



# FCC Report

**Applicant:** Polk Audio

**Address of Applicant:** 5601 Metro Drive Baltimore, MD 21215

**Equipment Under Test (EUT)**

Product Name: Surroundbar 5000 Instant Home Theater

Model No.: Surroundbar 5000 Subwoofer

Trade Mark: 

**FCC ID:** WLQWF5000IHTRX

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.247:2010

**Date of sample receipt:** Aug. 06, 2012

**Date of Test:** Aug. 06-10, 2012

**Date of report issued:** Aug. 14, 2012

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:



Robinson Lo  
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of GTS International Electrical Approvals or testing done by GTS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by GTS International Electrical Approvals in writing.

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## 2 Version

Version No.	Date	Description
00	Aug. 14, 2012	Original

**Prepared By:**

*hank. yan.*

**Date:**

*Aug. 14, 2012*

**Project Engineer**

**Check By:**

*Hans. Hu*

**Date:**

*Aug. 14, 2012*

**Reviewer**

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## 4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
Emission Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

*Pass: The EUT complies with the essential requirements in the standard.*

## 5 General Information

### 5.1 Client Information

Applicant:	Polk Audio
Address of Applicant:	5601 Metro Drive Baltimore, MD 21215
Manufacturer/Factory:	ZHAO YANG ELEC.(SHENZHEN) CO., LTD.
Address of Manufacturer/Factory:	Section A, 4th Floor, Building 1 & Building 2, De Yong Jia Industrial Park, Guang Qiao Road, Yu Lv Community, Gong Ming Street, Guang Ming New District, Shenzhen

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

Product Name:	Surroundbar 5000 Instant Home Theater
Model No.:	Surroundbar 5000 Subwoofer
Operation Frequency:	2403.5MHz~2477.3MHz
Channel numbers:	49
Modulation type:	FSK
Antenna Type:	Integral
Antenna gain:	2dBi
Power supply:	AC 230V/50Hz

Operation Frequency each of channel							
Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency(MHz)	Channel	Frequency(MHz)
1	2403.5	14	2423.5	27	2443.5	40	2463.5
2	2405.1	15	2425.1	28	2445.0	41	2465.0
3	2406.6	16	2426.6	29	2446.6	42	2466.6
4	2408.1	17	2428.1	30	2448.1	43	2468.4
5	2409.7	18	2429.7	31	2449.6	44	2469.6
6	2411.2	19	2431.2	32	2451.2	45	2471.2
7	2412.8	20	2432.7	33	2452.7	46	2472.7
8	2414.3	21	2434.3	34	2454.3	47	2474.2
9	2415.8	22	2435.8	35	2455.8	48	2475.8
10	2417.4	23	2437.4	36	2457.3	49	2477.3
11	2418.9	24	2438.9	37	2458.9		
12	2420.4	25	2440.4	38	2460.4		
13	2422.0	26	2442.0	39	2461.9		

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency
The lowest channel	2403.5MHz
The middle channel	2438.9MHz
The Highest channel	2477.3MHz

### 5.3 Test mode

Transmitting mode	Keep transmitting mode
-------------------	------------------------

### 5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen 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 600491, July 20, 2010.

- **Industry Canada (IC)**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. Has been

Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-1.

### 5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

Tel: 0755-27798480

Fax: 0755-27798960

### 5.6 Other Information Requested by the Customer

None.

### 5.7 Description of Support Units

None.

## 5.8 Test Instruments list

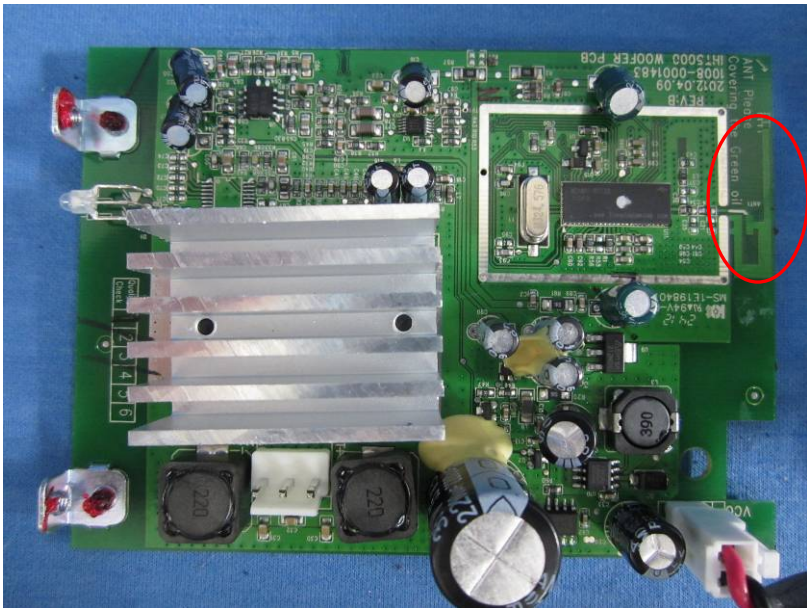
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 30 2011	Mar. 29 2013
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 03 2012	Jul. 02 2013
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 25 2012	Feb. 24 2013
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2012	June 28 2013
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 30 2011	Mar. 29 2013
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	Mar. 31 2012	Mar. 30 2013
9	Coaxial Cable	GTS	N/A	GTS211	Mar. 31 2012	Mar. 30 2013
10	Coaxial cable	GTS	N/A	GTS210	Mar. 31 2012	Mar. 30 2013
11	Coaxial Cable	GTS	N/A	GTS212	Mar. 31 2012	Mar. 30 2013
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 03 2012	Jul. 02 2013
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 03 2012	Jul. 02 2013
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2012	June 28 2013
15	Band filter	Amindeon	82346	GTS219	Mar. 31 2012	Mar. 30 2013

Conducted Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	Shielding Room	ZhongYu Electron	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 08 2011	Sep. 07 2013
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jul. 03 2012	Jul. 02 2013
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jul. 03 2012	Jul. 02 2013
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jul. 03 2012	Jul. 02 2013
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jul. 03 2012	Jul. 02 2013
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 03 2012	Jul. 02 2013
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A



## 6 Test results and Measurement Data

### 6.1 Antenna requirement:

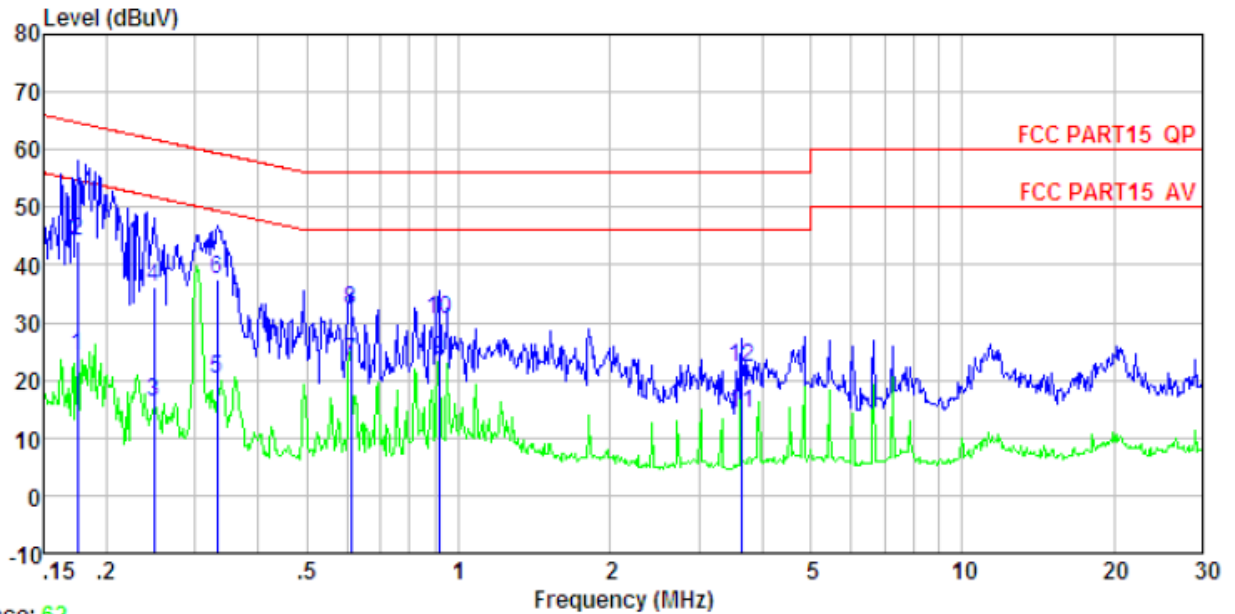
<b>Standard requirement:</b>	FCC Part15 C Section 15.203 /247(c)
<p><b>15.203 requirement:</b></p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p><b>15.247(c) (1)(i) requirement:</b></p> <p>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p>	
<b>E.U.T Antenna:</b>	
<p><i>The antenna is integral antenna, the best case gain of the antenna is 2dBi</i></p>  <p style="color: red; text-align: right;"><b>Antenna</b></p>	

## 6.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207																
Test Method:	ANSI C63.4:2003																
Test Frequency Range:	150KHz to 30MHz																
Class / Severity:	Class B																
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto																
Limit:	<table><tr><th rowspan="2">Frequency range (MHz)</th><th colspan="2">Limit (dBuV)</th></tr><tr><th>Quasi-peak</th><th>Average</th></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> <p>* Decreases with the logarithm of the frequency.</p>			Frequency range (MHz)	Limit (dBuV)		Quasi-peak	Average	0.15-0.5	66 to 56*	56 to 46*	0.5-5	56	46	5-30	60	50
Frequency range (MHz)	Limit (dBuV)																
	Quasi-peak	Average															
0.15-0.5	66 to 56*	56 to 46*															
0.5-5	56	46															
5-30	60	50															
Test setup:	<div><p style="text-align: center;"><b>Reference Plane</b></p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>																
Test procedure:	<ol style="list-style-type: none"><li>1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment.</li><li>2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs).</li><li>3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.</li></ol>																
Test Instruments:	Refer to section 5.8 for details																
Test mode:	Refer to section 5.3 for details																
Test results:	Pass																

### Measurement data:

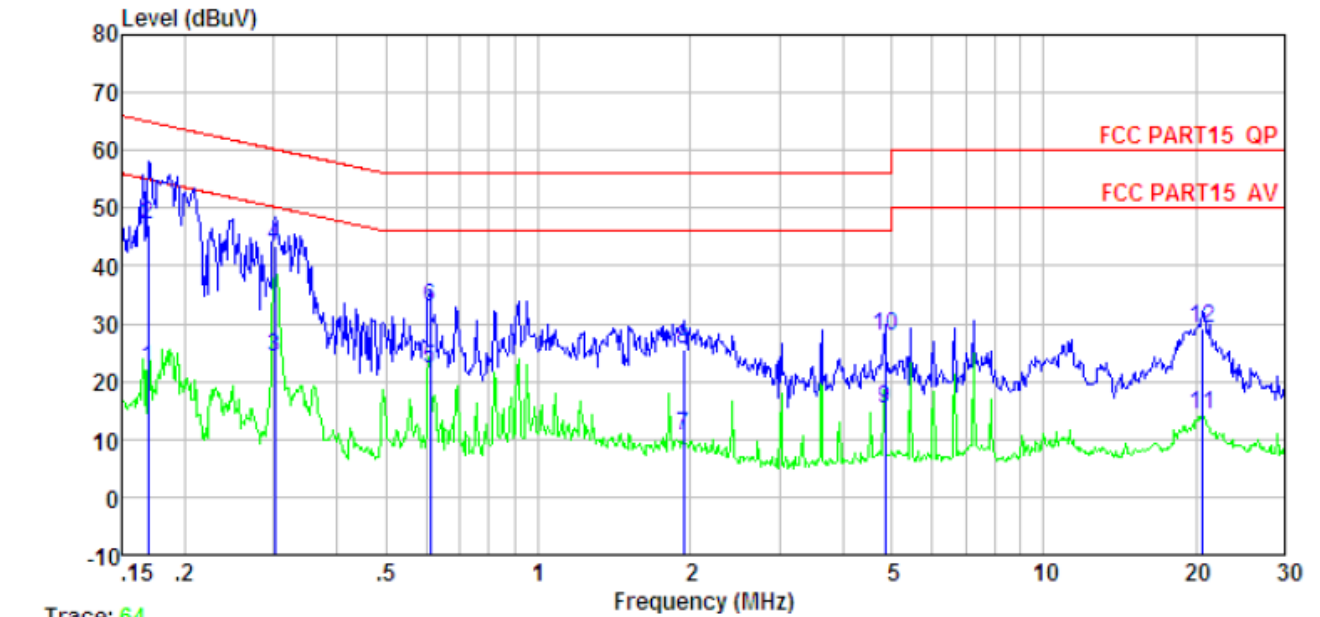
Line:



Condition : FCC PART15 QP LISN-2012 LINE  
 Job No. : 735RF  
 Test Mode : Operation mode  
 Test Engineer: Hank

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.175	24.23	-0.05	0.10	24.28	54.72	-30.44	Average
2	0.175	43.99	-0.05	0.10	44.04	64.72	-20.68	QP
3	0.248	16.33	-0.05	0.10	16.38	51.82	-35.44	Average
4	0.248	36.09	-0.05	0.10	36.14	61.82	-25.68	QP
5	0.332	20.33	-0.05	0.10	20.38	49.40	-29.02	Average
6	0.332	37.58	-0.05	0.10	37.63	59.40	-21.77	QP
7	0.611	23.29	-0.05	0.10	23.34	46.00	-22.66	Average
8	0.611	32.17	-0.05	0.10	32.22	56.00	-23.78	QP
9	0.914	23.36	-0.06	0.10	23.40	46.00	-22.60	Average
10	0.914	30.35	-0.06	0.10	30.39	56.00	-25.61	QP
11	3.642	14.26	-0.10	0.10	14.26	46.00	-31.74	Average
12	3.642	22.13	-0.10	0.10	22.13	56.00	-33.87	QP

**Neutral:**



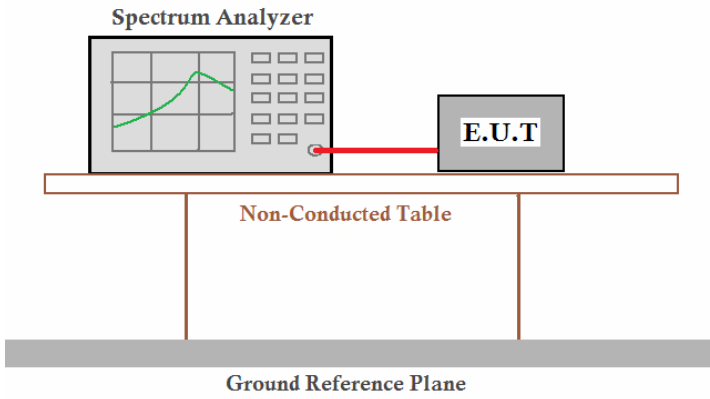
Trace: 64  
 Condition : FCC PART15 QP LISN-2012 NEUTRAL  
 Job No. : 735RF  
 Test Mode : Operation mode  
 Test Engineer: Hank

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.169	22.27	-0.05	0.10	22.32	54.99	-32.67	Average
2	0.169	46.99	-0.05	0.10	47.04	64.99	-17.95	QP
3	0.302	24.28	-0.05	0.10	24.33	50.19	-25.86	Average
4	0.302	43.34	-0.05	0.10	43.39	60.19	-16.80	QP
5	0.611	22.15	-0.05	0.10	22.20	46.00	-23.80	Average
6	0.611	32.79	-0.05	0.10	32.84	56.00	-23.16	QP
7	1.939	10.58	-0.08	0.10	10.60	46.00	-35.40	Average
8	1.939	25.40	-0.08	0.10	25.42	56.00	-30.58	QP
9	4.848	15.22	-0.11	0.10	15.21	46.00	-30.79	Average
10	4.848	28.00	-0.11	0.10	27.99	56.00	-28.01	QP
11	20.594	14.42	-0.32	0.21	14.31	50.00	-35.69	Average
12	20.594	29.30	-0.32	0.21	29.19	60.00	-30.81	QP

**Notes:**

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss

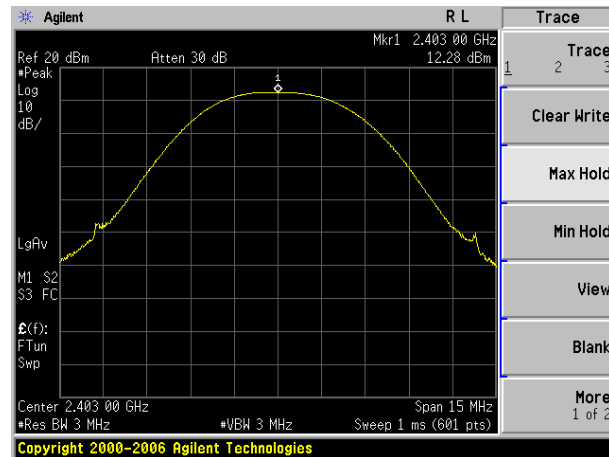
## 6.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.4:2003
Limit:	30dBm
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

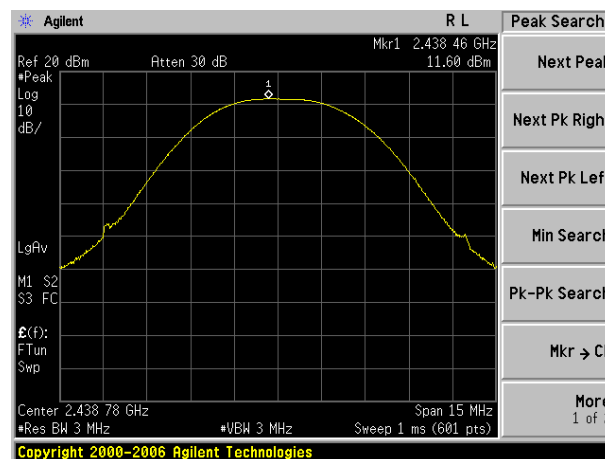
### Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	12.28	30.00	Pass
Middle	11.60		
Highest	10.34		

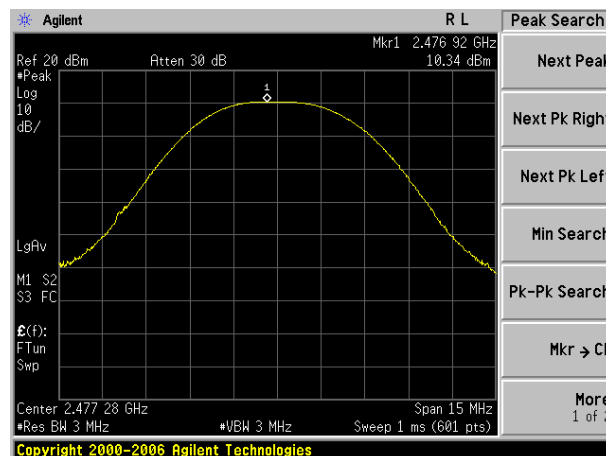
Test plot as follows:



Lowest channel

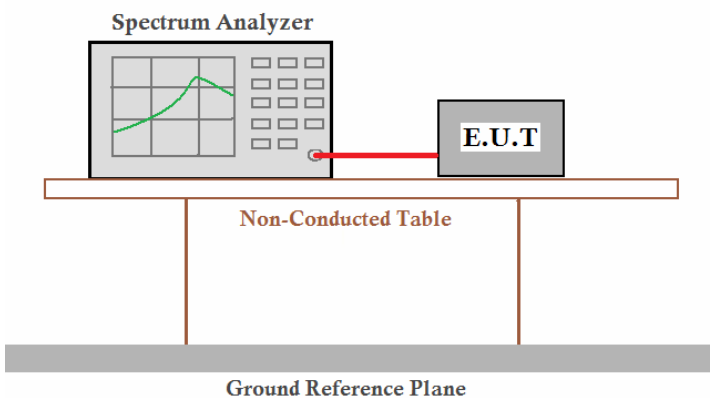


Middle channel



Highest channel

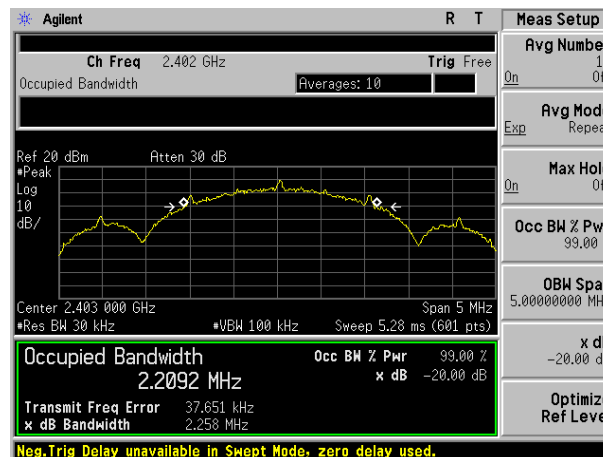
## 6.4 Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.4:2003
Limit:	N/A
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

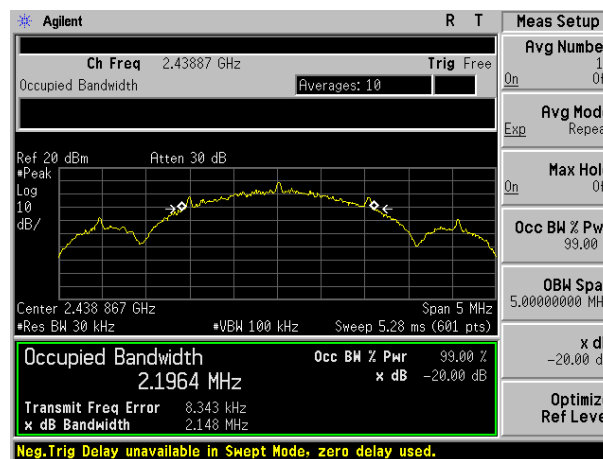
## Measurement Data

Test channel	Emission Bandwidth (MHz)	Result
Lowest	2.258	Pass
Middle	2.148	
Highest	2.284	

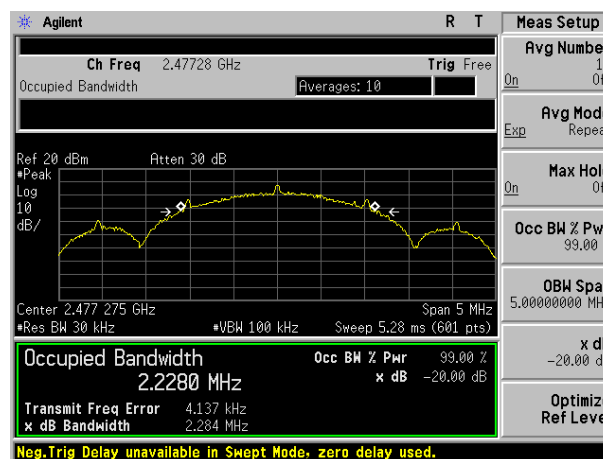
Test plot as follows:



Lowest channel



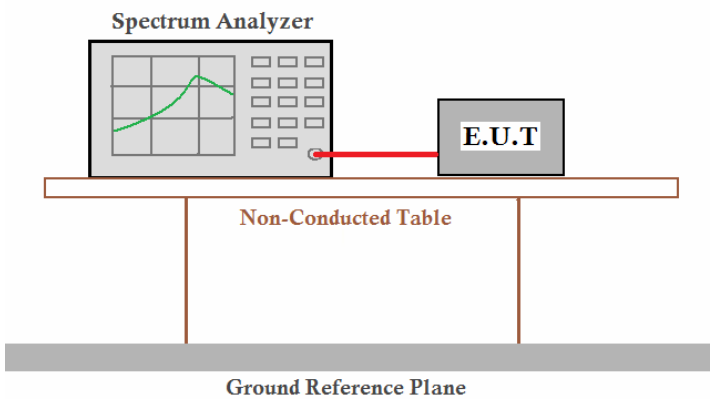
Middle channel



Highest channel



## 6.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

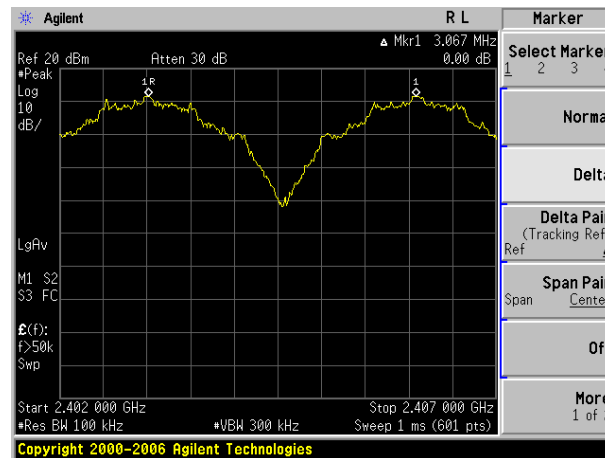
### Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3067	1523	Pass
Middle	3100	1523	Pass
Highest	1545	1523	Pass

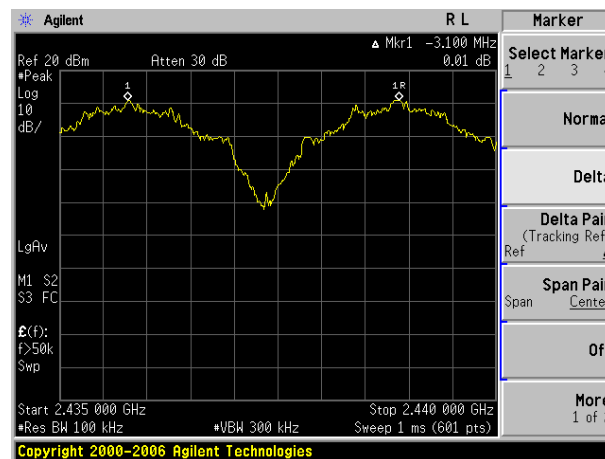
Note: According to section 6.4

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
FSK	2.284	1523

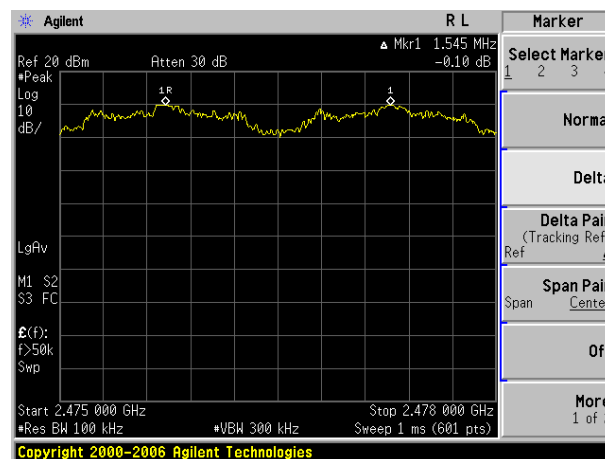
Test plot as follows:



Lowest channel

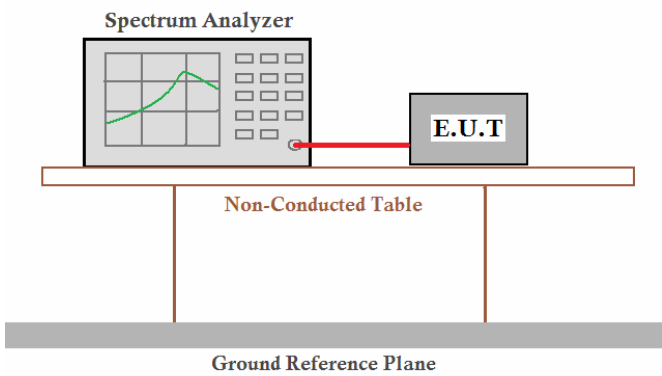


Middle channel



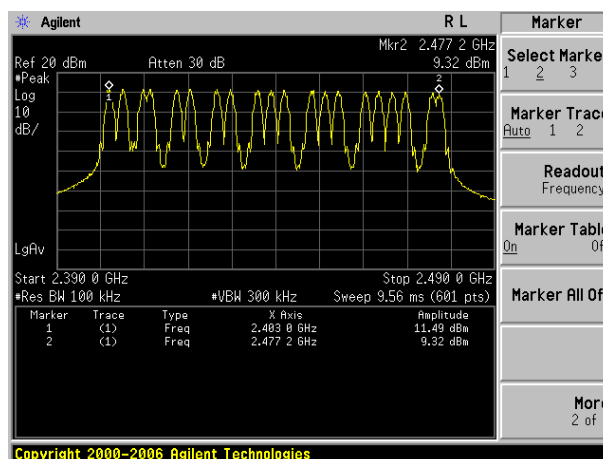
Highest channel

## 6.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

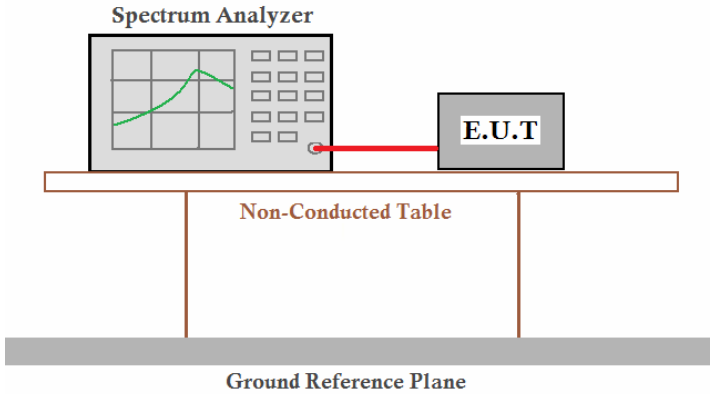
### Measurement Data:

Mode	Hopping channel numbers	Limit	Result
FSK	20	15	Pass



Remark: The RF Module has channel palette of 49 channels which are spaced every 1.537 MHz starting at 2403.5MHz. From this palette, 20 channels are used by the system at any given moment. Please refer to operational description for more information

## 6.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T (Equipment Under Test) via a red cable. Both are placed on a Non-Conducted Table, which is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

### Measurement Data

Channel	Dwell time (second)	Limit (second)	Result
lowest	0.27872	0.4	Pass
middle	0.27872		
highest	0.27872		

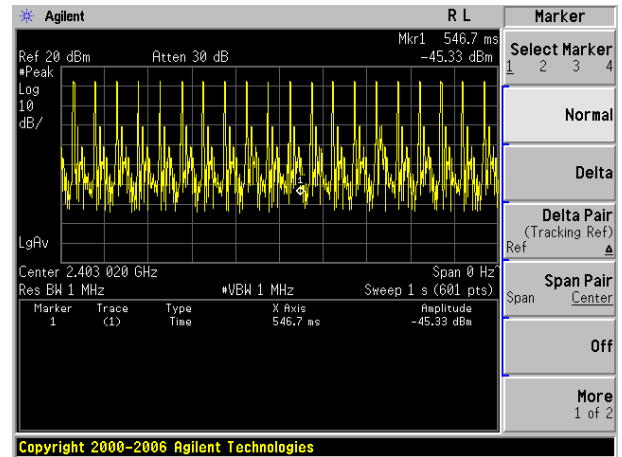
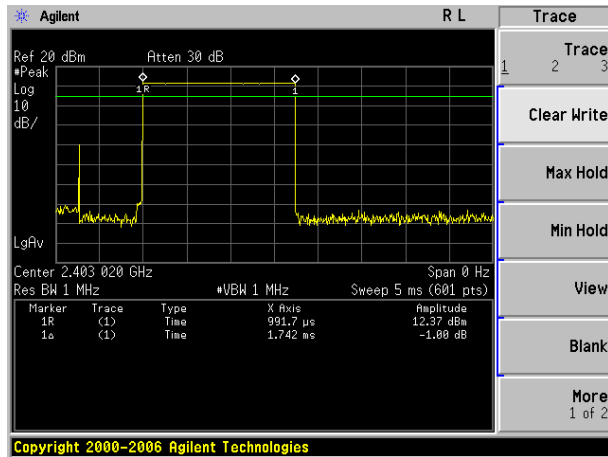
The formula of Dwell Time is below:

$$T = T_{on} * N * 0.4 * \text{Channel Numbers}$$

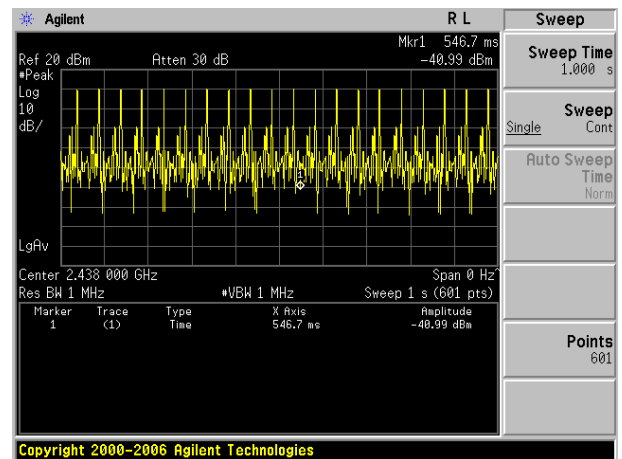
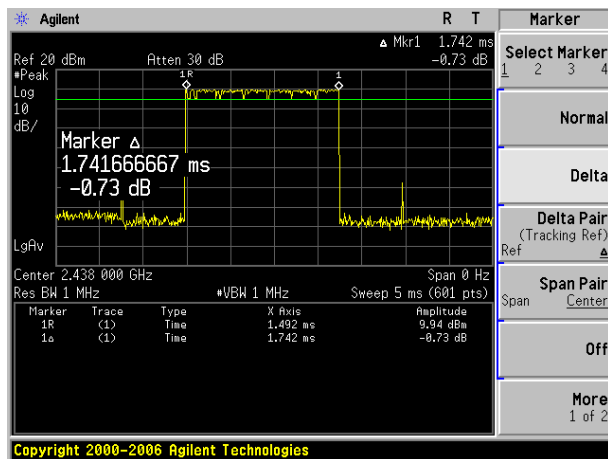
Remark:

N: Number of this channel is used in 1 second.

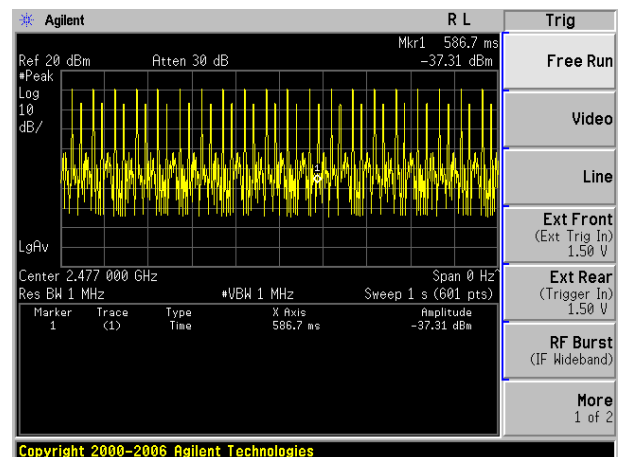
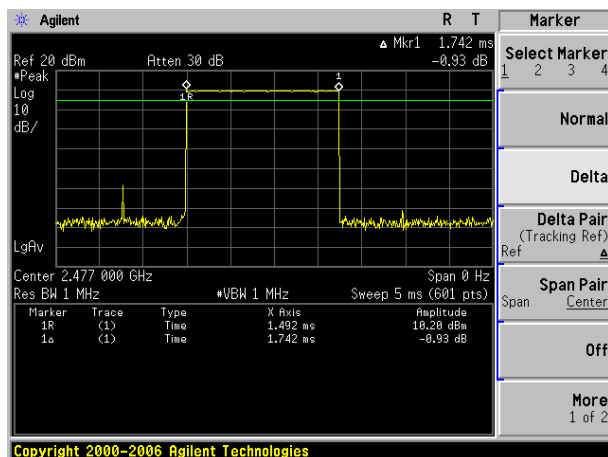
Test plot as follows:



Lowest channel



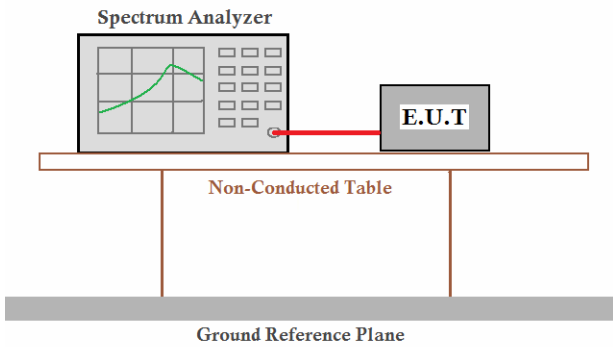
Middle channel



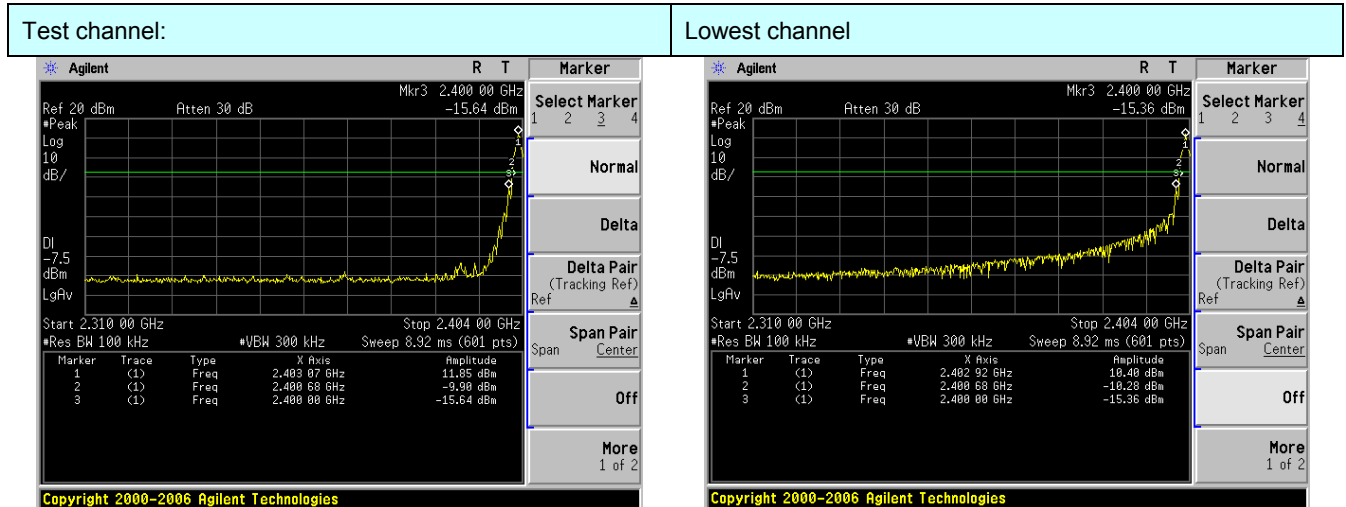
Highest channel

## 6.8 Band Edge

### 6.8.1 Conducted Emission Method

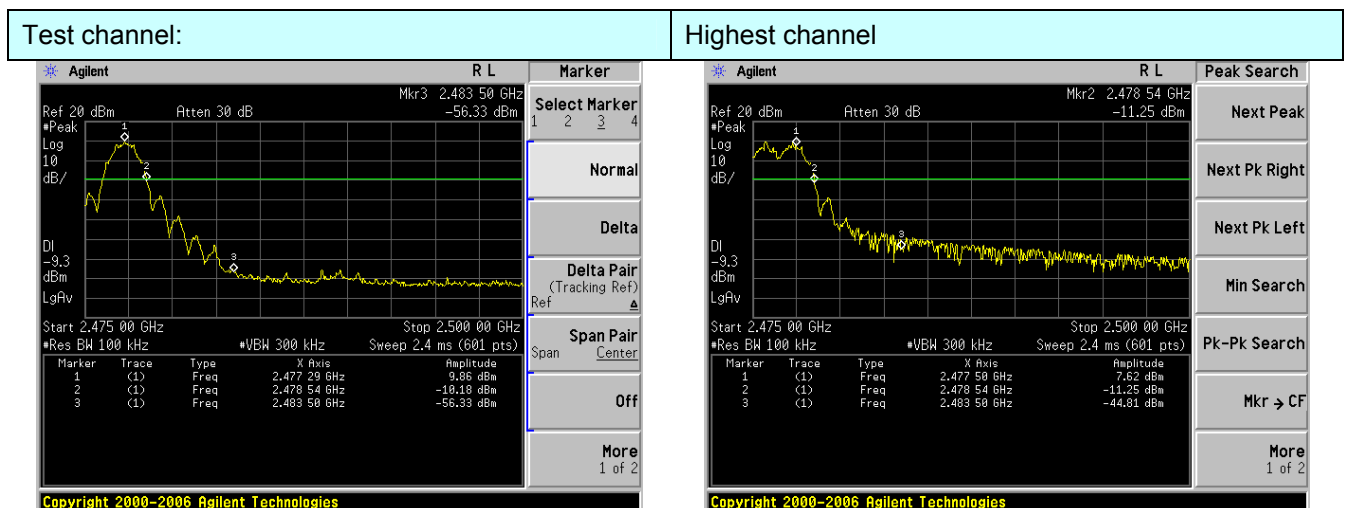
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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.
Test setup:	 <p>The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Test plot as follows:



No-hopping mode

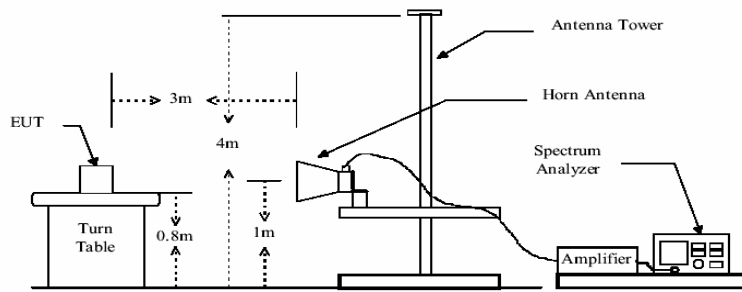
Hopping mode



No-hopping mode

Hopping mode

## 6.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.4: 2003				
Test Frequency Range:	All restriction band have been tested, and 2.3GHz to 2.5GHz band is the worse case				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		AV	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	Above 1GHz		54.00		Average Value
			74.00		Peak Value
Test setup:					
Test Procedure:	<ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li></ol>				
Test Instruments:	Refer to section 5.8 for details				
Test mode:	Refer to section 5.3 for details				
Test results:	Pass				

### Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.



Test channel:	Lowest
---------------	--------

**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	45.86	27.59	5.38	30.18	48.65	74.00	-25.35	Horizontal
2400.00	60.63	27.58	5.39	30.18	63.42	74.00	-10.58	Horizontal
2390.00	46.92	27.59	5.38	30.18	49.71	74.00	-24.29	Vertical
2400.00	63.12	27.58	5.39	30.18	65.91	74.00	-8.09	Vertical

**Average value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	31.07	27.59	5.38	30.18	33.86	54.00	-20.14	Horizontal
2400.00	45.00	27.58	5.39	30.18	47.79	54.00	-6.21	Horizontal
2390.00	32.47	27.59	5.38	30.18	35.26	54.00	-18.74	Vertical
2400.00	47.71	27.58	5.39	30.18	50.50	54.00	-3.50	Vertical

Test channel:	Highest
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**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	54.25	27.53	5.47	29.93	57.32	74.00	-16.68	Horizontal
2500.00	45.98	27.55	5.49	29.93	49.09	74.00	-24.91	Horizontal
2483.50	56.65	27.53	5.47	29.93	59.72	74.00	-14.28	Vertical
2500.00	44.70	27.55	5.49	29.93	47.81	74.00	-26.19	Vertical

**Average value:**

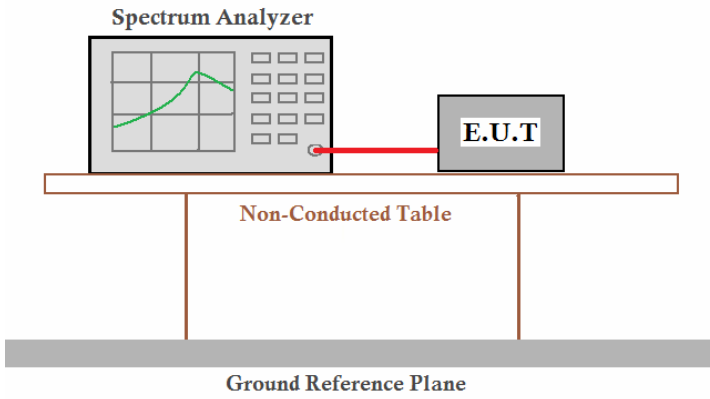
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	43.44	27.53	5.47	29.93	46.51	54.00	-7.49	Horizontal
2500.00	30.29	27.55	5.49	29.93	33.40	54.00	-20.60	Horizontal
2483.50	46.00	27.53	5.47	29.93	49.07	54.00	-4.93	Vertical
2500.00	30.20	27.55	5.49	29.93	33.31	54.00	-20.69	Vertical

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

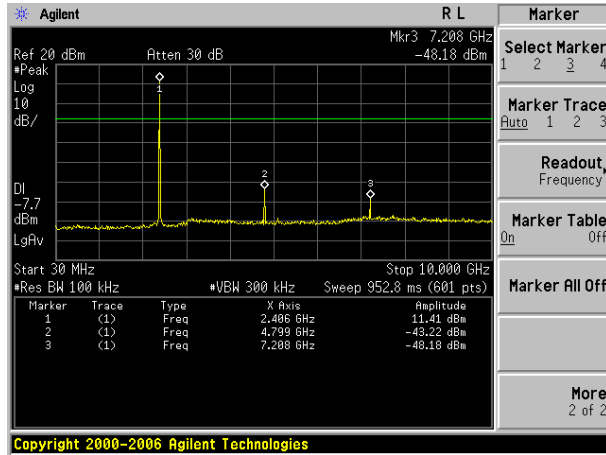
## 6.9 Spurious Emission

### 6.9.1 Conducted Emission Method

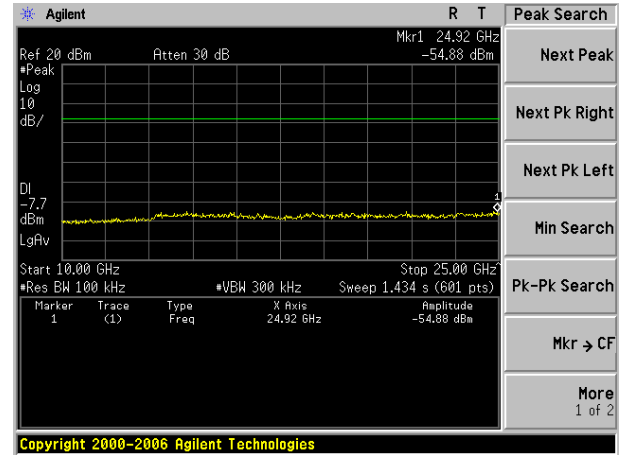
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and KDB558074 D01 Meas Guidance
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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.
Test setup:	 <p>The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T (Equipment Under Test). Both are placed on a Non-Conducted Table, which sits on a Ground Reference Plane.</p>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Test channel:

Lowest channel



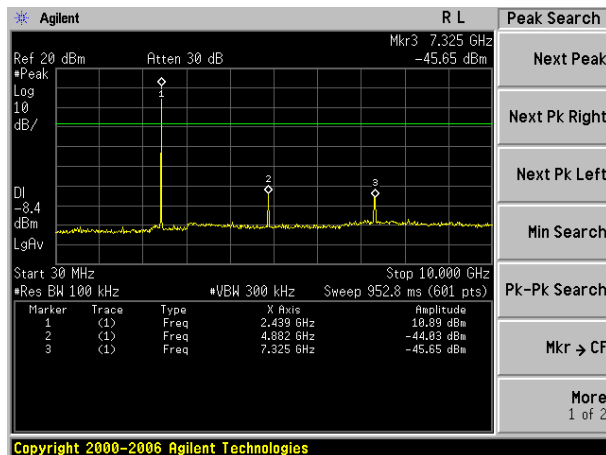
30MHz~10GHz



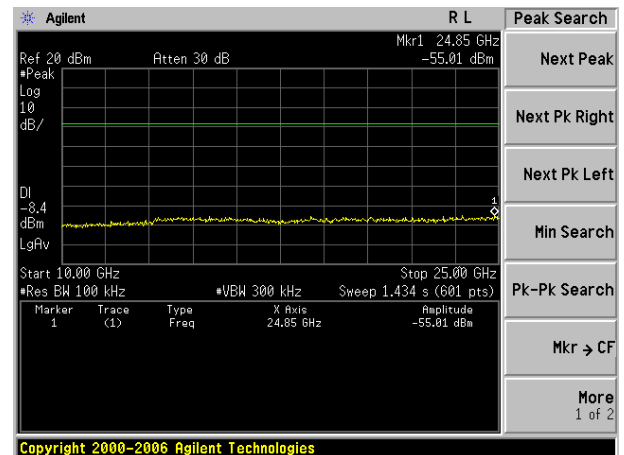
10GHz~25GHz

Test channel:

Middle channel

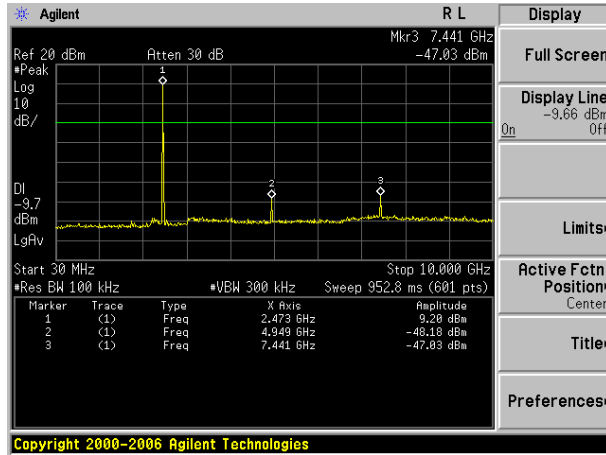


30MHz~10GHz

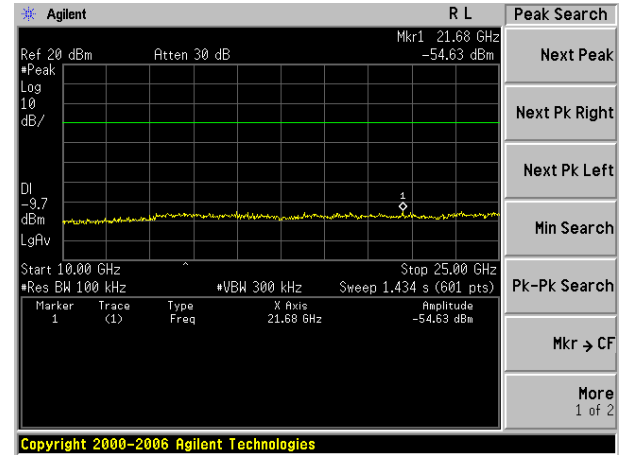


10GHz~25GHz

Test channel:	Highest channel
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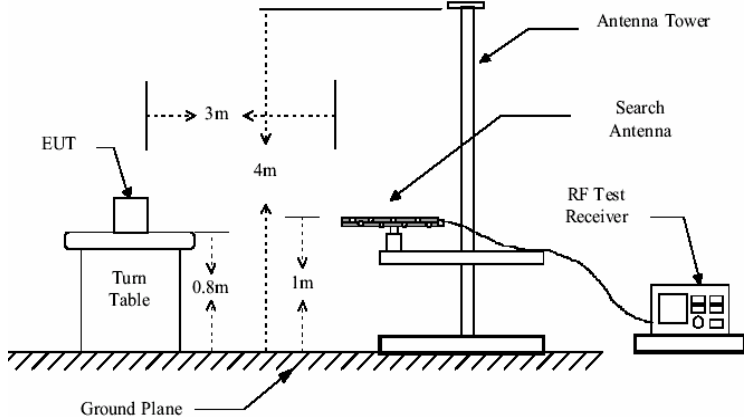
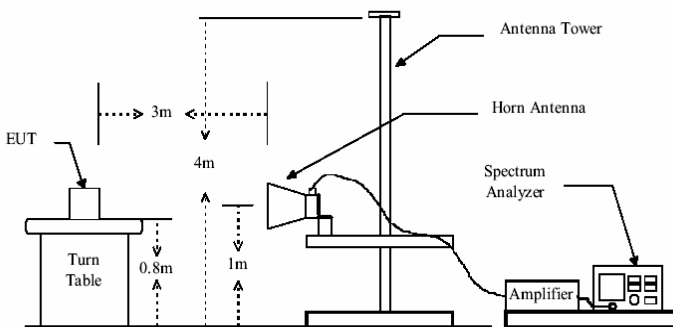


30MHz~10GHz



10GHz~25GHz

## 6.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.4: 2003				
Test Frequency Range:	30MHz to 25GHz				
Test site:	Measurement Distance: 3m				
Receiver setup:	Frequency	Detector	RBW	VBW	Remark
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		Av	1MHz	10Hz	Average Value
Limit:	Frequency		Limit (dBuV/m @3m)		Remark
	30MHz-88MHz		40.0		Quasi-peak Value
	88MHz-216MHz		43.5		Quasi-peak Value
	216MHz-960MHz		46.0		Quasi-peak Value
	960MHz-1GHz		54.0		Quasi-peak Value
	Above 1GHz		54.0		Average Value
			74.0		Peak Value
Test setup:	Below 1GHz				
					
Test setup:	Above 1GHz				
					

Test Procedure:	<ol style="list-style-type: none"> <li>1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li> <li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li> <li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li> <li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li> <li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li> <li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li> </ol>
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

1. Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.

### Measurement data:

#### ■ Below 1GHz

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
33.45	47.34	15.77	0.59	32.06	31.64	40.00	-8.36	Vertical
39.02	43.69	16.58	0.65	32.06	28.86	40.00	-11.14	Vertical
113.32	44.21	14.15	1.31	31.83	27.84	43.50	-15.66	Vertical
304.61	40.86	16.14	2.38	32.16	27.22	46.00	-18.78	Vertical
381.25	41.36	16.68	2.77	31.94	28.87	46.00	-17.13	Vertical
406.09	43.01	17.22	2.88	31.87	31.24	46.00	-14.76	Vertical
40.70	37.75	16.58	0.67	32.05	22.95	40.00	-17.05	Horizontal
59.65	37.73	15.78	0.86	31.94	22.43	40.00	-17.57	Horizontal
100.93	38.78	16.06	1.20	31.76	24.28	43.50	-19.22	Horizontal
239.99	38.05	15.07	2.07	32.16	23.03	46.00	-22.97	Horizontal
360.45	38.60	16.43	2.67	32.00	25.70	46.00	-20.30	Horizontal
750.11	37.08	22.43	4.28	31.26	32.53	46.00	-13.47	Horizontal

■ Above 1GHz

Test channel:	Lowest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4807.00	33.54	31.78	8.60	24.17	49.75	74.00	-24.25	Vertical
7210.50	35.01	36.15	11.66	26.46	56.36	74.00	-17.64	Vertical
9614.00	32.77	38.01	14.14	25.45	59.47	74.00	-14.53	Vertical
12017.50	*					74.00		Vertical
14421.00	*					74.00		Vertical
4807.00	33.34	31.78	8.60	24.17	49.55	74.00	-24.45	Horizontal
7210.50	39.97	36.15	11.66	26.46	61.32	74.00	-12.68	Horizontal
9614.00	31.29	38.01	14.14	25.45	57.99	74.00	-16.01	Horizontal
12017.50	*					74.00		Horizontal
14421.00	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4807.00	23.12	31.78	8.60	24.17	39.33	54.00	-14.67	Vertical
7210.50	21.04	36.15	11.66	26.46	42.39	54.00	-11.61	Vertical
9614.00	19.36	38.01	14.14	25.45	46.06	54.00	-7.94	Vertical
12017.50	*					54.00		Vertical
14421.00	*					54.00		Vertical
4807.00	24.32	31.78	8.60	24.17	40.53	54.00	-13.47	Horizontal
7210.50	22.33	36.15	11.66	26.46	43.68	54.00	-10.32	Horizontal
9614.00	19.17	38.01	14.14	25.45	45.87	54.00	-8.13	Horizontal
12017.50	*					54.00		Horizontal
14421.00	*					54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel:	Middle
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### Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4877.80	35.11	31.85	8.66	24.10	51.52	74.00	-22.48	Vertical
7316.70	40.40	36.37	11.72	26.71	61.78	74.00	-12.22	Vertical
9755.60	31.65	38.35	14.25	25.36	58.89	74.00	-15.11	Vertical
12194.50	*					74.00		Vertical
14633.40	*					74.00		Vertical
4877.80	35.50	31.85	8.66	24.10	51.91	74.00	-22.09	Horizontal
7316.70	40.38	36.37	11.72	26.71	61.76	74.00	-12.24	Horizontal
9755.60	30.90	38.35	14.25	25.36	58.14	74.00	-15.86	Horizontal
12194.50	*					74.00		Horizontal
14633.40	*					74.00		Horizontal

### Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4877.80	28.46	31.85	8.66	24.10	44.87	54.00	-9.13	Vertical
7316.70	25.14	36.37	11.72	26.71	46.52	54.00	-7.48	Vertical
9755.60	21.17	38.35	14.25	25.36	48.41	54.00	-5.59	Vertical
12194.50	*					54.00		Vertical
14633.40	*					54.00		Vertical
4877.80	25.41	31.85	8.66	24.10	41.82	54.00	-12.18	Horizontal
7316.70	23.28	36.37	11.72	26.71	44.66	54.00	-9.34	Horizontal
9755.60	21.08	38.35	14.25	25.36	48.32	54.00	-5.68	Horizontal
12194.50	*					54.00		Horizontal
14633.40	*					54.00		Horizontal

### Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.



Test channel:	Highest
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**Peak value:**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4954.60	35.10	31.93	8.73	24.03	51.73	74.00	-22.27	Vertical
7431.90	31.85	36.56	11.79	27.03	53.17	74.00	-20.83	Vertical
9909.20	28.15	38.81	14.35	25.27	56.04	74.00	-17.96	Vertical
12386.50	*					74.00		Vertical
14863.80	*					74.00		Vertical
4954.60	35.49	31.91	8.71	24.05	52.06	74.00	-21.94	Horizontal
7431.90	41.35	36.56	11.79	27.03	62.67	74.00	-11.33	Horizontal
9909.20	29.32	38.81	14.35	25.27	57.21	74.00	-16.79	Horizontal
12386.50	*					74.00		Horizontal
14863.80	*					74.00		Horizontal

**Average value:**

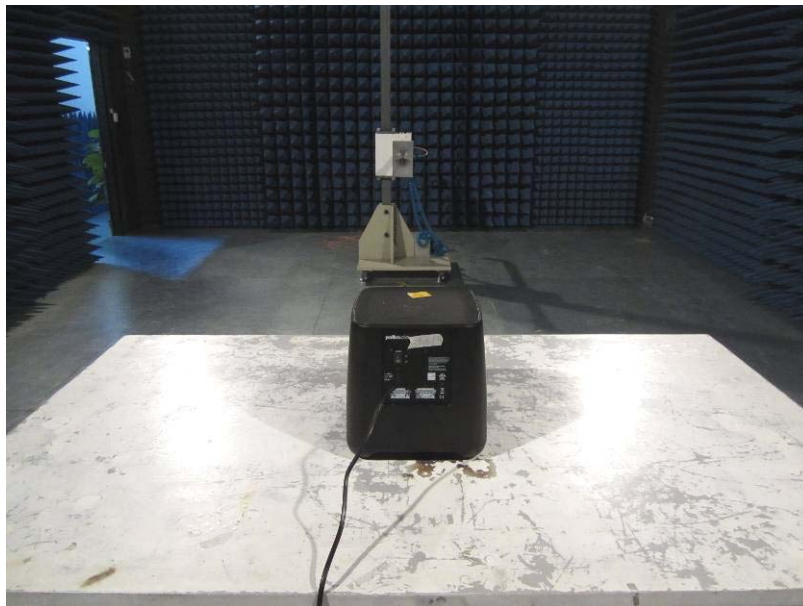
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4954.60	25.09	31.93	8.73	24.03	41.72	54.00	-12.28	Vertical
7431.90	21.47	36.56	11.79	27.03	42.79	54.00	-11.21	Vertical
9909.20	20.09	38.81	14.35	25.27	47.98	54.00	-6.02	Vertical
12386.50	*					54.00		Vertical
14863.80	*					54.00		Vertical
4954.60	25.74	31.91	8.71	24.05	42.31	54.00	-11.69	Horizontal
7431.90	21.35	36.56	11.79	27.03	42.67	54.00	-11.33	Horizontal
9909.20	19.97	38.81	14.35	25.27	47.86	54.00	-6.14	Horizontal
12386.50	*					54.00		Horizontal
14863.80	*					54.00		Horizontal

**Remark:**

1. *Final Level* = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 7 Test Setup Photo

Radiated Emission



## Conducted Emission



## 8 EUT Constructional Details

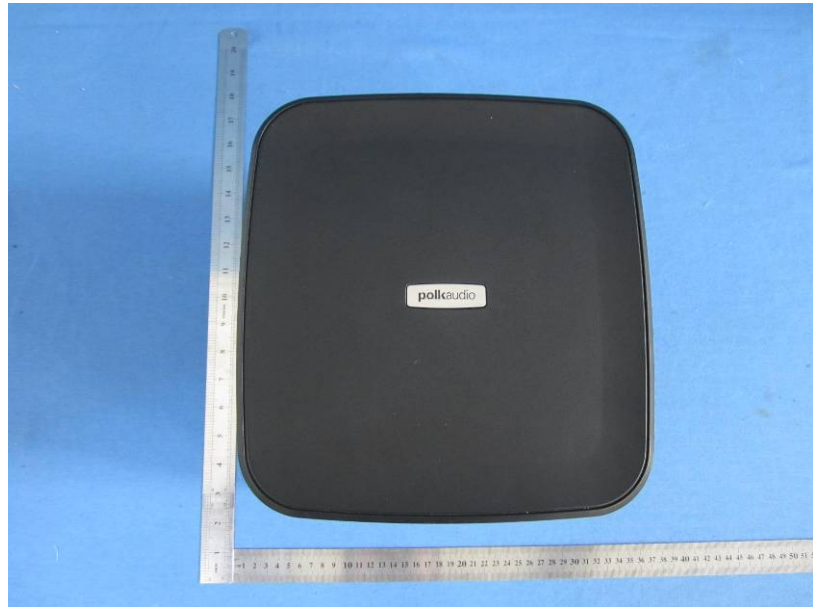
Product View



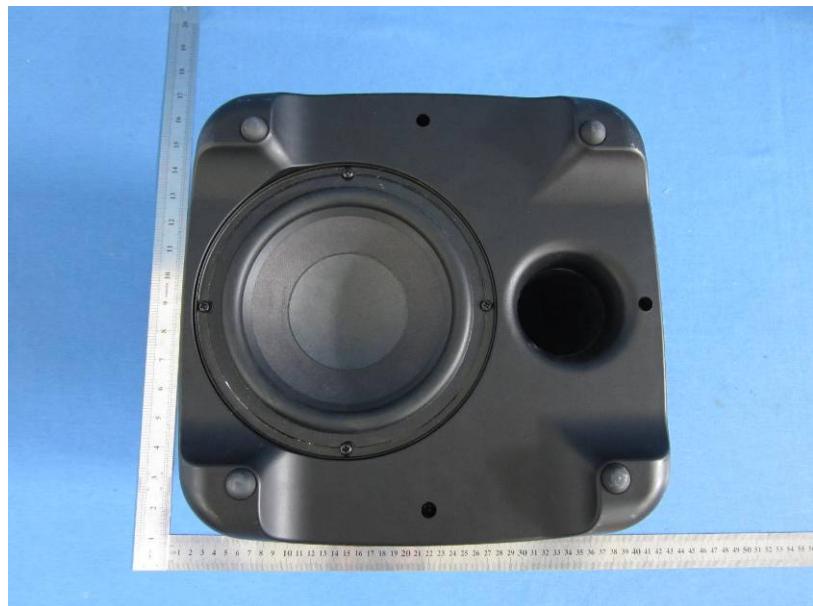
Front



Top

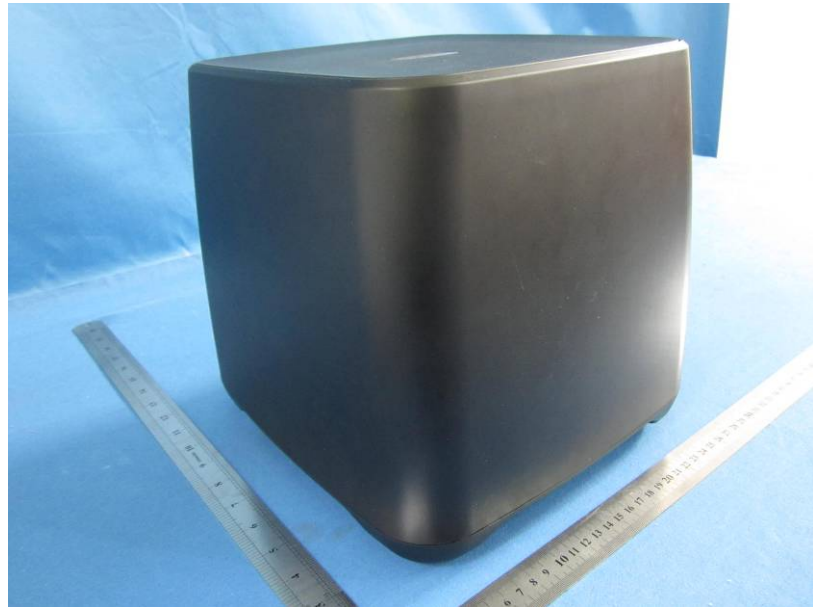


Bottom

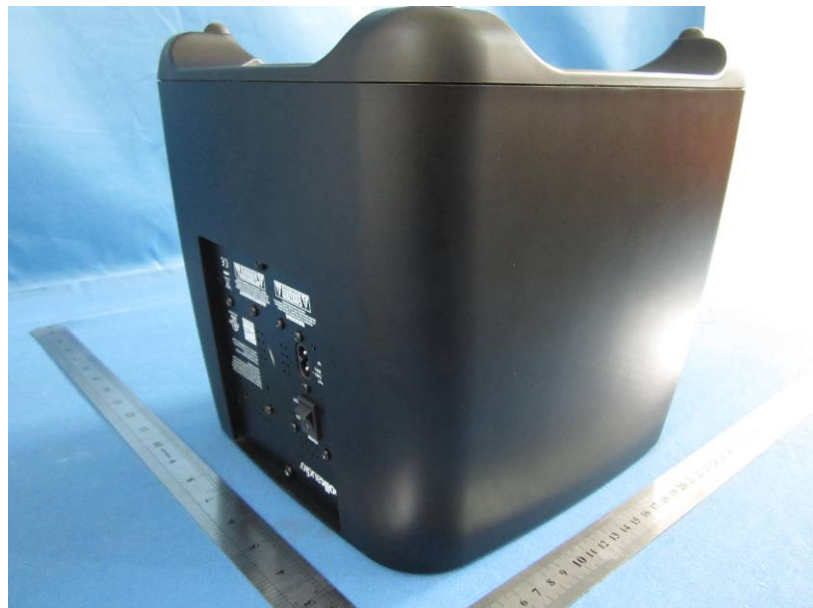




Left-front



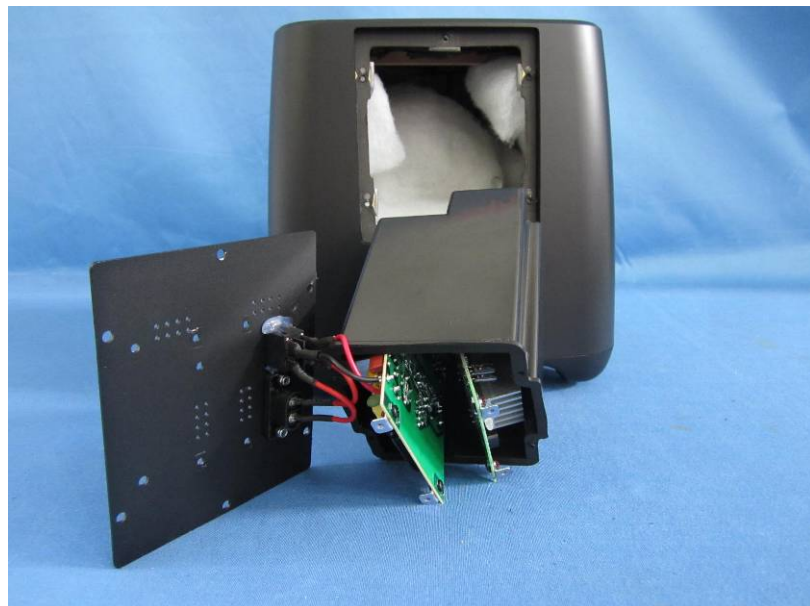
Right-back



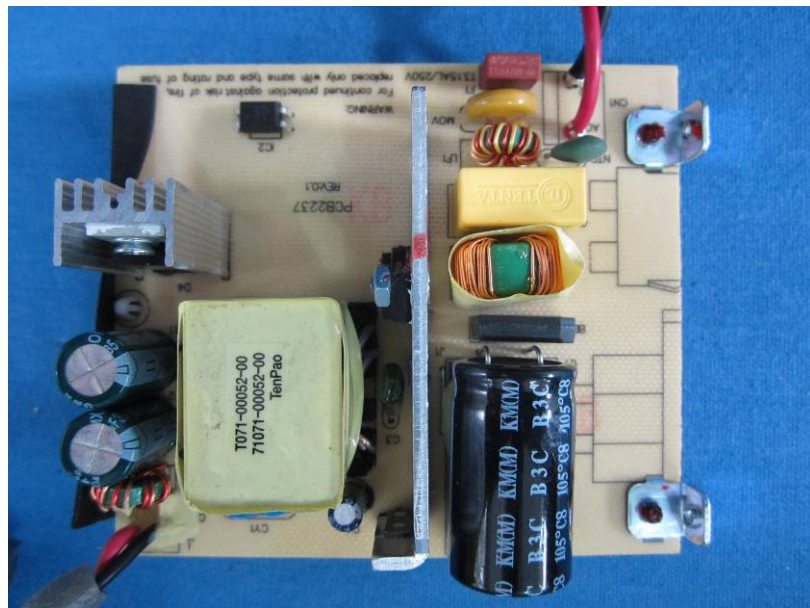
Interface



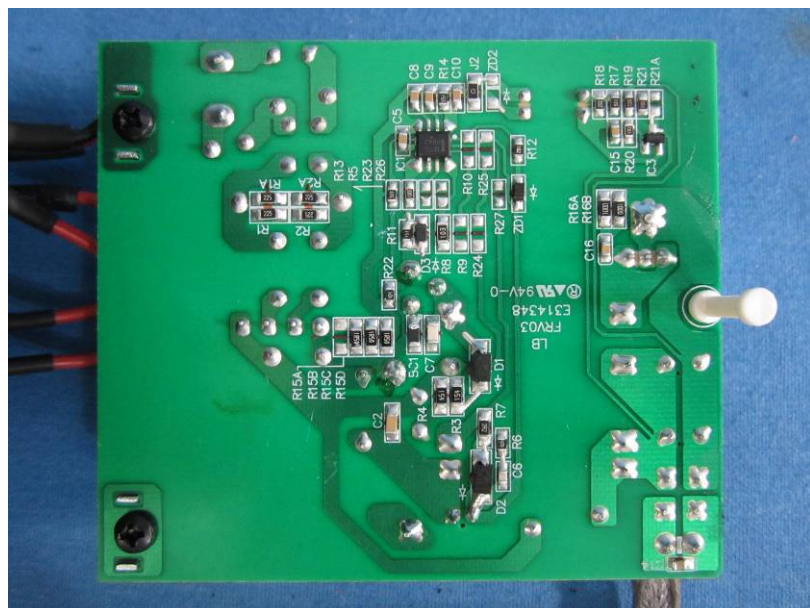
Open-1



Power-1

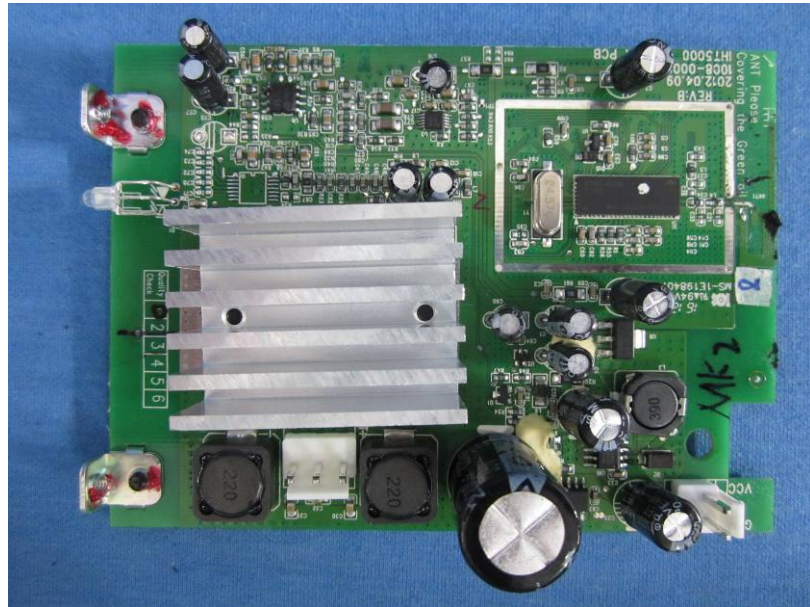


## Power-2

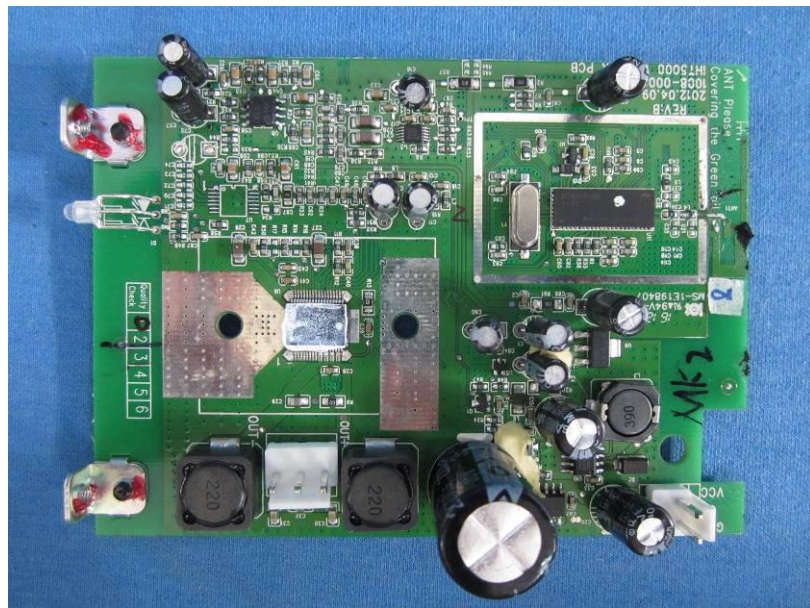




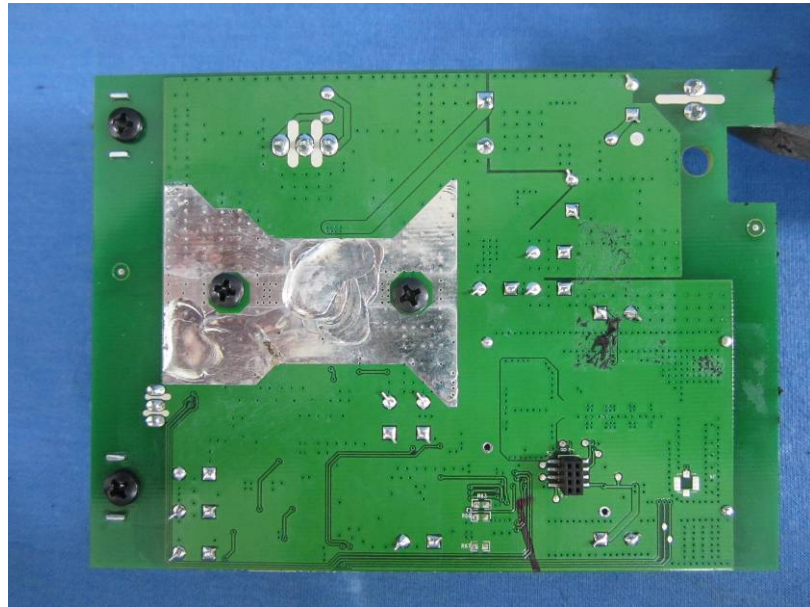
Mainboard-1



Mainboard-2



Mainboard-3



-----End-----