vertical	30.91	54.00	-23.09	1.5	205
2480.00	AV	Horizontal	91.63		(Fund.)	1.8	140
4960.00	AV	Horizontal	40.30	54.00	-13.70	2.3	220
7440.00	AV	Horizontal	35.67	54.00	-18.33	1.1	140
9920.00	AV	Horizontal	36.24	54.00	-17.76	1.5	260
12400.00	AV	Horizontal	37.51	54.00	-16.49	1.0	135
14880.00	AV	Horizontal	34.06	54.00	-19.94	1.3	200
17360.00	AV	Horizontal	31.22	54.00	-22.78	1.3	210
19840.00	AV	Horizontal	33.85	54.00	-20.15	2.1	120
22320.00	AV	Horizontal	29.11	54.00	-24.89	1.1	100
24800.00	AV	Horizontal	29.96	54.00	-24.04	1.9	180
2480.00	PK	Vertical	106.87		(Fund.)	1.1	190
4960.00	PK	Vertical	61.67	74.00	-12.33	1.2	100
7440.00	PK	Vertical	58.10	74.00	-15.90	1.9	130
9920.00	PK	Vertical	60.56	74.00	-13.44	1.6	170
12400.00	PK	Vertical	55.66	74.00	-18.34	1.3	110
14880.00	PK	Vertical	62.21	74.00	-11.79	1.2	140
17360.00	PK	Vertical	56.24	74.00	-17.76	1.0	90
19840.00	PK	Vertical	57.11	74.00	-16.89	1.3	200
22320.00	PK	Vertical	55.43	74.00	-18.57	1.5	150
24800.00	PK	Vertical	49.05	74.00	-24.95	1.6	195
2480.00	PK	Horizontal	100.28		(Fund.)	1.5	190
4960.00	PK	Horizontal	58.14	74.00	-15.86	1.5	150
7440.00	PK	Horizontal	56.45	74.00	-17.55	1.4	130
9920.00	PK	Horizontal	57.27	74.00	-16.73	1.3	250
12400.00	PK	Horizontal	55.13	74.00	-18.87	1.0	110
14880.00	PK	Horizontal	49.32	74.00	-24.68	2.1	160
17360.00	PK	Horizontal	53.53	74.00	-20.47	1.8	170
19840.00	PK	Horizontal	48.20	74.00	-25.80	1.5	230
22320.00	PK	Horizontal	51.03	74.00	-22.97	2.1	120
24800.00	PK	Horizontal	46.41	74.00	-27.59	2.0	270

7.8 Photograph – Radiation Spurious Emission Test Setup

Below 1GHz



Above 1GHz

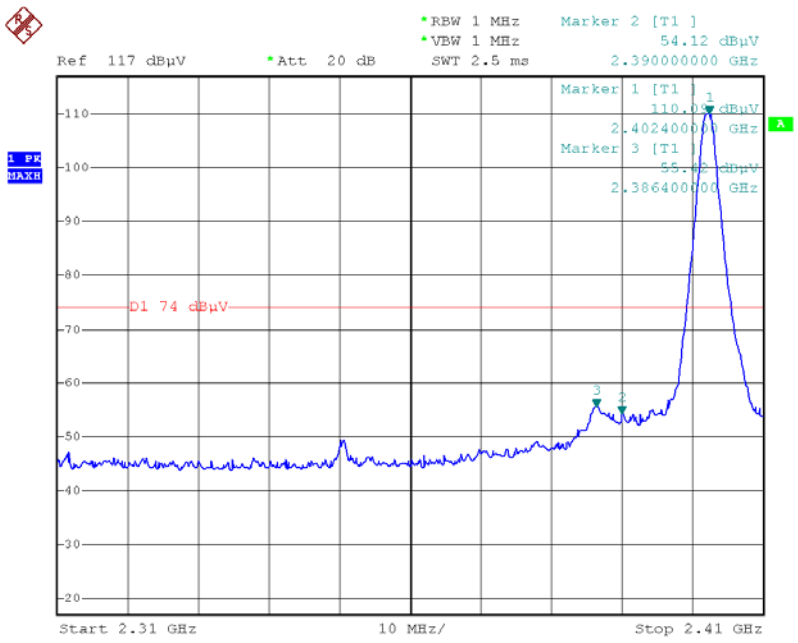


8 Band Edge Measurements

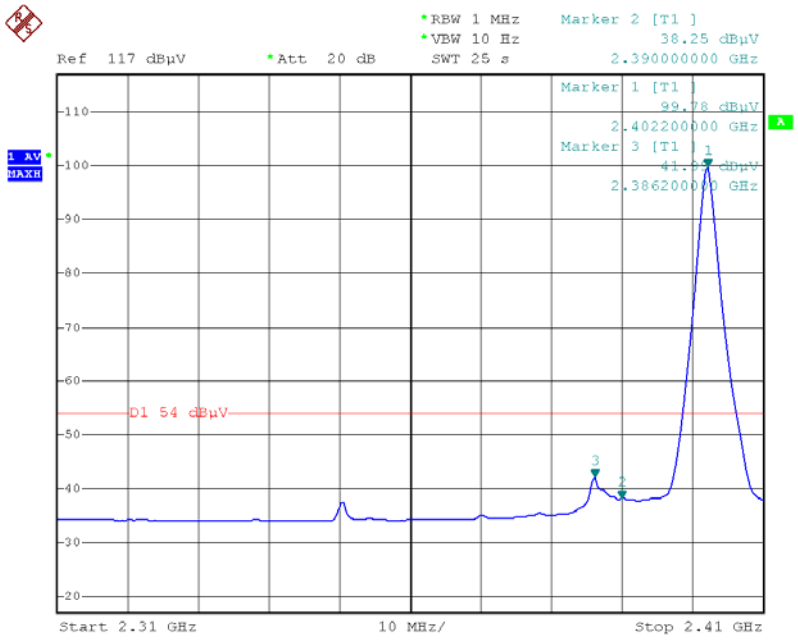
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	Based on DA 00-705
Measurement Distance:	3m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

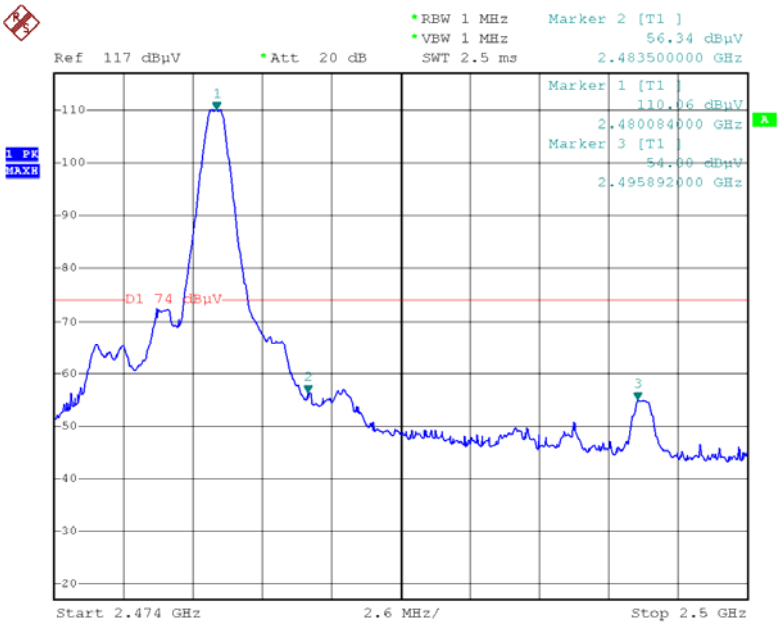
Low Channel – Peak



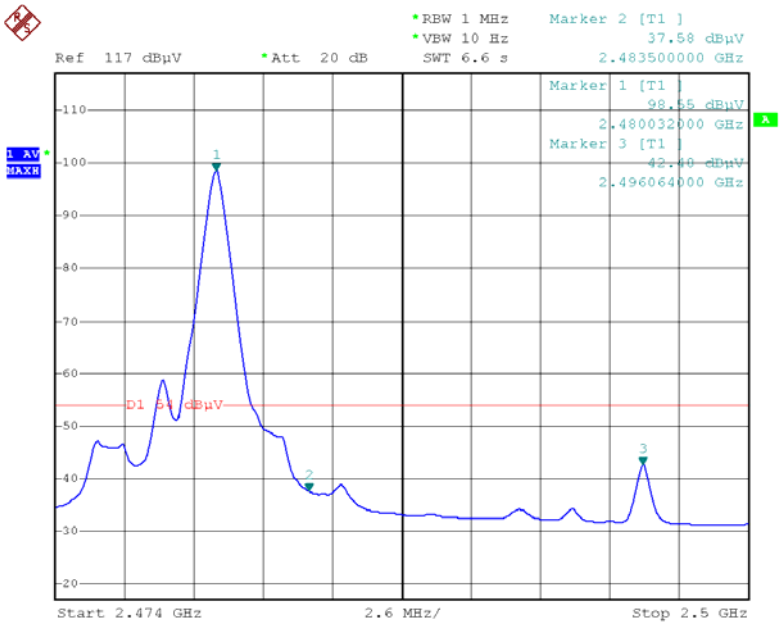
Low Channel – AV



High Channel – Peak



High Channel – AV



9 20 dB Bandwidth Measurement

Test Requirement: FCC CFR47 Part 15 Section 15.247
Test Method: Based on DA 00-705
Test Mode: Test in fixing operating frequency at low, Middle, high channel.

9.1 Test Procedure:

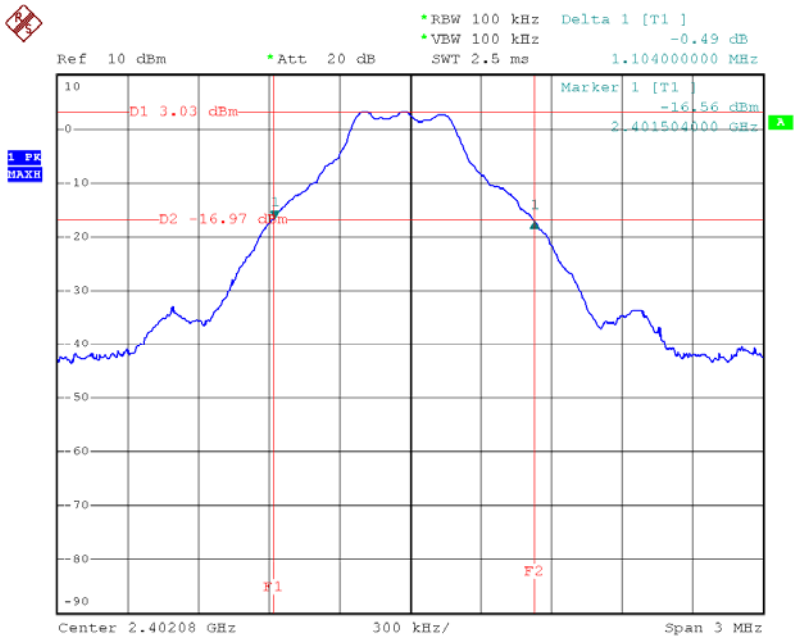
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = 3MHz, RBW = 100kHz, VBW = 100kHz

9.2 Test Result:

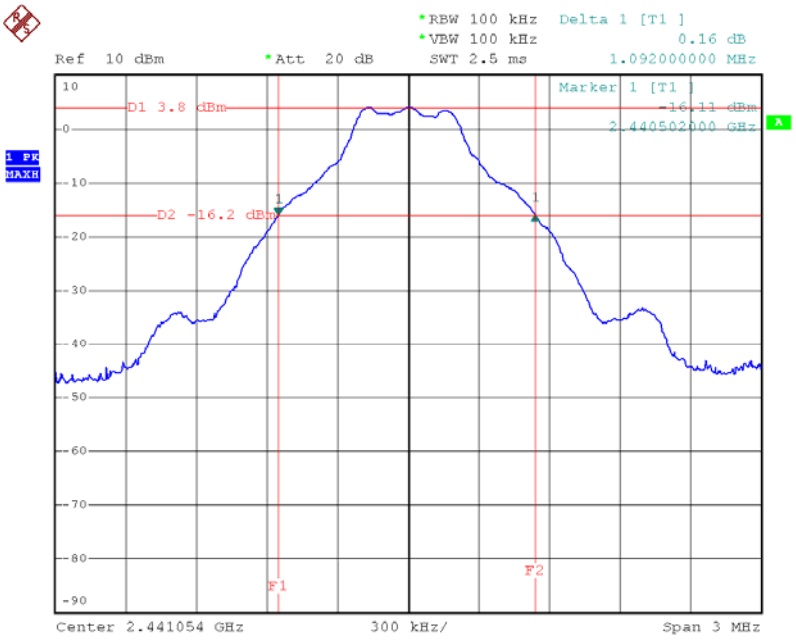
Test Channel	Bandwidth
Low	1.104MHz
Middle	1.092MHz
High	1.098MHz

Test result plot as follows:

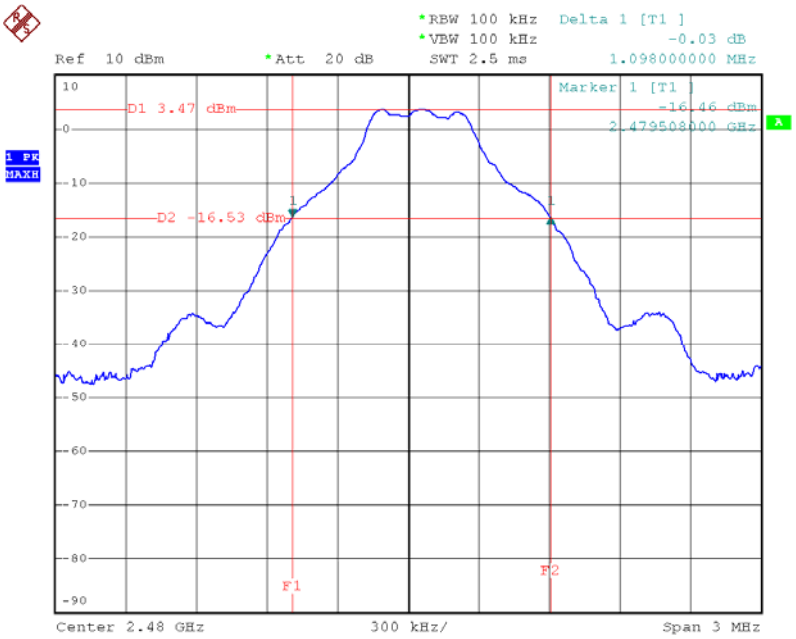
Low Channel



Middle Channel



High Channel



10 Maximum Peak Output Power

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on ANSI C63.4:2003
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	3.27	30
Middle	3.48	30
High	3.75	30

11 Hopping Channel Separation

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on 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.

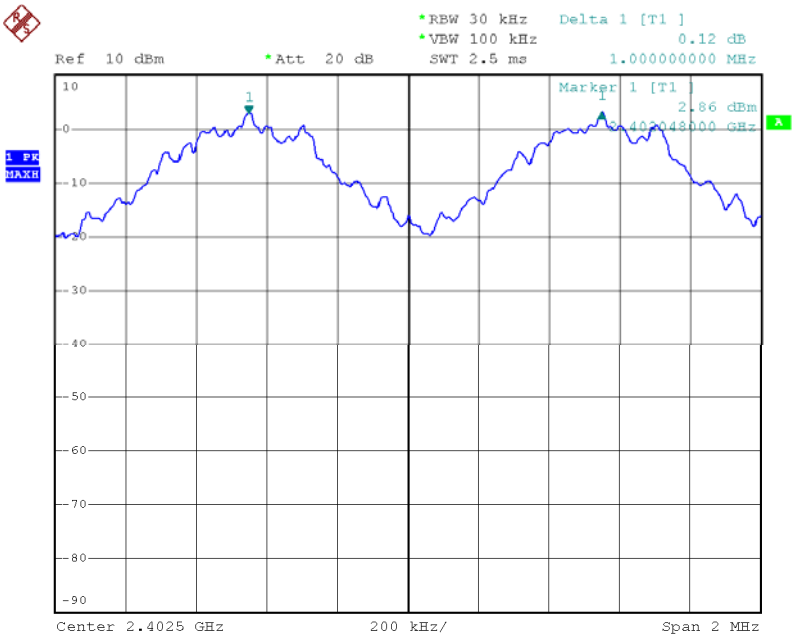
3. Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The limit is specified in one of the subparagraphs of this Section Submit this plot.

11.2 Test Result:

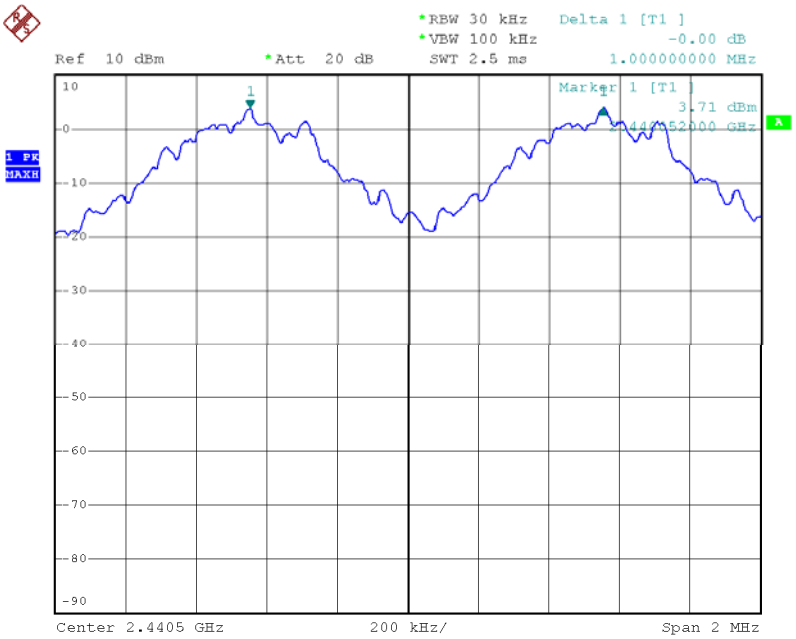
Test Channel	Separation (MHz)	Result
Low	1.000	PASS
Middle	1.000	PASS
High	1.004	PASS

Test result plot as follows:

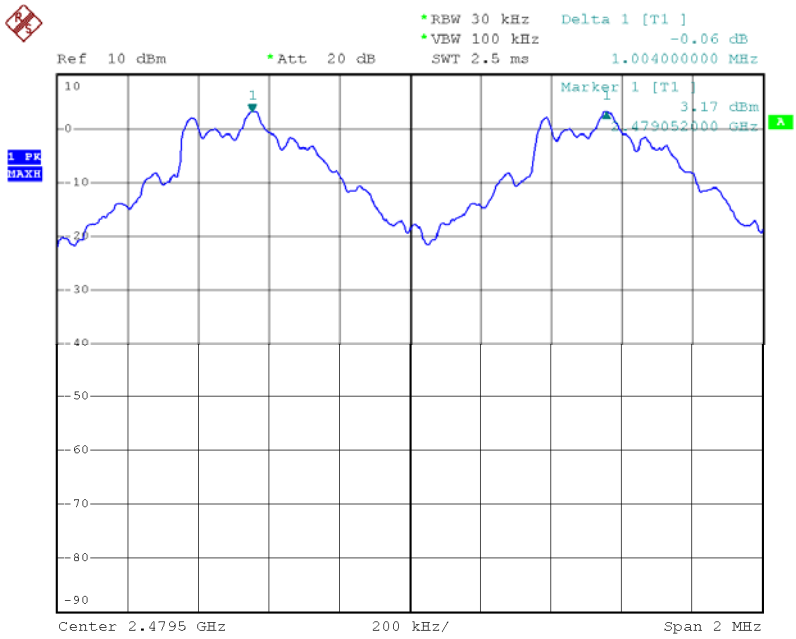
Low Channel:



Middle Channel



High Channel



12 Number of Hopping Frequency

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on 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.

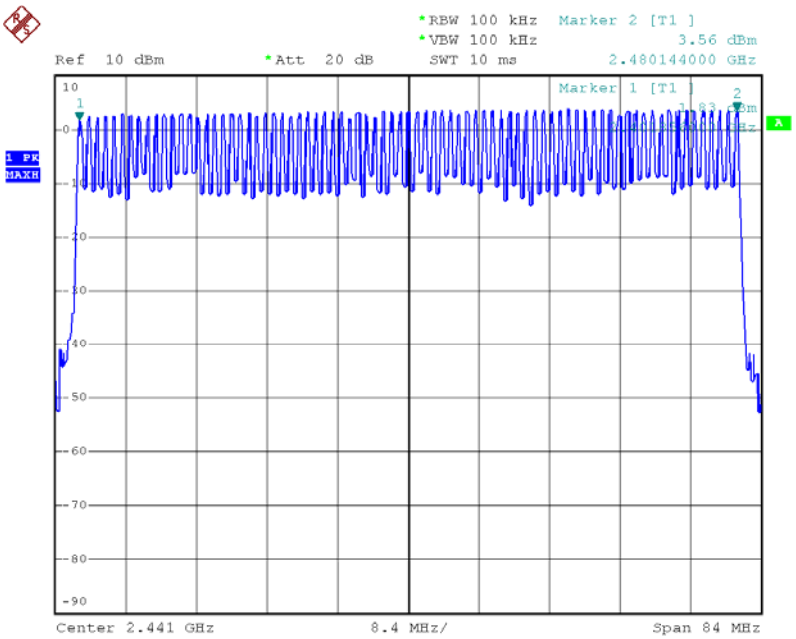
2. Set the spectrum analyzer: RBW = 100 kHz. VBW = 100 kHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.

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



13 Dwell Time

Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on 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:

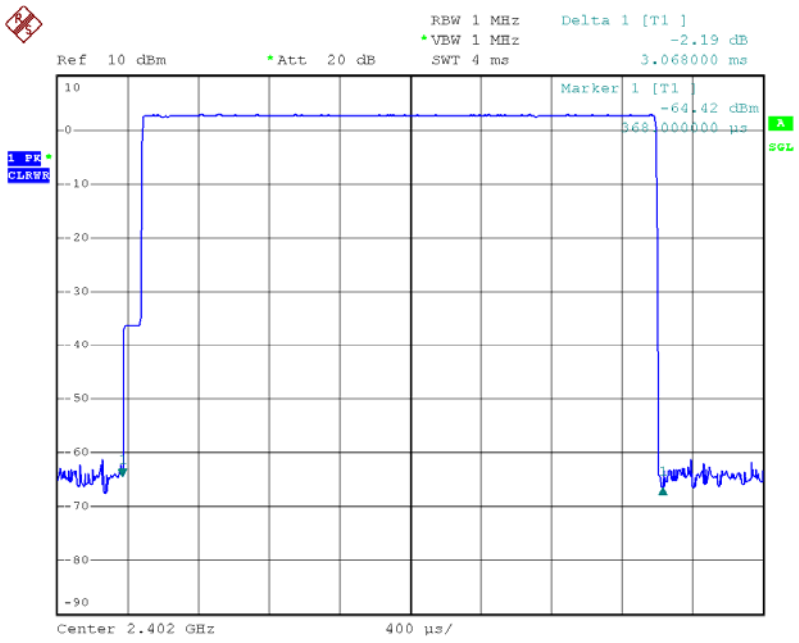
Data Packet	Dwell Time(s)
DH5	1600/79/6*31.6*(MkrDelta)/1000
DH3	1600/79/4*31.6*(MkrDelta)/1000
DH1	1600/79/2*31.6*(MkrDelta)/1000

Note : Mkr Delta is once pulse time .

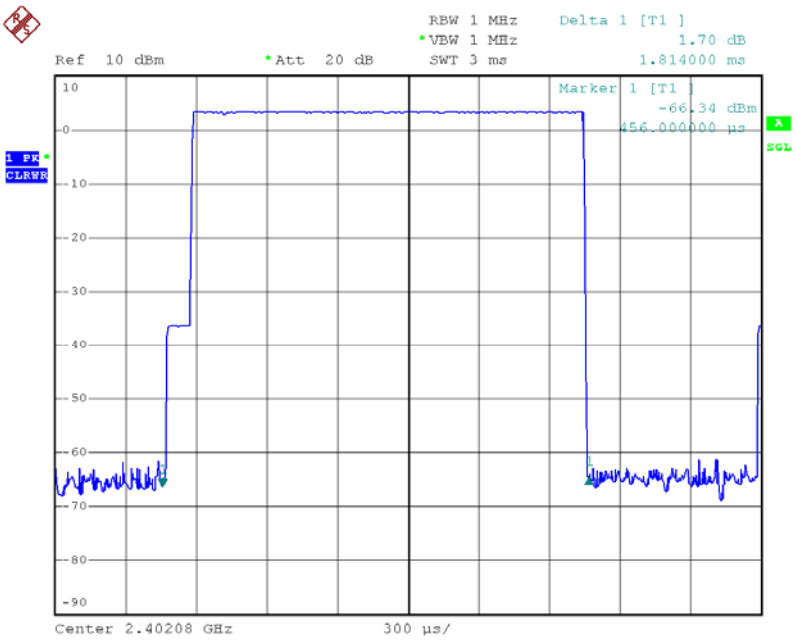
Low Channel: 2402MHz

Dwell time of each occupation in this channel as follows:

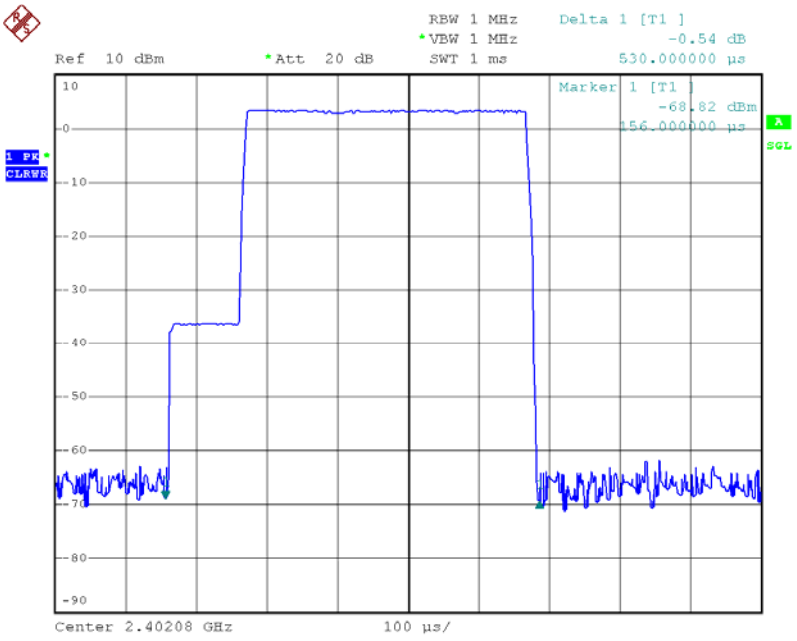
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	3.068	0.327	0.400	Pass
DH3	2402 MHz	1.814	0.290	0.400	Pass
DH1	2402 MHz	0.530	0.170	0.400	Pass



(DH5)



(DH3)

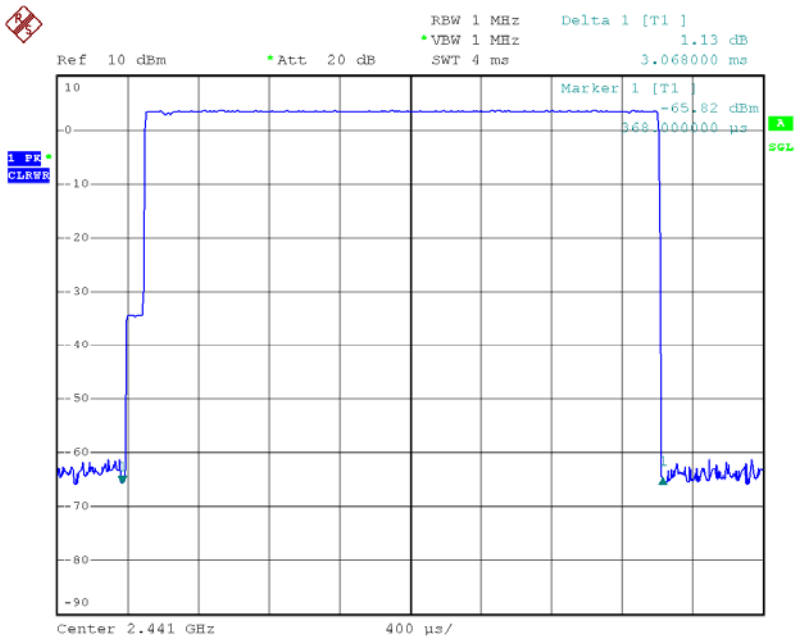


(DH1)

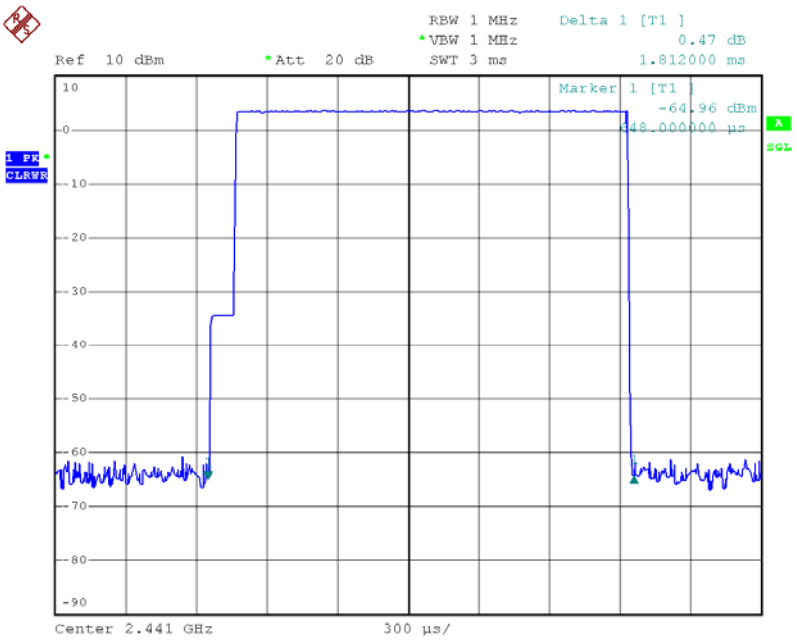
Middle Channel: 2441MHz

Dwell time of each occupation in this channel as follows:

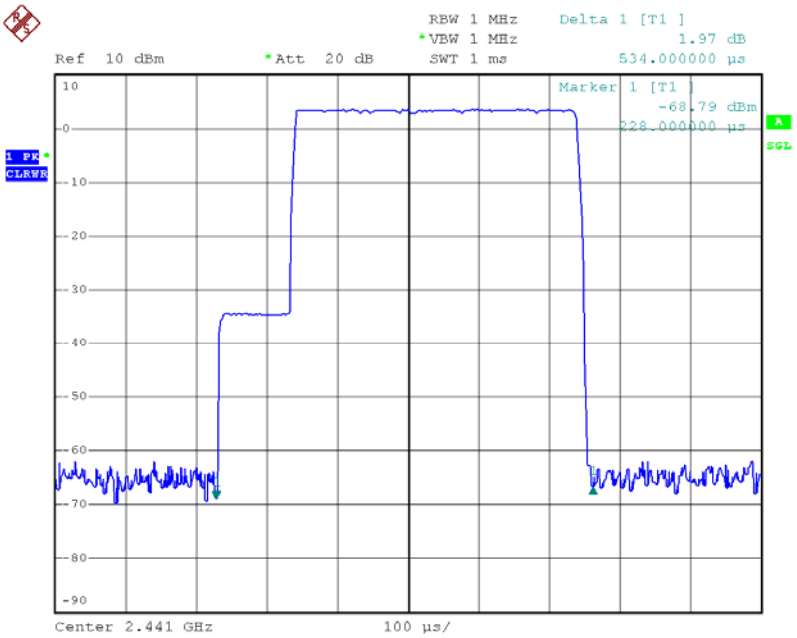
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2441 MHz	3.068	0.327	0.400	Pass
DH3	2441 MHz	1.812	0.290	0.400	Pass
DH1	2441 MHz	0.534	0.171	0.400	Pass



(DH5)



(DH3)

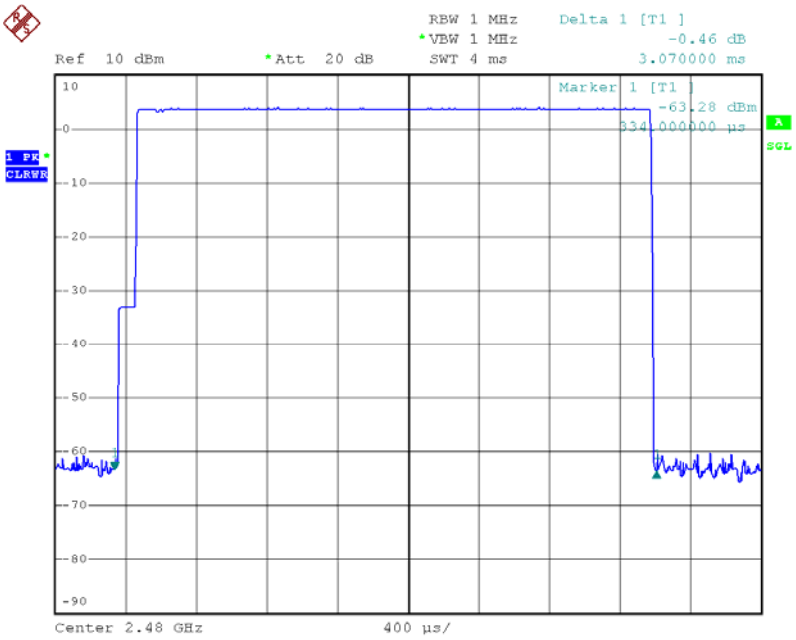


(DH1)

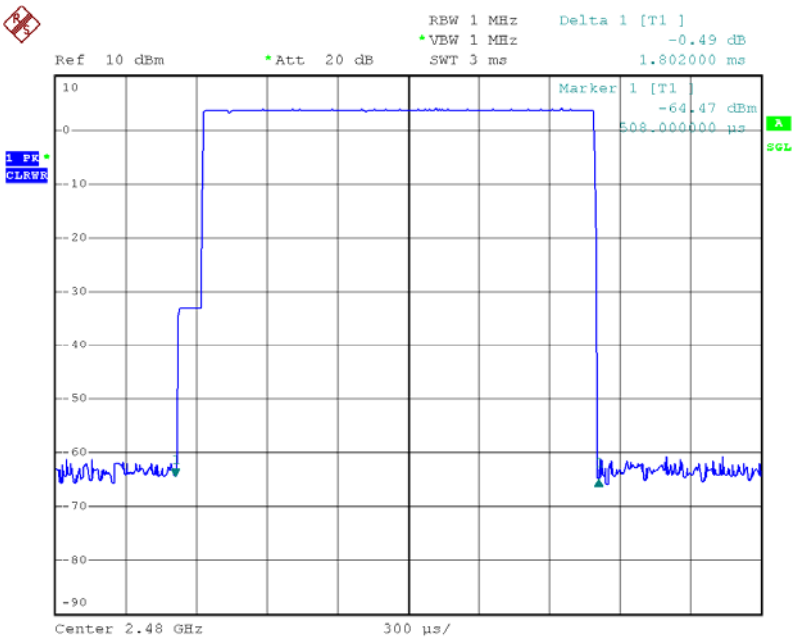
High Channel: 2480MHz

Dwell time of each occupation in this channel as follows:

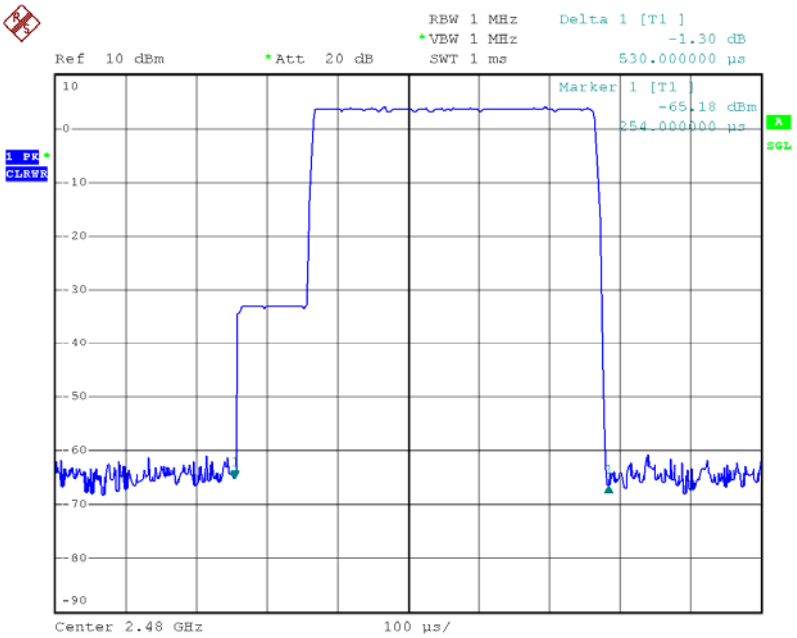
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	3.070	0.327	DH5	Pass
DH3	2480 MHz	1.802	0.288	DH3	Pass
DH1	2480 MHz	0.530	0.170	DH1	Pass



(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 moblie 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

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

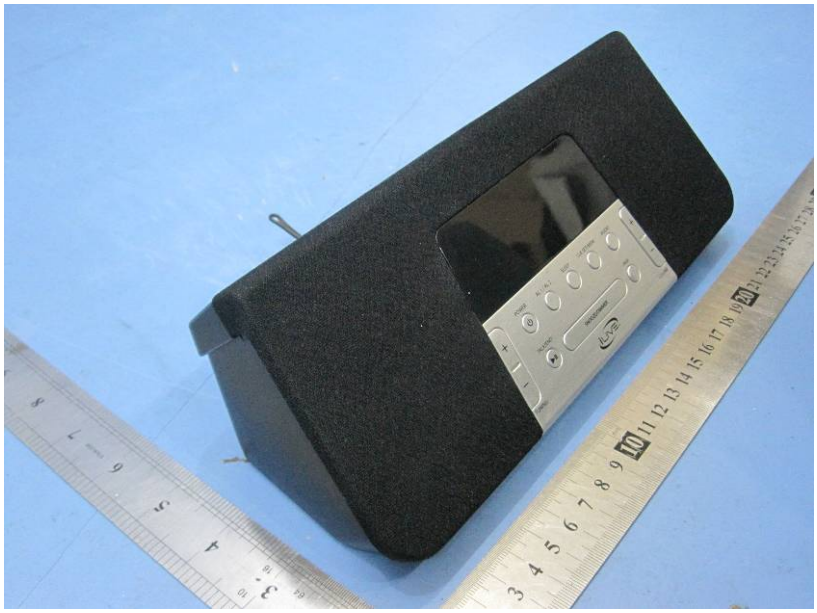
From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

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
0	1	3.27	2.123	0.000422	1	Complies
0	1	3.48	2.228	0.000443	1	Complies
0	1	3.75	2.371	0.000472	1	Complies

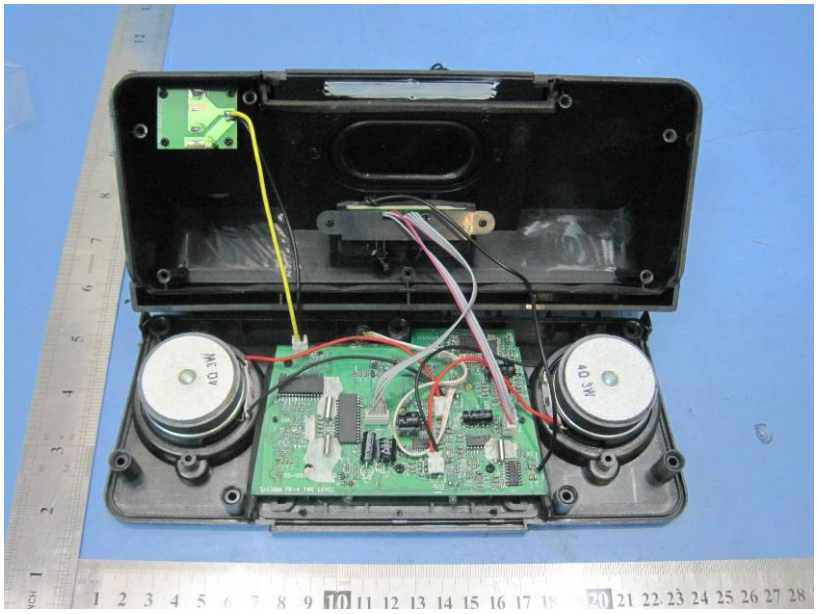
16 Photographs - Constructional Details

16.1 Product View

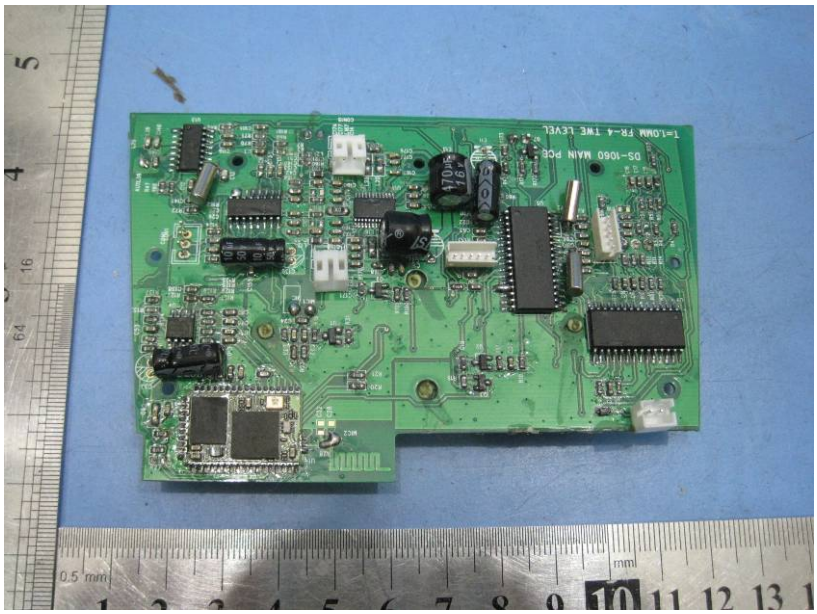
16.2 EUT – Appearance View

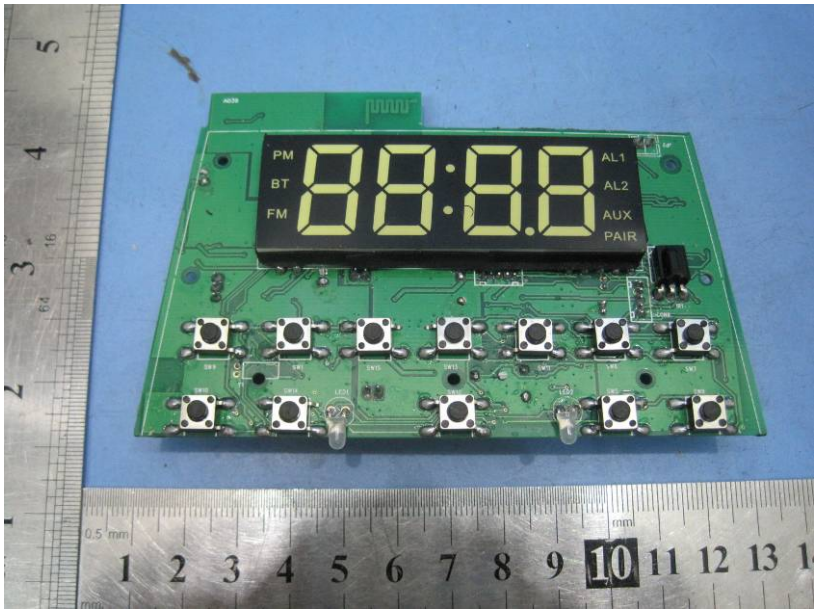


16.3 EUT – Open View



16.4 EUT – PCB 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