

# ***FCC TEST REPORT***

**FCC ID** : ATL-ISP245  
**Applicant** : iLUV Creative Technology  
**Address** : Harbor Park Drive, Port Washington, NY11050, USA

**Equipment Under Test (EUT) :**

Product Name : Bluetooth Speaker  
Model No. : iSP245, iSP245SIL, iSP245BLK

**Standards** : FCC CFR47 Part 15 Section 15.247:2010

**Date of Test** : March 1 ~ March 9, 2012

**Date of Issue** : March 21, 2012

**Test Engineer** : Hunk yan / Engineer



**Reviewed By** : Philo zhong / Manager



<b>Test Result</b>	<b>: PASS</b>
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**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

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### 3 Contents

	<b>Page</b>
<b>1 COVER PAGE.....</b>	<b>1</b>
<b>2 TEST SUMMARY .....</b>	<b>2</b>
<b>3 CONTENTS.....</b>	<b>3</b>
<b>4 GENERAL INFORMATION .....</b>	<b>5</b>
4.1 CLIENT INFORMATION.....	5
4.2 GENERAL DESCRIPTION OF E.U.T.....	5
4.3 DETAILS OF E.U.T.....	5
4.4 DESCRIPTION OF SUPPORT UNITS.....	5
4.5 STANDARDS APPLICABLE FOR TESTING .....	5
4.6 TEST FACILITY .....	6
4.7 TEST LOCATION .....	6
<b>5 EQUIPMENT USED DURING TEST .....</b>	<b>7</b>
<b>6 CONDUCTED EMISSION .....</b>	<b>8</b>
6.1 E.U.T. OPERATION.....	8
6.2 EUT SETUP .....	9
6.3 CONDUCTED EMISSION TEST RESULT .....	9
6.4 PHOTOGRAPH – CONDUCTED EMISSION TEST SETUP .....	12
<b>7 RADIATED SPURIOUS EMISSIONS .....</b>	<b>13</b>
7.1 EUT OPERATION : .....	13
7.2 MEASUREMENT UNCERTAINTY .....	13
7.3 TEST SETUP.....	14
7.4 SPECTRUM ANALYZER SETUP .....	15
7.5 TEST PROCEDURE.....	16
7.6 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	16
7.7 SUMMARY OF TEST RESULTS .....	16
7.8 PHOTOGRAPH – RADIATION SPURIOUS EMISSION TEST SETUP .....	26
<b>8 BAND EDGE MEASUREMENTS.....</b>	<b>27</b>
<b>9 20 DB BANDWIDTH MEASUREMENT.....</b>	<b>32</b>
9.1 TEST PROCEDURE:.....	32
9.2 TEST RESULT: .....	32
<b>10 MAXIMUM PEAK OUTPUT POWER .....</b>	<b>34</b>
10.1 TEST PROCEDURE:.....	34
10.2 TEST RESULT:.....	34
<b>11 HOPPING CHANNEL SEPARATION.....</b>	<b>35</b>
11.1 TEST PROCEDURE:.....	35
11.2 TEST RESULT:.....	35
<b>12 NUMBER OF HOPPING FREQUENCY .....</b>	<b>38</b>
12.1 TEST PROCEDURE:.....	38
12.2 TEST RESULT:.....	38
<b>13 DWELL TIME .....</b>	<b>39</b>
13.1 TEST PROCEDURE:.....	39
13.2 TEST RESULT:.....	39
<b>14 ANTENNA REQUIREMENT .....</b>	<b>46</b>
<b>15 RF EXPOSURE .....</b>	<b>47</b>

The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

15.1 REQUIMENTS: ..... 47

15.2 MEASUREMENT RESULT: ..... 47

**16 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS..... 48**

16.1 PRODUCT VIEW ..... 48

16.2 EUT – APPEARANCE VIEW ..... 48

16.3 EUT – OPEN VIEW ..... 49

16.4 EUT – PCB1 VIEW ..... 50

16.5 EUT – PCB2 VIEW ..... 51

**17 FCC LABEL..... 53**

## 4 General Information

### 4.1 Client Information

**Applicant** : iLUV Creative Technology  
**Address of Applicant** : Harbor Park Drive, Port Washington, NY11050, USA

**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 Speaker  
**Model No.** : iSP245, iSP245SIL, iSP245BLK  
**Difference Description** : All models are exactly the same except for different color and appearance.

### 4.3 Details of E.U.T.

**Technical Data** : Internal Li-ion Battery: 3.7V  
Charging Voltage: DC 5.0V  
**Operation Frequency** : 2402MHz ~ 2480MHz  
**Antenna Gain** : 0dBi

### 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 Speaker. 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	SCHWARZECK MESS-ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Broad-band Horn Antenna	SCHWARZECK 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	SCHWARZECK 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	SCHWARZECK MESS-ELEKTROM / AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
10m 50 Ohm Coaxial Cable	SCHWARZECK 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	SUNSPON/ 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 RFelectricity 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

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## 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 dB $\mu$ V between 0.15MHz & 0.5MHz 56 dB $\mu$ V between 0.5MHz & 5MHz 60 dB $\mu$ V 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 charging mode.

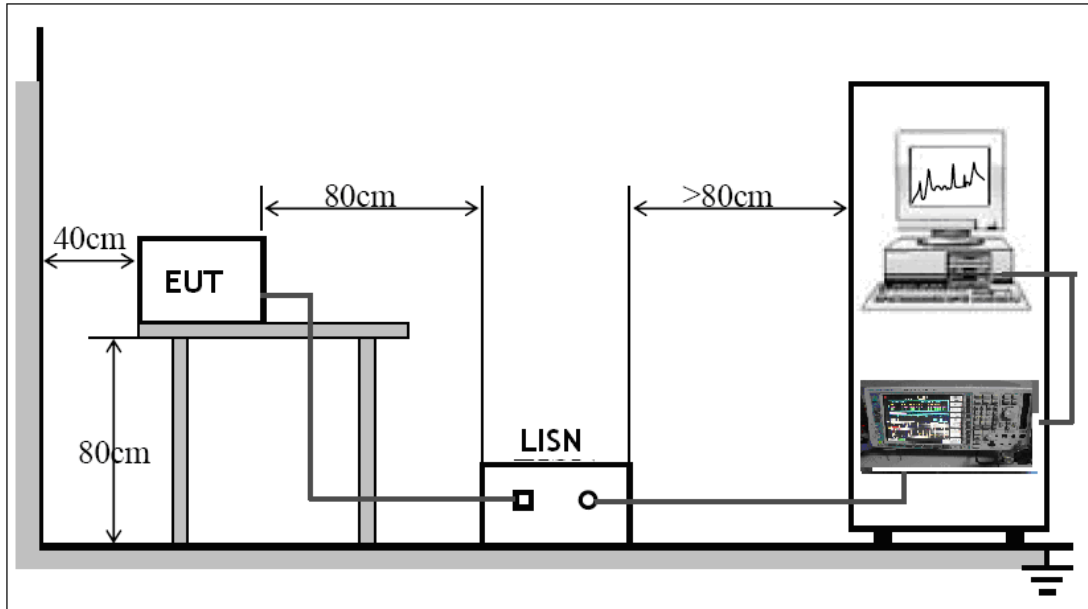
The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.

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.

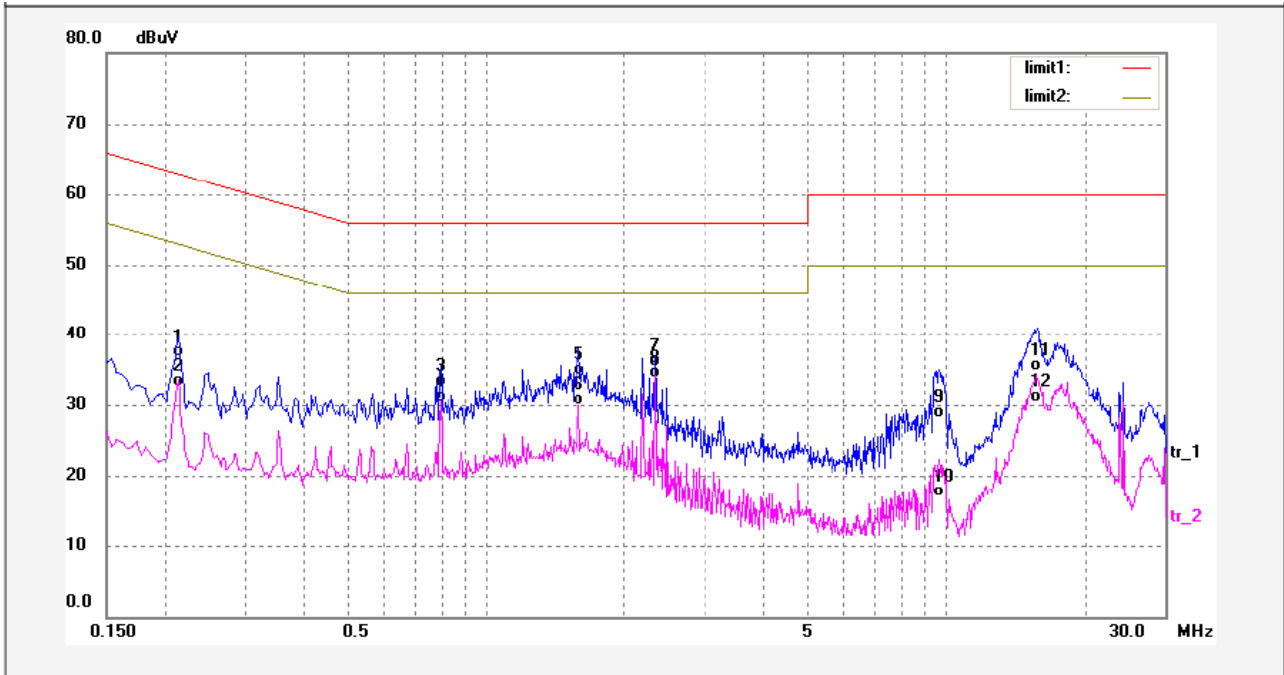


The EUT was placed on the test table in shielding room

## 6.3 Conducted Emission Test Result

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

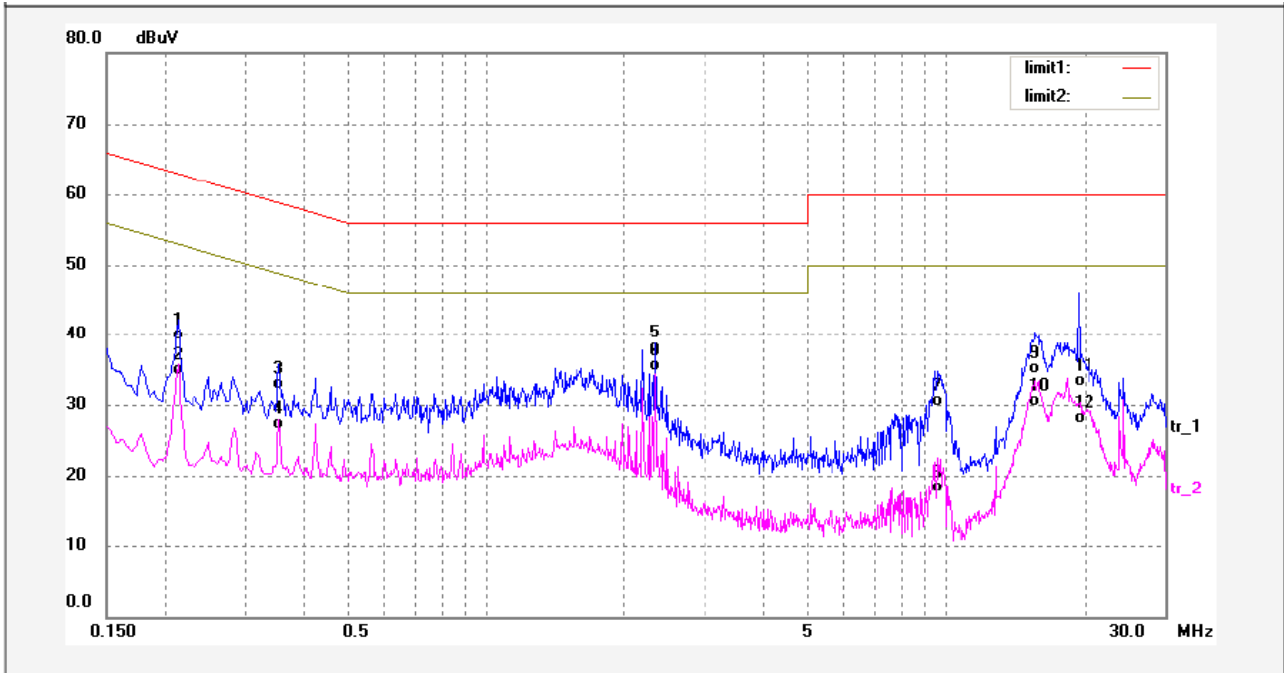
Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2140	26.12	10.66	36.78	63.04	-26.26	QP	
2	0.2140	21.81	10.66	32.47	53.04	-20.57	AVG	
3	0.7980	20.40	12.17	32.57	56.00	-23.43	QP	
4	0.7980	18.15	12.17	30.32	46.00	-15.68	AVG	
5	1.5940	21.91	12.20	34.11	56.00	-21.89	QP	
6	1.5940	17.70	12.20	29.90	46.00	-16.10	AVG	
7	2.3380	23.07	12.26	35.33	56.00	-20.67	QP	
8	2.3380	21.50	12.26	33.76	46.00	-12.24	AVG	
9	9.6779	16.09	11.92	28.01	60.00	-31.99	QP	
10	9.6779	4.99	11.92	16.91	50.00	-33.09	AVG	
11	15.8019	22.64	12.14	34.78	60.00	-25.22	QP	
12	15.8019	18.09	12.14	30.23	50.00	-19.77	AVG	

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Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.2140	28.49	10.66	39.15	63.04	-23.89	QP	
2	0.2140	23.37	10.66	34.03	53.04	-19.01	AVG	
3	0.3540	21.45	10.74	32.19	58.87	-26.68	QP	
4	0.3540	15.85	10.74	26.59	48.87	-22.28	AVG	
5	2.3380	25.10	12.26	37.36	56.00	-18.64	QP	
6	2.3380	22.48	12.26	34.74	46.00	-11.26	AVG	
7	9.4980	17.78	11.90	29.68	60.00	-30.32	QP	
8	9.4980	5.66	11.90	17.56	50.00	-32.44	AVG	
9	15.6860	22.26	12.13	34.39	60.00	-25.61	QP	
10	15.6860	17.52	12.13	29.65	50.00	-20.35	AVG	
11	19.4740	20.24	12.27	32.51	60.00	-27.49	QP	
12	19.4740	15.02	12.27	27.29	50.00	-22.71	AVG	

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#### 6.4 Photograph – Conducted Emission Test Setup



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WALTEK SERVICES

Reference No.: WT12021140-D-S-F

## 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

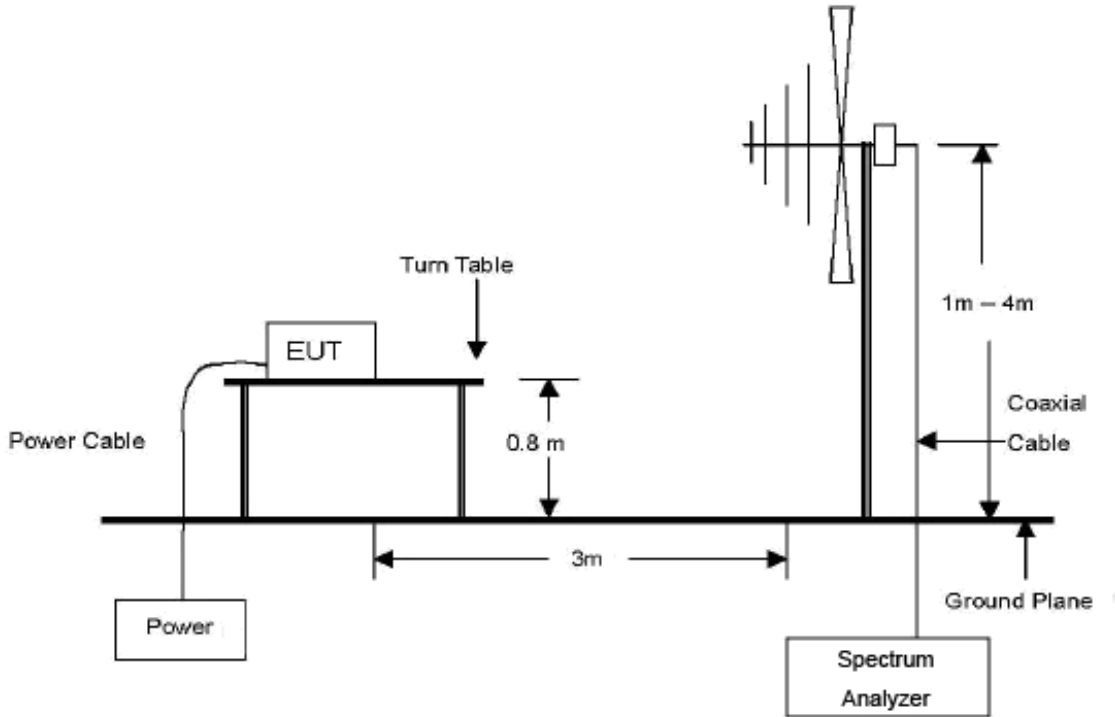
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor 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  $\pm 5.03$ dB.

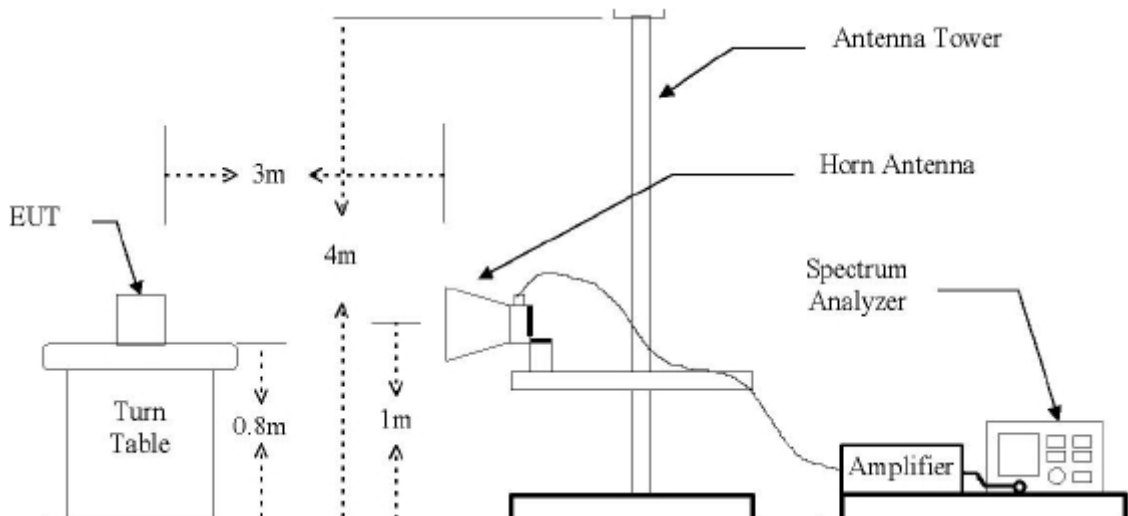
**7.3 Test Setup**

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.



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## 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:

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

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

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

## 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.

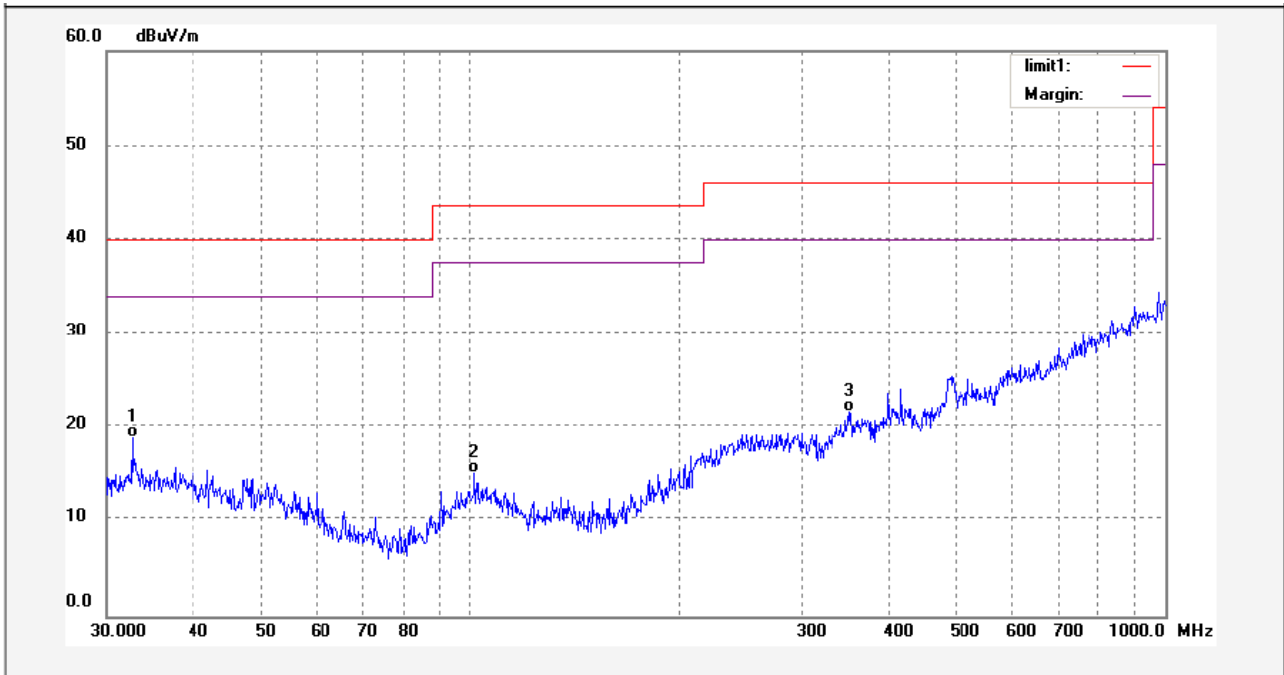


**Test mode: continuously receive mode**

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

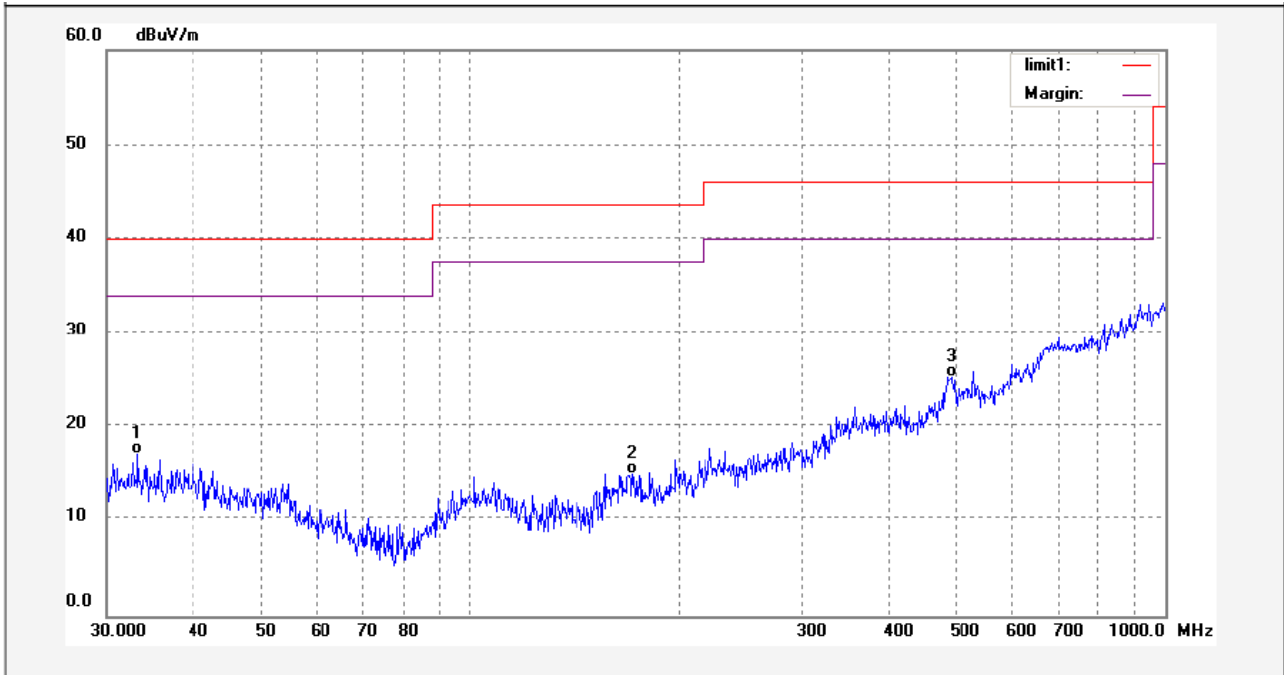
Antenna polarization: Vertical



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	

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Antenna polarization: Horizontal



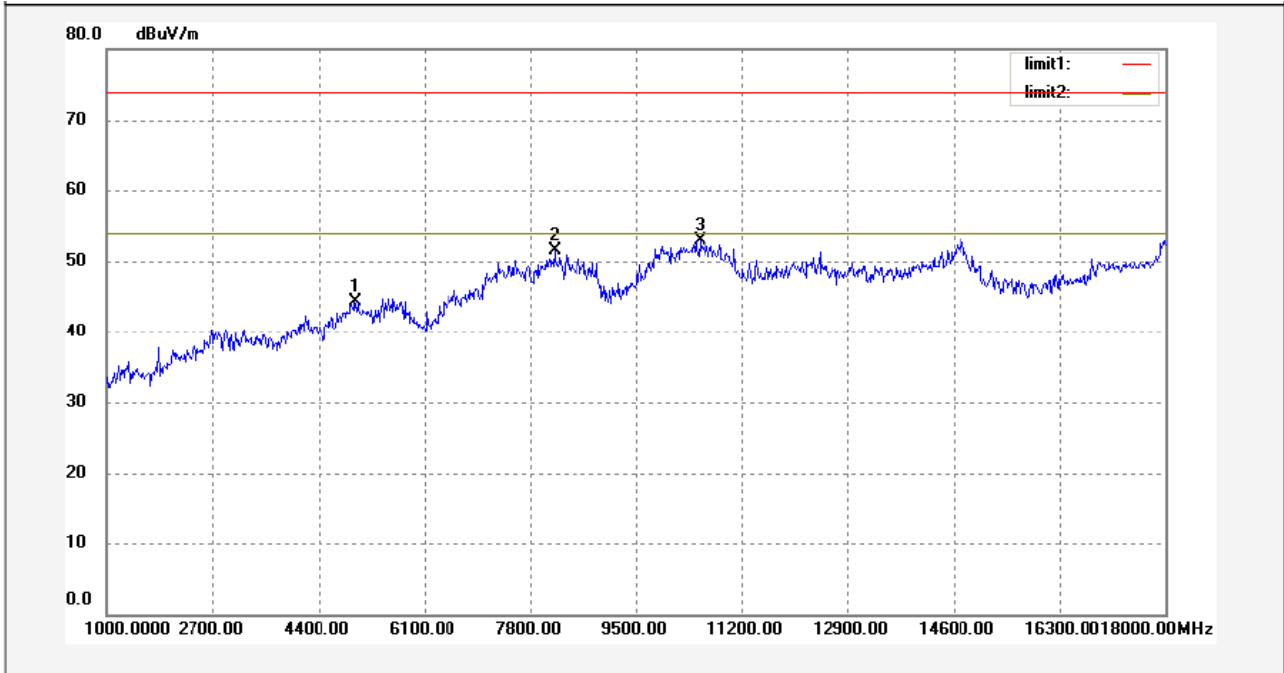
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.2180	0.55	16.56	17.11	40.00	-22.89	QP	
2	171.3890	2.97	12.15	15.12	43.50	-28.38	QP	
3	491.7700	0.04	25.29	25.33	46.00	-20.67	QP	

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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.

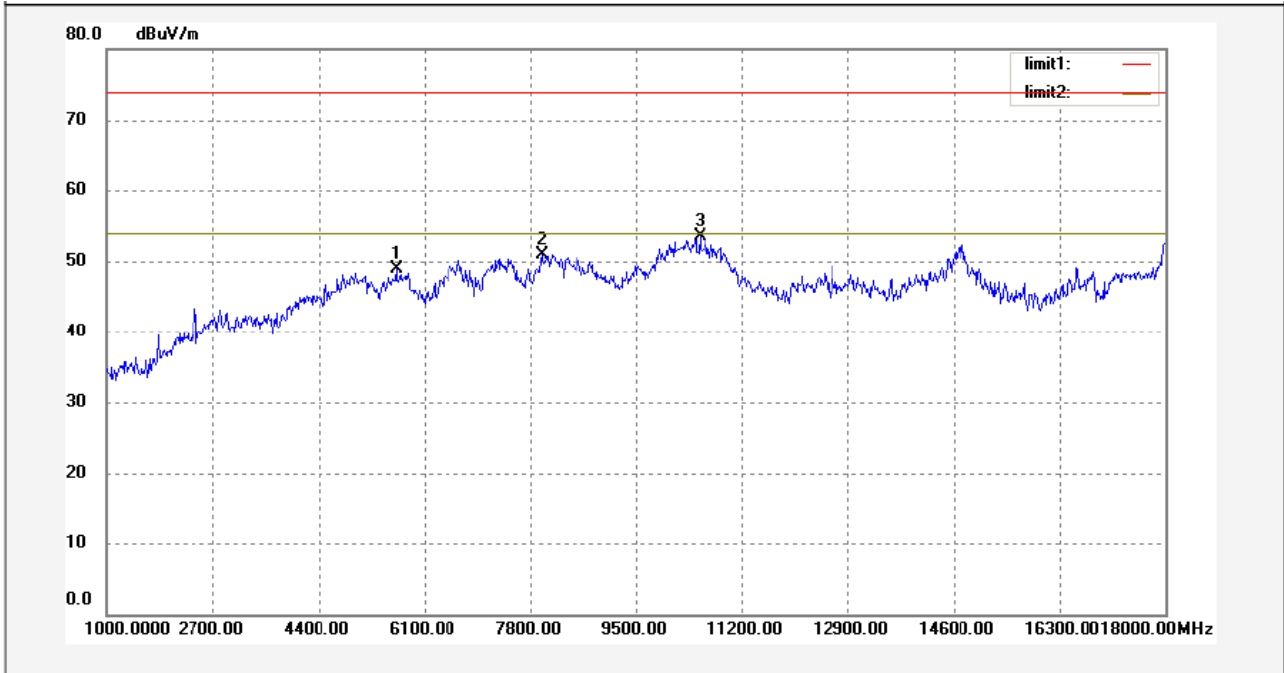
Antenna polarization: Vertical



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	

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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	

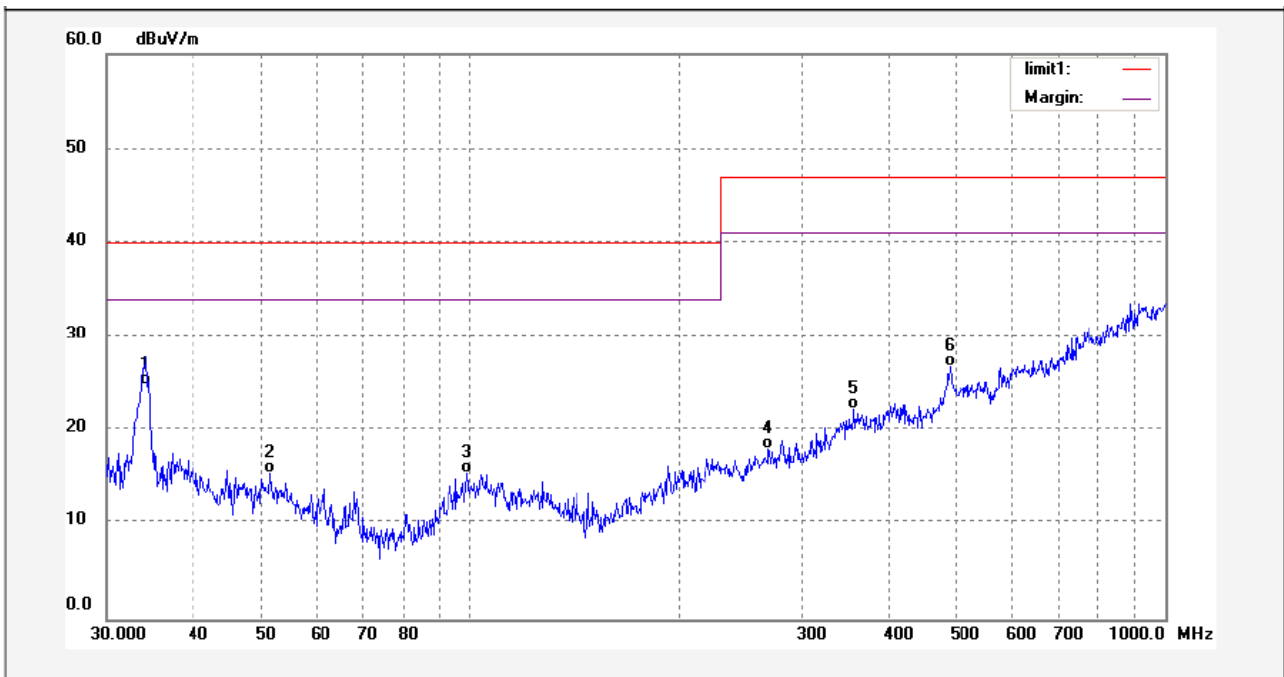
The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

**Test mode: continuously transmit mode**

Remark: The pre-test was performed 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

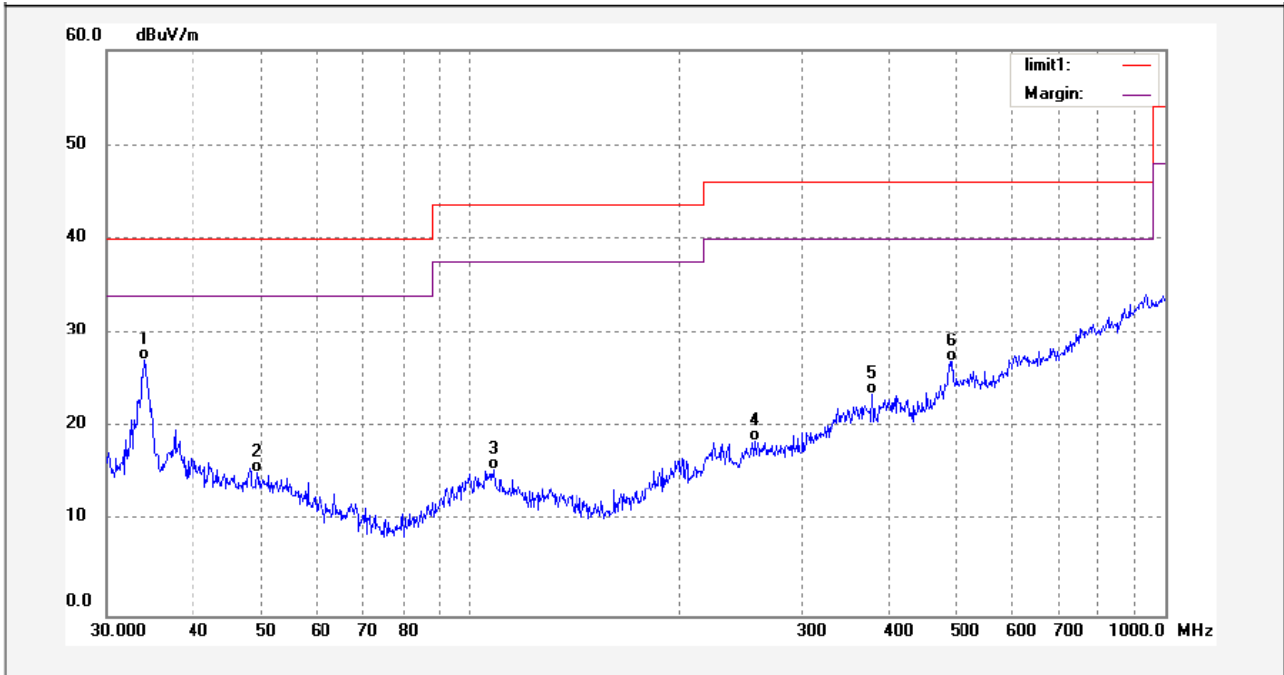
Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	34.1649	8.36	16.52	24.88	40.00	-15.12	QP	
2	51.5365	0.99	14.52	15.51	40.00	-24.49	QP	
3	99.0690	1.65	13.83	15.48	40.00	-24.52	QP	
4	268.7212	1.31	16.70	18.01	47.00	-28.99	QP	
5	357.1925	1.74	20.59	22.33	47.00	-24.67	QP	
6	490.0451	1.08	25.75	26.83	47.00	-20.17	QP	

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Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	33.9256	10.57	16.54	27.11	40.00	-12.89	QP	
2	49.4087	0.63	14.60	15.23	40.00	-24.77	QP	
3	108.1648	1.55	13.93	15.48	43.50	-28.02	QP	
4	256.7230	2.47	16.09	18.56	46.00	-27.44	QP	
5	379.1780	3.50	20.05	23.55	46.00	-22.45	QP	
6	493.5009	2.15	24.83	26.98	46.00	-19.02	QP	

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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 (°)
<b>Low frequency</b>							
2402.00	AV	Vertical	94.11		(Fund.)	1.2	80
4804.00	AV	Vertical	38.43	54.00	-15.57	1.3	125
7206.00	AV	Vertical	39.22	54.00	-14.78	1.4	150
9608.00	AV	Vertical	35.64	54.00	-18.36	1.6	140
12010.00	AV	Vertical	33.23	54.00	-20.77	1.9	155
14412.00	AV	Vertical	35.24	54.00	-18.76	1.1	180
16814.00	AV	Vertical	34.49	54.00	-19.51	1.7	140
19216.00	AV	Vertical	29.41	54.00	-24.59	1.6	150
21618.00	AV	Vertical	26.65	54.00	-27.35	1.5	0
24020.00	AV	Vertical	29.73	54.00	-24.27	1.0	130
2402.00	AV	Horizontal	87.87		(Fund.)	1.5	50
4804.00	AV	Horizontal	35.32	54.00	-18.68	1.4	190
7206.00	AV	Horizontal	33.65	54.00	-20.35	1.5	70
9608.00	AV	Horizontal	36.20	54.00	-17.80	1.3	180
12010.00	AV	Horizontal	34.44	54.00	-19.56	1.4	90
14412.00	AV	Horizontal	31.29	54.00	-22.71	1.0	200
16814.00	AV	Horizontal	34.10	54.00	-19.90	1.8	120
19216.00	AV	Horizontal	26.61	54.00	-27.39	1.5	160
21618.00	AV	Horizontal	27.55	54.00	-26.45	1.2	140
24020.00	AV	Horizontal	26.17	54.00	-27.83	1.6	100
2402.00	PK	Vertical	105.22		(Fund.)	1.4	0
4804.00	PK	Vertical	57.28	74.00	-16.72	1.6	130
7206.00	PK	Vertical	58.22	74.00	-15.78	1.9	140
9608.00	PK	Vertical	54.95	74.00	-19.05	1.1	250
12010.00	PK	Vertical	51.31	74.00	-22.69	1.2	70
14412.00	PK	Vertical	52.60	74.00	-21.40	1.3	140
16814.00	PK	Vertical	49.41	74.00	-24.59	1.3	165
19216.00	PK	Vertical	47.69	74.00	-26.31	1.0	200
21618.00	PK	Vertical	45.47	74.00	-28.53	2.0	80
24020.00	PK	Vertical	46.62	74.00	-27.38	1.1	150
2402.00	PK	Horizontal	99.57		(Fund.)	1.8	100
4804.00	PK	Horizontal	55.59	74.00	-18.41	1.9	180
7206.00	PK	Horizontal	53.34	74.00	-20.66	1.7	60
9608.00	PK	Horizontal	50.45	74.00	-23.55	1.0	70
12010.00	PK	Horizontal	52.43	74.00	-21.57	1.5	185
14412.00	PK	Horizontal	47.34	74.00	-26.66	1.2	70
16814.00	PK	Horizontal	53.44	74.00	-20.56	1.8	190
19216.00	PK	Horizontal	45.29	74.00	-28.71	1.6	140

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21618.00	PK	Horizontal	46.62	74.00	-27.38	1.1	150
24020.00	PK	Horizontal	48.39	74.00	-25.61	1.7	150
<b>Middle frequency</b>							
2441.00	AV	Vertical	93.46		(Fund.)	1.5	40
4882.00	AV	Vertical	40.95	54.00	-13.05	1.7	170
7323.00	AV	Vertical	39.16	54.00	-14.84	1.0	120
9764.00	AV	Vertical	35.07	54.00	-18.93	1.0	80
12205.00	AV	Vertical	39.66	54.00	-14.34	1.5	20
14646.00	AV	Vertical	33.48	54.00	-20.52	1.2	210
17087.00	AV	Vertical	35.28	54.00	-18.72	1.5	40
19528.00	AV	Vertical	32.07	54.00	-21.93	1.6	90
21969.00	AV	Vertical	30.20	54.00	-23.80	1.7	180
24410.00	AV	Vertical	34.29	54.00	-19.71	1.0	160
2441.00	AV	Horizontal	89.54		(Fund.)	1.4	170
4882.00	AV	Horizontal	37.42	54.00	-16.58	1.8	160
7323.00	AV	Horizontal	38.63	54.00	-15.37	1.5	280
9764.00	AV	Horizontal	33.54	54.00	-20.46	1.3	200
12205.00	AV	Horizontal	31.23	54.00	-22.77	1.1	180
14646.00	AV	Horizontal	35.13	54.00	-18.87	1.2	260
17087.00	AV	Horizontal	34.36	54.00	-19.64	1.9	155
19528.00	AV	Horizontal	29.04	54.00	-24.96	1.1	150
21969.00	AV	Horizontal	30.09	54.00	-23.91	1.2	190
24410.00	AV	Horizontal	28.27	54.00	-25.73	1.8	210
2441.00	PK	Vertical	104.95		(Fund.)	1.1	0
4882.00	PK	Vertical	62.18	74.00	-11.82	1.2	160
7323.00	PK	Vertical	60.29	74.00	-13.71	1.7	150
9764.00	PK	Vertical	56.15	74.00	-17.85	1.0	190
12205.00	PK	Vertical	59.39	74.00	-14.61	1.7	190
14646.00	PK	Vertical	52.06	74.00	-21.94	1.3	80
17087.00	PK	Vertical	55.31	74.00	-18.69	1.3	30
19528.00	PK	Vertical	50.12	74.00	-23.88	1.3	200
21969.00	PK	Vertical	54.11	74.00	-19.89	1.8	155
24410.00	PK	Vertical	47.17	74.00	-26.83	1.1	180
2441.00	PK	Horizontal	100.97		(Fund.)	1.6	40
4882.00	PK	Horizontal	57.25	74.00	-16.75	1.8	135
7323.00	PK	Horizontal	58.98	74.00	-15.02	1.5	90
9764.00	PK	Horizontal	53.09	74.00	-20.91	1.3	130
12205.00	PK	Horizontal	55.84	74.00	-18.16	1.7	200
14646.00	PK	Horizontal	51.24	74.00	-22.76	1.2	220
17087.00	PK	Horizontal	48.43	74.00	-25.57	1.1	130
19528.00	PK	Horizontal	51.12	74.00	-22.88	1.6	230
21969.00	PK	Horizontal	52.35	74.00	-21.65	1.0	30
24410.00	PK	Horizontal	47.03	74.00	-26.97	1.4	225
<b>High frequency</b>							

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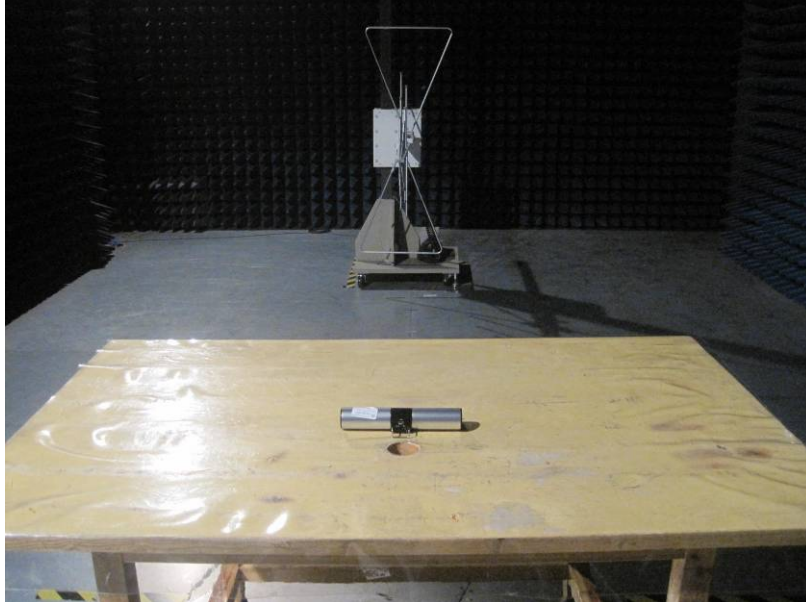


2480.00	AV	Vertical	94.45		(Fund.)	1.0	190
4960.00	AV	Vertical	41.22	54.00	-12.78	1.7	80
7440.00	AV	Vertical	40.18	54.00	-13.82	1.2	150
9920.00	AV	Vertical	38.66	54.00	-15.34	1.2	140
12400.00	AV	Vertical	37.22	54.00	-16.78	1.8	110
14880.00	AV	Vertical	40.76	54.00	-13.24	1.8	180
17360.00	AV	Vertical	34.15	54.00	-19.85	1.1	140
19840.00	AV	Vertical	31.44	54.00	-22.56	1.2	270
22320.00	AV	Vertical	38.21	54.00	-15.79	1.3	120
24800.00	AV	Vertical	30.17	54.00	-23.83	1.3	205
2480.00	AV	Horizontal	90.63		(Fund.)	1.4	170
4960.00	AV	Horizontal	39.51	54.00	-14.49	2.4	220
7440.00	AV	Horizontal	34.88	54.00	-19.12	1.2	130
9920.00	AV	Horizontal	35.45	54.00	-18.55	1.6	260
12400.00	AV	Horizontal	36.72	54.00	-17.28	1.1	165
14880.00	AV	Horizontal	33.27	54.00	-20.73	1.0	200
17360.00	AV	Horizontal	30.43	54.00	-23.57	1.7	200
19840.00	AV	Horizontal	33.06	54.00	-20.94	1.8	120
22320.00	AV	Horizontal	28.32	54.00	-25.68	1.3	130
24800.00	AV	Horizontal	29.17	54.00	-24.83	2.5	180
2480.00	PK	Vertical	104.63		(Fund.)	1.1	180
4960.00	PK	Vertical	60.75	74.00	-13.25	1.3	100
7440.00	PK	Vertical	57.18	74.00	-16.82	2.4	160
9920.00	PK	Vertical	59.64	74.00	-14.36	1.2	170
12400.00	PK	Vertical	54.74	74.00	-19.26	1.4	100
14880.00	PK	Vertical	61.29	74.00	-12.71	1.3	140
17360.00	PK	Vertical	55.32	74.00	-18.68	1.1	120
19840.00	PK	Vertical	56.19	74.00	-17.81	1.0	200
22320.00	PK	Vertical	54.51	74.00	-19.49	1.9	140
24800.00	PK	Vertical	48.13	74.00	-25.87	1.3	195
2480.00	PK	Horizontal	98.17		(Fund.)	1.7	220
4960.00	PK	Horizontal	57.14	74.00	-16.86	1.5	150
7440.00	PK	Horizontal	55.45	74.00	-18.55	1.4	120
9920.00	PK	Horizontal	56.27	74.00	-17.73	1.1	250
12400.00	PK	Horizontal	54.13	74.00	-19.87	1.5	140
14880.00	PK	Horizontal	48.32	74.00	-25.68	1.7	160
17360.00	PK	Horizontal	52.53	74.00	-21.47	1.9	160
19840.00	PK	Horizontal	47.20	74.00	-26.80	1.6	230
22320.00	PK	Horizontal	50.03	74.00	-23.97	2.2	150
24800.00	PK	Horizontal	45.41	74.00	-28.59	1.7	270

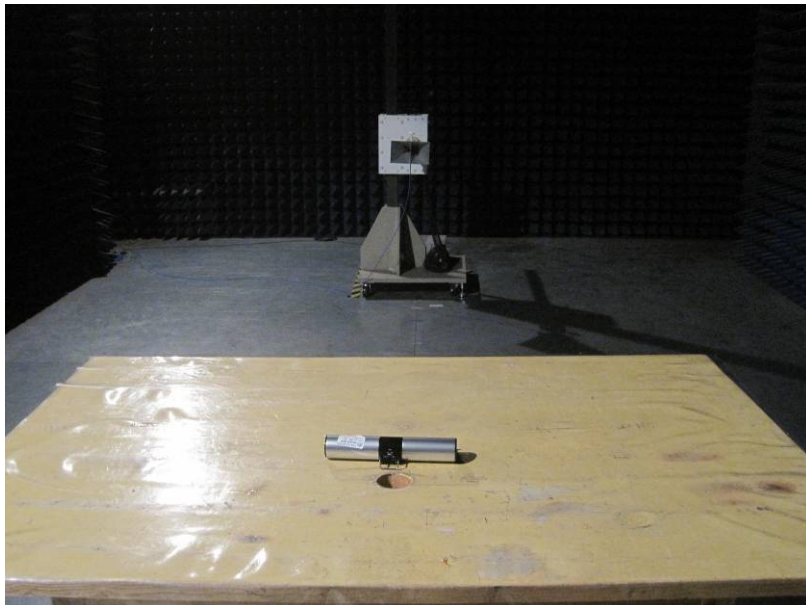
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### 7.8 Photograph – Radiation Spurious Emission Test Setup

Below 1GHz



Above 1GHz

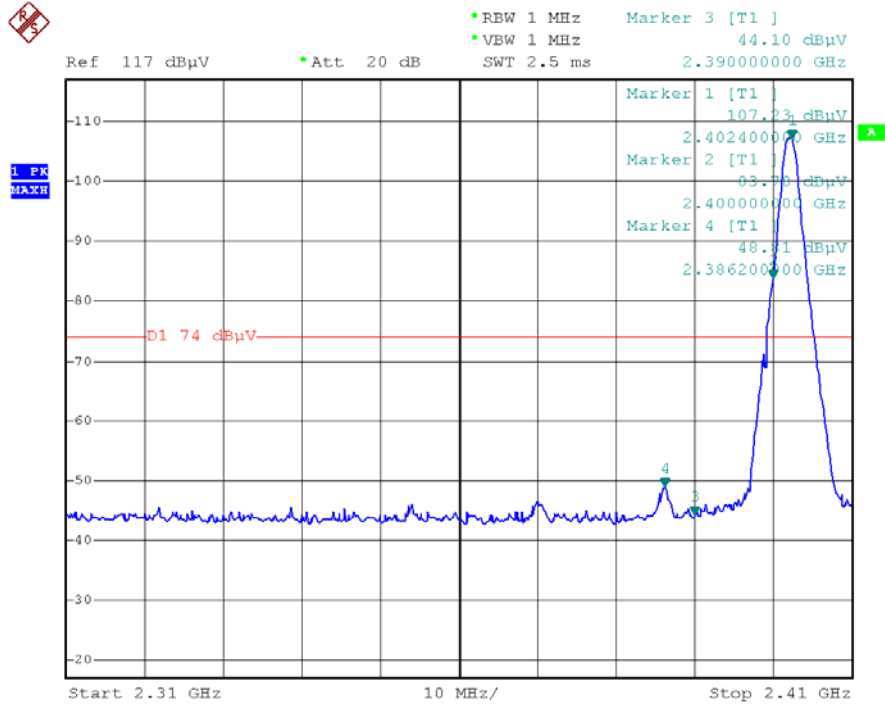


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## 8 Band Edge Measurements

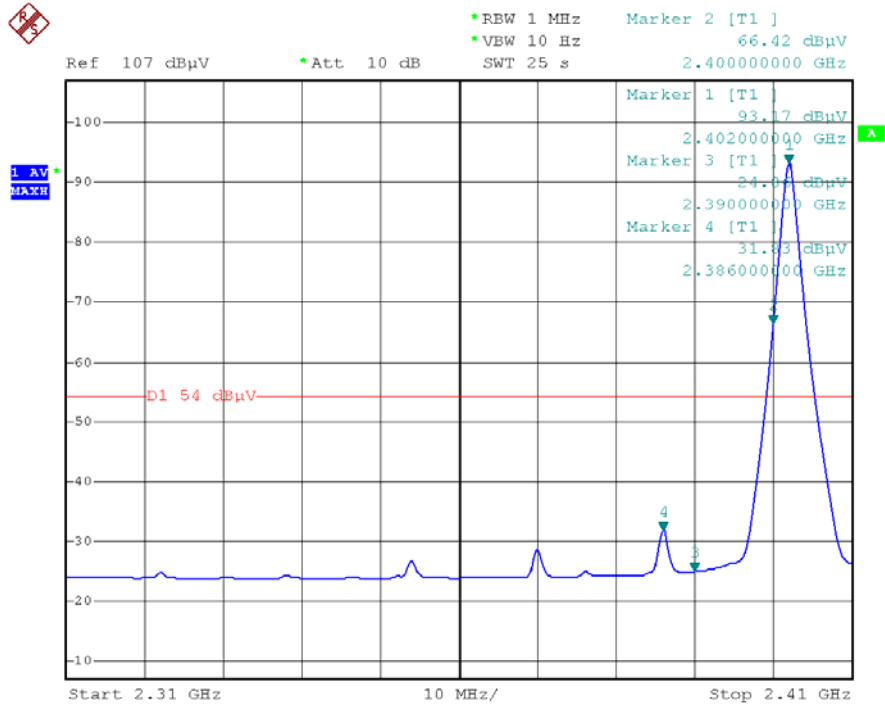
Test Requirement:	Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).
Test Method:	Based on DA 00-705
Measurement Distance:	3m
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 $f \geq 1$ GHz VBW $\geq$ RBW; Sweep = auto Detector function = peak Trace = max hold For AVG value: RBW = 1 MHz for $f \geq 1$ GHz VBW = 10Hz; Sweep = auto Detector function = AVG Trace = max hold

**Test Result:**  
**Low Channel – Peak**



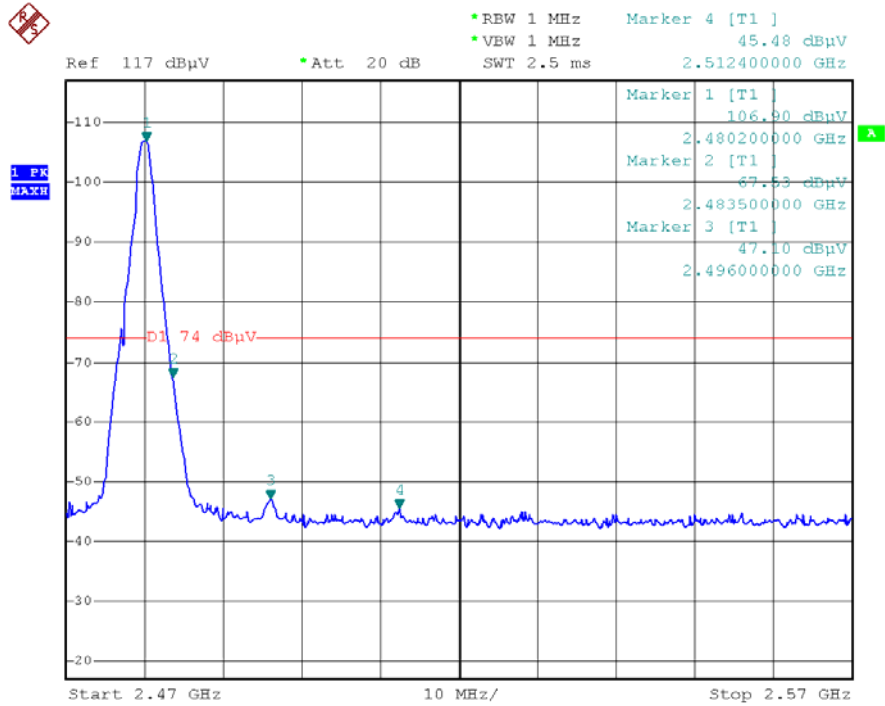
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Low Channel – AV



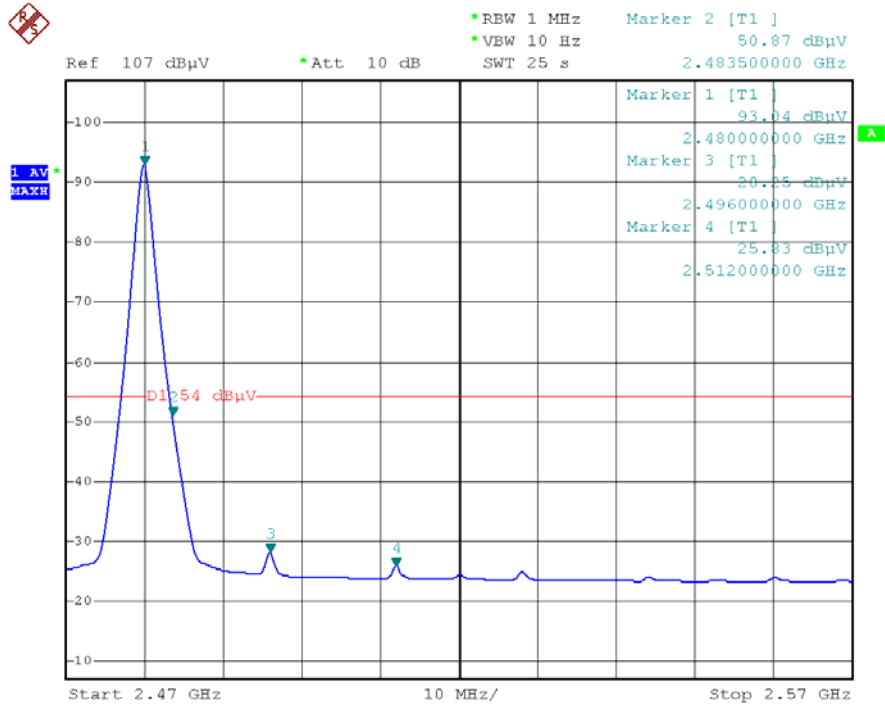
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### High Channel – Peak



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### High Channel – AV



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## 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:

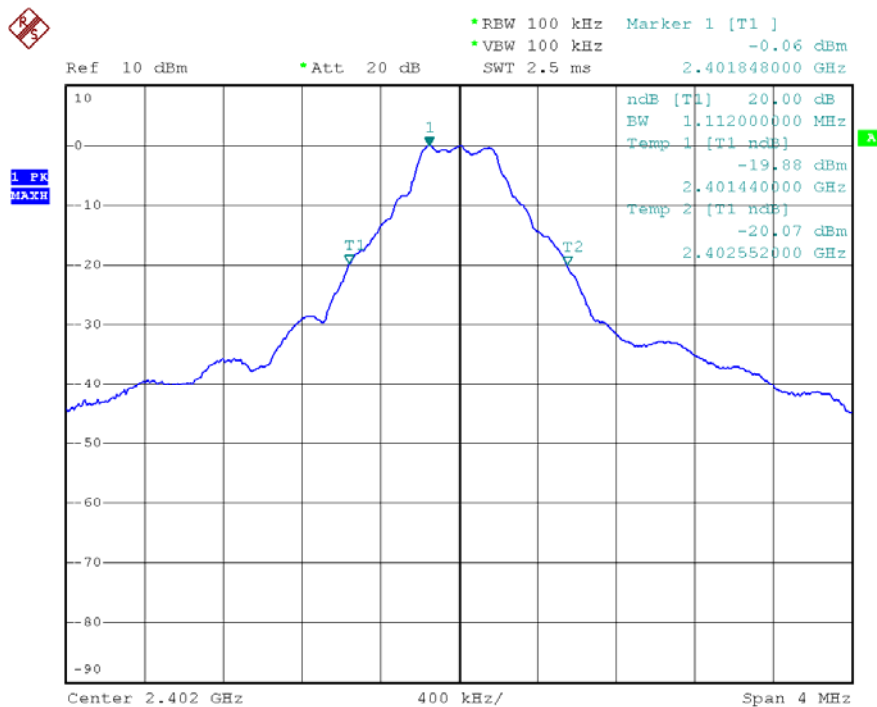
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: Span = 4MHz, RBW = 100kHz, VBW = 100kHz

### 9.2 Test Result:

Test Channel	Bandwidth
Low	1.112MHz
Middle	1.112MHz
High	1.112MHz

Test result plot as follows:

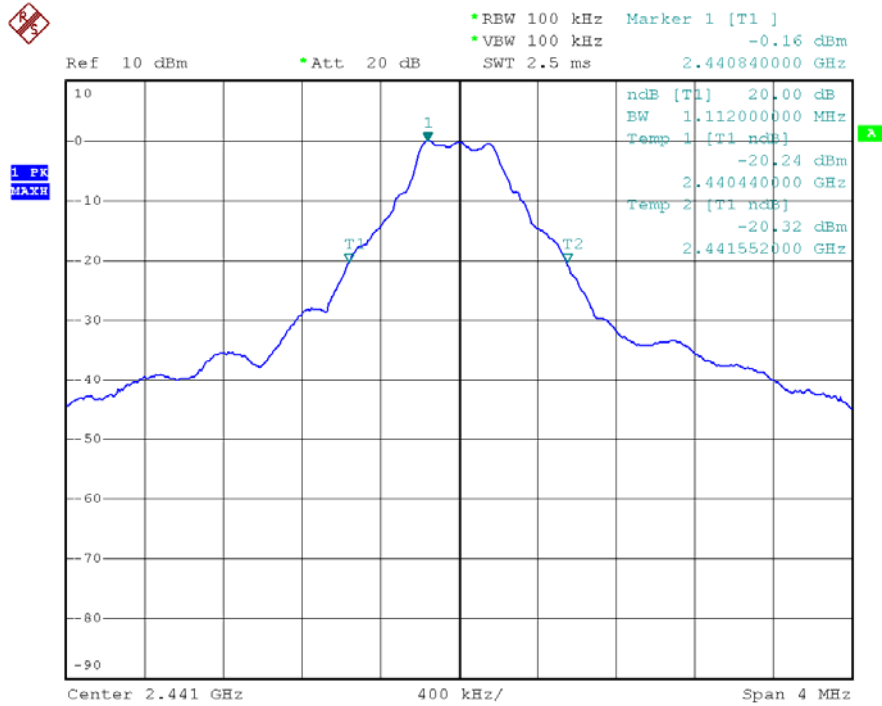
Low Channel



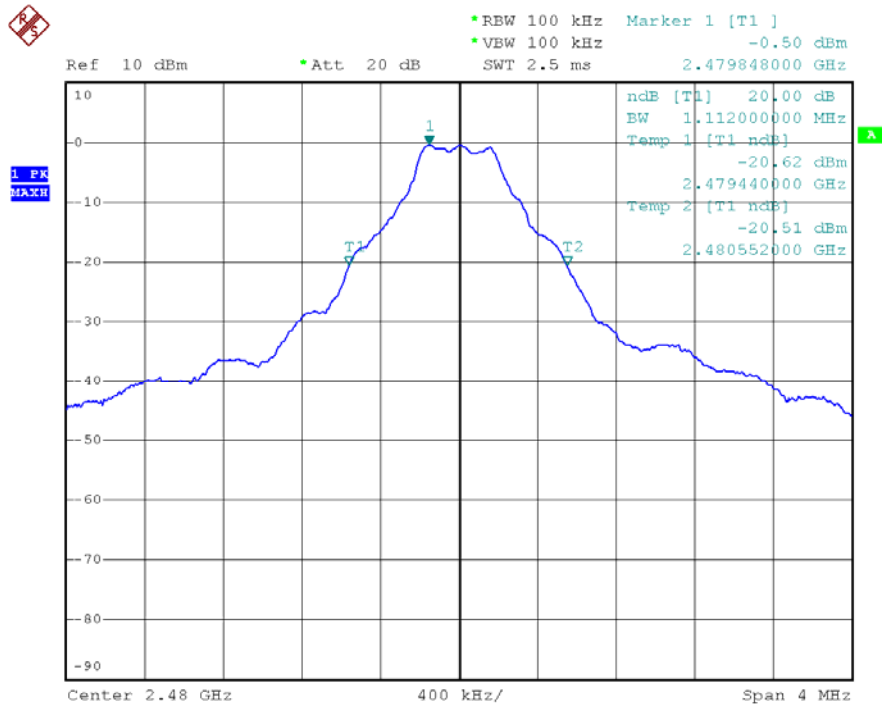
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Middle Channel



High Channel



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## 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 1 watts (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	0.26	30
Middle	0.22	30
High	-0.06	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:

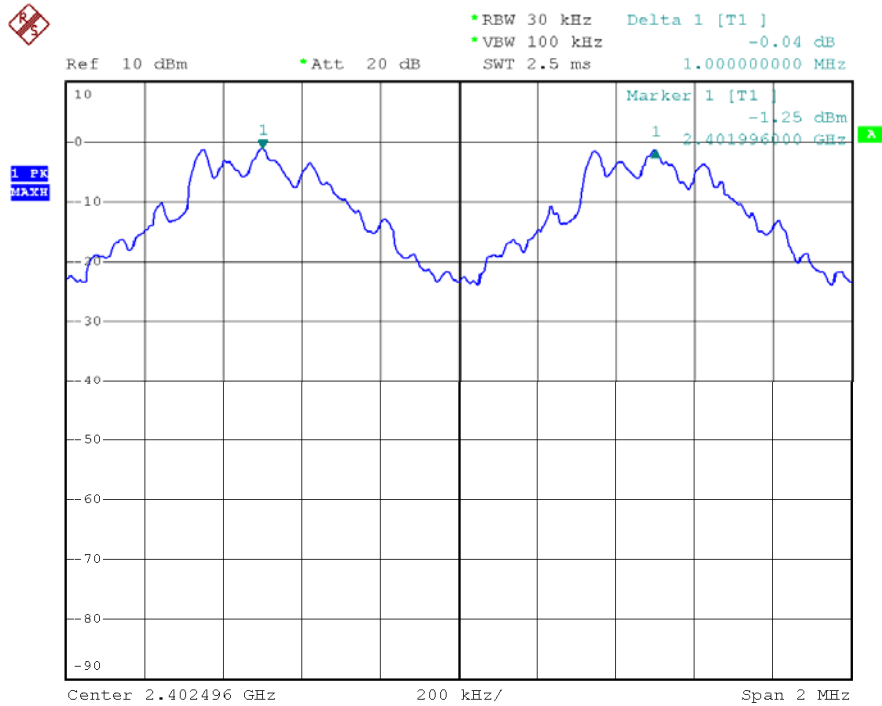
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 30kHz. VBW = 100kHz , Span = 2MHz. Sweep = auto; Detector Function = Peak. Trace = Max hold.
3. Allow the trace to stabilize. Use the marker-delta function to 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:

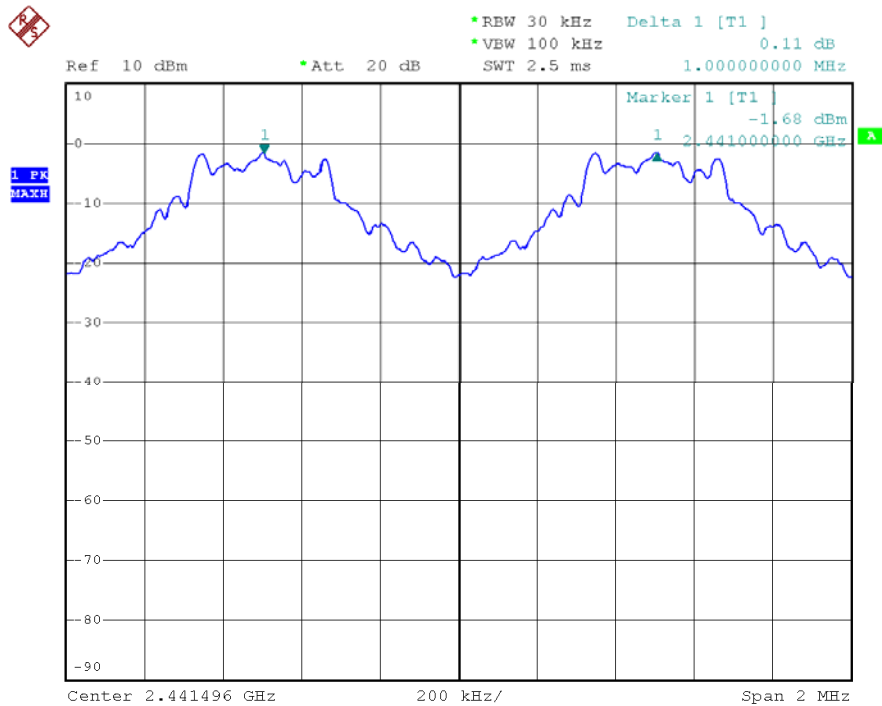
Test Channel	Separation (MHz)	Result
Low	1.000	PASS
Middle	1.000	PASS
High	1.004	PASS

Test result plot as follows:

Low Channel:

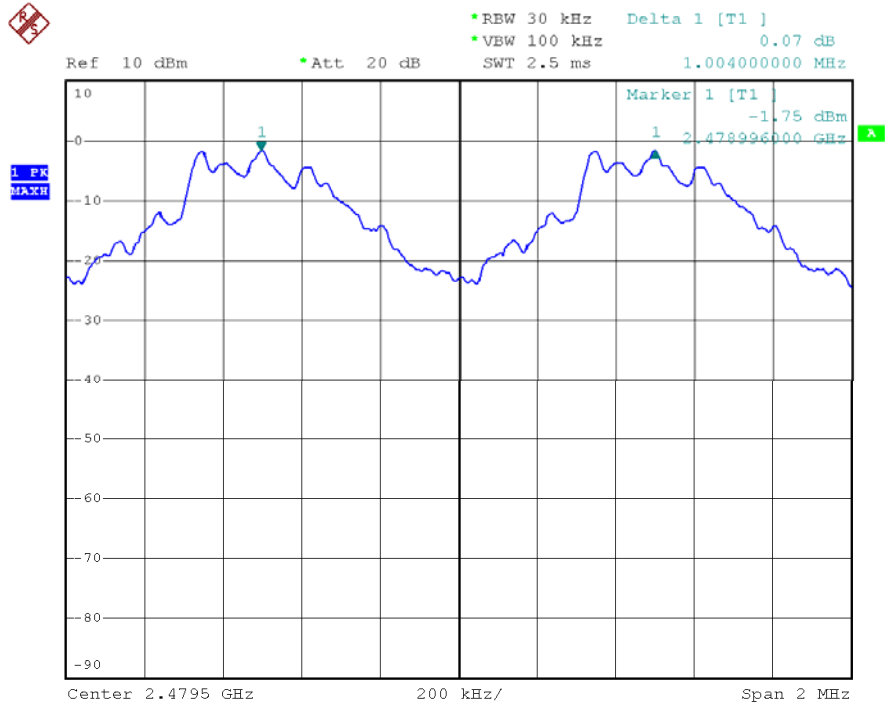


Middle Channel



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High Channel



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## 12 Number of Hopping Frequency

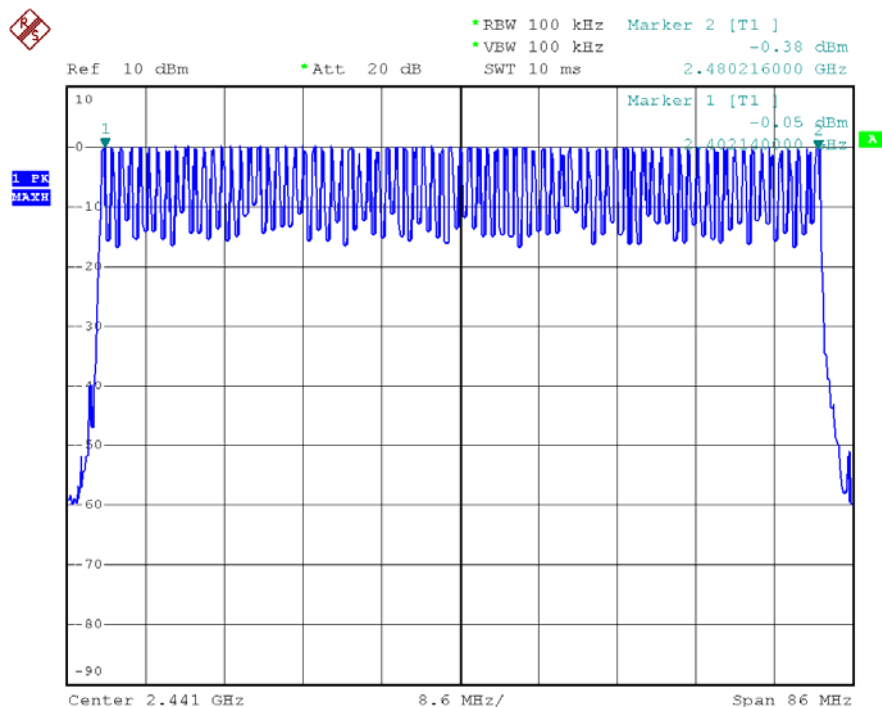
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

### 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



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### 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:

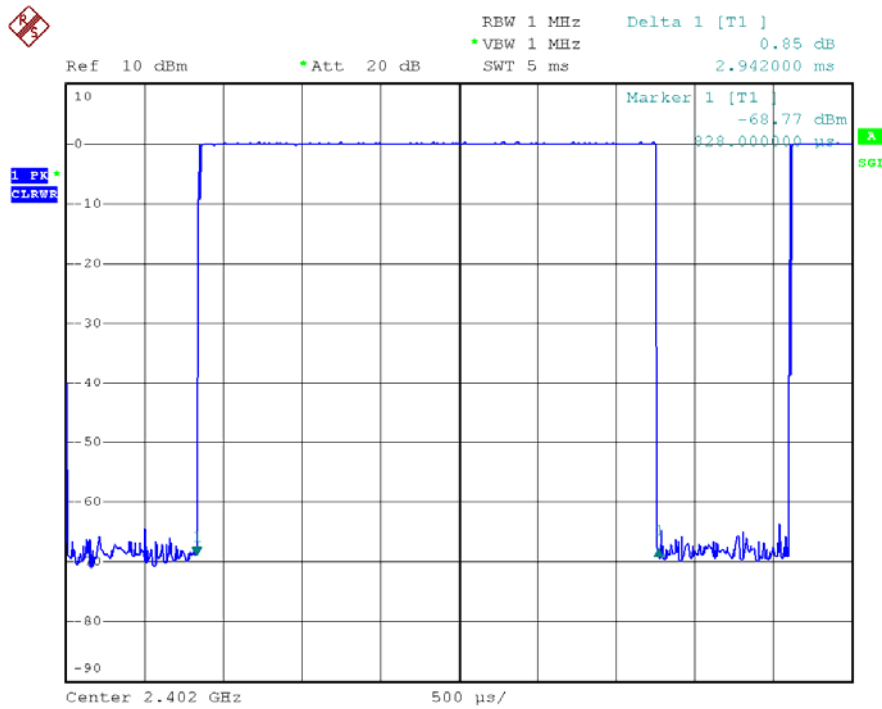
Data Packet	Dwell Time(s)
DH5	$1600/79/6*31.6*(MkrDelta)/1000$
DH3	$1600/79/4*31.6*(MkrDelta)/1000$
DH1	$1600/79/2*31.6*(MkrDelta)/1000$

**Note** : Mkr Delta is once pulse time .

**Low Channel: 2402MHz**

Dwell time of each occupation in this channel as follows:

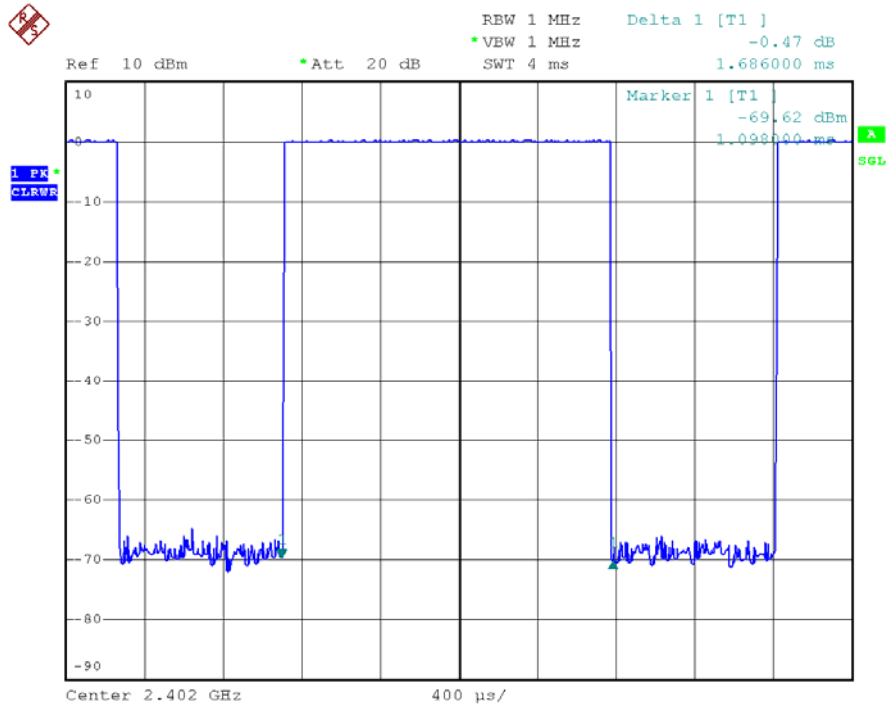
Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2402 MHz	2.942	0.314	0.400	Pass
DH3	2402 MHz	1.686	0.270	0.400	Pass
DH1	2402 MHz	0.414	0.132	0.400	Pass



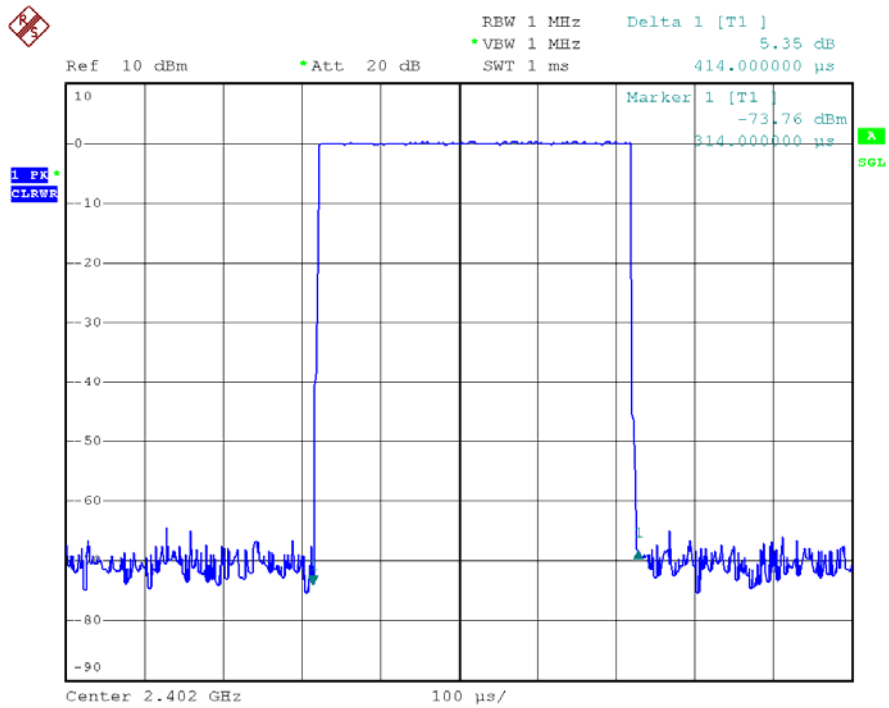
(DH5)

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(DH3)



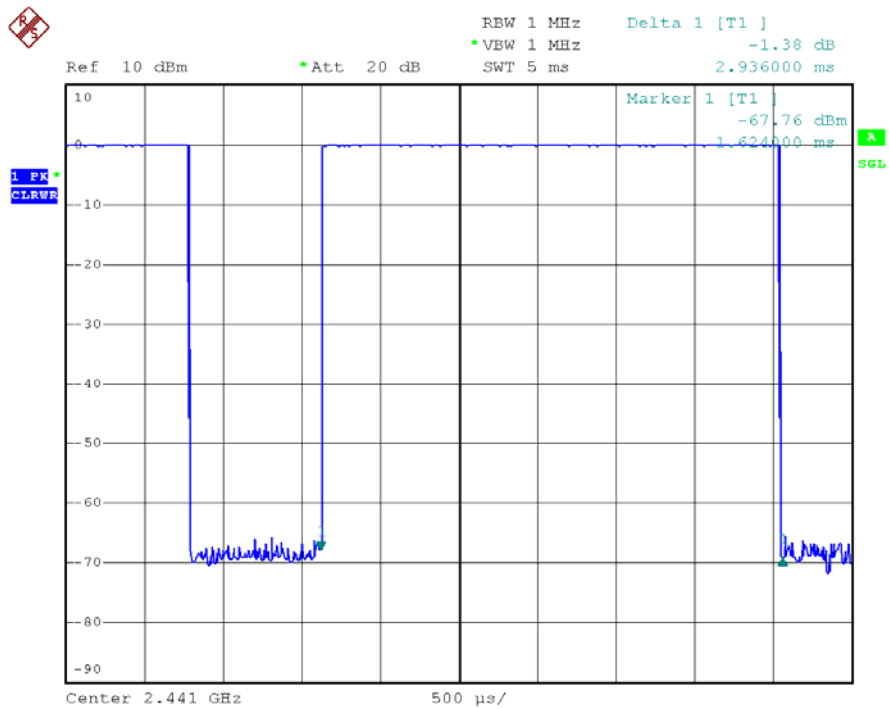
(DH1)

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**Middle Channel: 2441MHz**

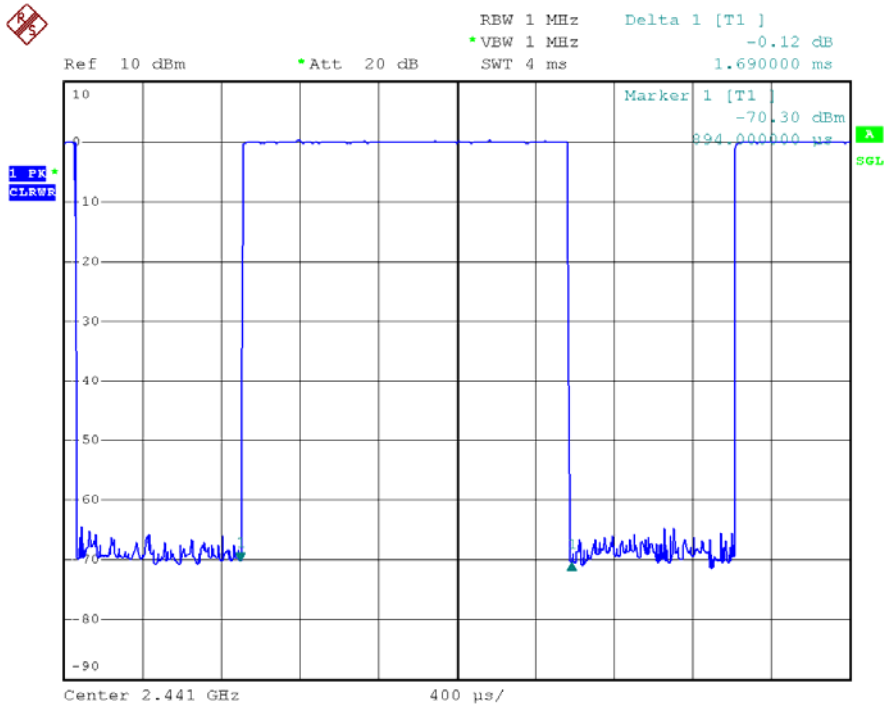
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2441 MHz	2.936	0.313	0.400	Pass
DH3	2441 MHz	1.690	0.270	0.400	Pass
DH1	2441 MHz	0.422	0.135	0.400	Pass

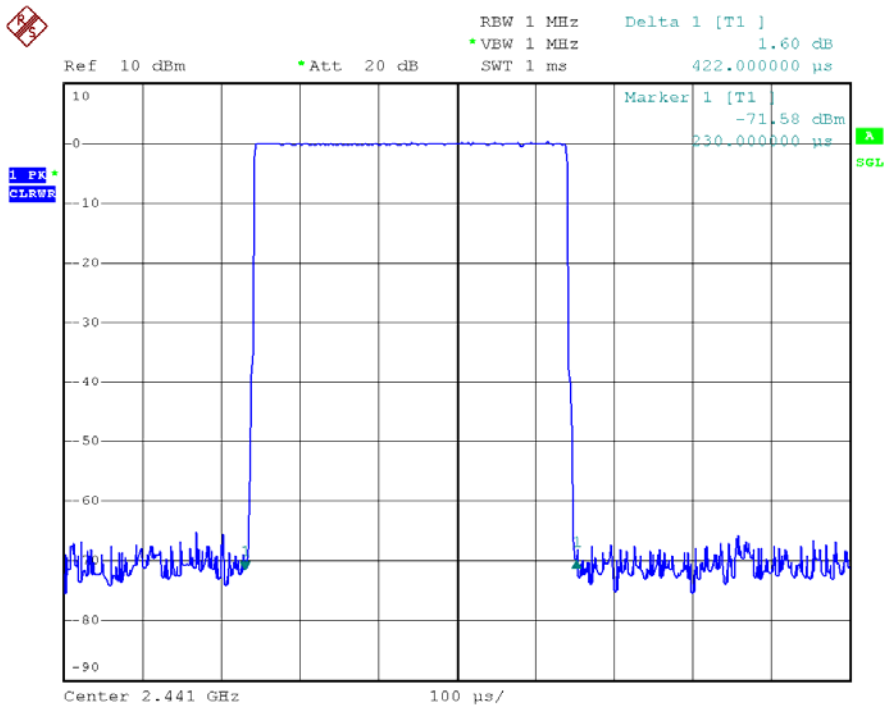


(DH5)

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(DH3)



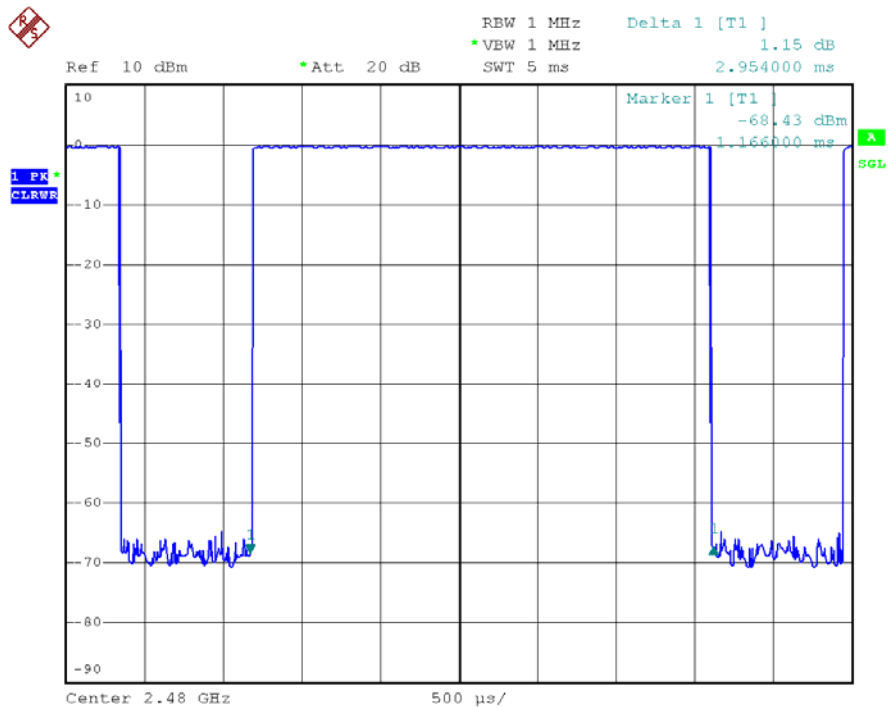
(DH1)

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**High Channel: 2480MHz**

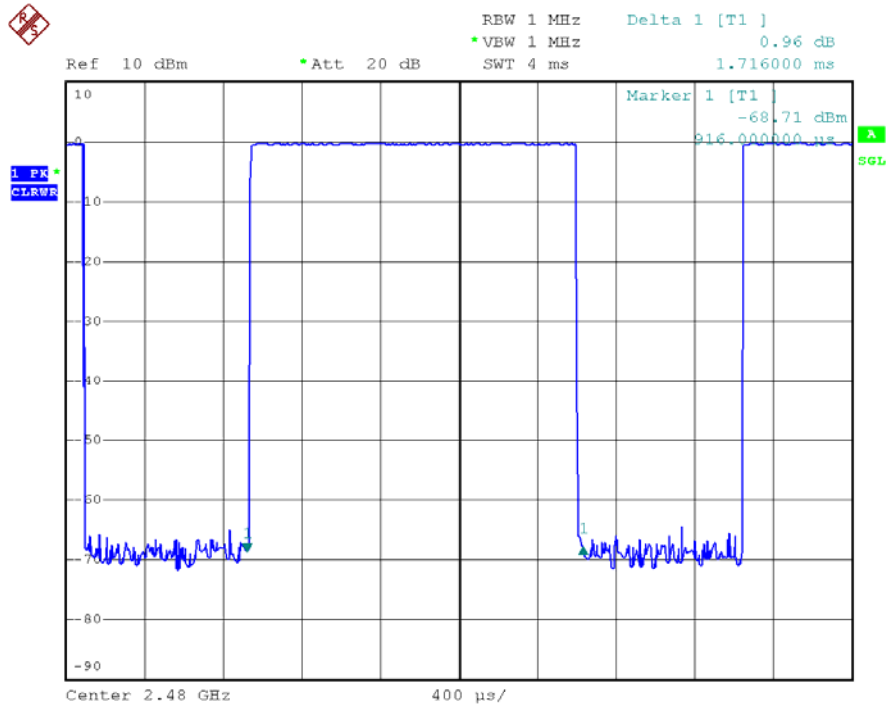
Dwell time of each occupation in this channel as follows:

Data Packet	Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
DH5	2480 MHz	2.954	0.315	DH5	Pass
DH3	2480 MHz	1.716	0.275	DH3	Pass
DH1	2480 MHz	0.418	0.134	DH1	Pass

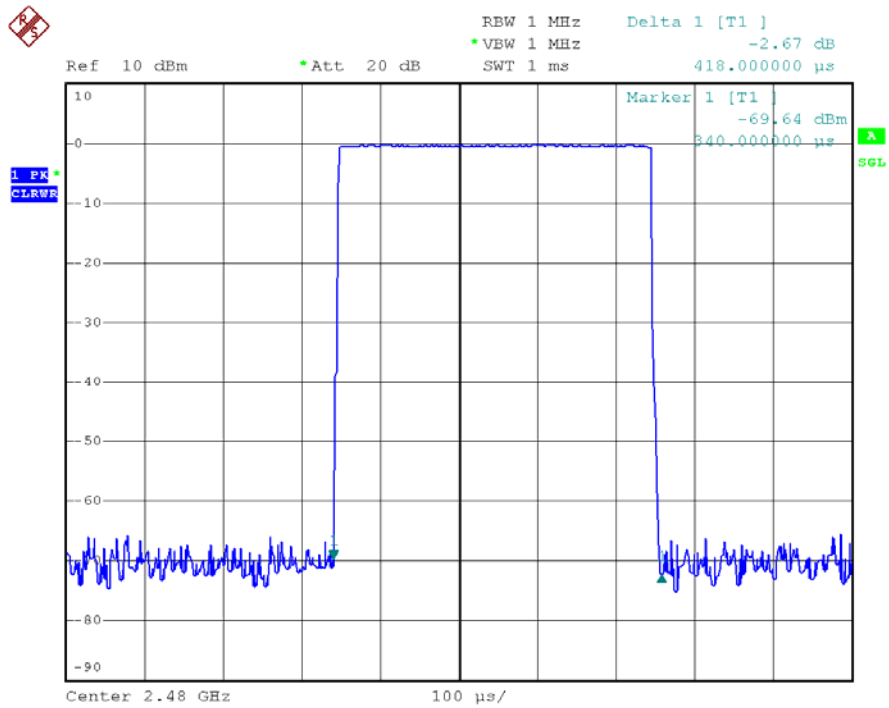


(DH5)

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(DH3)



(DH1)

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## **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 Requirments:

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	0.26	1.062	1.062
0	1	0.22	1.052	1.052
0	1	-0.06	0.986	0.986

The EUT works on the 2.4G ISM band, and the max output power (conducted) of which is 1.062 mW lower than low threshold 60/f (GHz) mW (24.48mW),  $d < 2.5\text{cm}$  in general population category.

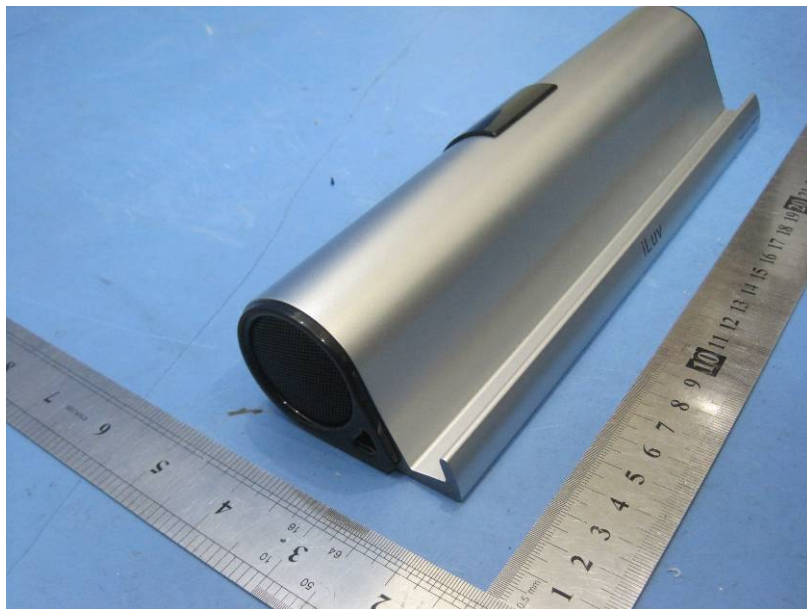
The SAR evaluation is not required.

## 16 Photographs - Constructional Details

### 16.1 Product View



### 16.2 EUT – Appearance View

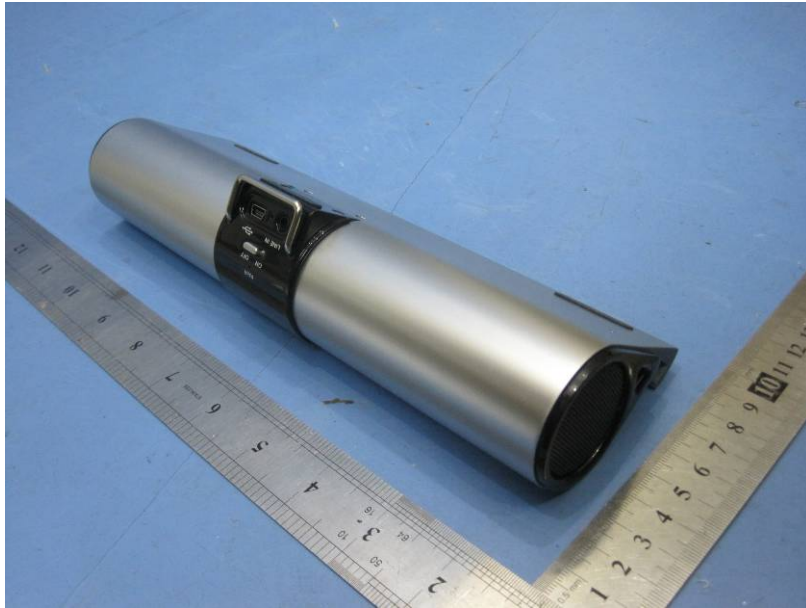


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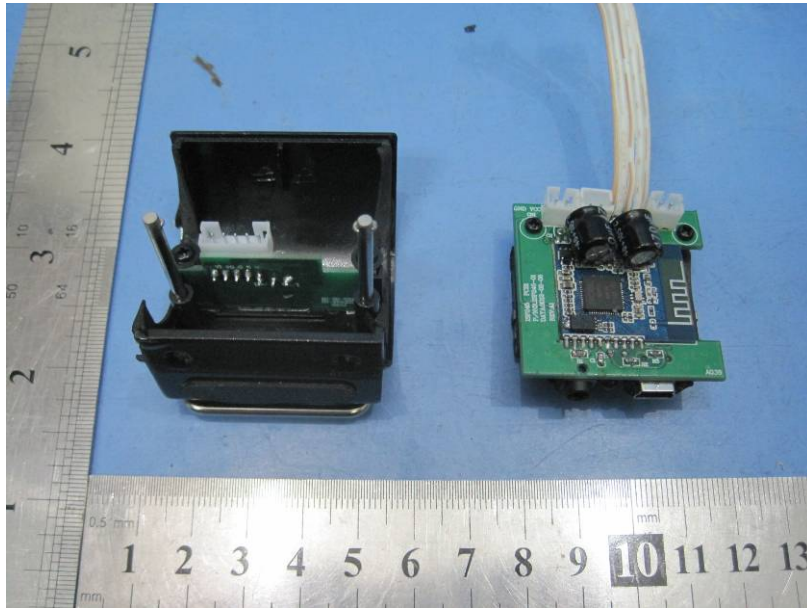
Reference No.: WT12021140-D-S-F



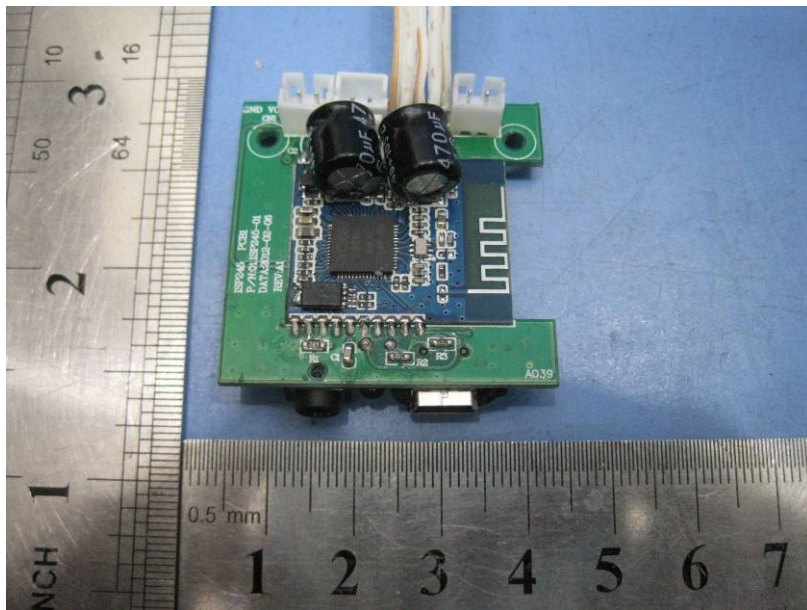


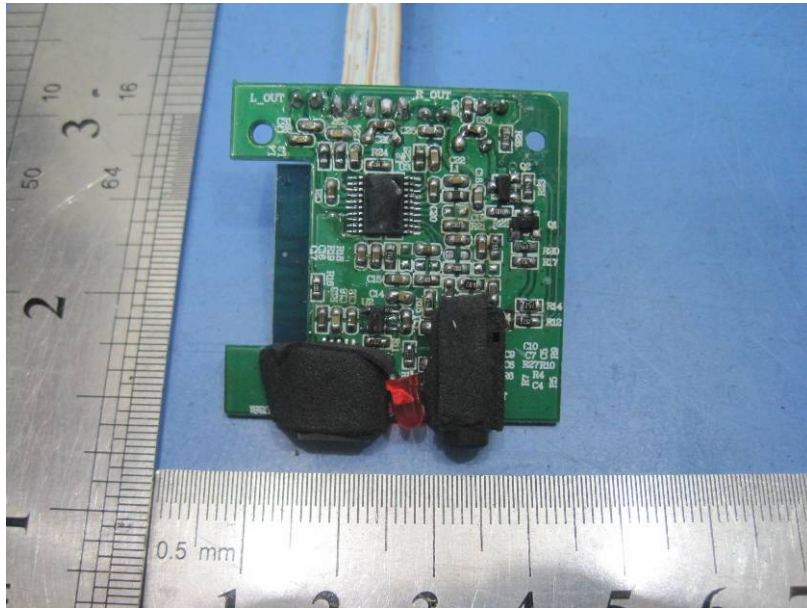
### 16.3 EUT – Open View



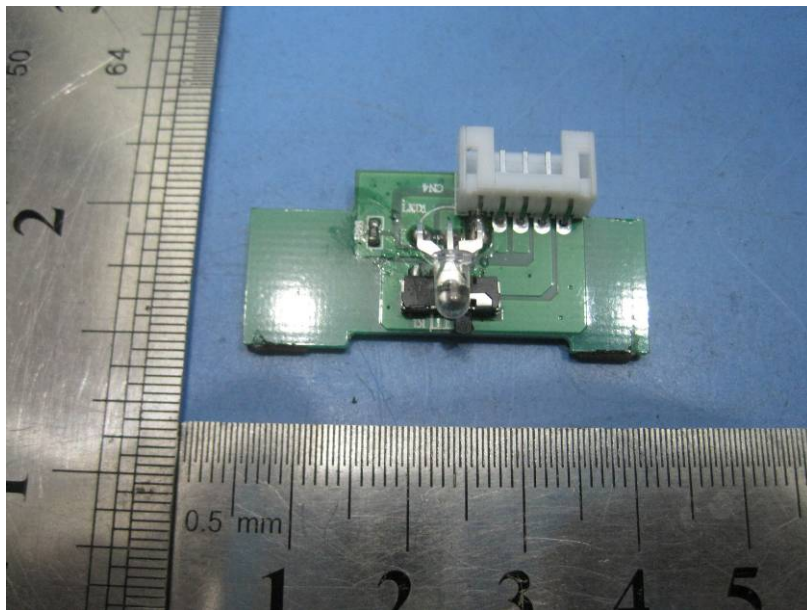


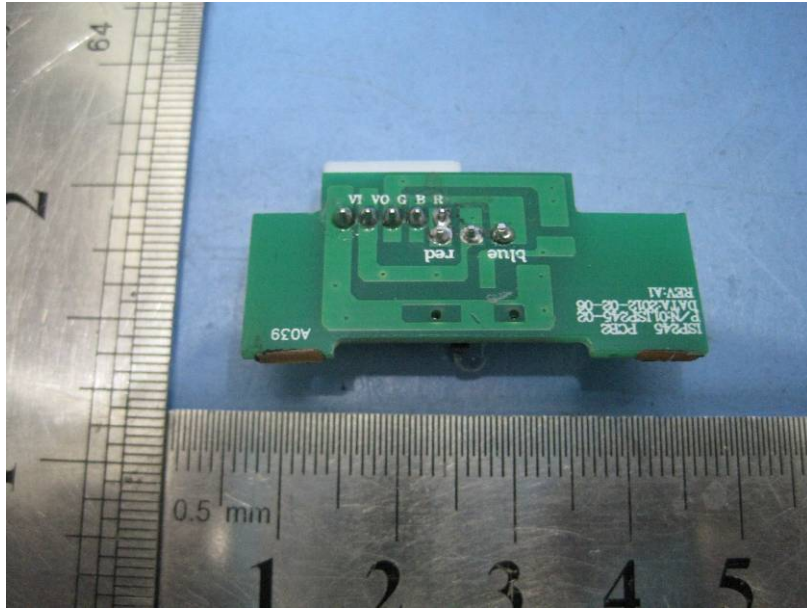
**16.4 EUT – PCB1 View**





**16.5 EUT – PCB2 View**





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## 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



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