

APPLICATION CERTIFICATION
On Behalf of
Klipsch L.L.C

Audio Speaker System
Model No.: RoomGroove

FCC ID: STI-RG
IC ID: 5788A-RG

Prepared for : Klipsch L.L.C
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Test Report Certification

Applicant : Klipsch L.L.C
Manufacturer : 1. Zhao Yang Elec. (Shenzhen) Co., Ltd.
2. Jie Hao Elec. (Su Zhou) Co., Ltd.
EUT Description : Audio Speaker System
(A) MODEL NO.: RoomGrove
(B) SERIAL NO.: N/A
(C) POWER SUPPLY: DC 15V, 3.0A (Power by AC/DC Adaptor)

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.207, Section 15.247:2006
RSS-210 Annex 8: Issue 6 September 2005

The device described above is tested by ACCURATE TECHNOLOGY CO. LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.207, Section 15.247, RSS-210 Annex 8 limits. The measurement results are contained in this test report and ACCURATE TECHNOLOGY CO. LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of ACCURATE TECHNOLOGY CO. LTD.

Date of Test : February 3-6, 2007

Prepared by : 
(Engineer)

Reviewer : 
(Quality Manager)

Approved & Authorized Signer : 
(Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Audio Speaker System
Model Number	:	RoomGroove
Frequency Band	:	2400MHz-2483.5MHz
Number of Channels	:	3
Carrier Frequency of Each Channel	:	Channel 1: 2412MHz Channel 2: 2438MHz Channel 3: 2464MHz
Antenna Type/Gain	:	Dipole/1.8dBi
Power Supply	:	DC 15V, 3.0A (Power by AC/DC Adaptor)
AC/DC Adaptor	:	Model: ADS-48R-12-2 1545 Input: AC 100-240V, 50/60Hz Output: DC 15V, 3.0A
Applicant	:	Klipsch L.L.C
Address	:	3502 Woodview Trace, Suite 200 Indianapolis, IN 46268
Manufacturer	:	1. Zhao Yang Elec. (Shenzhen) Co., Ltd. 2. Jie Hao Elec. (Su Zhou) Co., Ltd.
Address	:	1. Ma Bu Technology Park, Xixiang Town, Baoan District, Shenzhen, P.R.China 2. No.1 High-technical Industry Park, Linggang, Luzhi Town, Wuzhong Area, Suzhou, P.R.China
Date of sample received	:	February 1, 2007
Date of Test	:	February 3-6, 2007

1.2. Description of Test Facility

EMC Lab	:	Accredited by TUV Rheinland Shenzhen, May 10, 2004 Accredited by FCC, May 10, 2004 The Certificate Registration Number is 253065 Accredited by Industry Canada, May 18, 2004 The Certificate Registration Number is IC 5077
Name of Firm	:	ACCURATE TECHNOLOGY CO. LTD
Site Location	:	F1, Bldg. A, Changyuan New Material Port, Keyuan Rd. Science & Industry Park, Nanshan, Shenzhen, Guangdong P.R. China

1.3.Measurement Uncertainty

Conducted emission expanded uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty = 4.12dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	03.31.2007
EMI Test Receiver	Rohde&Schwarz	ESI26	838786/013	01.24.2008
Loop Antenna	Schwarzbeck	FMZB1516	113	01.24.2008
Bilog Antenna	Schwarzbeck	VULB9163	9163-194	03.31.2007
Bilog Antenna	Chase	CBL6112B	2591	01.24.2008
Horn Antenna	Rohde&Schwarz	HF906	100013	01.24.2008
L.I.S.N.	Rohde&Schwarz	ESH3-Z5	100305	03.31.2007
L.I.S.N.	Rohde&Schwarz	ESH3-Z5	100310	03.31.2007
iPod	Apple	A1136	JQ543GF9SZ A	N.A.

3. OPERATION OF EUT DURING TESTING

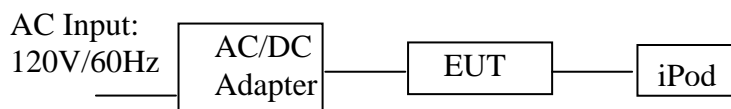
3.1. Operating Modes

The EUT exercise program was used while the testing was performed in a manner similar to typical use.

The sequence is used:

- Mode 1. TX(CH1: 2412MHz) with iPod playing
- Mode 2. TX(CH2: 2438MHz) with iPod playing
- Mode 3. TX(CH3: 2464MHz) with iPod playing
- Mode 4. RX(CH1: 2412MHz)
- Mode 5. RX(CH2: 2438MHz)
- Mode 6. RX(CH3: 2464MHz)

3.2. Configuration and peripherals



3.3. Test Voltage

AC 120V/60Hz

3.4. Standard for Methods of Measurement

ANSI C63.4-2003 for conducted power line test and radiated emission test.

3.5. Frequency Range Investigated

- a. Conducted Emission: from 150kHz to 30MHz
- b. Radiated Emission: from 30MHz to 25000MHz

3.6. Test Distance

The test distance of radiated emission from antenna to EUT is 3 meter.

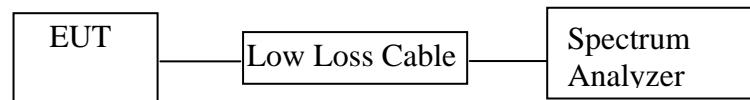
4. TEST PROCEDURES AND RESULTS

Test Procedures	Description of Test	Results
15.207(a)	Conducted Emission	Pass
15.247(a)(2) RSS210: A8.2(1)	6dB Bandwidth	Pass
15.247(b)(3) RSS210: A8.4(4)	Maximum Peak Output Power	Pass
15.247(d) RSS210: A8.5	Radiated Emission	Pass
15.247(d) RSS210: A8.5	100kHz Bandwidth of Frequency Band Edges	Pass
15.247(e) RSS210: A8.2(2)	Power Spectral Density	Pass
15.203	Antenna Requirement	Pass
1.1310	Maximum Permissible Exposure	Pass

5. 6DB BANDWIDTH

5.1. Block Diagram of Test Setup

5.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

5.2. The Requirement For Section 15.247(a)(2) & RSS210: A8.2(1)

Section 15.247(a)(2): System using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6dB bandwidth shall be least 500kHz.

RSS210: A8.2(1): The minimum 6dB bandwidth shall be least 500kHz.

5.3. EUT Configuration on Measurement

The following equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.3.1. Audio Speaker System (EUT)

Model Number	:	RoomGroove
Serial Number	:	N/A
Manufacturer	:	1. Zhao Yang Elec. (Shenzhen) Co., Ltd. 2. Jie Hao Elec. (Su Zhou) Co., Ltd.

5.4. Test Procedure

5.4.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.4.2. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz.

5.4.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.5. Test Result

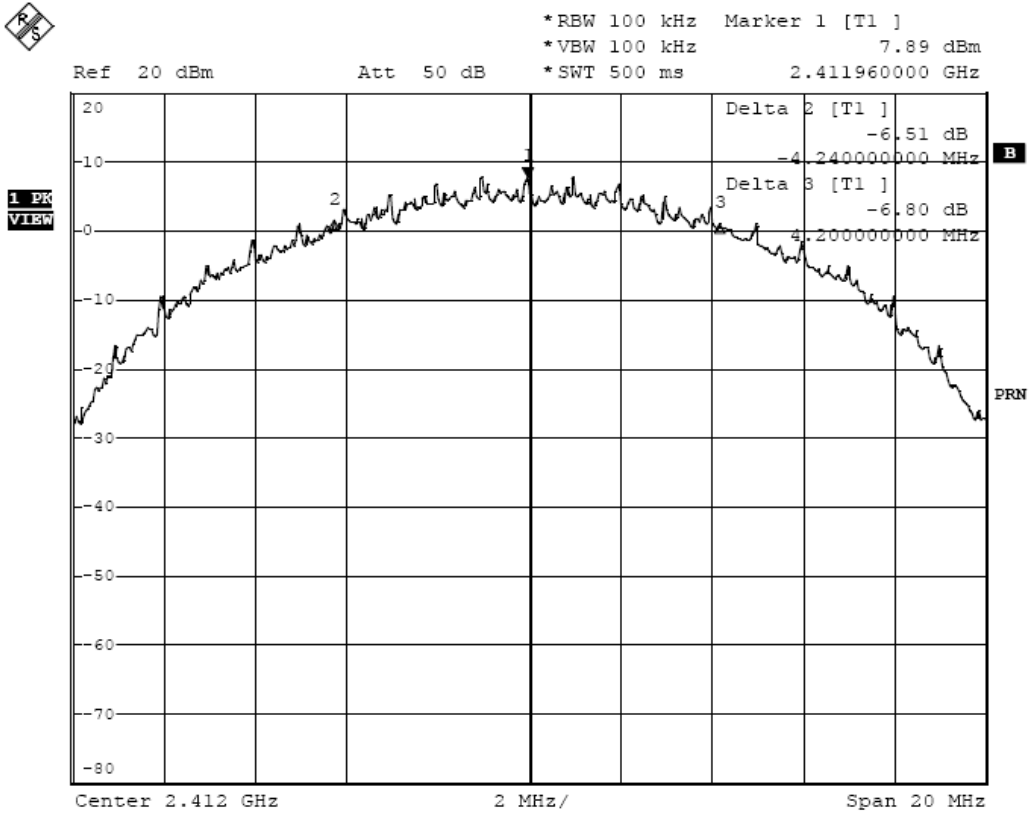
PASS.

Date of Test:	<u>February 3, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>50%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>TX</u>	Test Engineer:	<u>Andy</u>

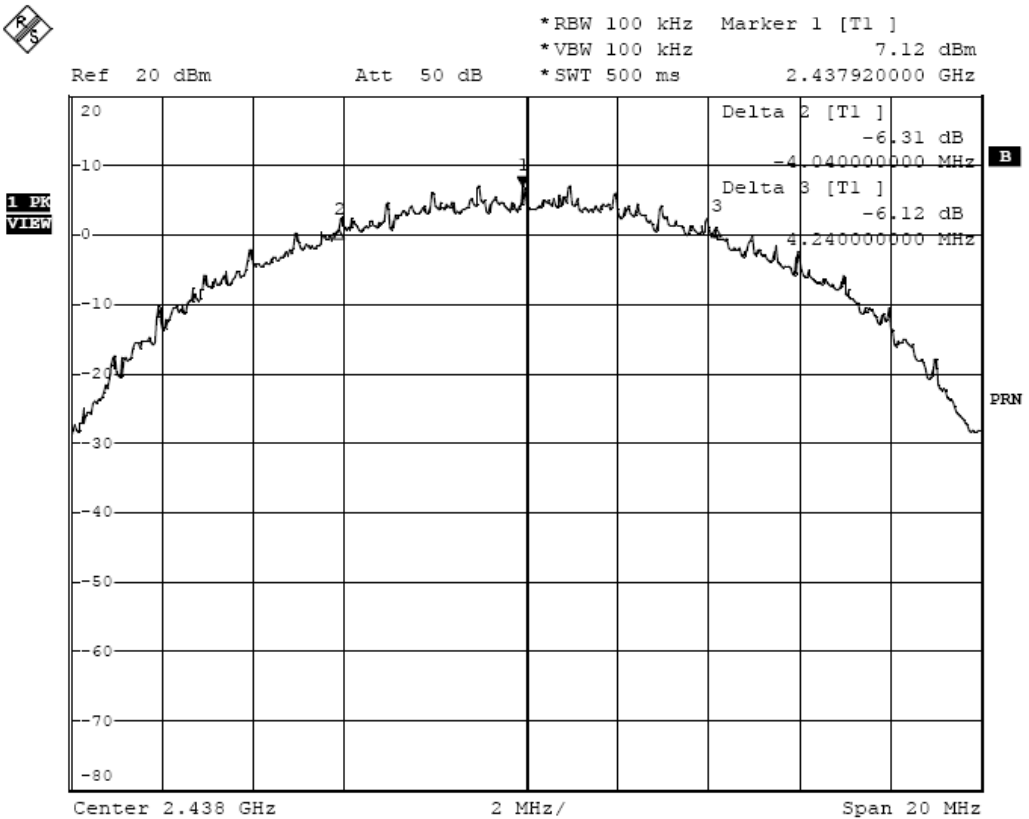
Antenna Port	Channel	Frequency MHz	6dB Emission Bandwidth MHz	Limits MHz
A	1	2412	8.44	0.5
	2	2438	8.28	0.5
	3	2464	8.28	0.5
B	1	2412	8.28	0.5
	2	2438	7.68	0.5
	3	2464	8.16	0.5

The spectrum analyzer plots are attached as below.

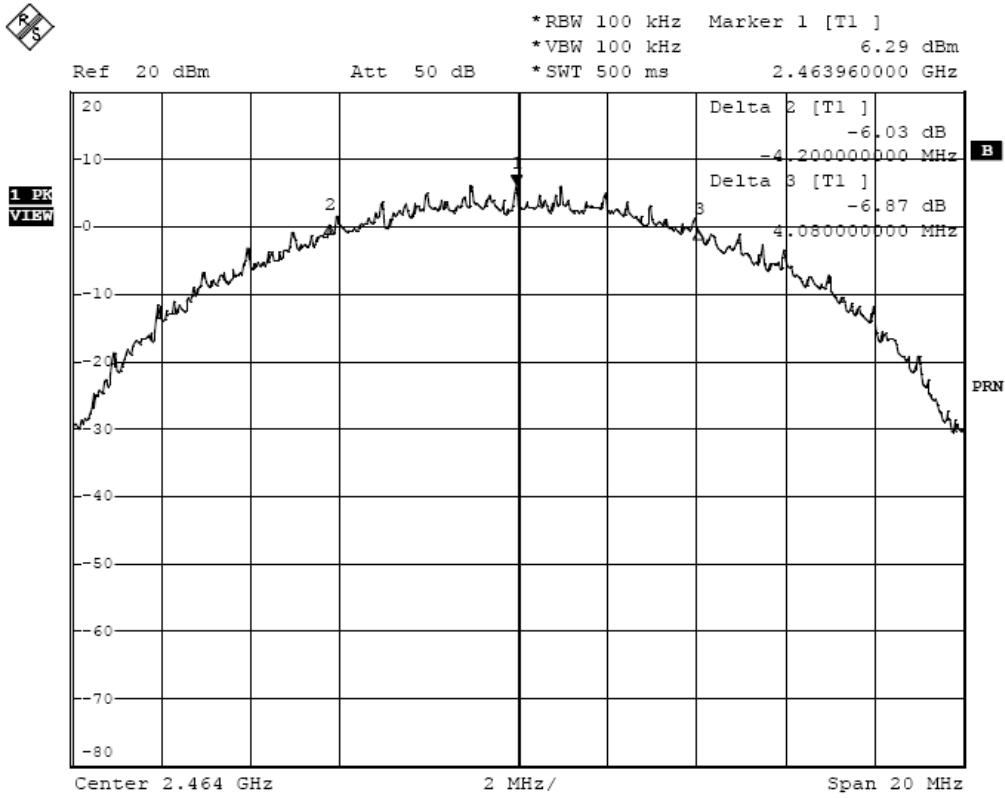
Antenna Port: A



Channel 1: 2412MHz

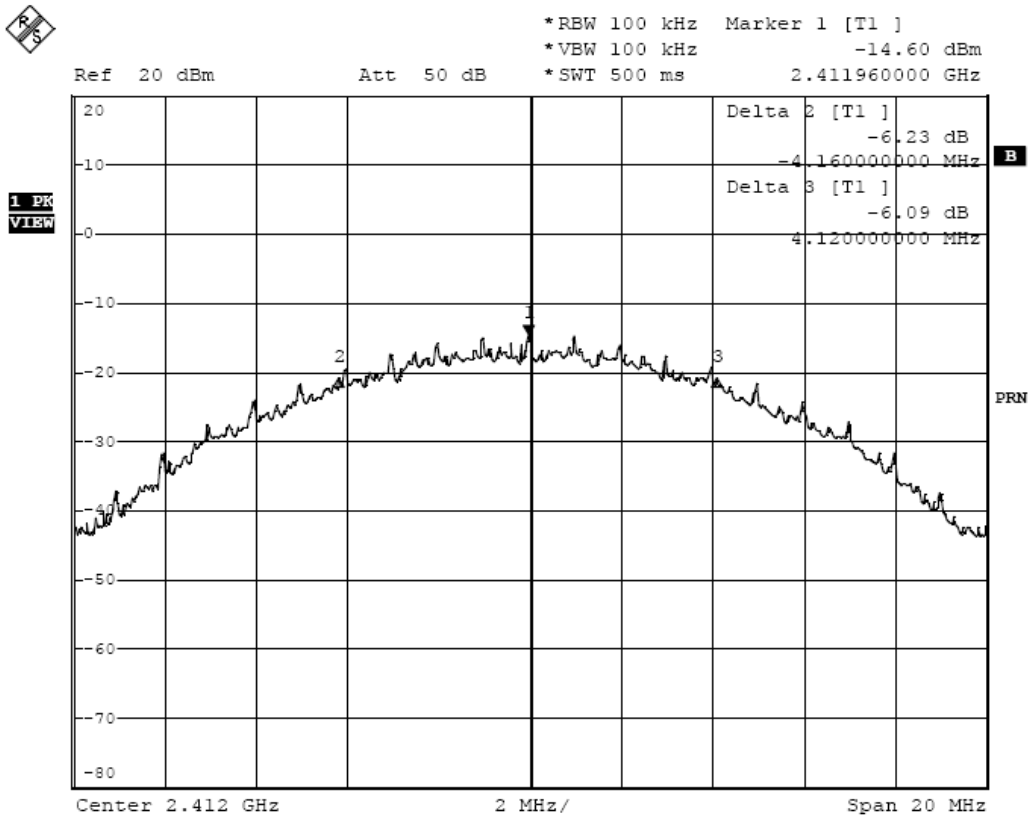


Channel 2: 2438MHz



Channel 3: 2464MHz

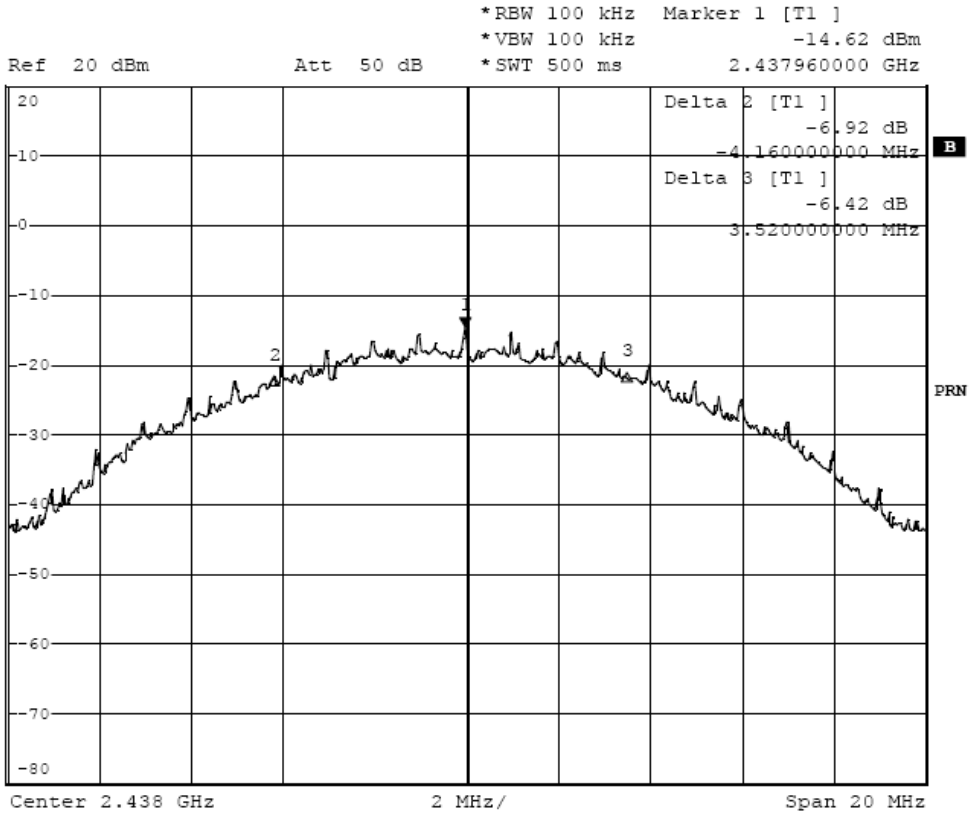
Antenna Port: B



Channel 1: 2412MHz



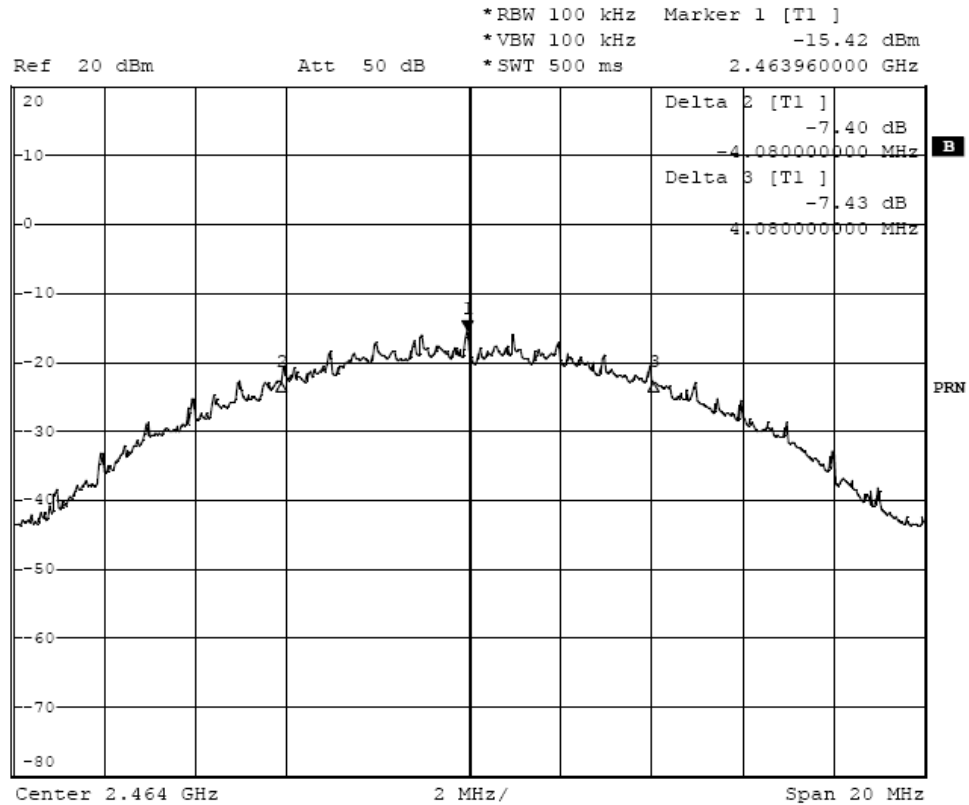
1 PK
VIEW



Channel 2: 2438MHz



1 PK
VIEW

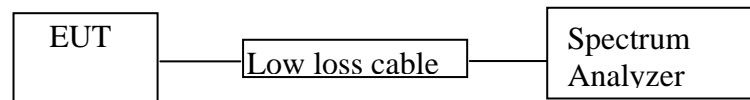


Channel 3: 2464MHz

6. PEAK OUTPUT POWER

6.1. Block Diagram of Test Setup

6.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

6.2. The Requirement For Section 15.247(b)(3) & RSS210: A8.4(4)

Section 15.247(b)(3): For system using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

RSS210: A8.4(4): For system employing digital modulation techniques operating in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands, the maximum peak conducted power shall not exceed 1 Watt.

6.3. EUT Configuration on Measurement

The following equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.3.1. Audio Speaker System (EUT)

Model Number	:	RoomGroove
Serial Number	:	N/A
Manufacturer	:	1. Zhao Yang Elec. (Shenzhen) Co., Ltd. 2. Jie Hao Elec. (Su Zhou) Co., Ltd.

6.4. Test Procedure

6.4.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.4.2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz.

6.5. Test Result

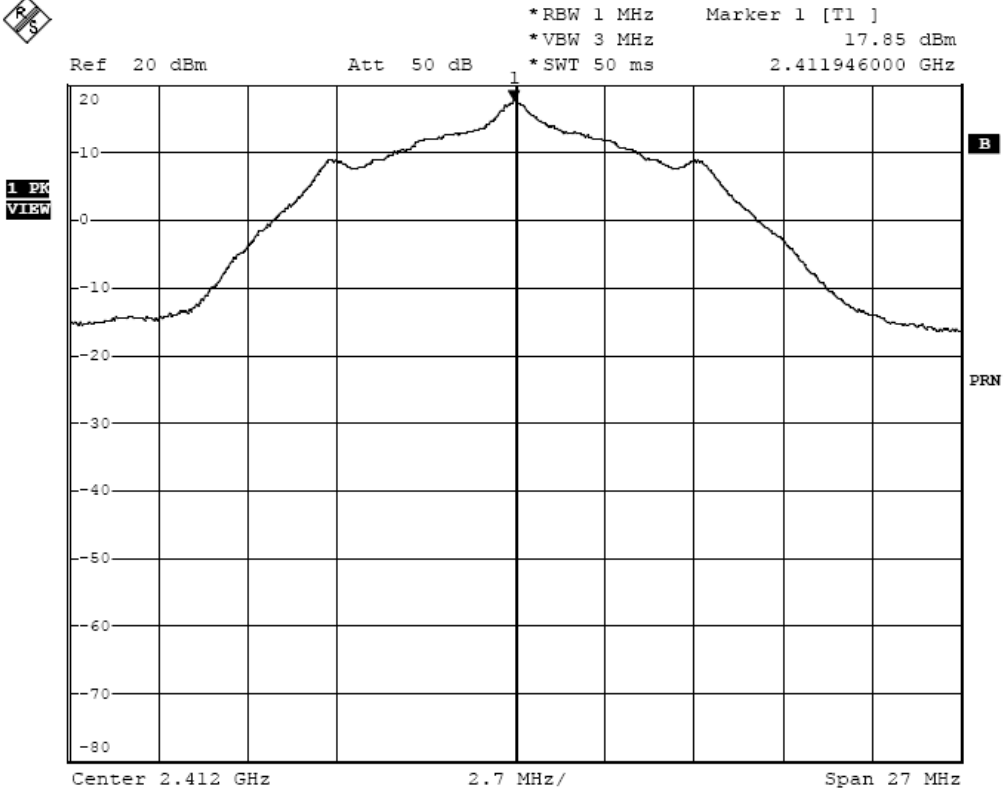
PASS.

Date of Test:	<u>February 3, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>50%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>TX</u>	Test Engineer:	<u>Andy</u>

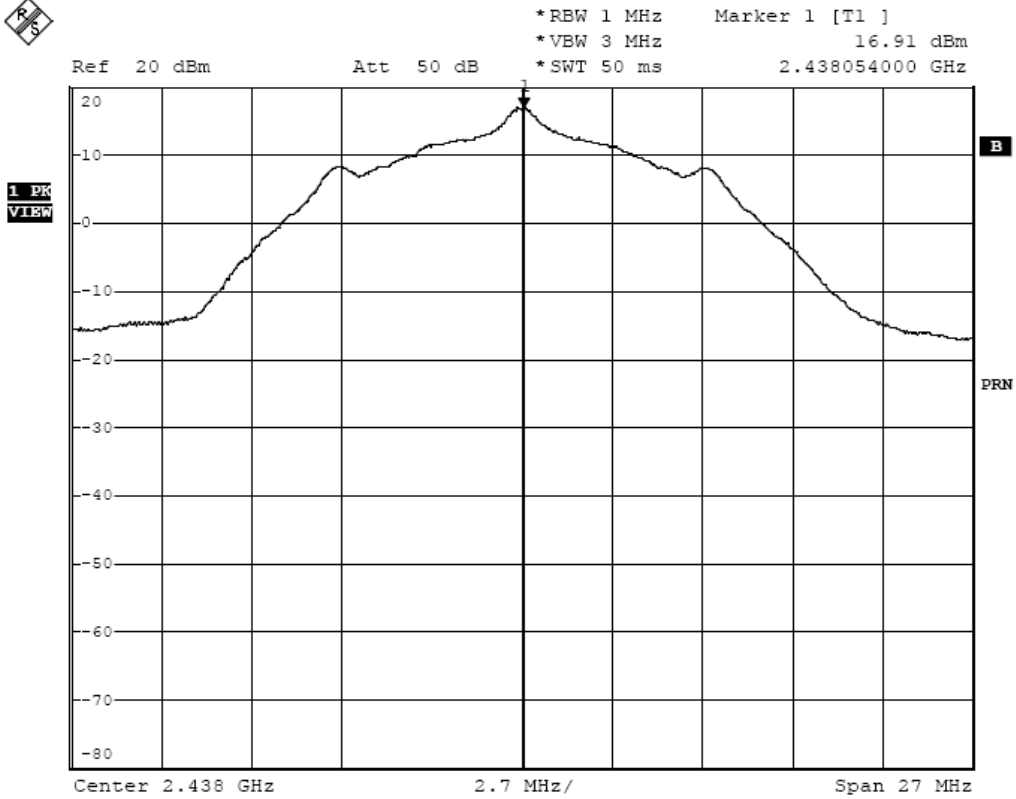
Antenna Port	Channel	Frequency MHz	Peak Output Power dBm	Peak Output Power mW	Limits dBm/W
A	1	2412	17.85	60.95	30 dBm /1 W
	2	2438	16.91	49.09	30 dBm /1 W
	3	2464	16.11	40.83	30 dBm /1 W
B	1	2412	-5.09	0.31	30 dBm /1 W
	2	2438	-5.69	0.27	30 dBm /1 W
	3	2464	-6.44	0.23	30 dBm /1 W

The spectrum analyzer plots are attached as below.

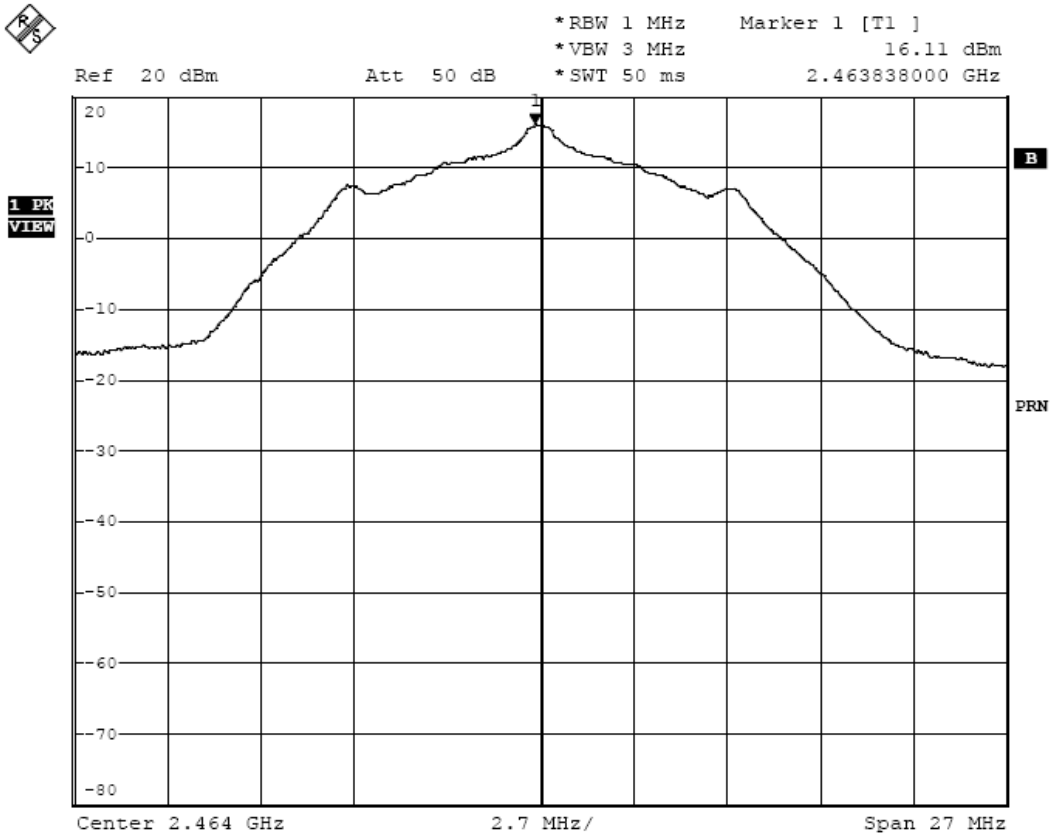
Antenna Port: A



Channel 1: 2412MHz

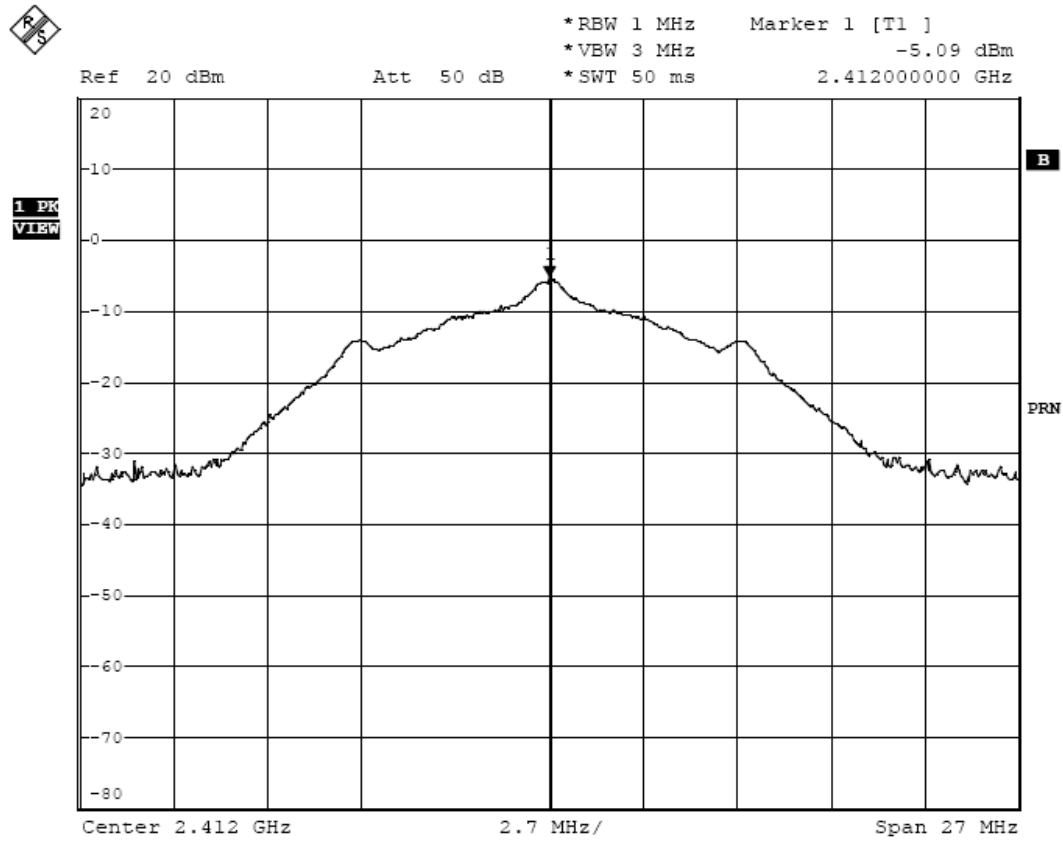


Channel 2: 2438MHz

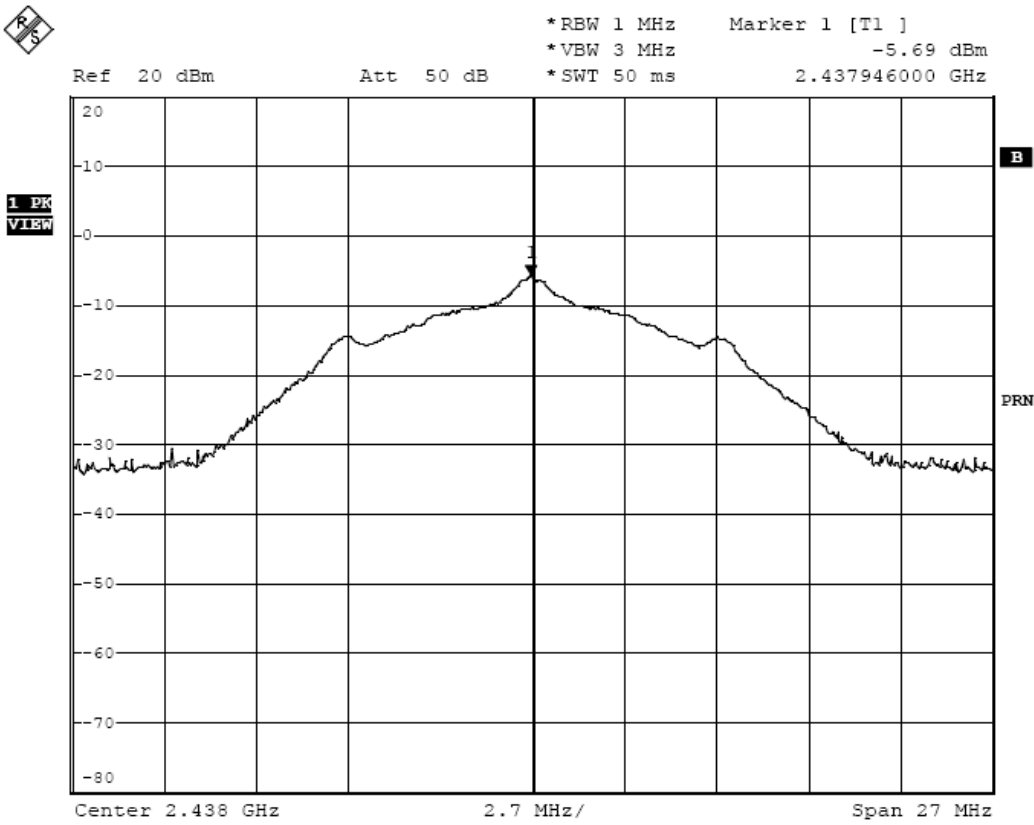


Channel 3: 2464MHz

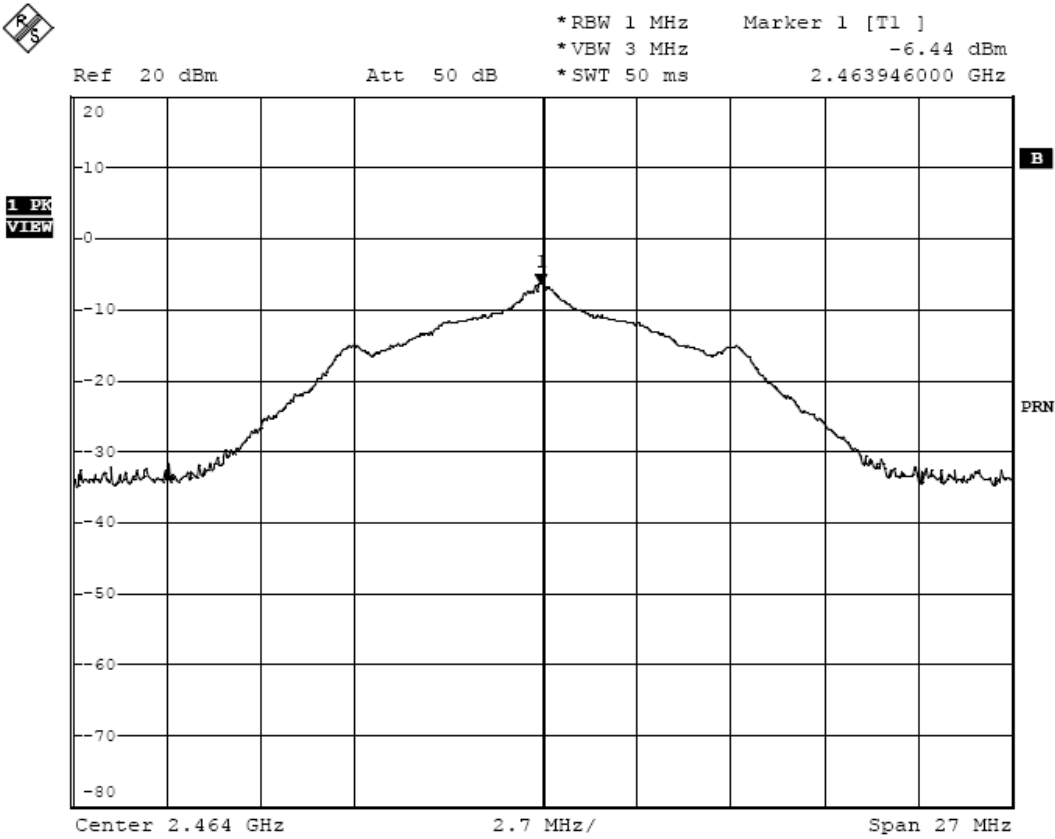
Antenna Port: B



Channel 1: 2412MHz



Channel 2: 2438MHz

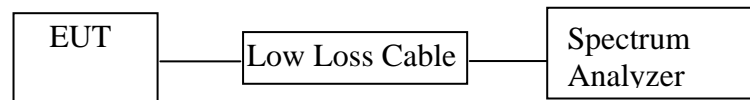


Channel 3: 2464MHz

7. POWER SPECTRAL DENSITY

7.1. Block Diagram of Test Setup

7.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

7.2. The Requirement For Section 15.247(e) & RSS210: A8.2(2)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RSS210: A8.2(2): The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

7.3. EUT Configuration on Measurement

The following equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.3.1. Audio Speaker System (EUT)

Model Number	:	RoomGroove
Serial Number	:	N/A
Manufacturer	:	1. Zhao Yang Elec. (Shenzhen) Co., Ltd. 2. Jie Hao Elec. (Su Zhou) Co., Ltd.

7.4. Test Procedure

7.4.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.4.2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz as that of the fundamental frequency. Set the sweep time = span/3kHz.

7.4.3. The power spectral density was measured and recorded.

7.4.4. The sweep time is allowed to be longer than span/3kHz for a full response of the

mixer in the spectrum analyzer.

7.5. Test Result

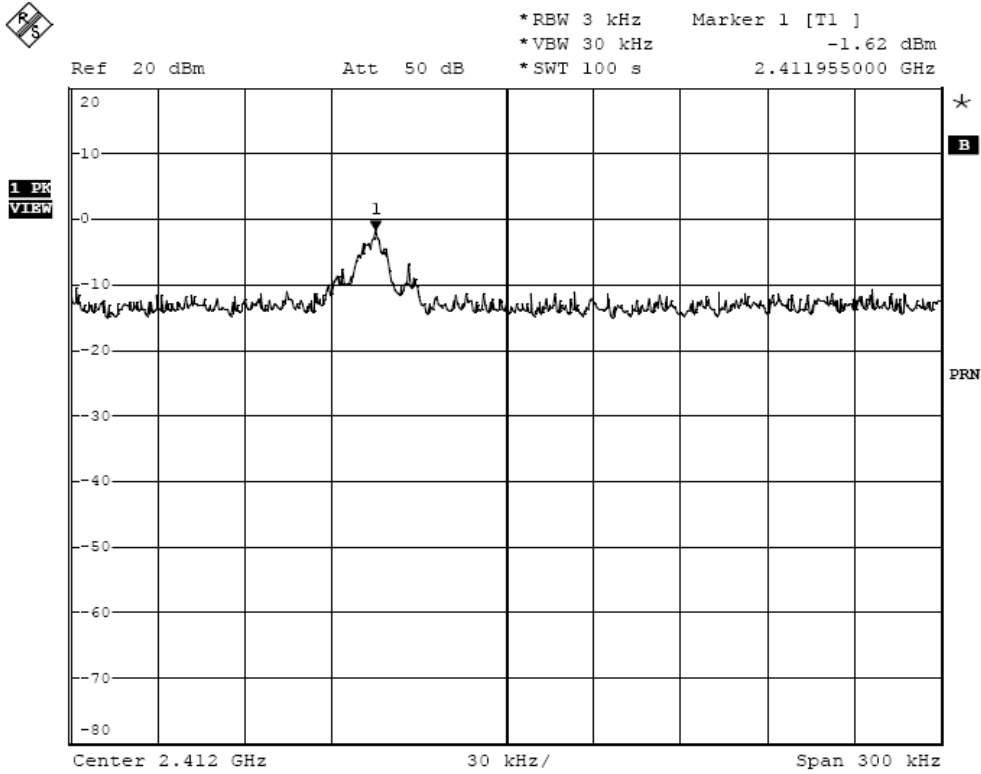
PASS.

Date of Test:	<u>February 3, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>50%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>TX</u>	Test Engineer:	<u>Andy</u>

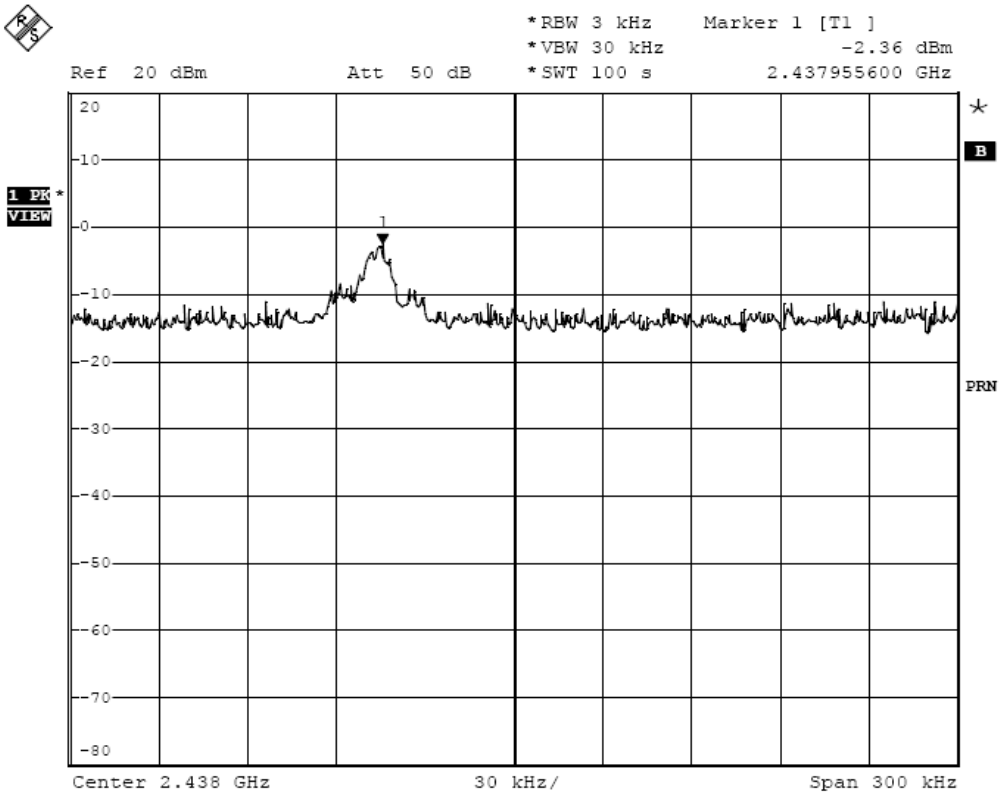
Antenna Port	Channel	Frequency MHz	Power Spectral Density dBm	Limits dBm
A	1	2412	-1.62	8
	2	2438	-2.36	8
	3	2464	-3.22	8
B	1	2412	-25.03	8
	2	2438	-24.94	8
	3	2464	-25.81	8

The spectrum analyzer plots are attached as below.

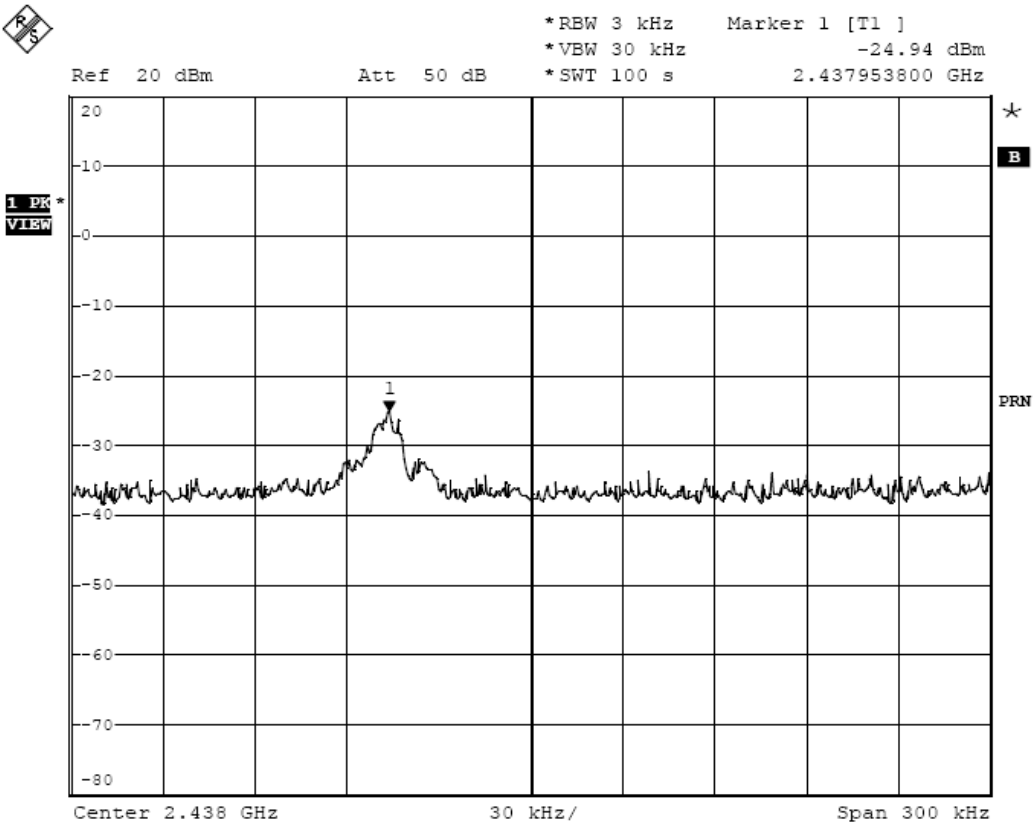
Antenna Port: A



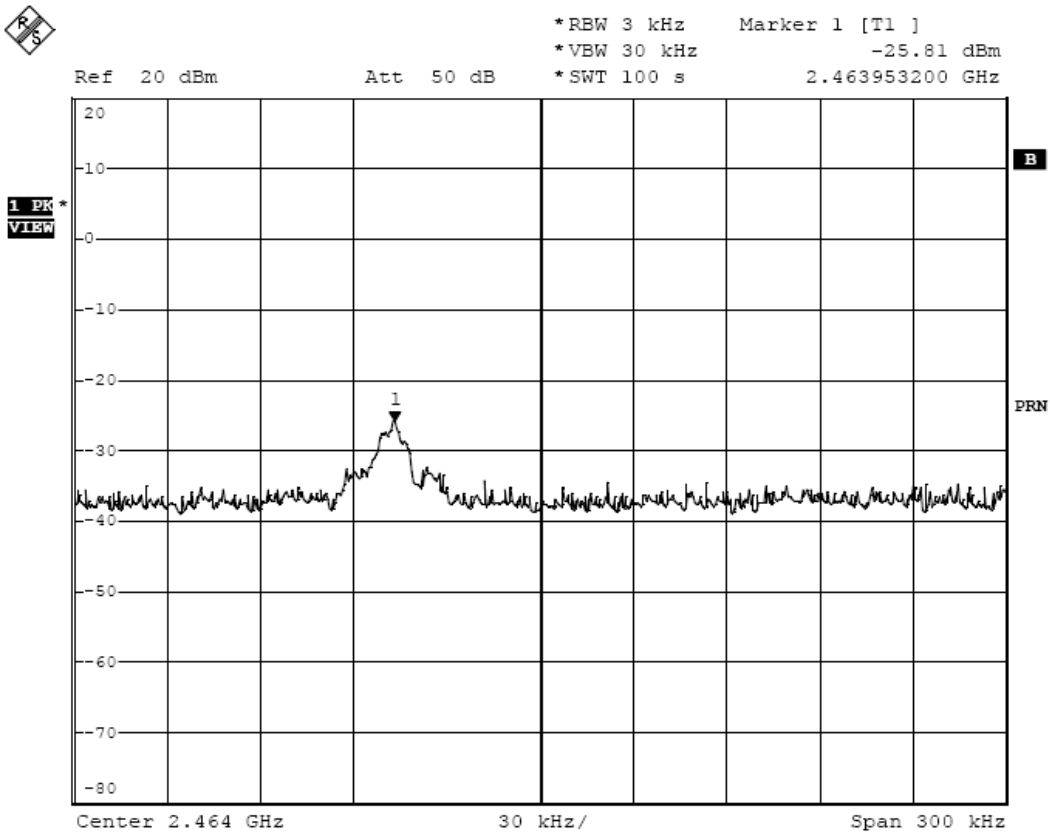
Channel 1: 2412MHz



Channel 2: 2438MHz



Channel 2: 2438MHz

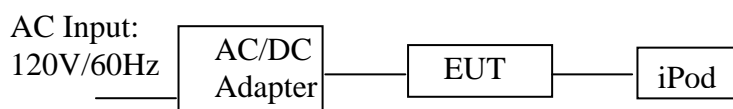


Channel 3: 2464MHz

8. POWER LINE CONDUCTED EMISSION MEASUREMENT

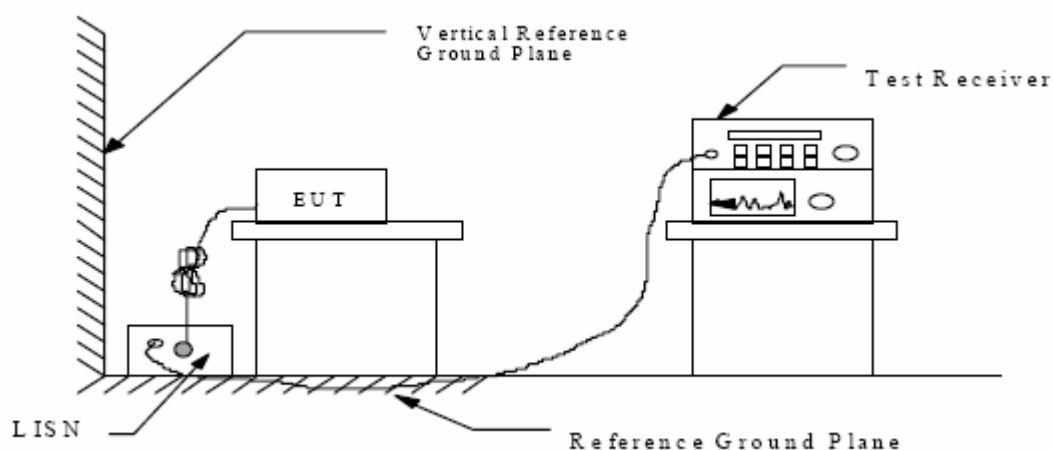
8.1. Block Diagram of Test Setup

8.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

8.1.2. Shielding Room Test Setup Diagram



(EUT: Audio Speaker System)

8.2. The Limit For Section 15.207(a)

5.2.1 Conducted Emission Measurement Limits According to Section 15.207(a)

Frequency (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

* Decreases with the logarithm of the frequency.

8.3. EUT Configuration on Measurement

The following equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.3.1. Audio Speaker System (EUT)

Model Number : RoomGroove
Serial Number : N/A
Manufacturer : 1. Zhao Yang Elec. (Shenzhen) Co., Ltd.
2. Jie Hao Elec. (Su Zhou) Co., Ltd.

8.4. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2003 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

8.5. Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150kHz to 30MHz is checked.

Date of Test:	<u>February 5, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>50%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>Mode 1 TX(2412MHz)</u>	Test Engineer:	<u>Andy</u>

Test Line	Frequency MHz	Emission Level(dBμV)		Limits(dBμV)		Margin(dBμV)	
		QP	AV	QP	AV	QP	AV
Va	0.155	47.4	35.1	65.7	55.7	18.3	20.6
Va	0.420	39.3	38.3	57.5	47.5	18.2	9.2
Va	0.445	36.0	34.6	57.0	47.0	21.0	12.4
Vb	0.155	48.7	36.7	65.7	55.7	17.0	19.0
Vb	0.180	44.3	33.2	64.5	54.5	20.2	21.3
Vb	0.420	34.6	33.6	57.5	47.5	22.9	13.9
Vb	0.445	32.0	31.2	57.0	47.0	25.0	15.8

Date of Test:	<u>February 5, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>50%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>Mode 2 TX(2438MHz)</u>	Test Engineer:	<u>Andy</u>

Test Line	Frequency MHz	Emission Level(dBμV)		Limits(dBμV)		Margin(dBμV)	
		QP	AV	QP	AV	QP	AV
Va	0.155	47.6	35.1	65.7	55.7	18.1	20.6
Va	0.415	38.7	37.2	57.6	47.6	18.9	10.4
Va	0.440	37.5	35.7	57.1	47.1	19.6	11.4
Vb	0.155	48.8	36.8	65.7	55.7	16.9	18.9
Vb	0.415	34.0	33.8	57.6	47.6	23.6	13.8
Vb	0.440	33.6	32.4	57.1	47.1	23.5	14.7

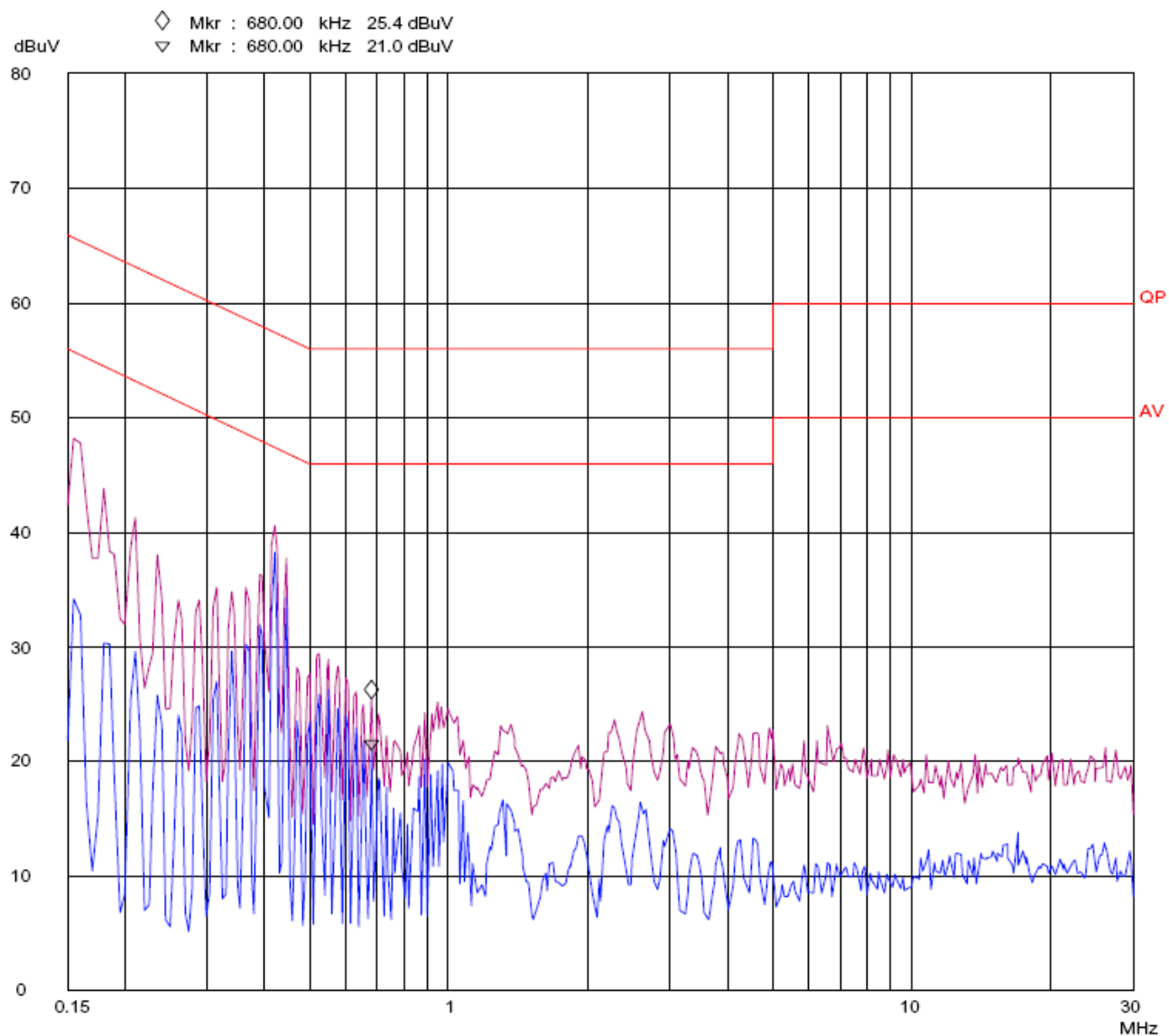
Date of Test:	February 5, 2007	Temperature:	25°C
EUT:	Audio Speaker System	Humidity:	50%
Model No.:	RoomGroove	Power Supply:	AC120V/60Hz
Test Mode:	Mode 3 TX(2464MHz)	Test Engineer:	Andy

Test Line	Frequency MHz	Emission Level(dBμV)		Limits(dBμV)		Margin(dBμV)	
		QP	AV	QP	AV	QP	AV
Va	0.155	47.4	35.0	65.7	55.7	18.3	20.7
Va	0.415	38.1	36.2	57.6	47.6	19.5	11.4
Va	0.440	37.7	36.5	57.1	47.1	19.4	10.6
Vb	0.155	47.3	35.0	65.7	55.7	18.4	20.7
Vb	0.415	38.1	36.3	57.6	47.6	19.5	11.3
Vb	0.440	37.7	36.4	57.1	47.1	19.4	10.7

The spectrum analyzer plots are attached in below.

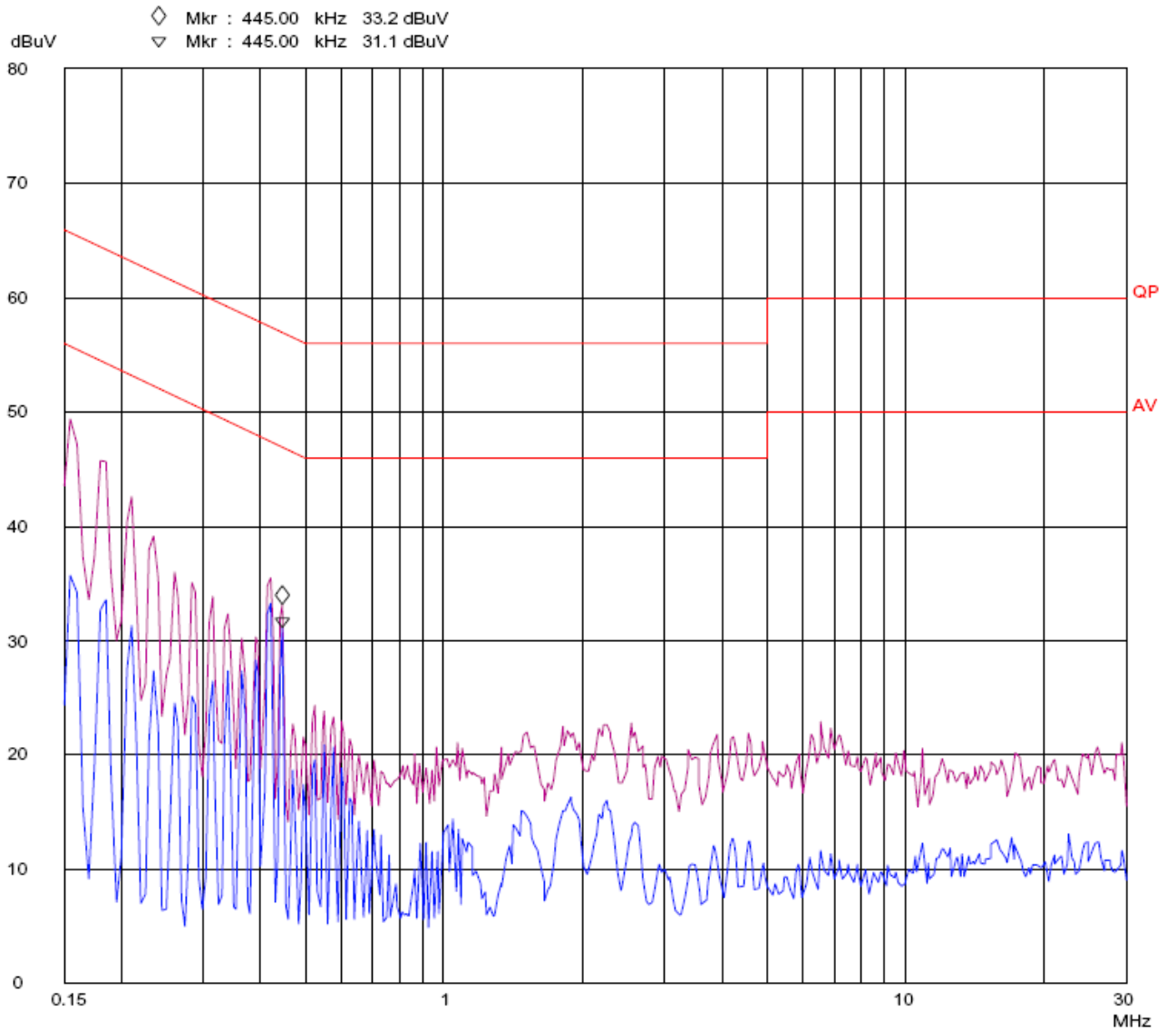
CONDUCTION EMISSION STANDARD FCC PART 15B 05. Feb 07 15:42

EUT: Audio Speaker System m/n:RoomGroove
Manuf: Klipsch
Op Cond: TX (2412MHz)
Operator: Andy.tan
Test Spec: Va 120V/60Hz
Comment: Tem25°C Humi50%
 Sample no.:064396



CONDUCTION EMISSION STANDARD FCC PART 15B 05. Feb 07 15:46

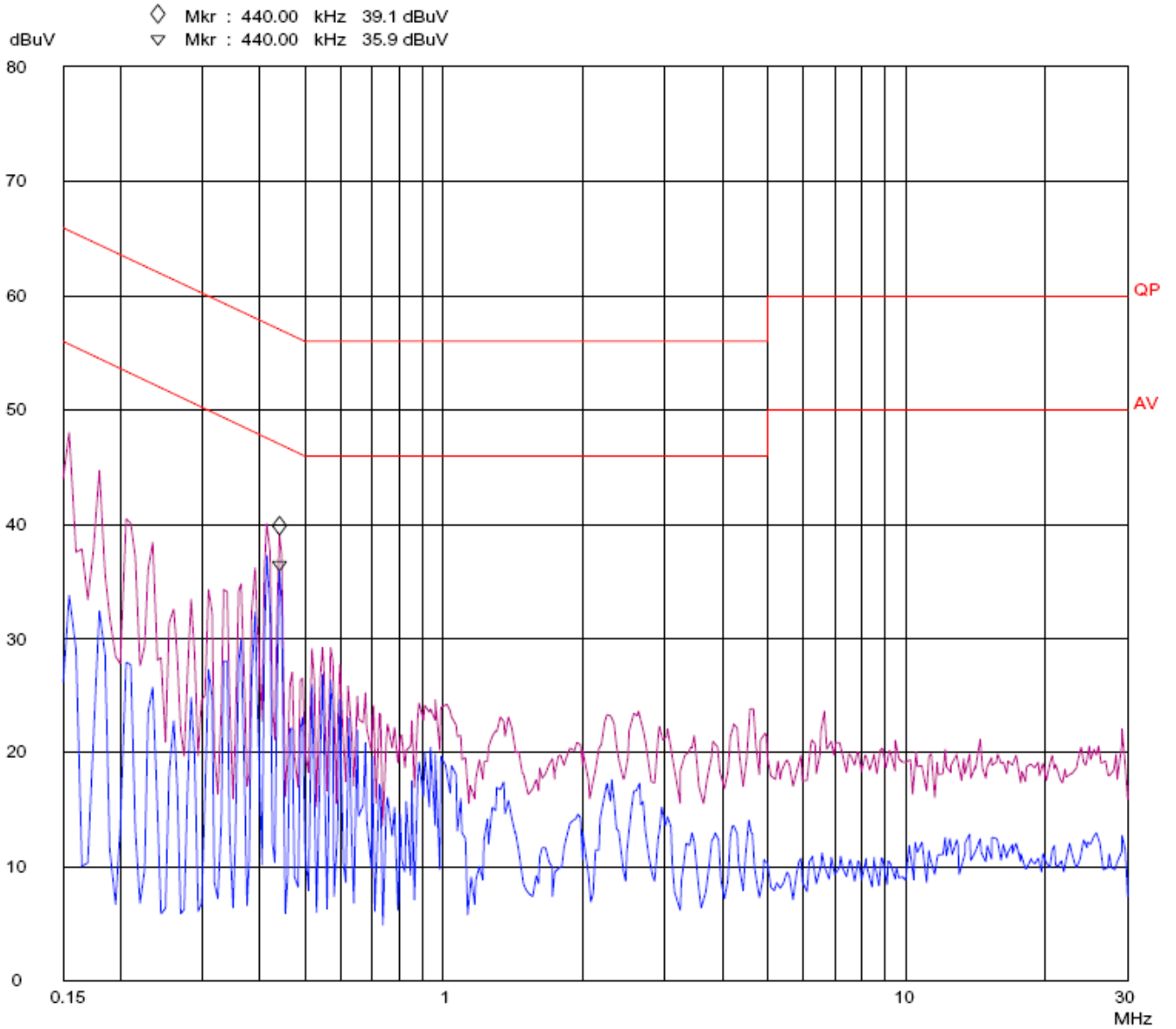
EUT: Audio Speaker System m/n:RoomGroove
Manuf: Klipsch
Op Cond: TX (2412MHz)
Operator: Andy.tan
Test Spec: Vb 120V/60Hz
Comment: Tem25°C Humi50%
Sample no.:064396



CONDUCTION EMISSION STANDARD FCC PART 15B

05. Feb 07 15:53

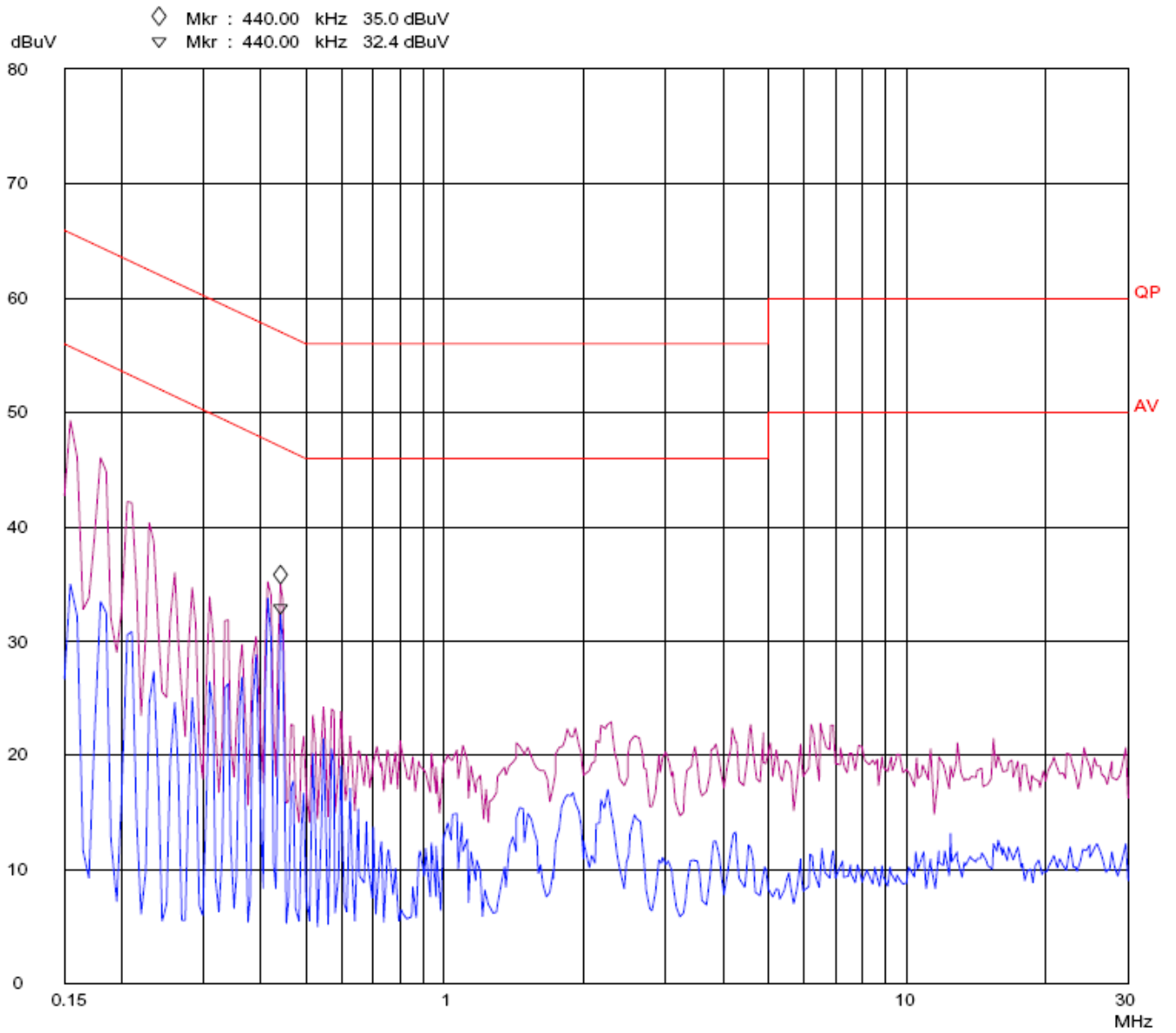
EUT: Audio Speaker System m/n:RoomGroove
Manuf: Klipsch
Op Cond: TX (2438MHz)
Operator: Andy.tan
Test Spec: Va 120V/60Hz
Comment: Tem25°C Humi50%
Sample no.:064396



CONDUCTION EMISSION STANDARD FCC PART 15B

05. Feb 07 15:50

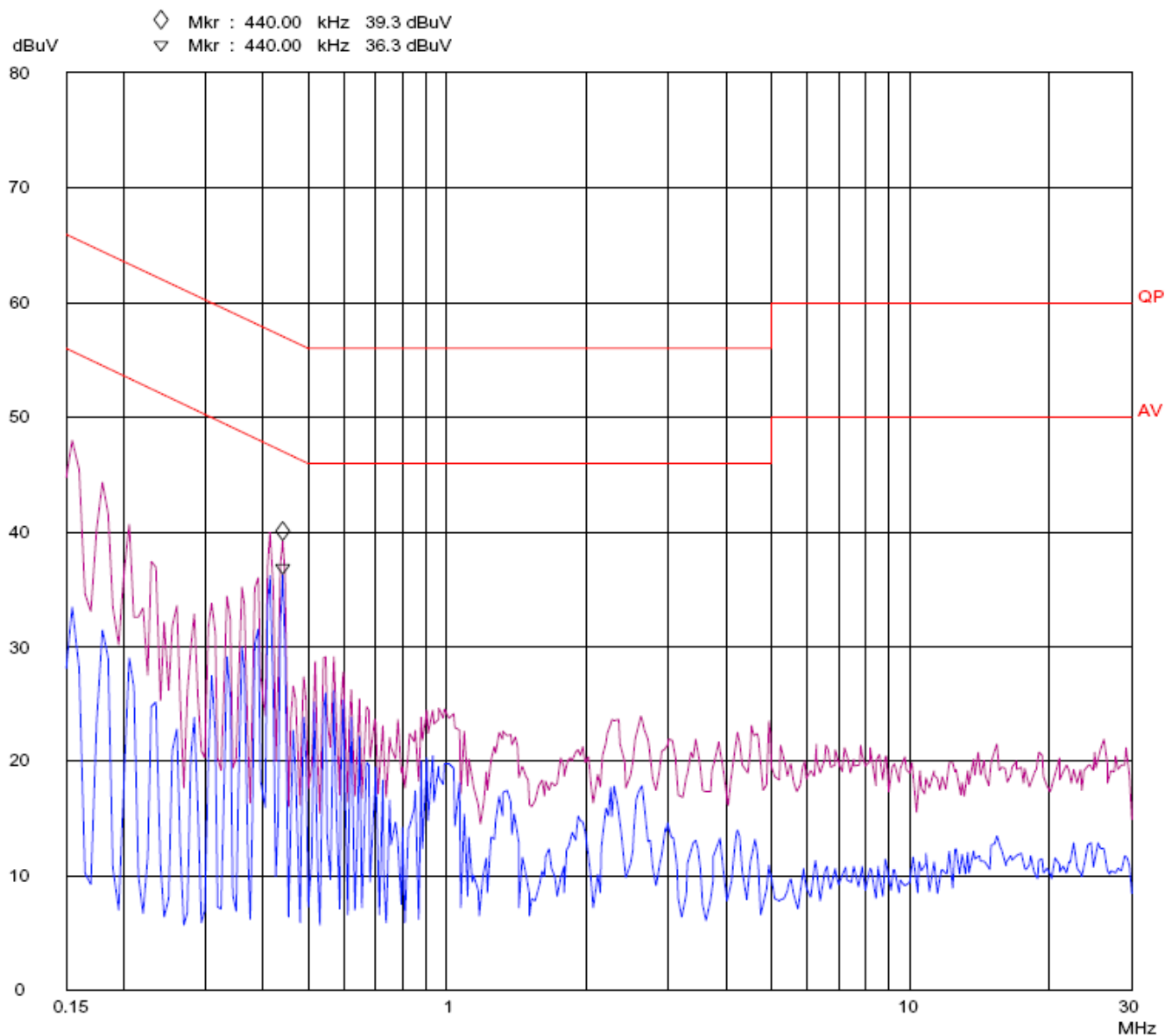
EUT: Audio Speaker System m/n:RoomGroove
Manuf: Klipsch
Op Cond: TX (2438MHz)
Operator: Andy.tan
Test Spec: Vb 120V/60Hz
Comment: Tem25°C Humi50%
Sample no.:064396



CONDUCTION EMISSION STANDARD FCC PART 15B

05. Feb 07 15:57

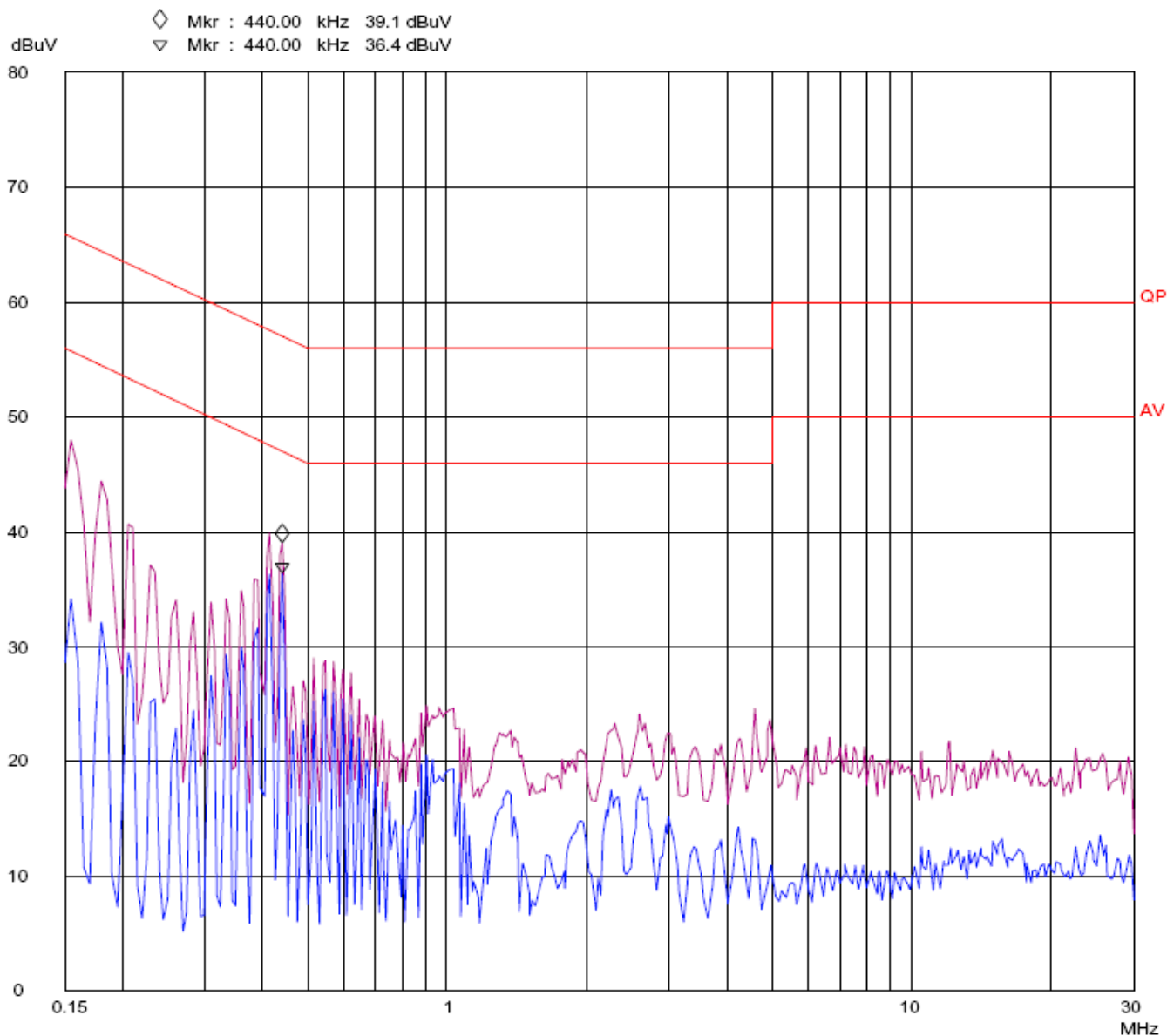
EUT: Audio Speaker System m/n:RoomGroove
 Manuf: Klipsch
 Op Cond: TX (2464MHz)
 Operator: Andy.tan
 Test Spec: Va 120V/60Hz
 Comment: Tem25°C Humi50%
 Sample no.:064396



CONDUCTION EMISSION STANDARD FCC PART15B

05. Feb 07 15:59

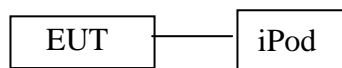
EUT: Audio Speaker System m/n:RoomGroove
 Manuf: Klipsch
 Op Cond: TX (2464MHz)
 Operator: Andy.tan
 Test Spec: Vb 120V/60Hz
 Comment: Tem25°C Humi50%
 Sample no.:064396



9. RADIATED EMISSION MEASUREMENT

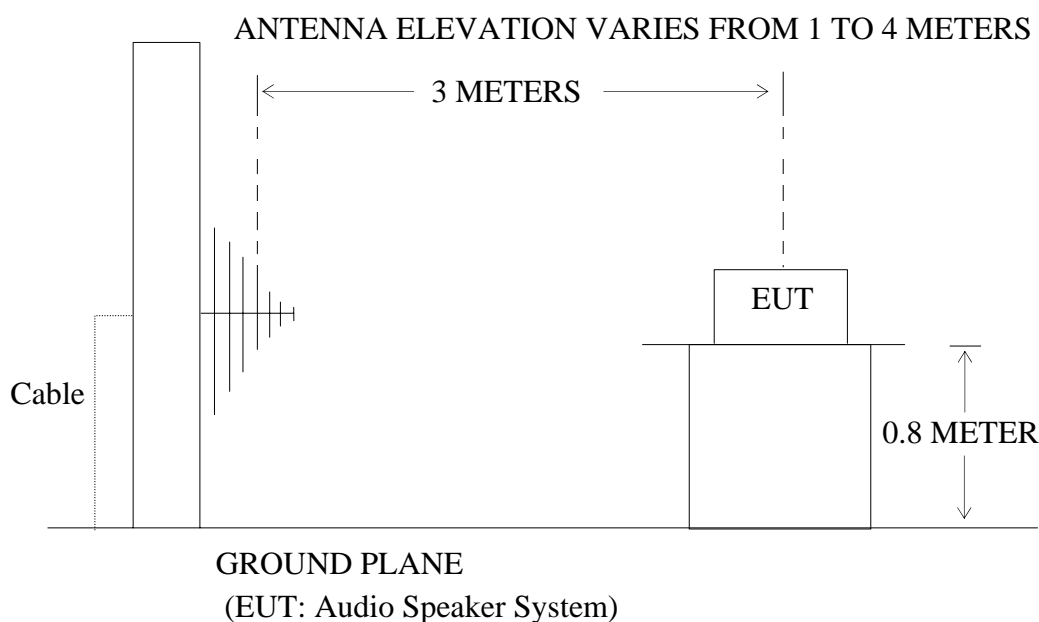
9.1. Block Diagram of Test Setup

9.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

9.1.2. Anechoic Chamber Test Setup Diagram



9.2. The Limit For Section 15.247(d) & RSS210: A8.5

Section 15.247(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. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission 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).

RSS210: A8.5: 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. Attenuation below the general limits specified in Table 2 and 3 is not required. In addition, radiated emission which fall in the restricted bands, as defined in Table 1, must also comply with the radiated emission limits specified in section Table 2 and 3.

9.3. Restricted bands of operation

9.3.1. FCC Part 15.205 Restricted bands of operation

- (a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 38.6

- (b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

9.3.2.RSS-210 2.2 & Table 1: Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090-0.110	73-74.6	7250-7750	9.0-9.2
2.1735-2.1905	74.8-75.2	8025-8500	9.3-9.5
3.020-3.026	108-138		10.6-12.7
4.125-4.128	156.52475-156.52525		13.25-13.4
4.17725-4.17775	156.7-156.9		14.47-14.5
4.20725-4.20775	240-285		15.35-16.2
5.677-5.683	322-335.4		17.7-21.4
6.215-6.218	399.9-410		22.01-23.12
6.26775-6.26825	608-614		23.6-24.0
6.31175-6.31225	960-1427		31.2-31.8
8.291-8.294	1435-1626.5		36.43-36.5
8.362-8.366	1645.5-1646.5		Above 38.6
8.37625-8.38675	1660-1710		
8.41425-8.41475	1718.8-1722.2		
12.29-12.293	2200-2300		
12.51975-12.52025	2310-2390		
12.57675-12.57725	2655-2900		
13.36-13.41	3260-3267		
16.42-16.423	3332-3339		
16.69475-16.69525	3345.8-3358		
16.80425-16.80475	3600-4400		
25.5-25.67	4500-5150		
37.5-38.25	5350-5460		

9.4. Configuration of EUT on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4.1. Audio Speaker System (EUT)

Model Number : RoomGroove
 Serial Number : N/A
 Manufacturer : 1. Zhao Yang Elec. (Shenzhen) Co., Ltd.
 2. Jie Hao Elec. (Su Zhou) Co., Ltd.

9.5. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground. The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bilog antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the

interface cables must be manipulated according to ANSI C63.4: 2003 on radiated emission measurement.

The bandwidth of test receiver (R&S ESI26) is set at 120KHz in 30-1000MHz. and set at 1MHz in above 1000MHz.

The frequency range from 30MHz to 25000MHz is checked.

The final measurement in band 9-90kHz, 110-490kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

$$\text{Where Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

Sample calculation for corrected factor:

$$17.7\text{GHz: Antenna factor} + \text{cable loss} = 41.7\text{dB}; \text{Amplifier gain} = 27.5\text{dB}$$

$$\text{Corrected factor} = 14.2\text{dB}$$

$$21.4\text{GHz: Antenna factor} + \text{cable loss} = 46.1\text{dB}; \text{Amplifier gain} = 27.4\text{dB}$$

$$\text{Corrected factor} = 18.7\text{dB}$$

9.6. The Field Strength of Radiation Emission Measurement Results
PASS.

Date of Test:	<u>February 6, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>55%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>Mode 1 TX (2412MHz)</u>	Test Engineer:	<u>Andy</u>

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBμV/m)	Factor Corr. (dB)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)	Polarization
	QP		QP	QP	QP	
45.165	58.0	-22.7	35.3	40	4.7	Vertical
191.882	63.4	-23.6	39.8	43.5	3.7	Vertical
237.037	62.8	-21.4	41.4	46	4.6	Vertical
191.882	62.6	-23.6	39.0	43.5	4.5	Horizontal
372.496	54.1	-17.1	37.0	46	9.0	Horizontal
756.284	51.5	-12.7	38.8	46	7.2	Horizontal
801.436	52.5	-12.4	40.1	46	5.9	Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBμV/m)		Factor Corr. (dB)	Result(dBμV/m)		Limit(dBμV/m)		Margin(dBμV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2412.983	88.9	107.5	-3.6	85.3	103.9	-	-	-	-	Vertical
3215.945	46.0	54.8	-1.2	44.8	53.6	54	74	9.2	20.4	Vertical
*4823.898	43.3	60.3	2.1	45.4	62.4	54	74	8.6	11.6	Vertical
7236.845	33.3	50.4	7.0	40.3	57.4	54	74	13.7	16.6	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
2412.977	89.5	108.3	-3.6	85.9	104.7	-	-	-	-	Horizontal
3215.934	50.1	57.8	-1.2	48.9	56.6	54	74	5.1	17.4	Horizontal
*4823.902	43.6	61.0	2.1	45.7	63.1	54	74	8.3	10.9	Horizontal
7236.862	33.4	49.0	7.0	40.4	56.0	54	74	13.6	18.0	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.

2. *: Denotes restricted band of operation.

Date of Test:	February 6, 2007	Temperature:	25°C
EUT:	Audio Speaker System	Humidity:	55%
Model No.:	RoomGroove	Power Supply:	AC120V/60Hz
Test Mode:	Mode 2 TX(2438MHz)	Test Engineer:	Andy

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBµV/m)		Factor Corr. (dB)		Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Polarization
	QP				QP		QP		QP		
47.967	60.1		-24.3		35.8		40		4.2		Vertical
191.887	63.1		-23.6		39.5		43.5		4.0		Vertical
237.037	62.1		-21.4		40.7		46		5.3		Vertical
191.877	63.4		-23.6		39.8		43.5		3.7		Horizontal
237.037	59.0		-21.4		37.6		46		8.4		Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBµV/m)		Factor Corr. (dB)	Result(dBµV/m)		Limit(dBµV/m)		Margin(dBµV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2438.977	88.7	108.0	-3.5	85.2	104.5	-	-	-	-	Vertical
3250.602	46.2	55.3	-1.1	45.1	54.2	54	74	8.9	19.8	Vertical
*4875.902	46.1	62.5	2.2	48.3	64.7	54	74	5.7	9.3	Vertical
*7314.831	36.0	51.0	7.2	43.2	58.2	54	74	10.8	15.8	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
2438.993	87.8	106.7	-3.5	84.3	103.2	-	-	-	-	Horizontal
3250.602	50.4	58.5	-1.1	49.3	57.4	54	74	4.7	16.6	Horizontal
*4875.922	46.3	62.9	2.2	48.5	65.1	54	74	5.5	8.9	Horizontal
*7314.852	34.6	49.1	7.2	41.8	56.3	54	74	12.2	17.7	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.**2. *: Denotes restricted band of operation.**

Date of Test:	February 6, 2007	Temperature:	25°C
EUT:	Audio Speaker System	Humidity:	55%
Model No.:	RoomGroove	Power Supply:	AC120V/60Hz
Test Mode:	Mode 3 TX(2464MHz)	Test Engineer:	Andy

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBµV/m)		Factor Corr. (dB)		Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Polarization
	QP				QP		QP		QP		
47.967	59.8		-24.3		35.5		40		4.5		Vertical
191.887	62.7		-23.6		39.1		43.5		4.4		Vertical
237.020	62.6		-21.4		41.2		46		4.8		Vertical
191.867	63.6		-23.6		40.0		43.5		3.5		Horizontal
237.037	58.7		-21.4		37.3		46		8.7		Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBµV/m)		Factor Corr. (dB)	Result(dBµV/m)		Limit(dBµV/m)		Margin(dBµV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2464.977	92.3	111.3	-3.4	88.9	107.9	-	-	-	-	Vertical
3285.271	46.6	55.4	-1.0	45.6	54.4	54	74	8.4	19.6	Vertical
*4927.892	48.5	66.5	2.2	50.7	68.7	54	74	3.3	5.3	Vertical
*7390.856	35.6	54.4	7.4	43.0	61.8	54	74	11.0	12.2	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
2464.977	91.2	108.7	-3.4	87.8	105.3	-	-	-	-	Horizontal
3285.276	50.9	58.1	-1.0	49.9	57.1	54	74	4.1	16.9	Horizontal
*4927.905	46.0	63.1	2.2	48.2	65.3	54	74	5.8	8.7	Horizontal
*7390.851	32.7	50.9	7.4	40.1	58.3	54	74	13.9	15.7	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.**2. *: Denotes restricted band of operation.**

Date of Test:	<u>March 23, 2007</u>	Temperature:	<u>25°C</u>
EUT:	<u>Audio Speaker System</u>	Humidity:	<u>55%</u>
Model No.:	<u>RoomGroove</u>	Power Supply:	<u>AC120V/60Hz</u>
Test Mode:	<u>Mode 4 RX(2412MHz)</u>	Test Engineer:	<u>Andy</u>

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBµV/m)		Factor Corr. (dB)		Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Polarization
	QP				QP		QP		QP		
54.448	59.2		-26.9		32.3		40.0		7.7		Vertical
*132.624	58.9		-21.1		37.8		43.5		5.7		Vertical
191.896	62.3		-23.6		38.7		43.5		4.8		Vertical
191.896	60.6		-23.6		37.0		43.5		6.5		Horizontal
*259.616	58.0		-19.7		38.3		46.0		7.7		Horizontal
*282.195	61.6		-20.0		41.6		46.0		4.4		Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBµV/m)		Factor Corr. (dB)	Result(dBµV/m)		Limit(dBµV/m)		Margin(dBµV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
3215.933	47.4	51.0	-1.3	46.1	49.7	54	74	7.9	24.3	Vertical
6431.882	44.2	46.4	5.7	49.9	52.1	54	74	4.1	21.9	Vertical
12863.767	35.2	40.1	11.2	46.4	51.3	54	74	7.6	22.7	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
3215.932	48.6	52.3	-1.3	47.3	51.0	54	74	6.7	23.0	Horizontal
6431.882	42.7	45.1	5.7	48.4	50.8	54	74	5.6	23.2	Horizontal
12863.767	34.9	39.7	11.2	46.1	50.9	54	74	7.9	23.1	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.**2. *: Denotes restricted band of operation.**

Date of Test:	March 23, 2007	Temperature:	25°C
EUT:	Audio Speaker System	Humidity:	55%
Model No.:	RoomGroove	Power Supply:	AC120V/60Hz
Test Mode:	Mode 5 RX(2438MHz)	Test Engineer:	Andy

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBµV/m)		Factor Corr. (dB)		Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Polarization
	AV	PEAK	AV	PEAK	AV	PEAK	AV	PEAK	AV	PEAK	
54.448	59.2		-26.9		32.3		40.0		7.7		Vertical
*132.624	58.6		-21.1		37.5		43.5		6.0		Vertical
191.896	62.2		-23.6		38.6		43.5		5.1		Vertical
191.896	60.7		-23.6		37.1		43.5		6.4		Horizontal
*259.616	58.1		-19.7		38.4		46.0		7.6		Horizontal
*282.195	61.5		-20.0		41.5		46.0		4.5		Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading(dBµV/m)		Factor Corr. (dB)	Result(dBµV/m)		Limit(dBµV/m)		Margin(dBµV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
3215.935	47.5	51.0	-1.3	46.2	49.7	54	74	7.8	24.3	Vertical
6431.882	44.2	46.3	5.7	49.9	52.0	54	74	4.1	22.0	Vertical
12863.767	35.1	40.1	11.2	46.3	51.3	54	74	7.7	22.7	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
3215.942	48.3	53.0	-1.3	47.0	51.7	54	74	7.0	22.3	Horizontal
6431.882	42.7	45.1	5.7	48.4	50.8	54	74	5.6	23.2	Horizontal
12863.770	34.8	39.7	11.2	46.0	50.9	54	74	8.0	23.1	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.**2. *: Denotes restricted band of operation.**

Date of Test:	March 23, 2007	Temperature:	25°C
EUT:	Audio Speaker System	Humidity:	55%
Model No.:	RoomGroove	Power Supply:	AC120V/60Hz
Test Mode:	Mode 6 RX(2464MHz)	Test Engineer:	Andy

For 30MHz-1000MHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

Frequency (MHz)	Reading (dBµV/m)		Factor Corr. (dB)		Result (dBµV/m)		Limit (dBµV/m)		Margin (dBµV/m)		Polarization
	QP				QP		QP		QP		
54.448	59.3		-26.9		32.4		40.0		7.6		Vertical
*132.624	59.0		-21.1		37.9		43.5		5.6		Vertical
191.896	63.0		-23.6		39.4		43.5		4.1		Vertical
191.896	60.6		-23.6		37.0		43.5		6.5		Horizontal
*259.616	57.9		-19.7		38.2		46.0		7.8		Horizontal
*282.195	61.6		-20.0		41.6		46.0		4.4		Horizontal

For 1GHz-25GHz

Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

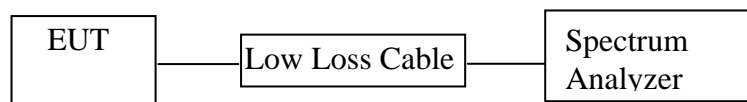
Frequency (MHz)	Reading(dBµV/m)		Factor Corr. (dB)	Result(dBµV/m)		Limit(dBµV/m)		Margin(dBµV/m)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
3215.937	46.7	50.0	-1.3	45.4	48.7	54	74	8.6	25.3	Vertical
6431.887	44.2	46.3	5.7	49.9	52.0	54	74	4.1	22.0	Vertical
12863.768	35.3	40.0	11.2	46.5	51.2	54	74	7.5	22.8	Vertical
*17700.0	28.9	42.8	14.2	43.1	57.0	54	74	10.9	17.0	Vertical
*21400.0	28.6	43.3	18.7	47.3	62.0	54	74	6.7	12.0	Vertical
3215.943	48.5	53.1	-1.3	47.2	51.8	54	74	6.8	22.2	Horizontal
6431.885	42.9	46.4	5.7	48.6	52.1	54	74	5.4	21.9	Horizontal
12863.768	34.5	38.9	11.2	45.7	50.1	54	74	8.3	23.9	Horizontal
*17700.0	28.9	43.0	14.2	43.1	57.2	54	74	10.9	16.8	Horizontal
*21400.0	28.6	43.4	18.7	47.3	62.1	54	74	6.7	11.9	Horizontal

Note: 1. The emission emitted by the EUT is too low to be measured except the emission listed above.**2. *: Denotes restricted band of operation.**

10. BAND EDGES MEASUREMENT

10.1. Block Diagram of Test Setup

10.1.1. Block diagram of connection between the EUT and simulators



(EUT: Audio Speaker System)

10.2. The Requirement For Section 15.247(d) & RSS210: A8.5

Section 15.247(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. Attenuation below the general limits specified in section 15.209(a) is not required. In addition, radiated emission 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).

RSS210: A8.5: 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. Attenuation below the general limits specified in Table 2 and 3 is not required. In addition, radiated emission which fall in the restricted bands, as defined in Table 1, must also comply with the radiated emission limits specified in section Table 2 and 3.

10.3. EUT Configuration on Measurement

The following equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.3.1. Audio Speaker System (EUT)

Model Number	:	RoomGroove
Serial Number	:	N/A
Manufacturer	:	1. Zhao Yang Elec. (Shenzhen) Co., Ltd. 2. Jie Hao Elec. (Su Zhou) Co., Ltd.

10.4. Test Procedure

10.4.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

10.4.2. Set RBW of spectrum analyzer to 100kHz and VBW to 100kHz with convenient frequency span including 100kHz bandwidth from band edge.

10.4.3. The band edges was measured and recorded.

10.5. Test Result

Test result in lower band (Channel 1): Pass

Test result in lower band (Channel 3): Pass

10.5.1. The lower band edge emission plot as below, shows 46.01dB delta between carrier maximum power and local maximum emission in the restricted band(2390MHz)

CH	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
1	104.7	62.65	74	-11.35	Peak
1	85.9	43.85	54	-10.15	Average

10.5.2. The higher band edge emission plot as below, shows 46.87dB delta between carrier maximum power and local maximum emission in the restricted band(2483.5MHz)

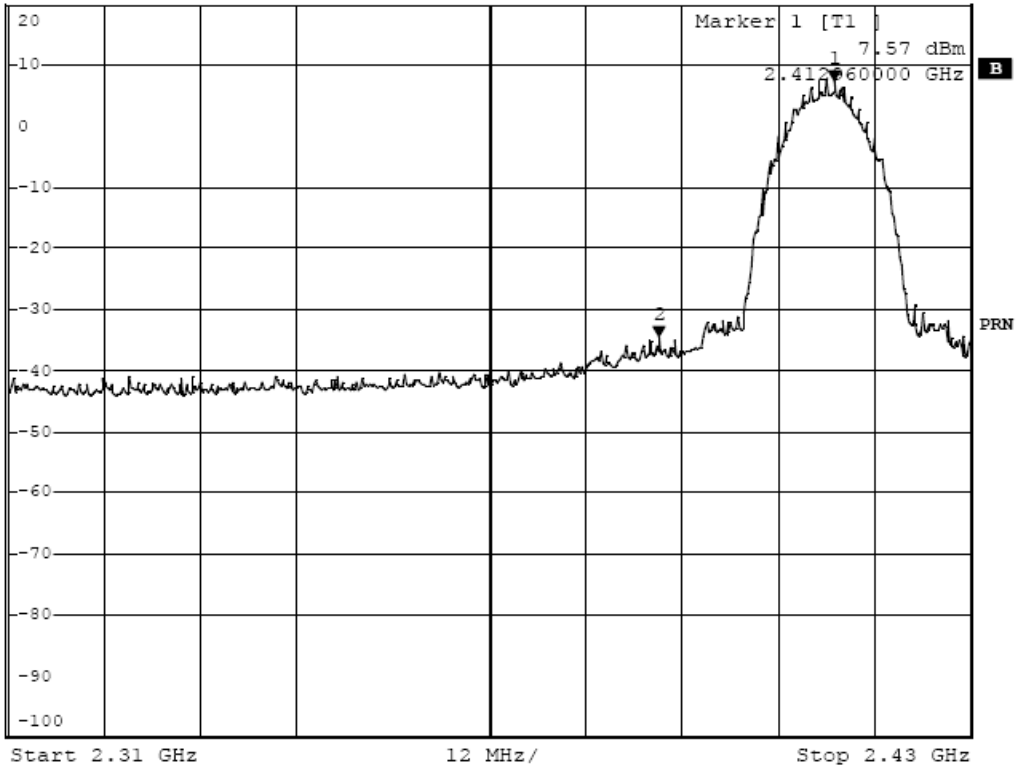
CH	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
3	107.9	63.79	74	-10.21	Peak
3	88.9	44.79	54	-9.21	Average

* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.



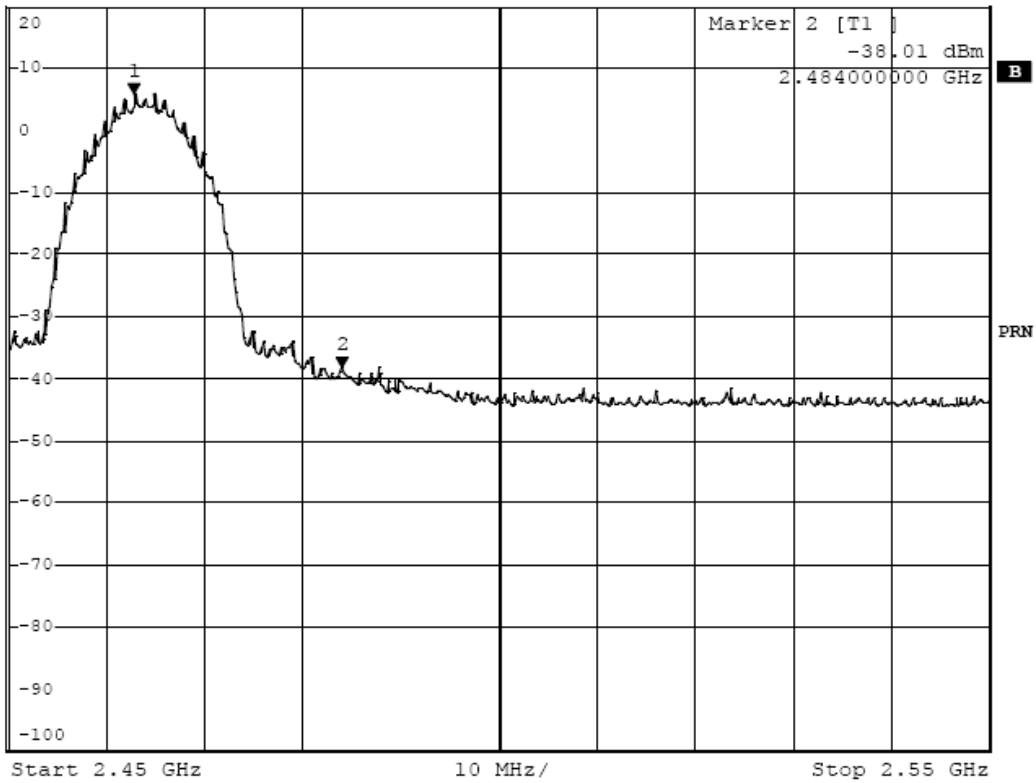
Ref 20 dBm Att 50 dB *RBW 100 kHz Marker 2 [T1]
*VBW 100 kHz -34.48 dBm
*SWT 500 ms 2.391120000 GHz

1 PK
VIEW



Ref 20 dBm Att 50 dB *RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz 6.10 dBm
*SWT 500 ms 2.462800000 GHz

1 PK
VIEW



11. ANTENNA REQUIREMENT

11.1. The Requirement

According to Section 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.

11.2. Antenna Construction

The maximum gain antenna used in this product is dipole antenna (use RG-178 cable).

Mount On PCB board, with MHF antenna connector.

It is impossible for end users to replace the antenna, Because antenna is mounted inside of the EUT. Therefore, The equipment complies with the antenna requirement of Section 15.203