

## ***FCC TEST REPORT***

FCC ID : SXJ87100-Z  
Applicant : Asoka Incorporation  
Address : 5F, No.9, Kuang Fu N. Rd., Taipei, Taiwan

Equipment Under Test (EUT) :

Product Name : WAND+  
Model No. : 87100-Z

Standards : FCC CFR47 Part 15 Section 15.247:2009

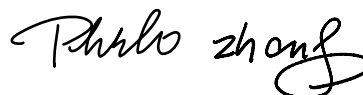
Date of Test : December 20 ~ December 30, 2011

Date of Issue : January 9, 2012

Test Engineer : Hunk yan / Engineer



Reviewed By : Philo zhong / Manager



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

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## 2 Test Summary

Test Items	Test Requirement	Result
Radiated Spurious Emissions (9kHz to 25GHz)	15.205(a) 15.209 15.247(d)	PASS
Conduct Emission	15.207	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

	Page
<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>9</b>
6.1 E.U.T. OPERATION.....	9
6.2 EUT SETUP.....	10
6.3 CONDUCTED EMISSION TEST RESULT .....	10
<b>7 RADIATED SPURIOUS EMISSIONS.....</b>	<b>11</b>
7.1 EUT OPERATION :.....	11
7.2 MEASUREMENT UNCERTAINTY .....	11
7.3 TEST SETUP.....	12
7.4 SPECTRUM ANALYZER SETUP .....	13
7.5 TEST PROCEDURE.....	14
7.6 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	14
7.7 SUMMARY OF TEST RESULTS .....	15
7.8 PHOTOGRAPH – RADIATION SPURIOUS EMISSION TEST SETUP .....	24
<b>8 BAND EDGE MEASUREMENT .....</b>	<b>25</b>
8.1 TEST RESULT: .....	26
<b>9 20 DB BANDWIDTH MEASUREMENT.....</b>	<b>30</b>
9.1 TEST PROCEDURE:.....	30
9.2 TEST RESULT: .....	30
<b>10 MAXIMUM PEAK OUTPUT POWER .....</b>	<b>32</b>
10.1 TEST PROCEDURE:.....	32
10.2 TEST RESULT:.....	32
<b>11 HOPPING CHANNEL SEPARATION.....</b>	<b>33</b>
11.1 TEST PROCEDURE:.....	33
11.2 TEST RESULT:.....	33
<b>12 NUMBER OF HOPPING FREQUENCY .....</b>	<b>36</b>
12.1 TEST PROCEDURE:.....	36
12.2 TEST RESULT:.....	36
<b>13 DWELL TIME .....</b>	<b>37</b>
13.1 TEST PROCEDURE:.....	37
13.2 TEST RESULT:.....	37
<b>14 ANTENNA REQUIREMENT .....</b>	<b>40</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 RF EXPOSURE ..... 41**

15.1 REQUIMENTS: ..... 41

15.2 MEASUREMENT RESULT:..... 41

**16 PHOTOGRAPHS - CONSTRUCTIONAL DETAILS..... 42**

16.1 EUT – APPEARANCE VIEW ..... 42

16.2 EUT – OPEN VIEW ..... 43

16.3 EUT – PCB VIEW..... 43

**17 FCC LABEL..... 45**

## 4 General Information

### 4.1 Client Information

**Applicant** : Asoka Incorporation  
**Address of Applicant** : 5F, No.9, Kuang Fu N. Rd., Taipei, Taiwan

**Manufacturer** : SHENZHEN ASOKA ELECTRONICS CO., LTD  
**Address of Manufacturer** : BaoZhiWei Technology park Luo Tian Guang Tian Road, Song Gang Town, BaoAn, ShenZhen, China

### 4.2 General Description of E.U.T.

**Product Name** : WAND+  
**Model No.** : 87100-Z  
**Remark** : *The product maybe have different color.*

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

**Technical Data** : DC 3.0V  
**Operation Frequency** : 2402MHz ~ 2480MHz  
**Antenna Gain** : 0 dBi  
**Modulation** : FSK

### 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 WAND+. 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	SCHWARZB ECK MESS- ELEKTROM / VULB9163	336	W2008002	30-3000 MHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Broad-band Horn Antenna	SCHWARZB ECK 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	SCHWARZB ECK MESS- ELEKTROM / BBV 9718	9718-148	W2008004	0.5-18GHz	Aug. 2, 2011	Aug. 1, 2012	±1.2dB
Broad-band Horn Antenna	SCHWARZB ECK MESS- ELEKTROM / BBHA 9170	399	W2008005	15-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.5dB
Broadband Preamplifier	SCHWARZB ECK MESS- ELEKTROM / BBV 9719	9719-254	W2008006	18-26.5GHz	Aug. 2, 2011	Aug. 1, 2012	±1.2dB
10m Coaxial Cable with N-male Connectors	SCHWARZB ECK MESS- ELEKTROM / AK 9515 H	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-
10m 50 Ohm Coaxial Cable	SCHWARZB ECK 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	SUNSP0/ SP-14C	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

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Asoka Incorporation

FCC ID: SXJ87100-Z

Equipment Name	Manufacturer Model	Equipment No	Internal No	Specification	Cal. Date	Due Date	Uncertainty
Test Receiver	ROHDE&SC HWAZ/ ESPI	101155	W2005001	9k-3GHz	Aug. 2, 2011	Aug. 1, 2012	±1dB
Two-Line V- Network	ROHDE&SC HWAZ/ 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
AC Power Supply	TONGYUN/ DTDGC-4	-	-	-	Aug. 2, 2011	Aug. 1, 2012	-

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WALTEK SERVICES

Reference No.: WT11116311-E-E-F



## 6 Conducted Emission

Test Requirement:	FCC CFR 47 Part 15 Section 15.207
Test Method:	ANSI C63.4:2003
Test Result:	N/A
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

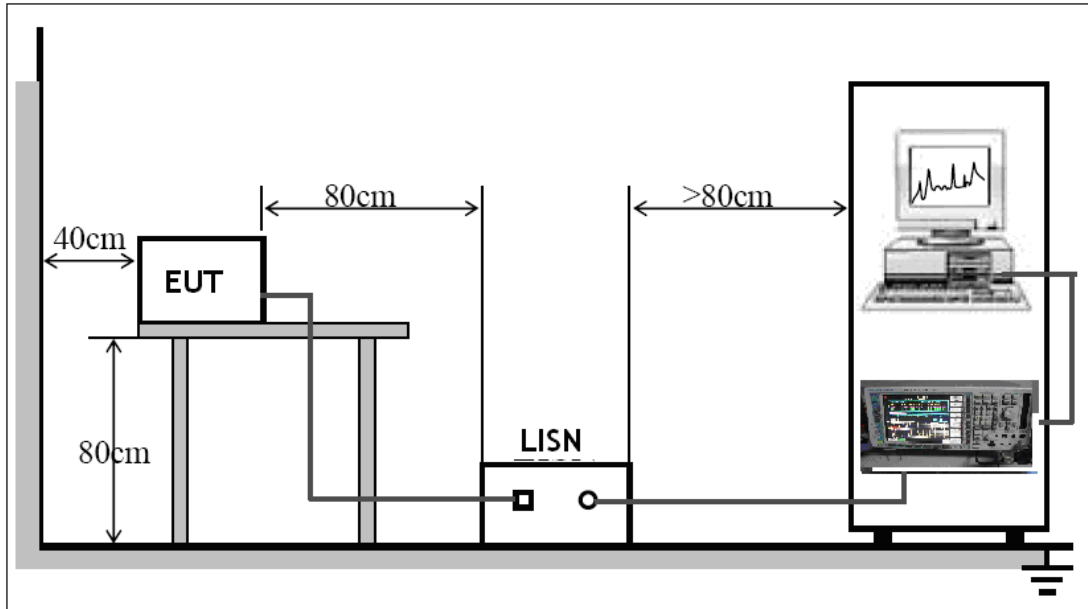
#### EUT Operation:

The EUT was tested 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

Due to the EUT is powered by DC 3.0V battery, the conducted emission test is not applicable.

## 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  
 Limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

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

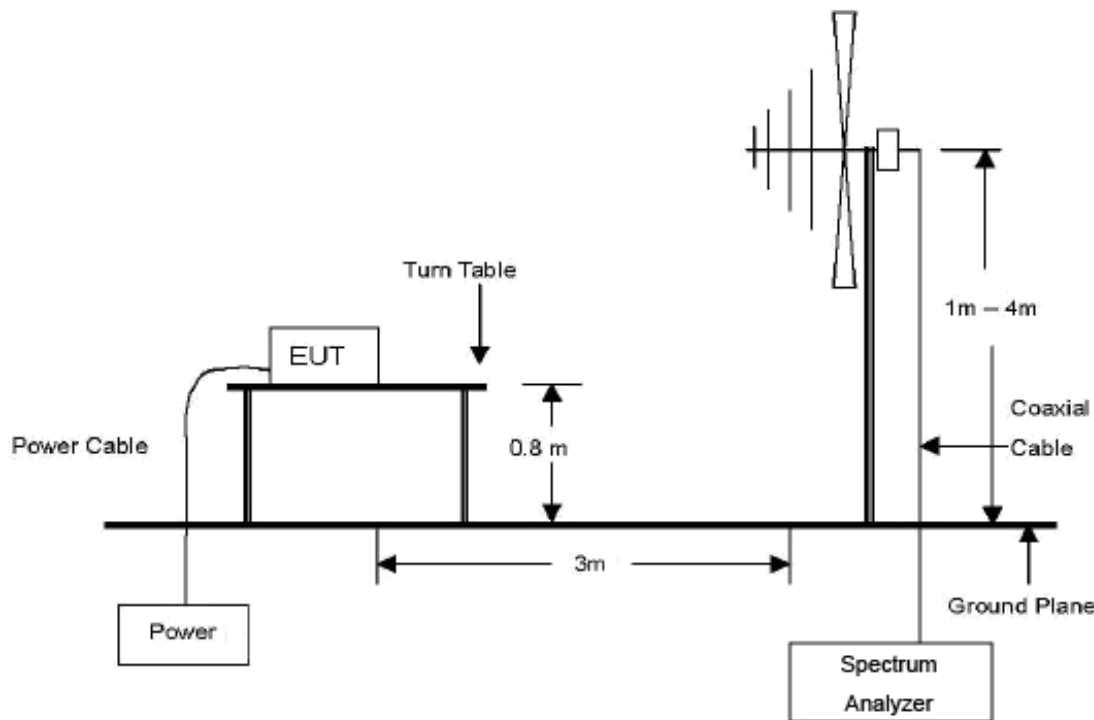
All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor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

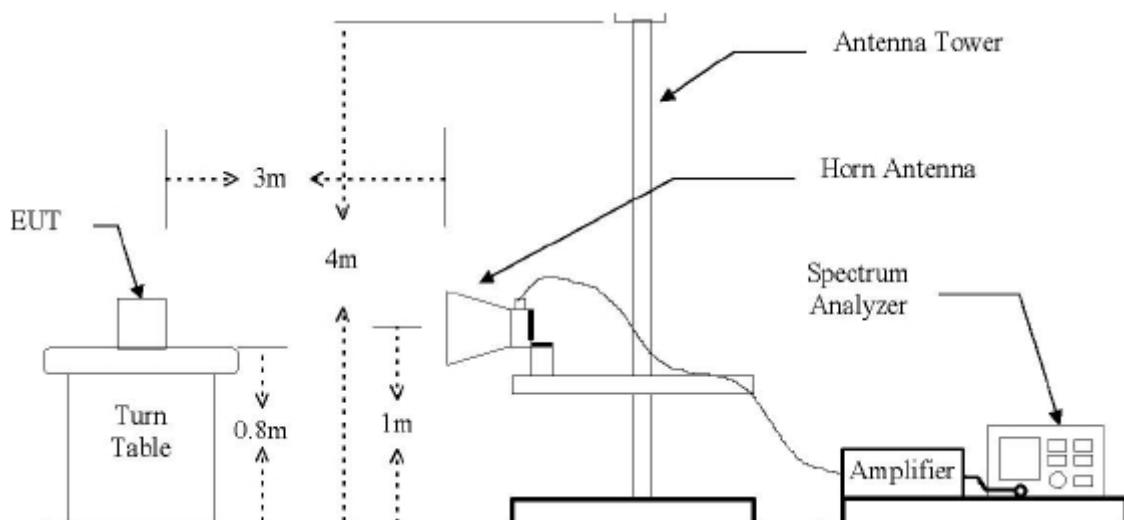
### 7.3 Test Setup

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. New battery was installed during the test, and the EUT was 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. This is a handheld device, 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

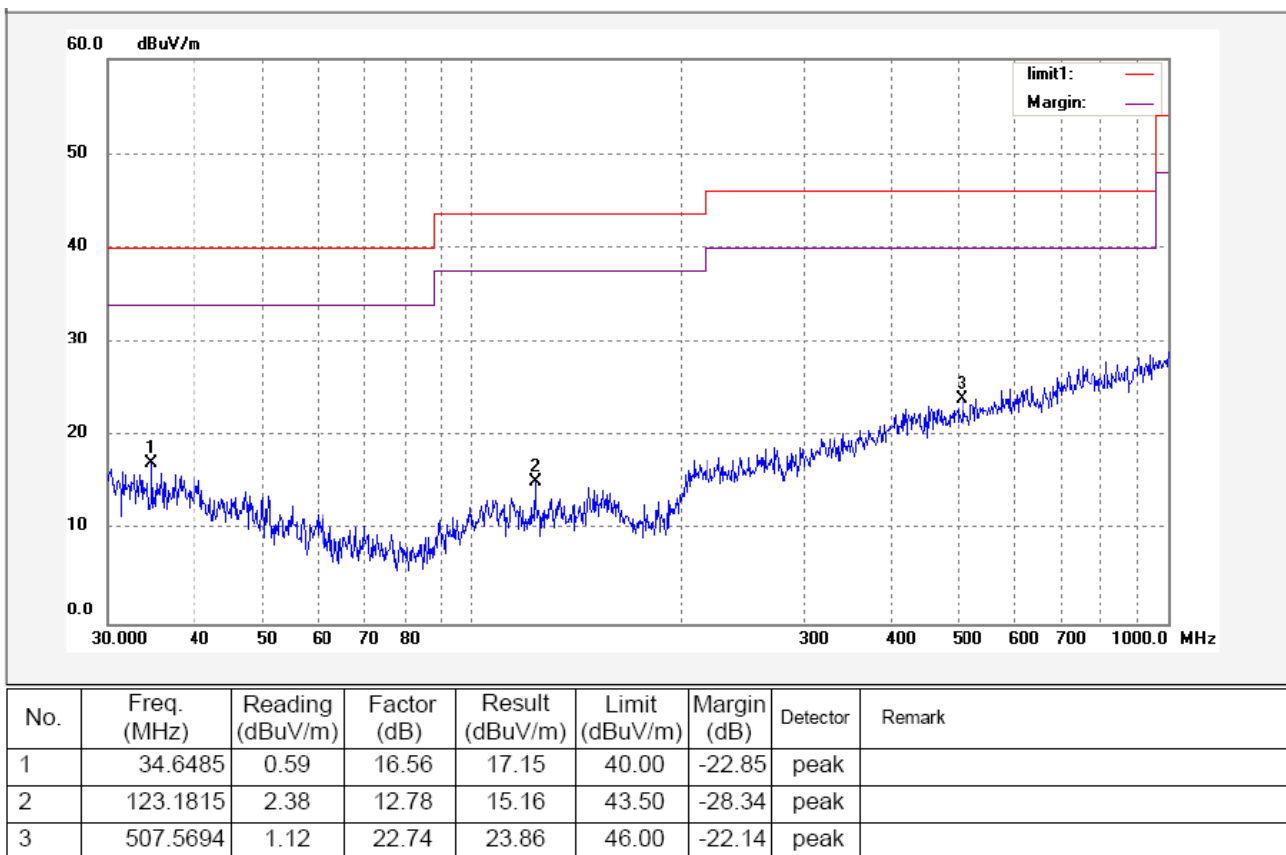
According to the data in this section, the EUT complied with the FCC CFR47 Part 15 Section 15.209 & 15.247 standards.

### Test mode: continuously receive mode

Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

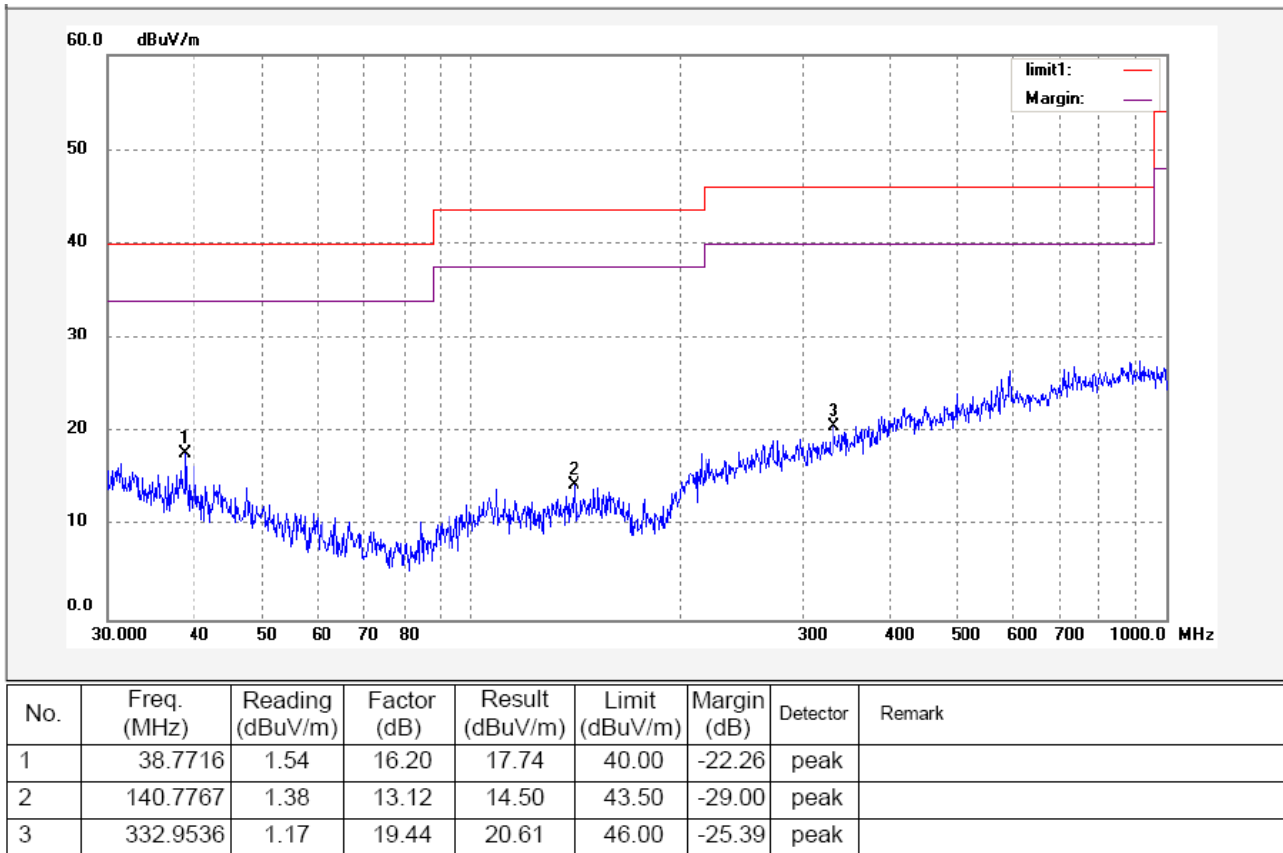
Test Frequency : 30MHz ~ 1000MHz

Antenna polarization: Vertical



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Antenna polarization: Horizontal



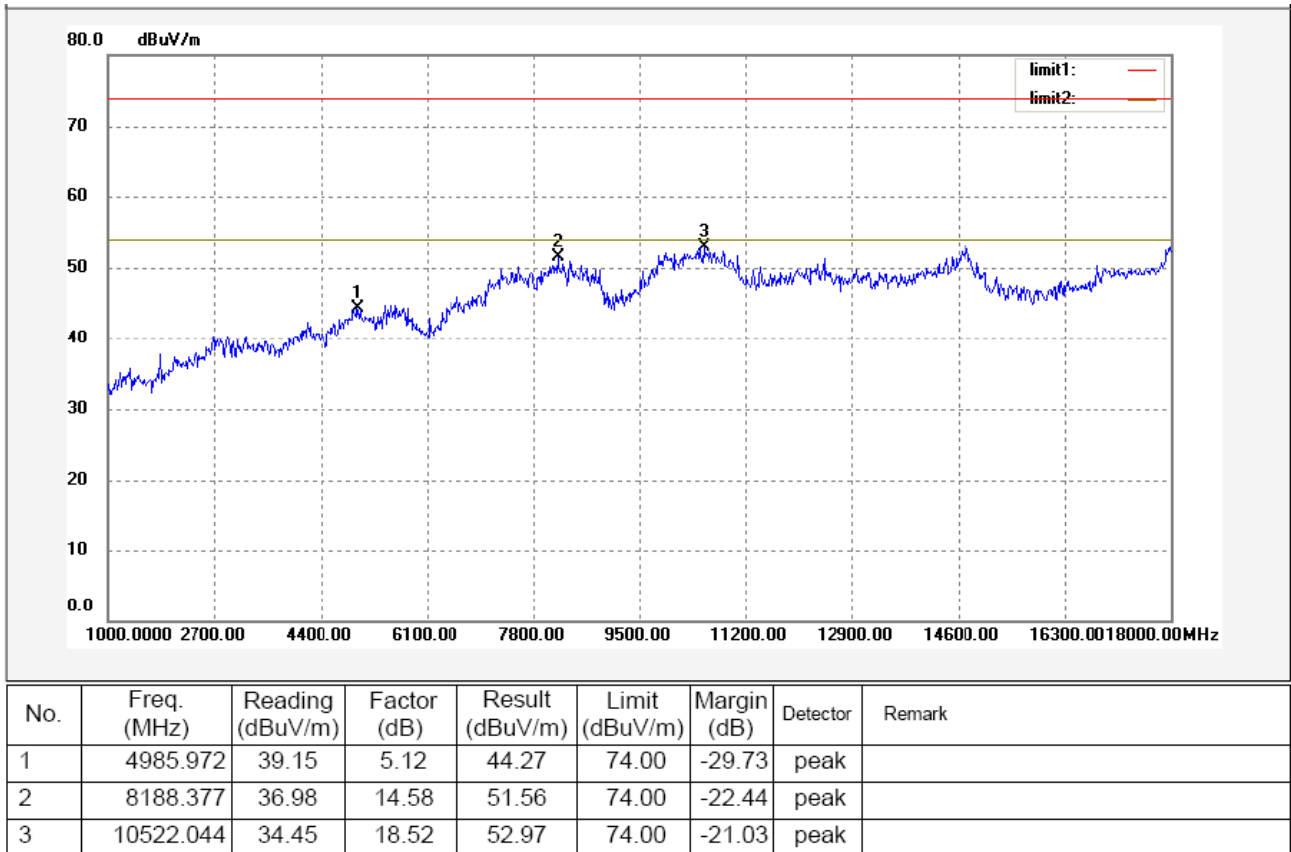
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Test Frequency: Above 1GHz radiation test data:

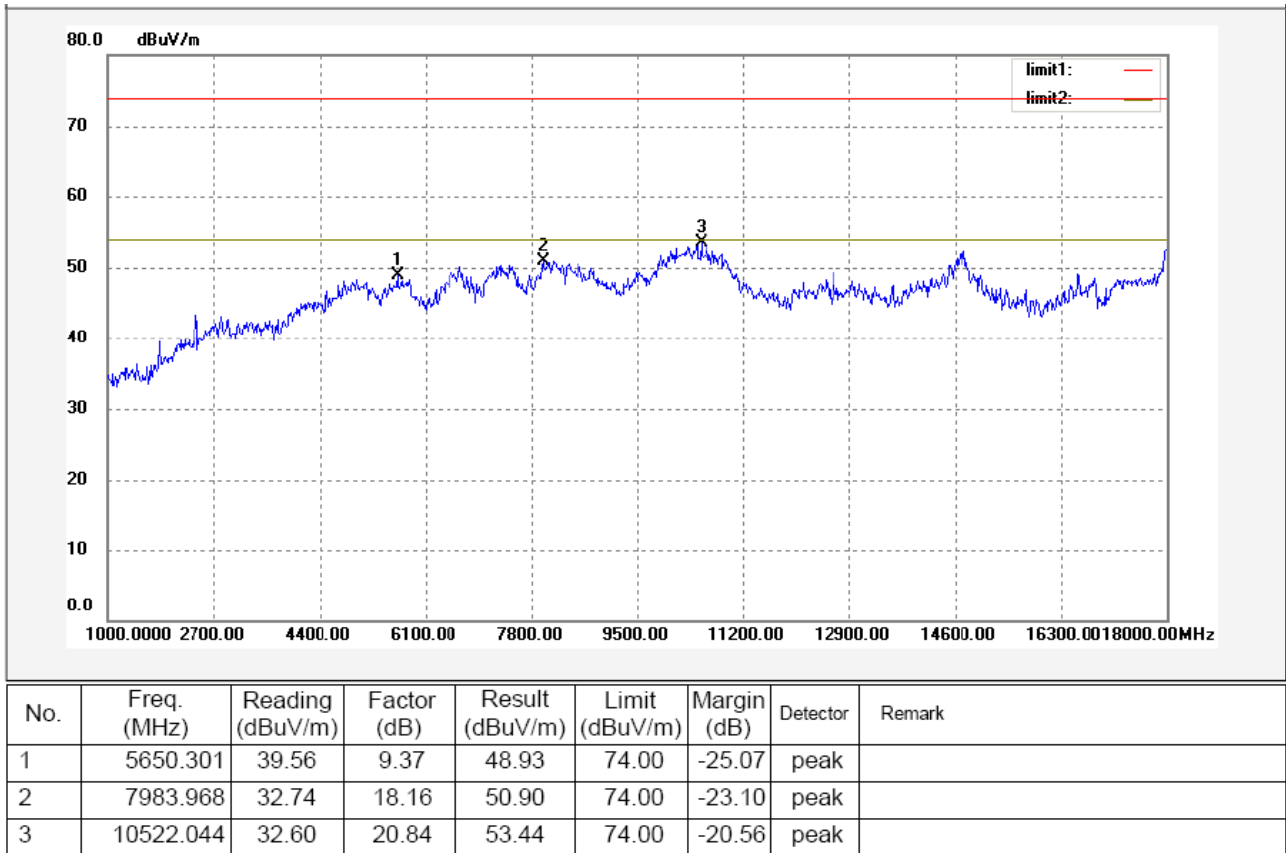
Remark: No any emissions were found from 18GHz to 25 GHz, So the radiated emissions from 18GHz to 25GHz were not record.

Antenna polarization: Vertical



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Antenna polarization: Horizontal



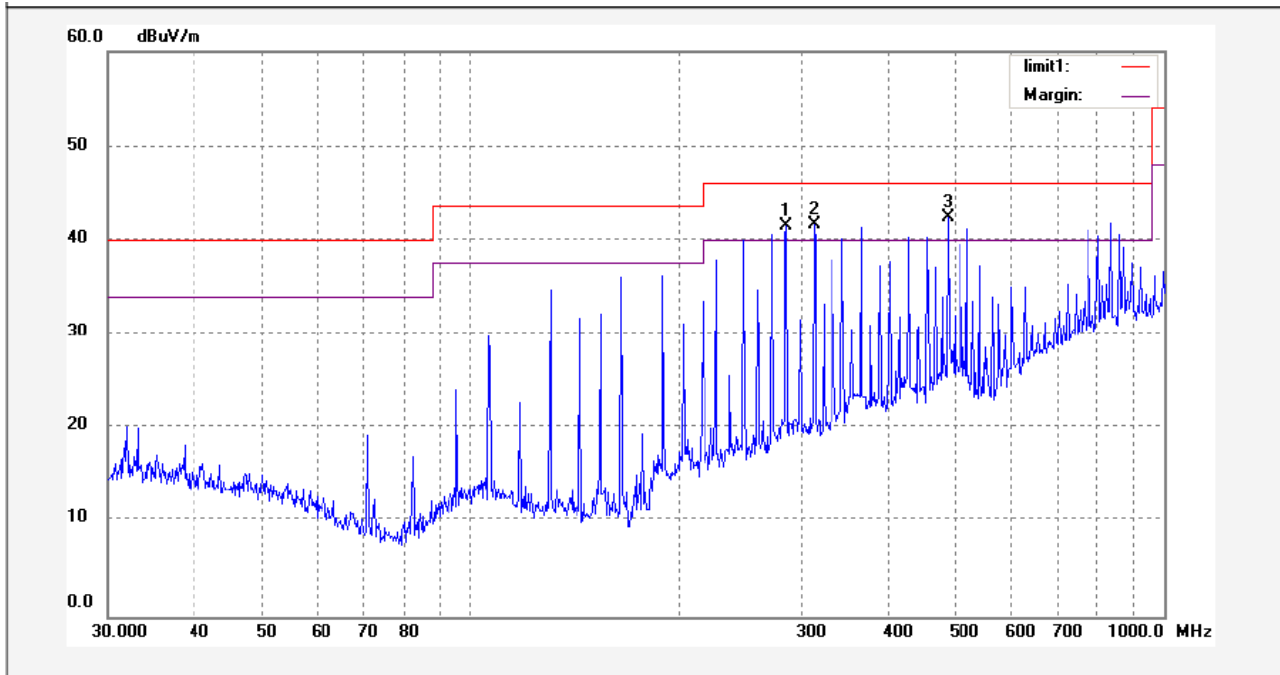
The results shown in this test report refer only to the sample(s) tested , This Test report cannot be reproduced, except in full, without prior written permission of the Company.

**Test mode: continuously transmit mode**

Remark: the EUT was pretested at the high, middle and low channel, and the worse case was the low Channel, so the data show was the low channel only. Because the emissions below 30MHz are more than 20dB below the limit, the data is not show in the report.

Test Frequency : 30MHz ~ 1000MHz

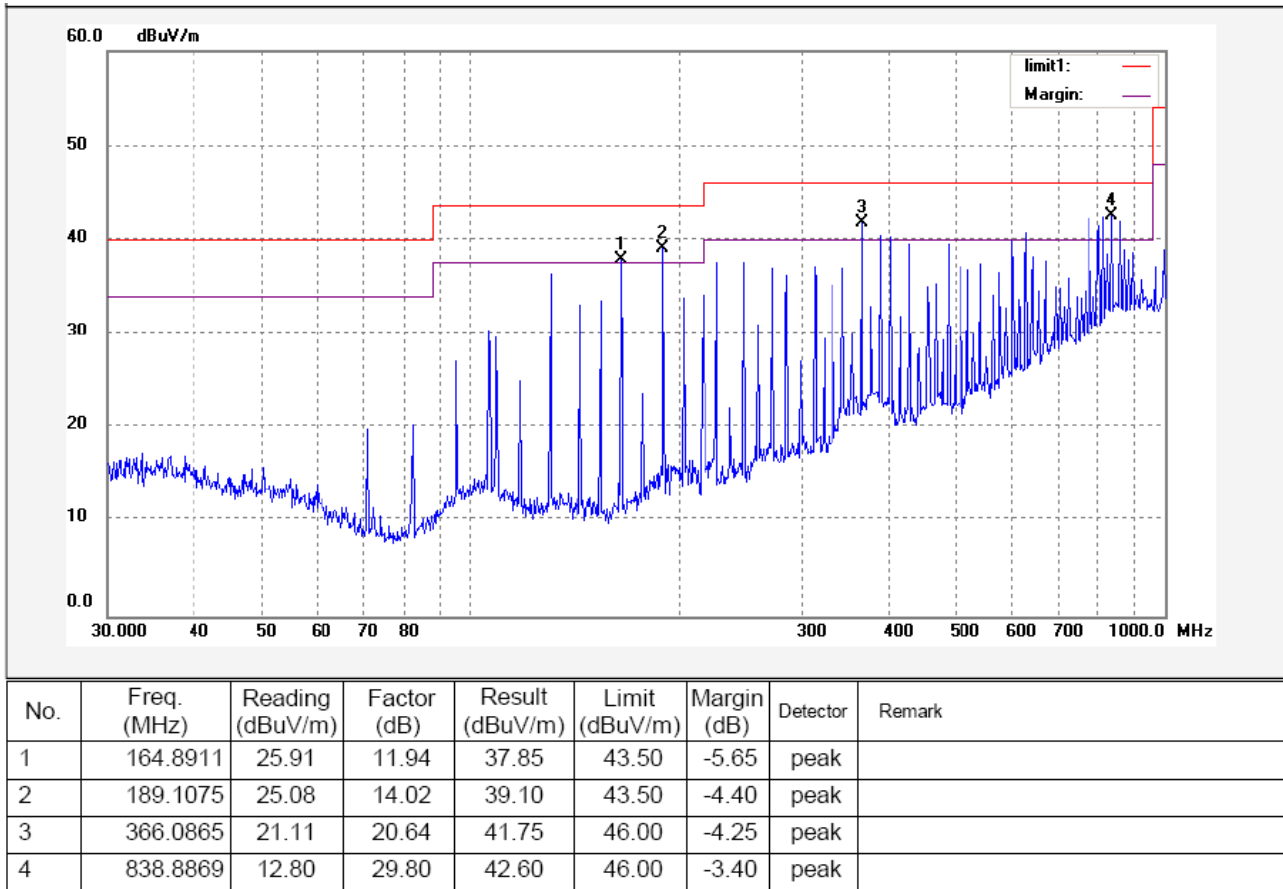
Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	285.2611	24.92	16.51	41.43	46.00	-4.57	peak	
2	312.5482	23.30	18.29	41.59	46.00	-4.41	peak	
3	488.3263	17.16	25.25	42.41	46.00	-3.59	peak	

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Antenna polarization: Horizontal



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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	95.44		(Fund.)	1.1	20
4804.00	AV	Vertical	46.31	54.00	-7.69	1.3	75
7206.00	AV	Vertical	47.25	54.00	-6.75	1.4	150
9608.00	AV	Vertical	43.98	54.00	-10.02	1.9	80
12010.00	AV	Vertical	40.34	54.00	-13.66	1.5	170
14412.00	AV	Vertical	41.63	54.00	-12.37	1.5	140
16814.00	AV	Vertical	38.44	54.00	-15.56	1.6	130
19216.00	AV	Vertical	36.72	54.00	-17.28	1.6	90
21618.00	AV	Vertical	34.50	54.00	-19.50	1.5	20
24020.00	AV	Vertical	35.65	54.00	-18.35	1.3	95
2402.00	AV	Horizontal	89.32		(Fund.)	1.1	20
4804.00	AV	Horizontal	43.51	54.00	-10.49	1.3	150
7206.00	AV	Horizontal	41.26	54.00	-12.74	1.4	90
9608.00	AV	Horizontal	38.37	54.00	-15.63	1.3	120
12010.00	AV	Horizontal	40.35	54.00	-13.65	1.4	95
14412.00	AV	Horizontal	35.26	54.00	-18.74	1.3	140
16814.00	AV	Horizontal	41.36	54.00	-12.64	1.4	130
19216.00	AV	Horizontal	33.21	54.00	-20.79	1.9	130
21618.00	AV	Horizontal	34.54	54.00	-19.46	1.1	120
24020.00	AV	Horizontal	36.31	54.00	-17.69	1.6	45
2402.00	PK	Vertical	104.75		(Fund.)	1.4	20
4804.00	PK	Vertical	58.24	74.00	-15.76	1.9	90
7206.00	PK	Vertical	59.18	74.00	-14.82	1.5	120
9608.00	PK	Vertical	55.91	74.00	-18.09	1.5	200
12010.00	PK	Vertical	52.27	74.00	-21.73	1.1	95
14412.00	PK	Vertical	53.56	74.00	-20.44	1.3	80
16814.00	PK	Vertical	50.37	74.00	-23.63	1.3	165
19216.00	PK	Vertical	48.65	74.00	-25.35	1.3	150
21618.00	PK	Vertical	46.43	74.00	-27.57	1.6	80
24020.00	PK	Vertical	47.58	74.00	-26.42	1.5	125
2402.00	PK	Horizontal	99.33		(Fund.)	1.7	80
4804.00	PK	Horizontal	44.57	74.00	-29.43	1.9	120
7206.00	PK	Horizontal	42.32	74.00	-31.68	1.7	90
9608.00	PK	Horizontal	39.43	74.00	-34.57	1.3	20
12010.00	PK	Horizontal	41.41	74.00	-32.59	1.1	170
14412.00	PK	Horizontal	36.32	74.00	-37.68	1.6	20
16814.00	PK	Horizontal	42.42	74.00	-31.58	1.7	210
19216.00	PK	Horizontal	34.27	74.00	-39.73	1.6	90

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21618.00	PK	Horizontal	35.60	74.00	-38.40	1.1	140
24020.00	PK	Horizontal	37.37	74.00	-36.63	1.3	95
<b>Middle frequency</b>							
2441.00	AV	Vertical	96.09		(Fund.)	1.4	50
4882.00	AV	Vertical	45.86	54.00	-8.14	1.3	120
7323.00	AV	Vertical	43.97	54.00	-10.03	1.3	130
9764.00	AV	Vertical	42.83	54.00	-11.17	1.3	40
12205.00	AV	Vertical	46.07	54.00	-7.93	1.1	35
14646.00	AV	Vertical	38.74	54.00	-15.26	1.3	170
17087.00	AV	Vertical	41.99	54.00	-12.01	1.4	30
19528.00	AV	Vertical	36.80	54.00	-17.20	1.6	60
21969.00	AV	Vertical	40.79	54.00	-13.21	1.7	230
24410.00	AV	Vertical	33.85	54.00	-20.15	1.3	120
2441.00	AV	Horizontal	90.47		(Fund.)	1.2	160
4882.00	AV	Horizontal	41.82	54.00	-12.18	1.1	130
7323.00	AV	Horizontal	43.55	54.00	-10.45	1.4	305
9764.00	AV	Horizontal	37.66	54.00	-16.34	1.3	140
12205.00	AV	Horizontal	40.41	54.00	-13.59	1.1	180
14646.00	AV	Horizontal	35.81	54.00	-18.19	1.5	240
17087.00	AV	Horizontal	33.00	54.00	-21.00	1.5	185
19528.00	AV	Horizontal	35.69	54.00	-18.31	1.5	120
21969.00	AV	Horizontal	36.92	54.00	-17.08	1.1	190
24410.00	AV	Horizontal	31.60	54.00	-22.40	1.8	160
2441.00	PK	Vertical	106.23		(Fund.)	1.3	35
4882.00	PK	Vertical	60.79	74.00	-13.21	1.2	110
7323.00	PK	Vertical	58.90	74.00	-15.10	1.3	130
9764.00	PK	Vertical	54.76	74.00	-19.24	1.4	180
12205.00	PK	Vertical	58.00	74.00	-16.00	1.6	230
14646.00	PK	Vertical	50.67	74.00	-23.33	1.3	30
17087.00	PK	Vertical	53.92	74.00	-20.08	1.3	40
19528.00	PK	Vertical	48.73	74.00	-25.27	1.6	160
21969.00	PK	Vertical	52.72	74.00	-21.28	1.4	170
24410.00	PK	Vertical	45.78	74.00	-28.22	1.3	140
2441.00	PK	Horizontal	99.88		(Fund.)	1.4	30
4882.00	PK	Horizontal	55.88	74.00	-18.12	1.8	105
7323.00	PK	Horizontal	57.61	74.00	-16.39	1.5	140
9764.00	PK	Horizontal	51.72	74.00	-22.28	1.6	90
12205.00	PK	Horizontal	54.47	74.00	-19.53	1.3	190
14646.00	PK	Horizontal	49.87	74.00	-24.13	1.3	190
17087.00	PK	Horizontal	47.06	74.00	-26.94	1.0	155
19528.00	PK	Horizontal	49.75	74.00	-24.25	1.6	170
21969.00	PK	Horizontal	50.98	74.00	-23.02	1.0	30
24410.00	PK	Horizontal	45.66	74.00	-28.34	1.7	195
<b>High frequency</b>							

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Reference No.: WT11116311-E-E-F

Asoka Incorporation

FCC ID: SXJ87100-Z

2480.00	AV	Vertical	96.72		(Fund.)	1.4	200
4960.00	AV	Vertical	46.04	54.00	-7.96	1.3	30
7440.00	AV	Vertical	44.15	54.00	-9.85	1.5	160
9920.00	AV	Vertical	46.61	54.00	-7.39	1.5	100
12400.00	AV	Vertical	41.71	54.00	-12.29	1.4	125
14880.00	AV	Vertical	48.26	54.00	-5.74	1.9	140
17360.00	AV	Vertical	42.29	54.00	-11.71	1.0	130
19840.00	AV	Vertical	43.16	54.00	-10.84	1.2	240
22320.00	AV	Vertical	41.48	54.00	-12.52	1.3	170
24800.00	AV	Vertical	35.10	54.00	-18.90	1.6	165
2480.00	AV	Horizontal	91.02		(Fund.)	1.2	160
4960.00	AV	Horizontal	42.00	54.00	-12.00	1.9	190
7440.00	AV	Horizontal	40.31	54.00	-13.69	1.1	155
9920.00	AV	Horizontal	41.13	54.00	-12.87	1.6	200
12400.00	AV	Horizontal	38.99	54.00	-15.01	1.1	165
14880.00	AV	Horizontal	33.18	54.00	-20.82	1.3	180
17360.00	AV	Horizontal	37.39	54.00	-16.61	1.3	230
19840.00	AV	Horizontal	32.06	54.00	-21.94	1.9	90
22320.00	AV	Horizontal	34.89	54.00	-19.11	1.2	130
24800.00	AV	Horizontal	30.27	54.00	-23.73	1.7	130
2480.00	PK	Vertical	106.81		(Fund.)	1.3	215
4960.00	PK	Vertical	59.65	74.00	-14.35	1.3	50
7440.00	PK	Vertical	56.08	74.00	-17.92	1.7	140
9920.00	PK	Vertical	58.54	74.00	-15.46	1.6	160
12400.00	PK	Vertical	53.64	74.00	-20.36	1.3	140
14880.00	PK	Vertical	60.19	74.00	-13.81	1.3	90
17360.00	PK	Vertical	54.22	74.00	-19.78	1.1	130
19840.00	PK	Vertical	55.09	74.00	-18.91	1.3	160
22320.00	PK	Vertical	53.41	74.00	-20.59	1.5	155
24800.00	PK	Vertical	47.03	74.00	-26.97	1.5	155
2480.00	PK	Horizontal	99.55		(Fund.)	1.5	210
4960.00	PK	Horizontal	56.06	74.00	-17.94	1.5	120
7440.00	PK	Horizontal	54.37	74.00	-19.63	1.4	170
9920.00	PK	Horizontal	55.19	74.00	-18.81	1.4	210
12400.00	PK	Horizontal	53.05	74.00	-20.95	1.1	130
14880.00	PK	Horizontal	47.24	74.00	-26.76	1.8	130
17360.00	PK	Horizontal	51.45	74.00	-22.55	1.7	185
19840.00	PK	Horizontal	46.12	74.00	-27.88	1.6	170
22320.00	PK	Horizontal	48.95	74.00	-25.05	1.7	150
24800.00	PK	Horizontal	44.33	74.00	-29.67	1.1	240

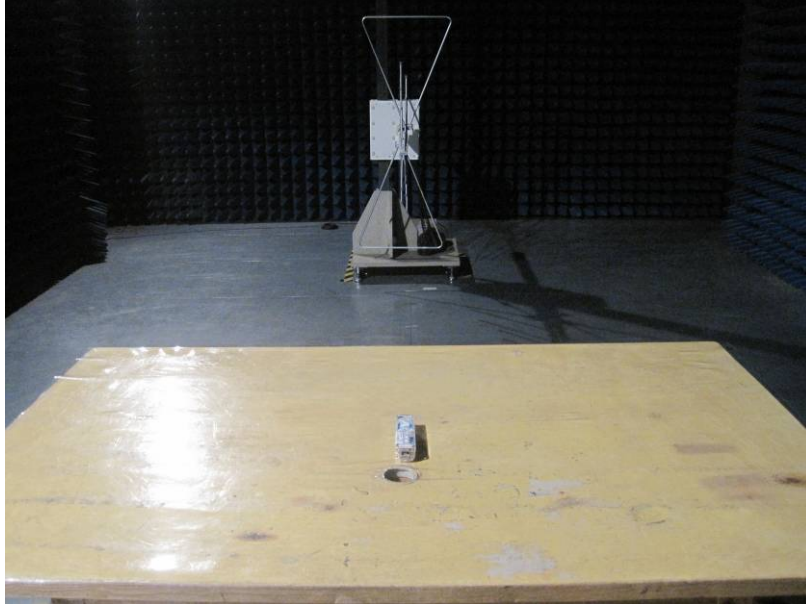
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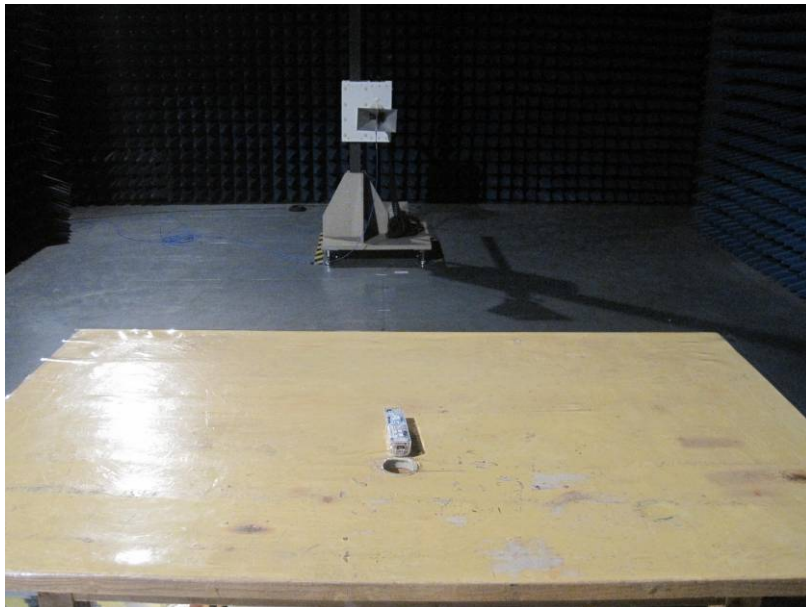
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## 7.8 Photograph – Radiation Spurious Emission Test Setup

Below 1GHz



Above 1GHz



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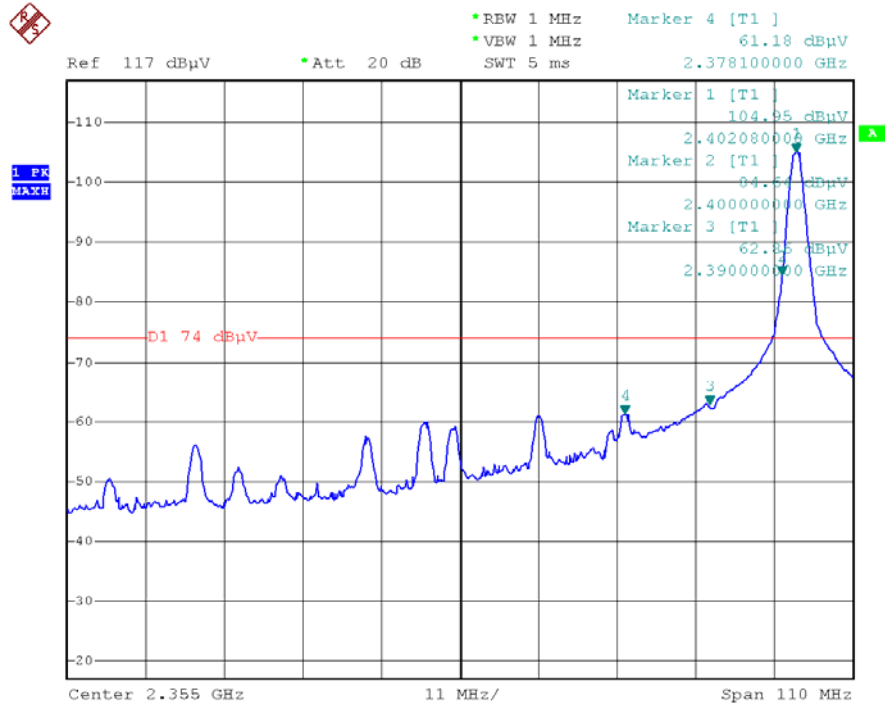


## 8 Band Edge Measurement

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

## 8.1 Test Result:

### Low Channel – Peak



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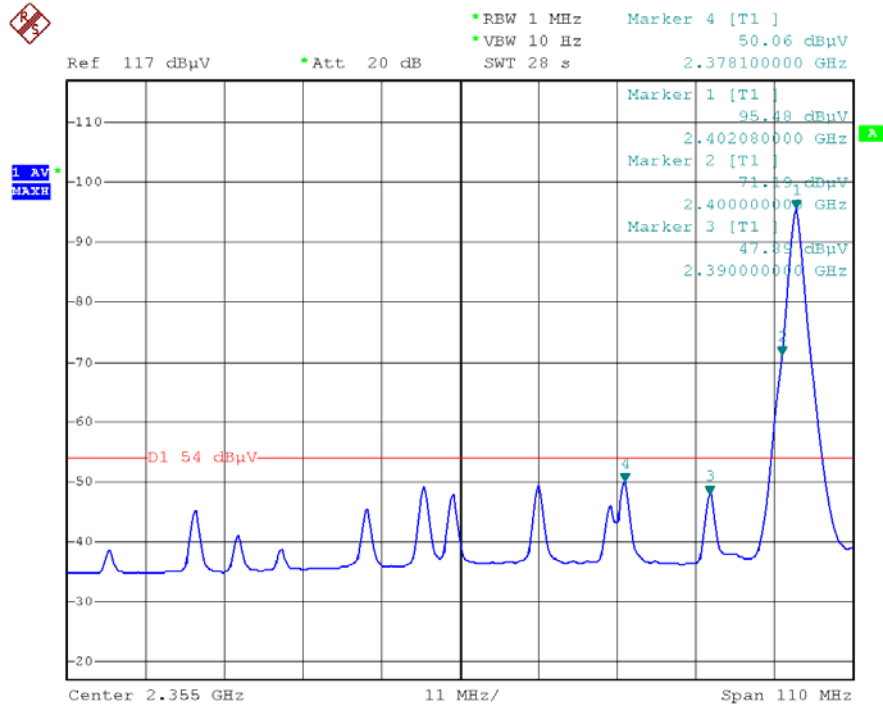
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### Low Channel – AV

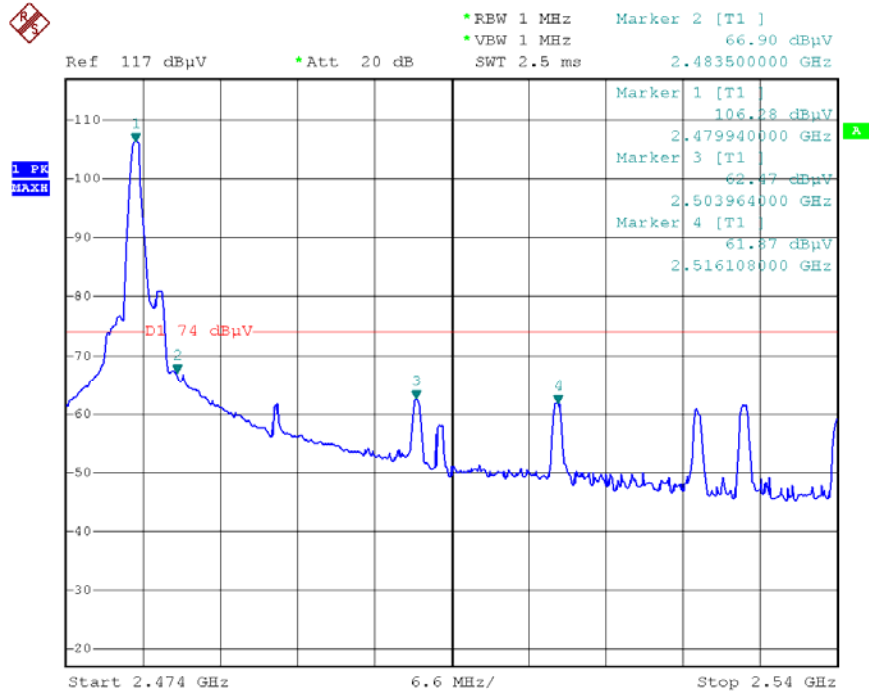


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# High Channel – Peak

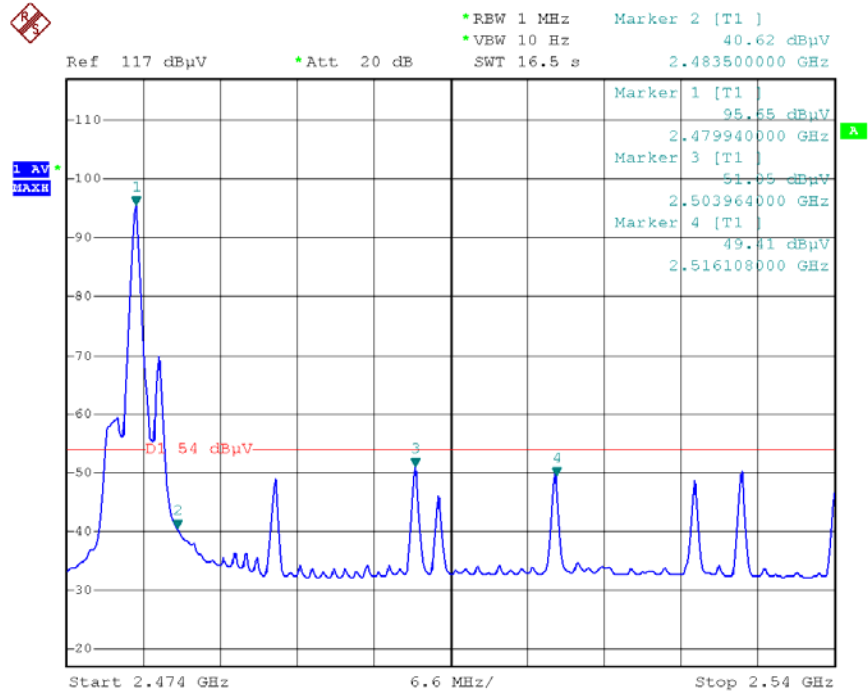


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# High Channel – AV



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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:

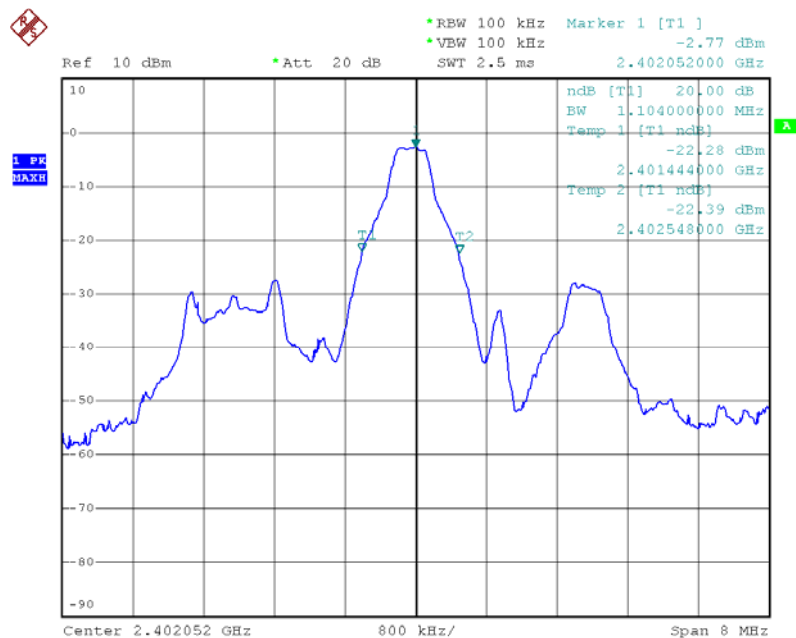
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 100kHz

### 9.2 Test Result:

Test Channel	Bandwidth
Low	1.104MHz
Middle	1.112MHz
High	1.104MHz

Test result plot as follows:

Low Channel



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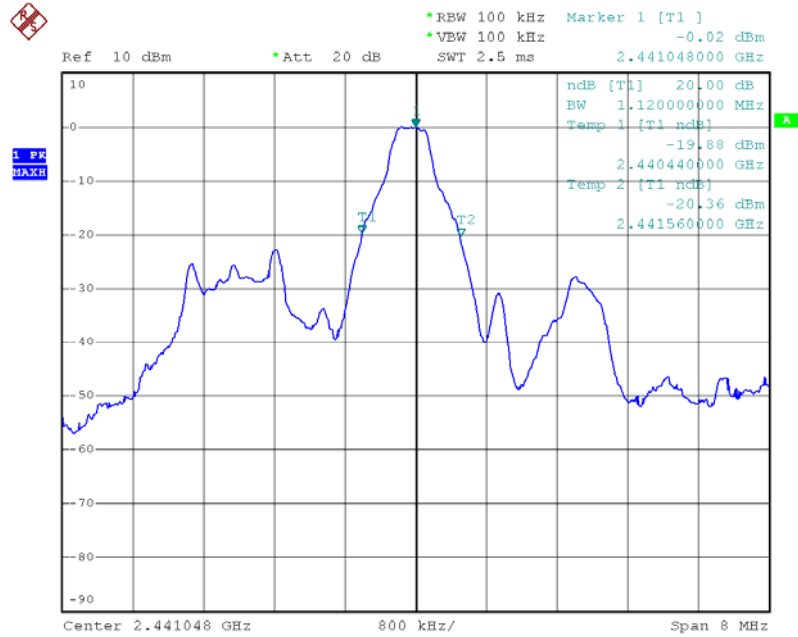
WALTEK SERVICES

Reference No.: WT11116311-E-E-F

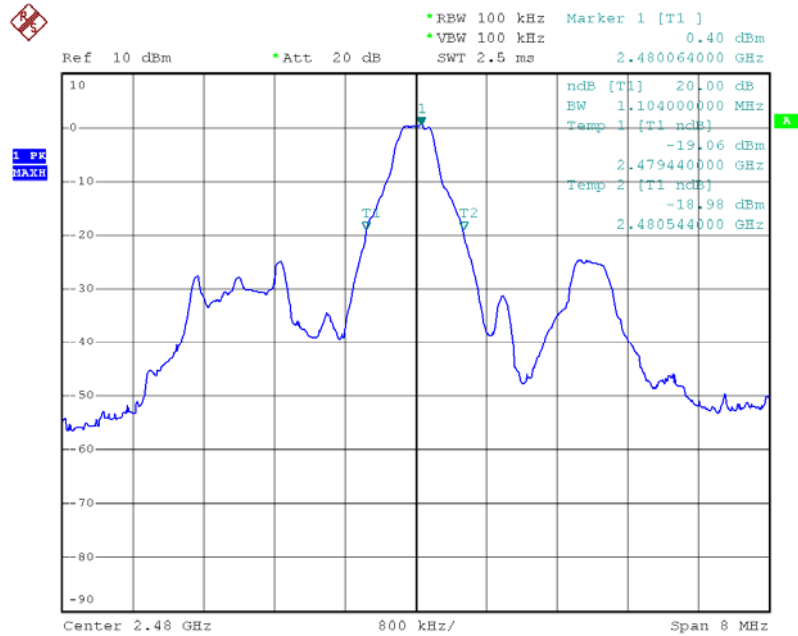
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## Middle Channel



## 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 = 3 MHz. Sweep = auto; Detector Function = Peak.
3. Keep the EUT in transmitting at lowest, medium and highest channel individually. Record the max value.

### 10.2 Test Result:

Test Channel	Output Power (dBm)	Limit (dBm)
Low	-1.26	30
Middle	1.27	30
High	1.64	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 1W.
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:

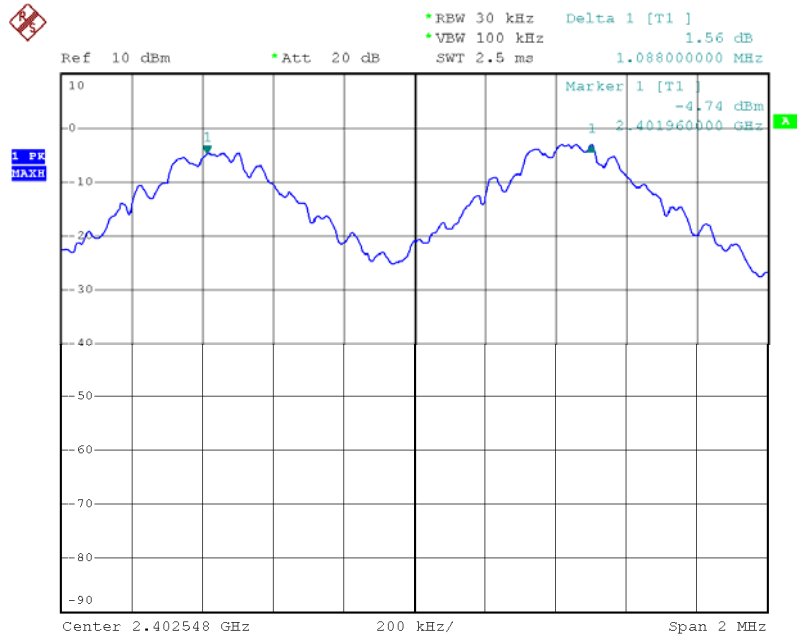
Test Channel	Separation (MHz)	Result
Low	1.088	PASS
Middle	1.000	PASS
High	1.004	PASS

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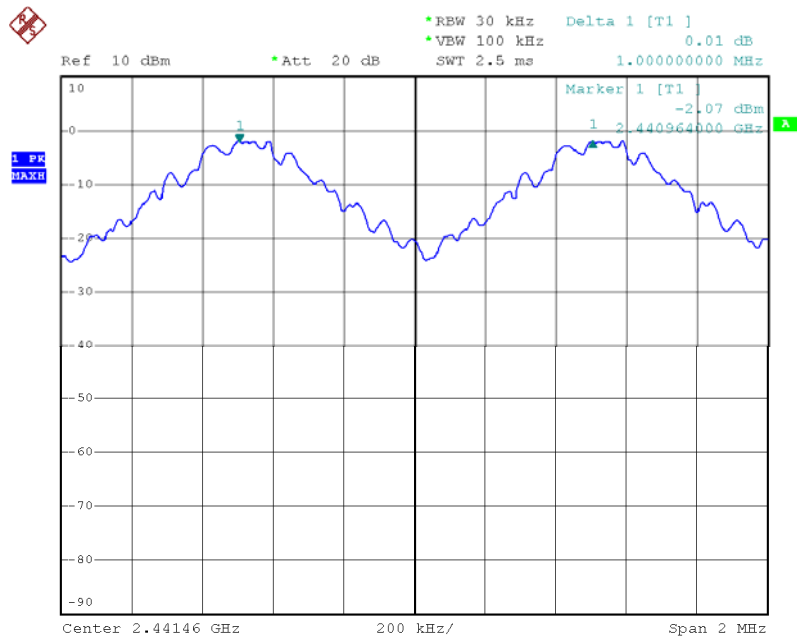
FCC ID: SXJ87100-Z

Test result plot as follows:

Low Channel:



Middle Channel



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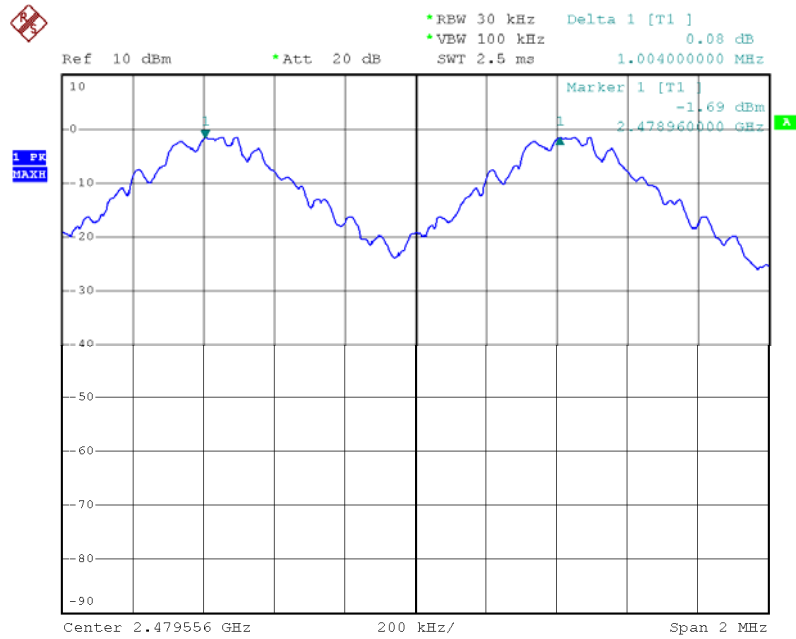
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High Channel



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## 12 Number of Hopping Frequency

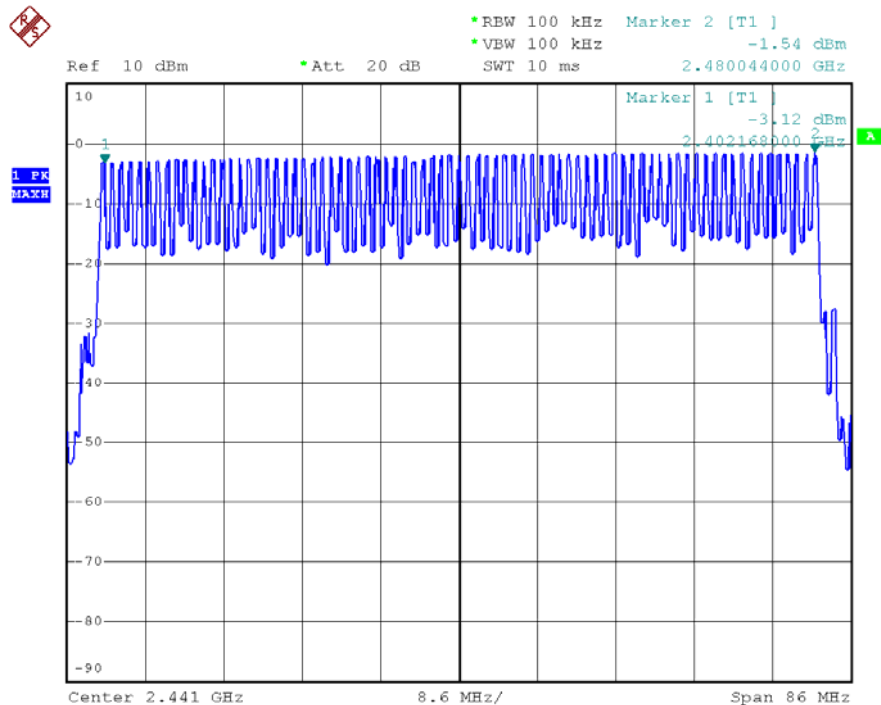
Test Requirement:	FCC CFR47 Part 15 Section 15.247
Test Method:	Based on DA 00-705
Test Limit:	Regulation 15.247 (a)(1)(iii) Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
Test Mode:	Test in hopping transmitting operating mode.

### 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.
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:  $T = 0.4(s) * 79 = 31.6 (s)$

So, the Dwell Time can be calculated as follows:

Dwell time =  $10 * 31.6 * (MkrDelta) / 1000$

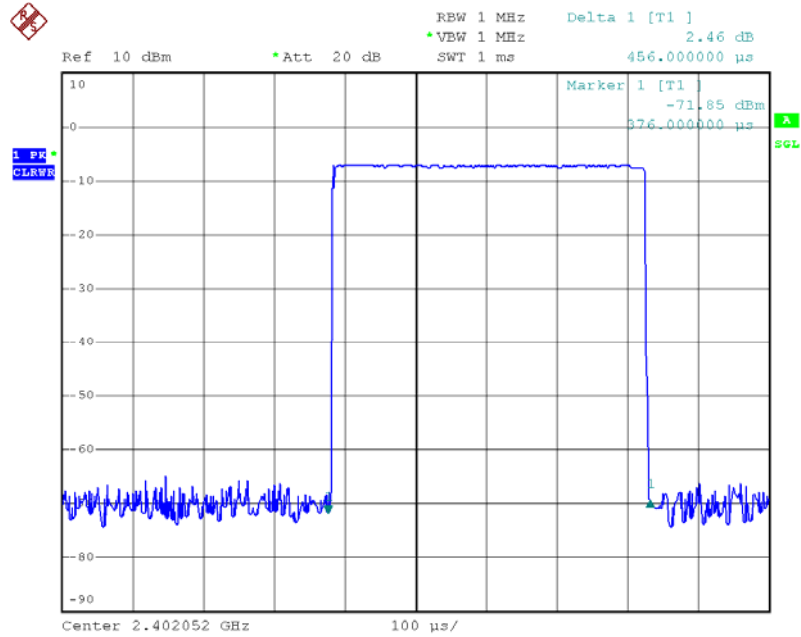
Note : Mkr Delta is once pulse time.

Frequency	Mkr Delta(ms)	Dwell Time(s)	Limits(s)	Result
2402 MHz	0.456	0.144	0.400	Pass
2441 MHz	0.454	0.143	0.400	Pass
2480 MHz	0.452	0.143	0.400	Pass

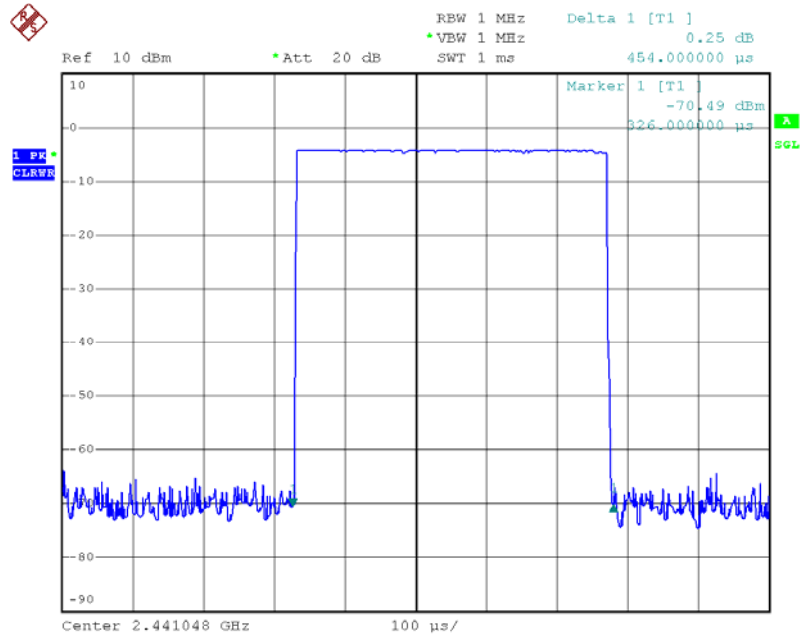
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FCC ID: SXJ87100-Z

### Low Channel



### Middle Channel



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Reference No.: WT11116311-E-E-F



## **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:

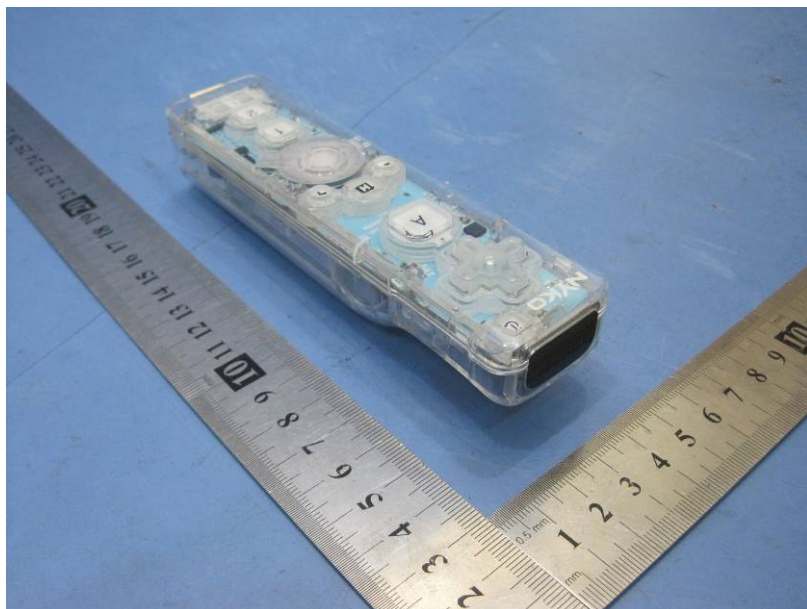
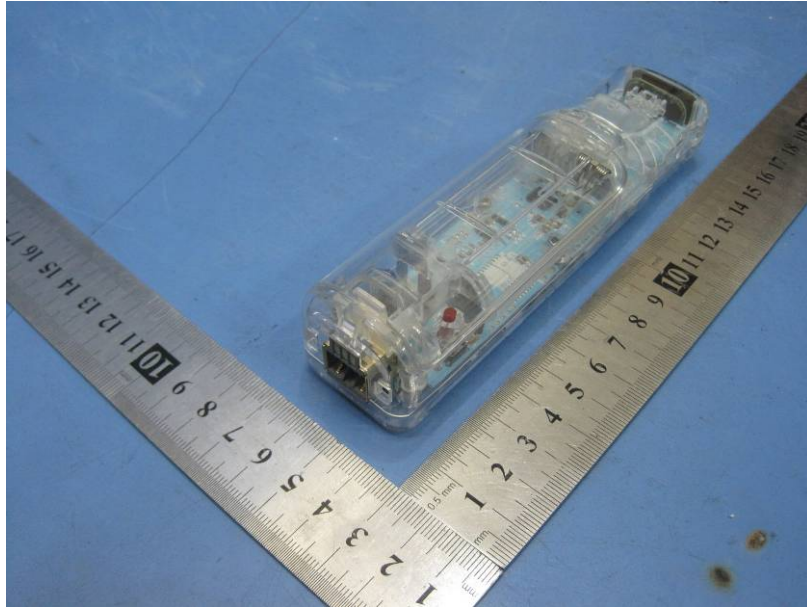
Antenna Gain (dBi)	Antenna Gain (numeric)	Conducted Power (dBm)	Conducted Power (mW)	Radiated Power (e.i.r.p) (mW)
0	1	-1.26	0.748	0.748
0	1	1.27	1.340	1.340
0	1	1.64	1.459	1.459

The EUT works on the 2.4G ISM band, and the max output power (conducted) of which is 1.459 mW lower than low threshold 60/f (GHz) mW (24.19mW),  $d < 2.5\text{cm}$  in general population category.

The SAR evaluation is not required.

## 16 Photographs - Constructional Details

### 16.1 EUT – Appearance View

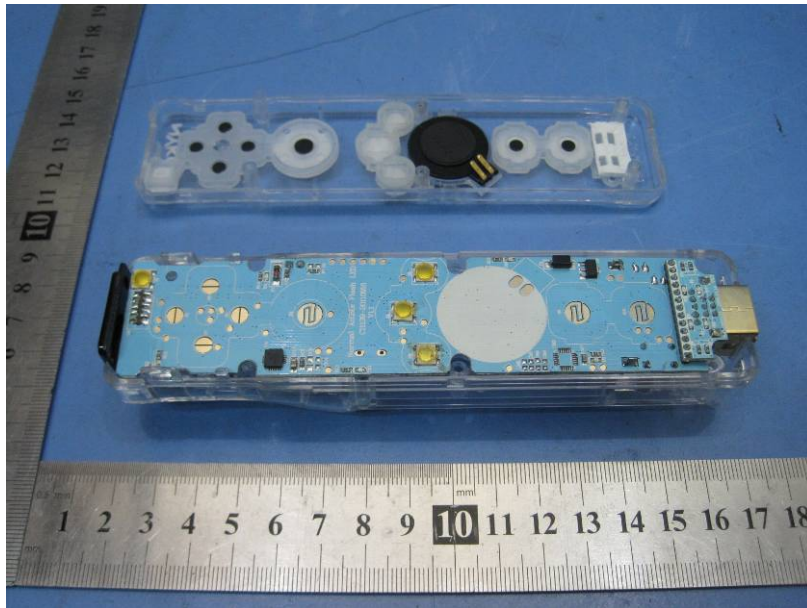


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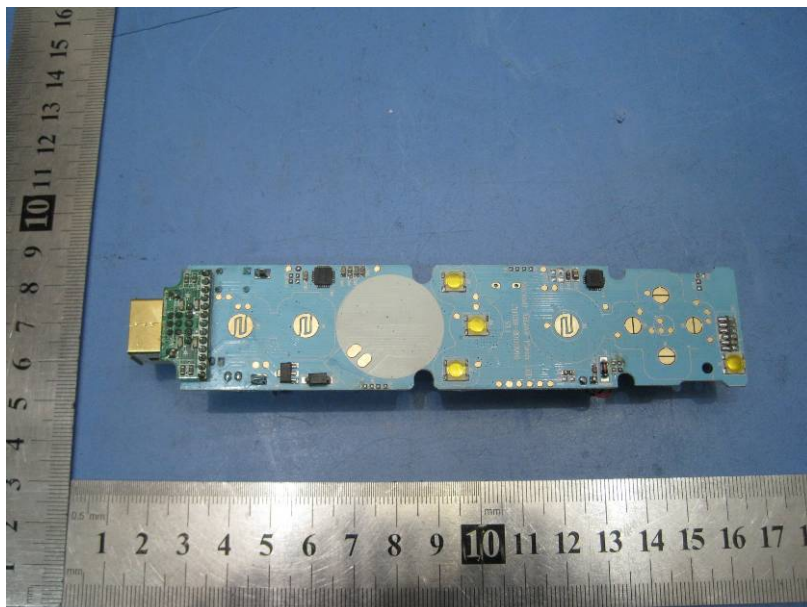
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## 16.2 EUT – Open View



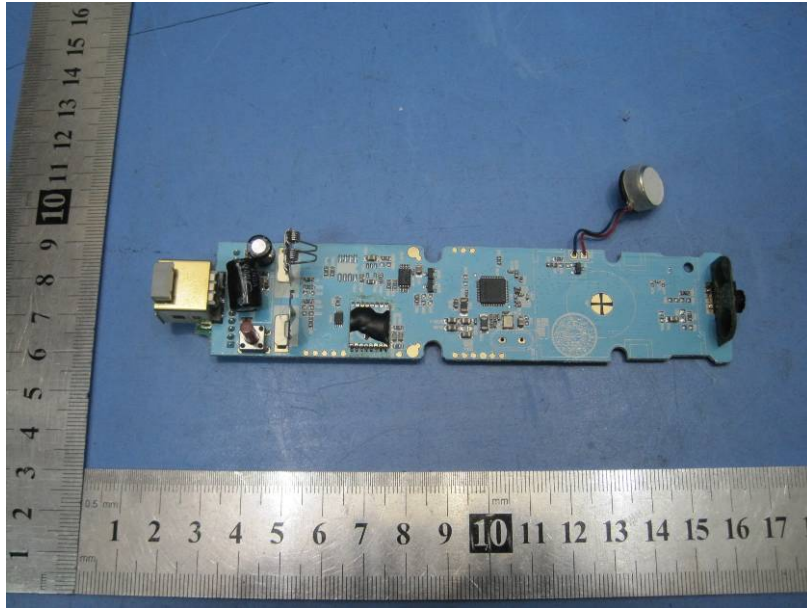
## 16.3 EUT – PCB View



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Reference No.: WT11116311-E-E-F

## 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 interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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 Top View/ proposed FCC Label Location

