



## STC Test Report

Date : 2012-12-18

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No. : MH187693

**Applicant (C01494):** Hip Shing Electronics Ltd.  
Units 1, 2 & 3, 20/F., New Treasure Centre, 10., Ng Fong Street, San Po Kong, Kowloon, Hong Kong

**Manufacturer:** Dongguan Zhi Cheng Electronic Products Co., Ltd.  
China, Dongguanshi, Tangxia, Ping San 188 Ind. Zone

**Description of Sample(s):** Submitted sample(s) said to be  
Product: Cambridge SoundWorks Ambiance  
Touch World Radio  
Brand Name: SoundWorks  
Model Number: CW0380a  
FCC ID: BZAAVPCW0380A

**Date Sample(s) Received:** 2012-11-20

**Date Tested:** 2012-11-22 to 2012-12-06

**Investigation Requested:** Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2011 and ANSI C63.4:2009 for FCC Certification.

**Conclusion(s):** The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remark(s):** ---

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Dr. LEE Kam Chuen  
Authorized Signatory  
ElectroMagnetic Compatibility Department  
For and on behalf of  
The Hong Kong Standards and Testing Centre Ltd.



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### **Appendix A**

List of Measurement Equipment

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### **Appendix B**

Photographs of EUT

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### **1.0 General Details**

#### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate  
New Territories, Hong Kong

#### **1.2 Equipment Under Test [EUT] Description of Sample(s)**

Product: Cambridge SoundWorks Ambiance Touch World Radio  
Manufacturer: Dongguan Zhi Cheng Electronic Products Co., Ltd.  
Brand Name: SoundWorks  
Model Number: CW0380a  
Rating: 18Vd.c. with Jack

The AC/DC adaptor was provided by the applicant with following details:  
Brand name: GPE; Model no.: GPE602-180330D; Input: 100-240Va.c. 50/60Hz 1.5A;  
Output: 18Vd.c. 3300mA 59.4W.

##### **1.2.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a Hip Shing Electronics Ltd., Cambridge SoundWorks Ambiance Touch World Radio. the transmission signal is digital modulated with channel frequency range 2412-2462MHz..

#### **1.3 Date of Order**

2012-11-20

#### **1.4 Submitted Sample(s):**

1 Sample

#### **1.5 Test Duration**

2012-11-22 to 2012-12-06

#### **1.6 Country of Origin**

China

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### **2.0** **Technical Details**

#### **2.1** **Investigations Requested**

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2011 Regulations and ANSI C63.4:2009 for FCC Certification.

#### **2.2** **Test Standards and Results Summary Tables**

<b>EMISSION Results Summary</b>						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(3)	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Emissions	FCC 47CFR 15.207	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Power Spectral Density	FCC 47CFR 15.247(e)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6dB Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band Edge Emissions	FCC 47CFR 15.247(d)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RF Exposure	FCC 47CFR 15.247(i)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable

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### **3.0 Test Results**

#### **3.1 Emission**

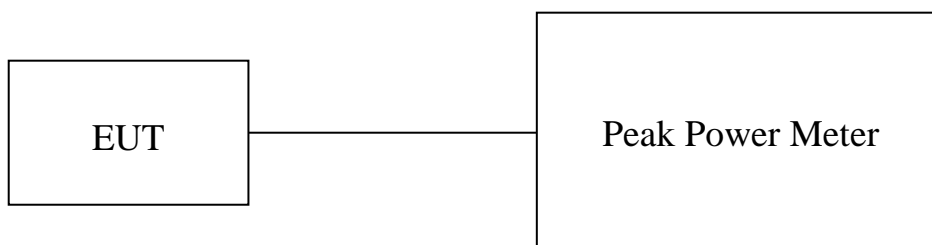
##### **3.1.1 Maximum Peak Output Power**

Test Requirement:	FCC 47CFR 15.247(b)(3)
Test Method:	N/A
Test Date:	2012-11-26
Mode of Operation:	WiFi mode

#### **Test Method:**

The RF output of the EUT was connected to the peak power meter. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in mW.

#### **Test Setup:**



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### **Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:**

For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt (30dBm)

<b>Results of WiFi Tx Mode 802.11 b, (2412MHz to 2462MHz) : Pass (TX Unit)</b>		
<b>Maximum conducted output power</b>		
<b>Channel</b>	<b>Frequency(MHz)</b>	<b>Output Power(Watt)</b>
Low	2412	0.00251
Middle	2437	0.00246
High	2462	0.00238

<b>Results of WiFi Tx Mode 802.11 g, (2412MHz to 2462MHz) : Pass (TX Unit)</b>		
<b>Maximum conducted output power</b>		
<b>Channel</b>	<b>Frequency(MHz)</b>	<b>Output Power(Watt)</b>
Low	2412	0.00234
Middle	2437	0.00241
High	2462	0.00230

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB  
1GHz to 25GHz 1.7dB

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### 3.1.2 Radiated Emissions

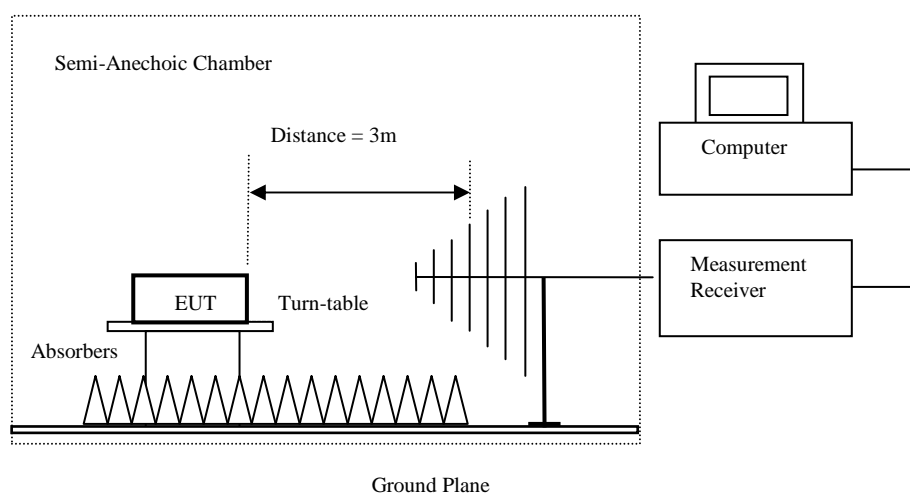
Test Requirement: FCC 47CFR 15.209  
Test Method: ANSI C63.4:2009  
Test Date: 2012-11-26 to 2012-12-06  
Mode of Operation: Tx mode / WiFi mode

#### Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\* Semi-anechoic chamber located on the G/F of "The Hong Kong Standards and Testing Centre Ltd." with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

#### Test Setup:



Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

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### Limits for Radiated Emissions [FCC 47 CFR 15.247 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Tx mode (2412.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level $\text{dB}\mu\text{V}$	Correction Factor $\text{dB/m}$	Field Strength $\text{dB}\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit $\mu\text{V/m}$	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Results of Tx mode (2412.0 MHz) (802.11b) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level $\text{dB}\mu\text{V}$	Correction Factor $\text{dB/m}$	Field Strength $\text{dB}\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit $\mu\text{V/m}$	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2412.0 MHz) (802.11b) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m $\text{dB}\mu\text{V}$	Correction Factor $\text{dB/m}$	Field Strength $\text{dB}\mu\text{V/m}$	Limit @3m $\text{dB}\mu\text{V/m}$	Margin $\text{dB}\mu\text{V/m}$	E-Field Polarity
4824.0	7.3	41.5	48.8	74.0	25.2	Horizontal
4824.0	10.7	41.5	52.2	74.0	21.8	Vertical
7236.0	2.7	48.8	51.5	74.0	22.5	Horizontal
7236.0	5.9	48.8	54.7	74.0	19.3	Vertical

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**Result of Tx mode (2412.0 MHz) (802.11b) (Above 1GHz): Pass**

<b>Field Strength of Spurious Emissions Average Value</b>						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4824.0	-3.5	41.5	38.0	54.0	16.0	Horizontal
4824.0	2.3	41.5	43.8	54.0	10.2	Vertical
7236.0	-8.2	48.8	40.6	54.0	13.4	Horizontal
7236.0	-4.0	48.8	44.8	54.0	9.2	Vertical

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### Result of Tx mode (2437.0 MHz) (802.11b) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Results of Tx mode (2437.0 MHz) (802.11b) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2437.0 MHz) (802.11b) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4874.0	11.2	41.4	52.6	74.0	21.4	Horizontal
4874.0	11.5	41.4	53.5	74.0	20.5	Vertical
7311.0	6.4	48.7	55.1	74.0	18.9	Horizontal
7311.0	5.6	48.7	54.3	74.0	19.7	Vertical

### Result of Tx mode (2437.0 MHz) (802.11b) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4874.0	-3.6	41.4	37.8	54.0	16.2	Horizontal
4874.0	-3.1	41.4	38.3	54.0	15.7	Vertical
7311.0	-10.4	48.7	38.3	54.0	15.7	Horizontal
7311.0	-11.5	48.7	37.2	54.0	16.8	Vertical

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**Result of Tx mode (2462.0 MHz) (802.11b) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Results of Tx mode (2462.0 MHz) (802.11b) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Result of Tx mode (2462.0 MHz) (802.11b) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4924.0	13.4	41.4	54.8	74.0	19.2	Horizontal
4924.0	12.1	41.4	53.5	74.0	20.5	Vertical
7386.0	3.4	48.7	52.1	74.0	21.9	Horizontal
7386.0	4.5	48.7	53.2	74.0	20.8	Vertical

**Result of Tx mode (2462.0 MHz) (802.11b) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4924.0	-3.9	41.4	37.5	54.0	16.5	Horizontal
4924.0	-6.8	41.4	34.6	54.0	19.4	Vertical
7386.0	-11.1	48.7	37.6	54.0	16.4	Horizontal
7386.0	-10.0	48.7	38.7	54.0	15.3	Vertical

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**Result of Tx mode (2412.0 MHz) (802.11g) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dB $\mu$ V	dB/m	dB $\mu$ V/m	$\mu$ V/m	$\mu$ V/m	
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Results of Tx mode (2412.0 MHz) (802.11g) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency	Measured Level	Correction Factor	Field Strength	Field Strength	Limit	E-Field Polarity
MHz	dB $\mu$ V	dB/m	dB $\mu$ V/m	$\mu$ V/m	$\mu$ V/m	
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Result of Tx mode (2412.0 MHz) (802.11g) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dB $\mu$ V	dB/m	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m	
4824.0	11.1	41.5	52.6	74.0	21.4	Horizontal
4824.0	12.8	41.5	54.3	74.0	19.7	Vertical
7236.0	5.9	48.8	54.7	74.0	19.3	Horizontal
7236.0	6.8	48.8	55.6	74.0	18.4	Vertical

**Result of Tx mode (2412.0 MHz) (802.11g) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency	Measured Level @3m	Correction Factor	Field Strength	Limit @3m	Margin	E-Field Polarity
MHz	dB $\mu$ V	dB/m	dB $\mu$ V/m	dB $\mu$ V/m	dB $\mu$ V/m	
4824.0	-2.5	41.5	39.0	54.0	15.0	Horizontal
4824.0	0.7	41.5	42.2	54.0	11.8	Vertical
7236.0	-6.7	48.8	42.1	54.0	11.9	Horizontal
7236.0	-6.3	48.8	42.5	54.0	11.5	Vertical

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**Result of Tx mode (2437.0 MHz) (802.11g) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Results of Tx mode (2437.0 MHz) (802.11g) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Result of Tx mode (2437.0 MHz) (802.11g) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4874.0	12.1	41.4	53.5	74.0	20.5	Horizontal
4874.0	12.5	41.4	53.9	74.0	20.1	Vertical
7311.0	4.6	48.7	53.3	74.0	20.7	Horizontal
7311.0	5.6	48.7	54.3	74.0	19.7	Vertical

**Result of Tx mode (2437.0 MHz) (802.11g) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4874.0	-9.6	41.4	31.8	54.0	22.2	Horizontal
4874.0	-10.7	41.4	30.7	54.0	23.3	Vertical
7311.0	-7.5	48.7	41.2	54.0	12.8	Horizontal
7311.0	-8.6	48.7	40.1	54.0	13.9	Vertical

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**Result of Tx mode (2462.0 MHz) (802.11g) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Results of Tx mode (2462.0 MHz) (802.11g) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Result of Tx mode (2462.0 MHz) (802.11g) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4924.0	12.8	41.4	54.2	74.0	19.8	Horizontal
4924.0	14.1	41.4	55.5	74.0	18.5	Vertical
7386.0	5.1	48.7	53.8	74.0	20.2	Horizontal
7386.0	4.0	48.7	52.7	74.0	21.3	Vertical

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### **Result of Tx mode (2462.0 MHz) (802.11g) (Above 1GHz): Pass**

<b>Field Strength of Spurious Emissions</b>						
<b>Average Value</b>						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4924.0	-3.8	41.4	37.6	54.0	16.4	Horizontal
4924.0	-3.1	41.4	38.3	54.0	15.7	Vertical
7386.0	-11.2	48.7	37.5	54.0	16.5	Horizontal
7386.0	-10.1	48.7	38.6	54.0	15.4	Vertical

Remarks:

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 4.9dB  
1GHz to 6GHz 4.02dB  
6GHz to 18GHz 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

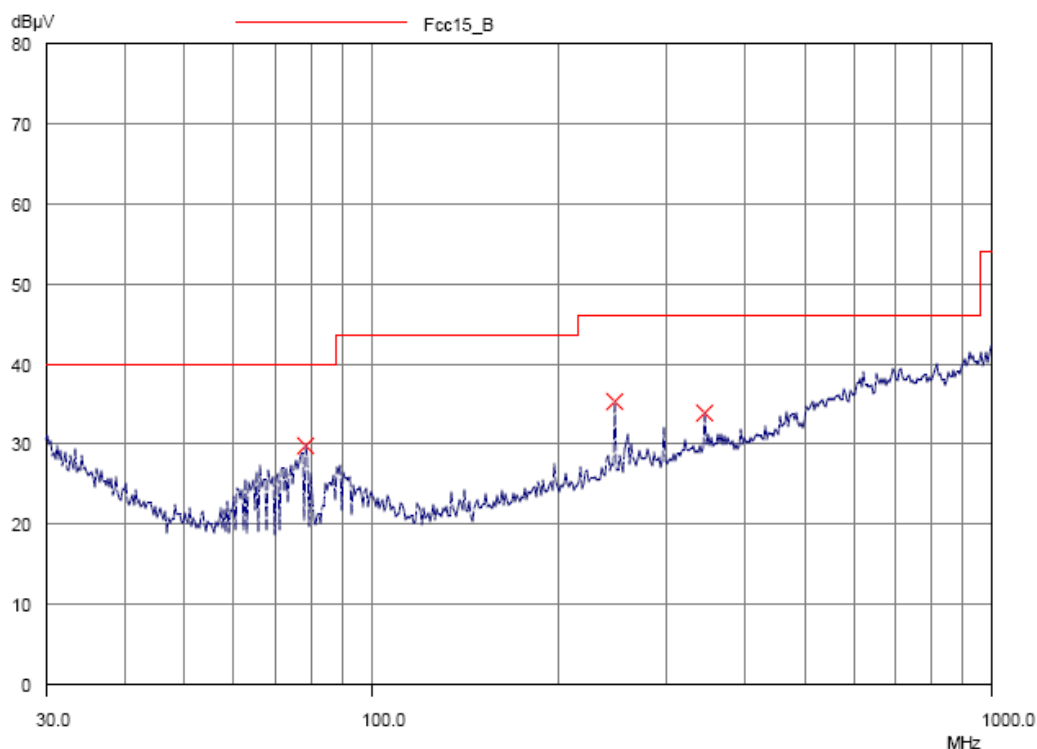
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of WiFi mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

#### Horizontal



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### **Result of WiFi mode (30MHz – 1GHz): Pass**

<b>Radiated Emissions Quasi-Peak</b>					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
32.8	Vertical	31.8	40.0	38.9	100
58.1	Vertical	34.9	40.0	55.6	100
139.8	Vertical	32.1	43.5	40.3	150

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

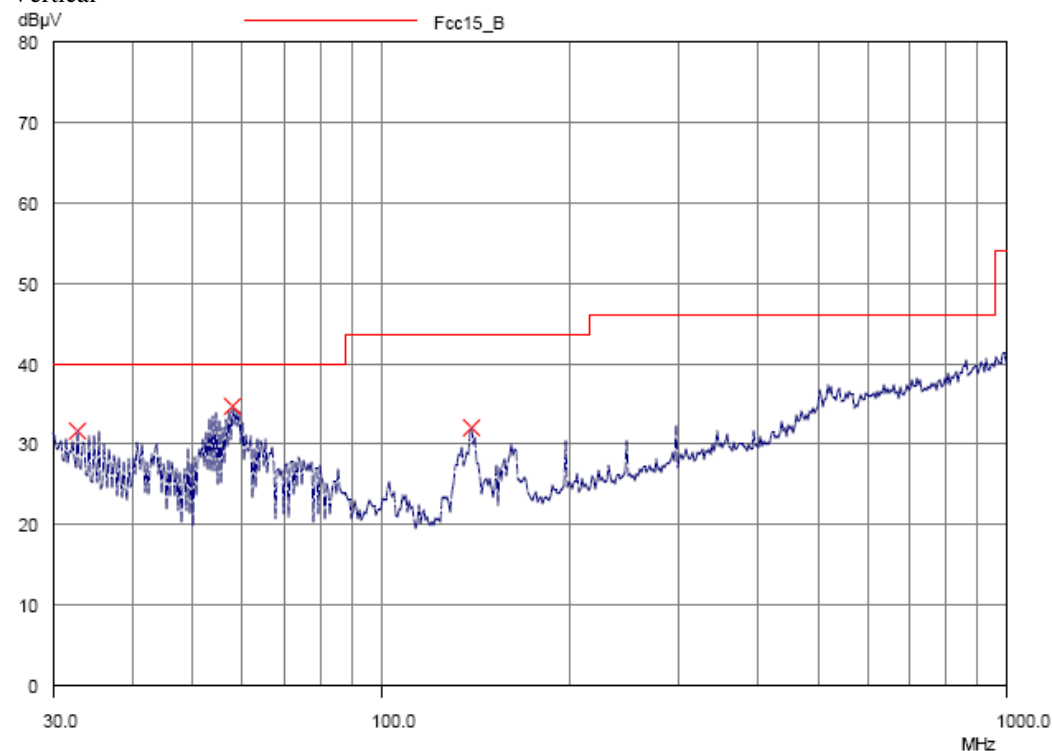
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of WiFi mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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### Result of WiFi mode (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
32.8	Vertical	31.8	40.0	38.9	100
58.1	Vertical	34.9	40.0	55.6	100
139.8	Vertical	32.1	43.5	40.3	150

#### Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 4.9dB  
1GHz to 6GHz 4.02dB  
6GHz to 18GHz 4.03dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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### 3.1.3 Power Spectral Density

Test Requirement: FCC 47CFR 15.247(e)  
Test Method: ANSI C63.4:2009  
Test Date: 2012-12-06  
Mode of Operation: WiFi mode

#### Test Method:

The RF output of the EUT was connected to the spectrum analyzer. Set the fundamental frequency as the center frequency of the spectral analyzer. Use RBW=3kHz and sweep time = span/3kHz. Measure the Power Spectral Density (PSD) and record the results in dBm.

For multiple antenna measurement, all the available transmitter output will be connected to the spectrum analyzer through a power combiner.

#### Test Setup:

As Test Setup of clause 3.1.1 in this test report.

#### Test Limit:

The maximum power spectral density (PSD) shall not exceeded 8dBm in any 3kHz band.

#### Results of WiFi Mode 802.11 b (Tx:2412MHz to 2462MHz) : Pass (TX Unit)

##### Maximum power spectral density

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2412.0	-8.37

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2437.0	-6.98

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2462.0	-7.02

#### Results of WiFi Mode 802.11 g (Tx:2412MHz to 2462MHz) : Pass (TX Unit)

##### Maximum power spectral density

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2412.0	-10.28

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2437.0	-8.55

Transmitter Frequency (MHz)	Maximum power spectral density (dBm)
2462.0	-8.37

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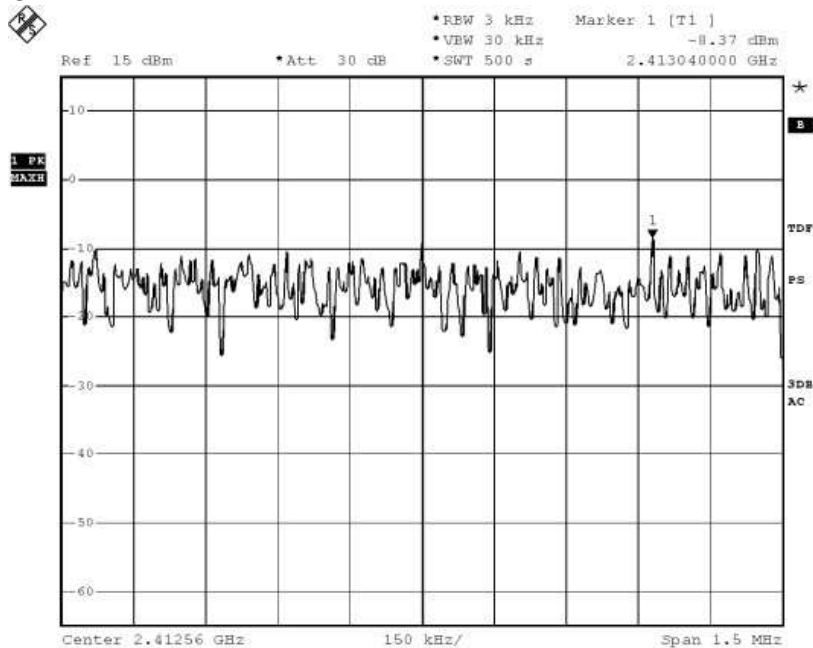
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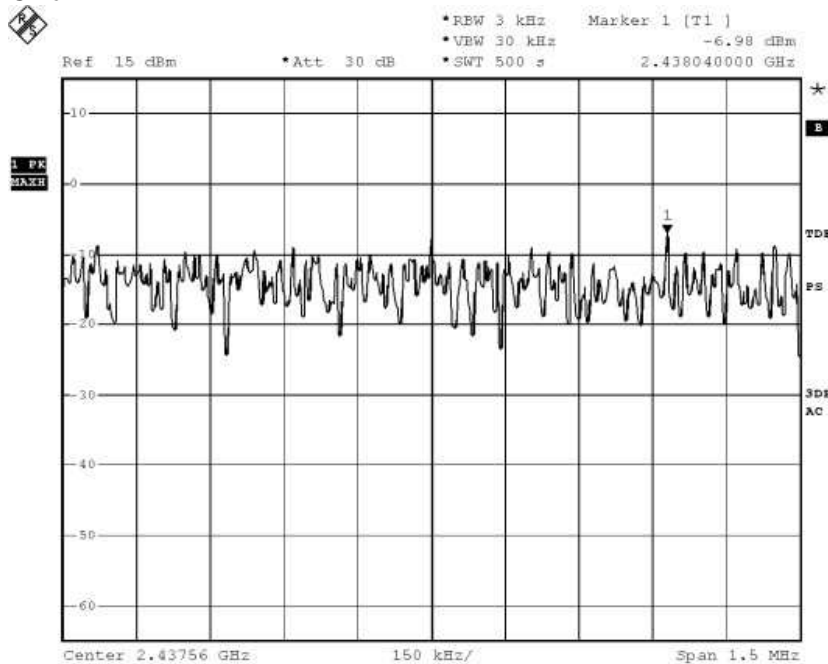
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WiFi mode 802.11 b 11Mbit, (Tx:2412MHz to 2462MHz)

Ch 1



Ch 6



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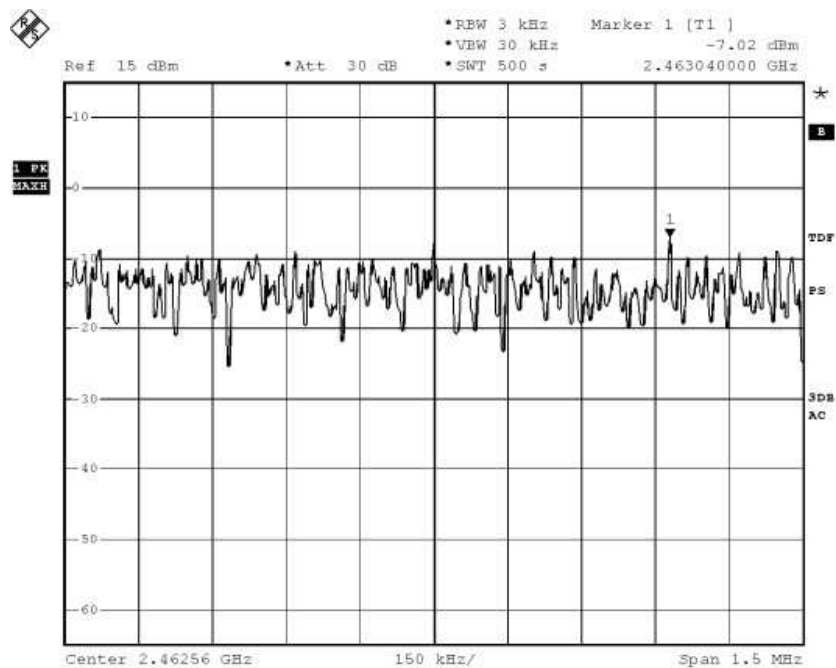
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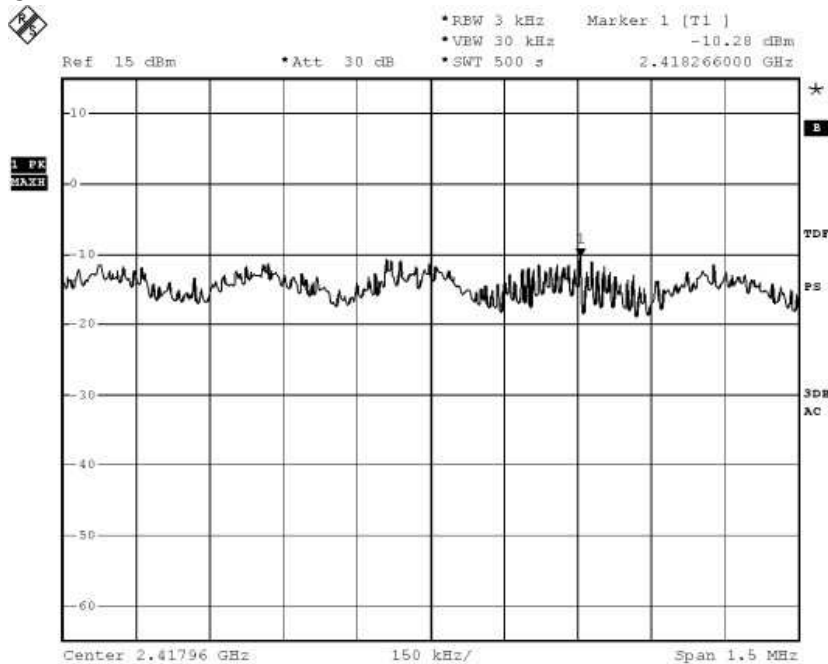
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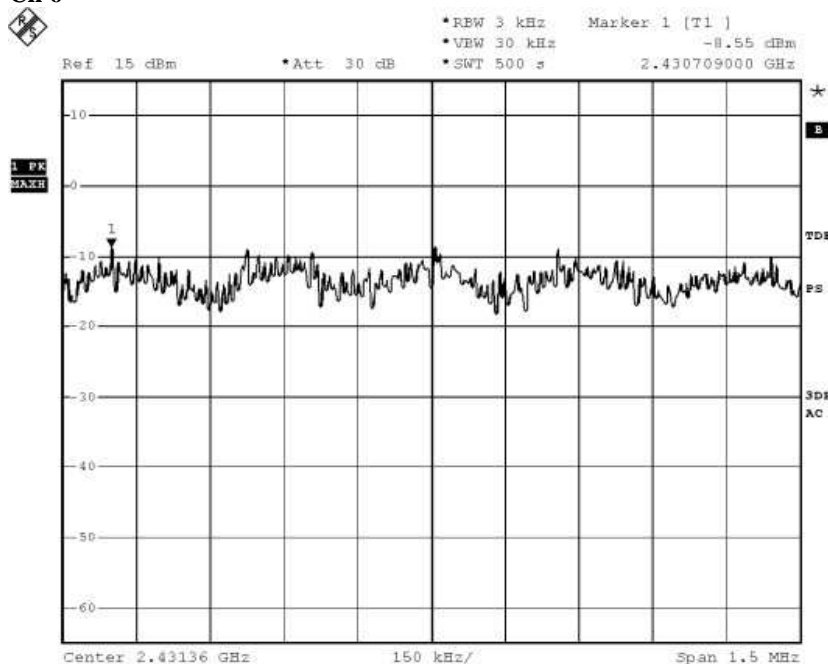
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WiFi mode 802.11 g 54Mbit, (Tx:2412MHz to 2462MHz)

Ch 1



Ch 6



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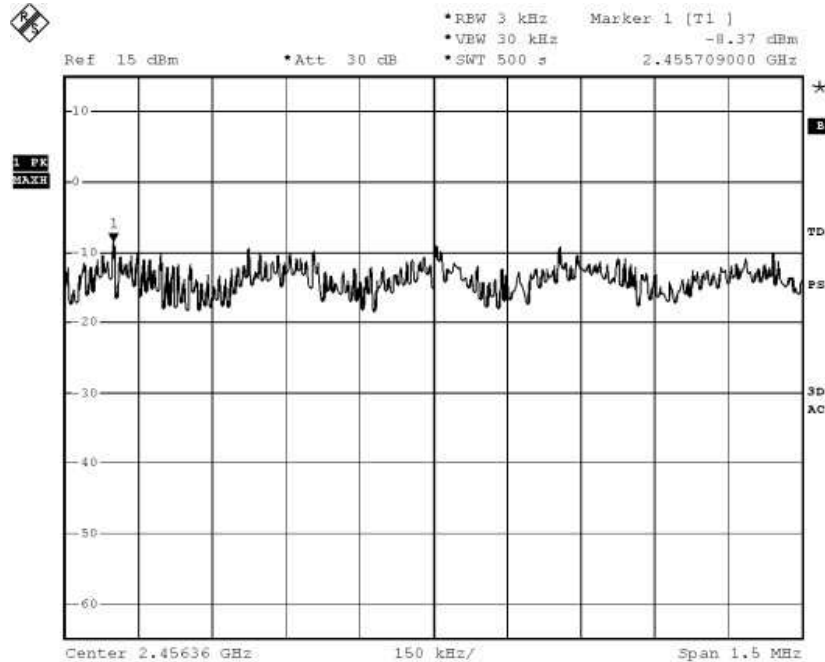
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### **3.1.4 6dB Spectrum Bandwidth Measurement**

Test Requirement:	FCC 47CFR 15.247(a)(2)
Test Method:	ANSI C63.4:2009
Test Date:	2012-12-06
Mode of Operation:	WiFi mode

#### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

For multiple antenna measurement, all the available transmitter output will be connected to the spectrum analyzer through a power combiner.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

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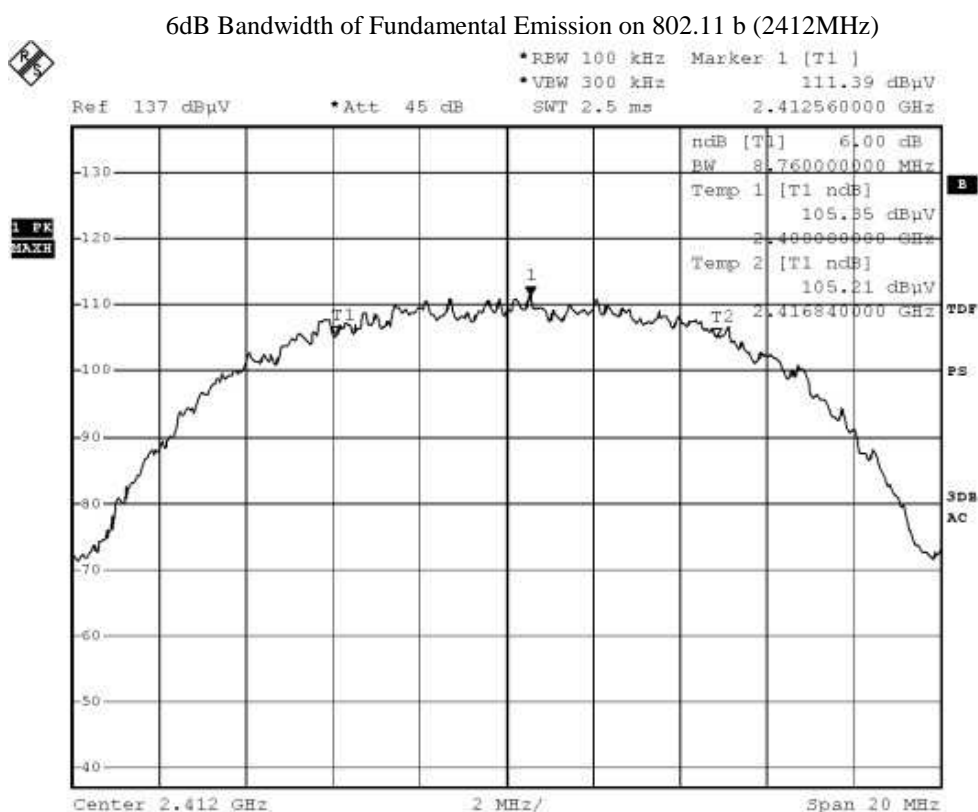
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### Limits for 6dB Spectrum Bandwidth Measurement:

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	8.76	> 500



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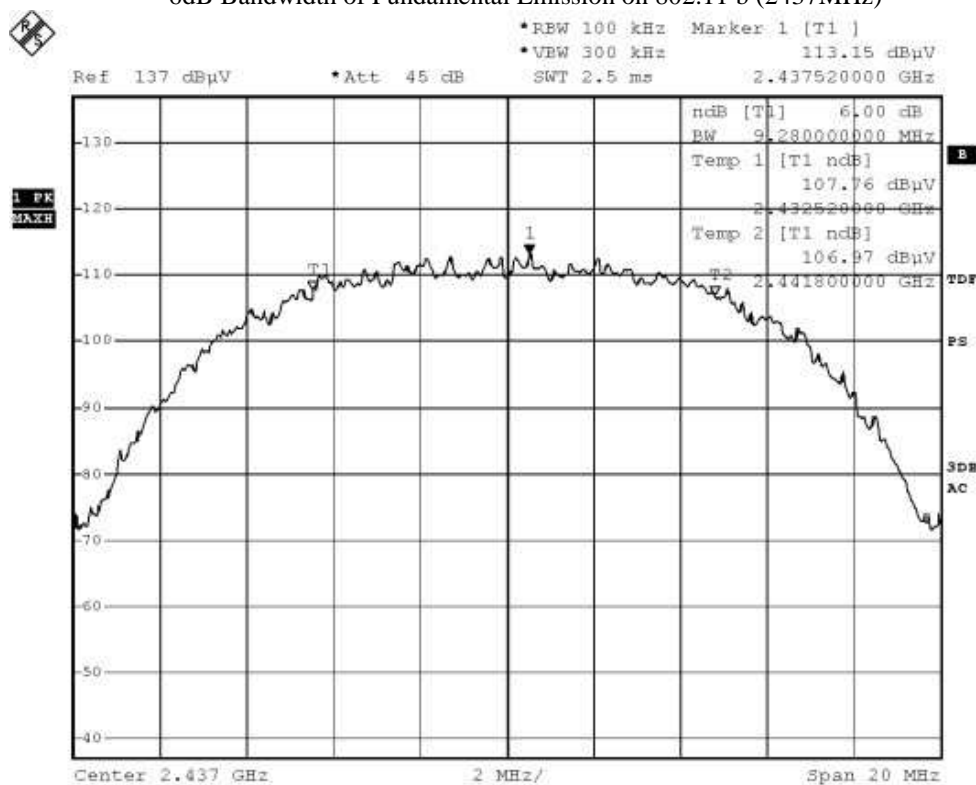
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### Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	9.28	> 500

### 6dB Bandwidth of Fundamental Emission on 802.11 b (2437MHz)



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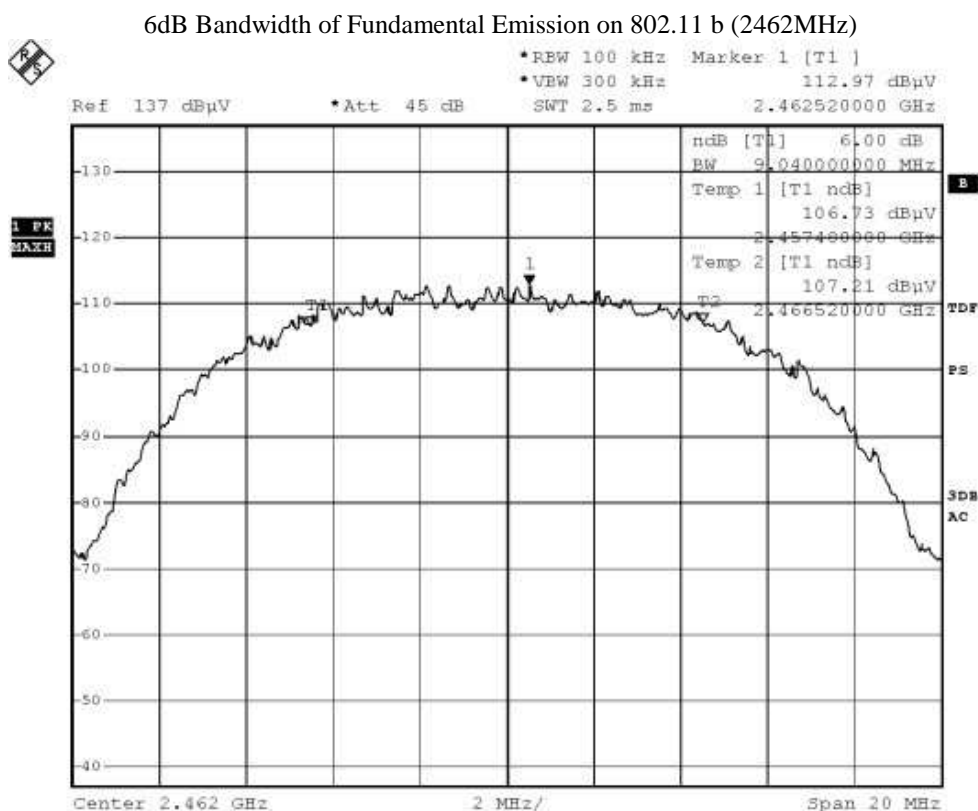
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### Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	9.04	> 500



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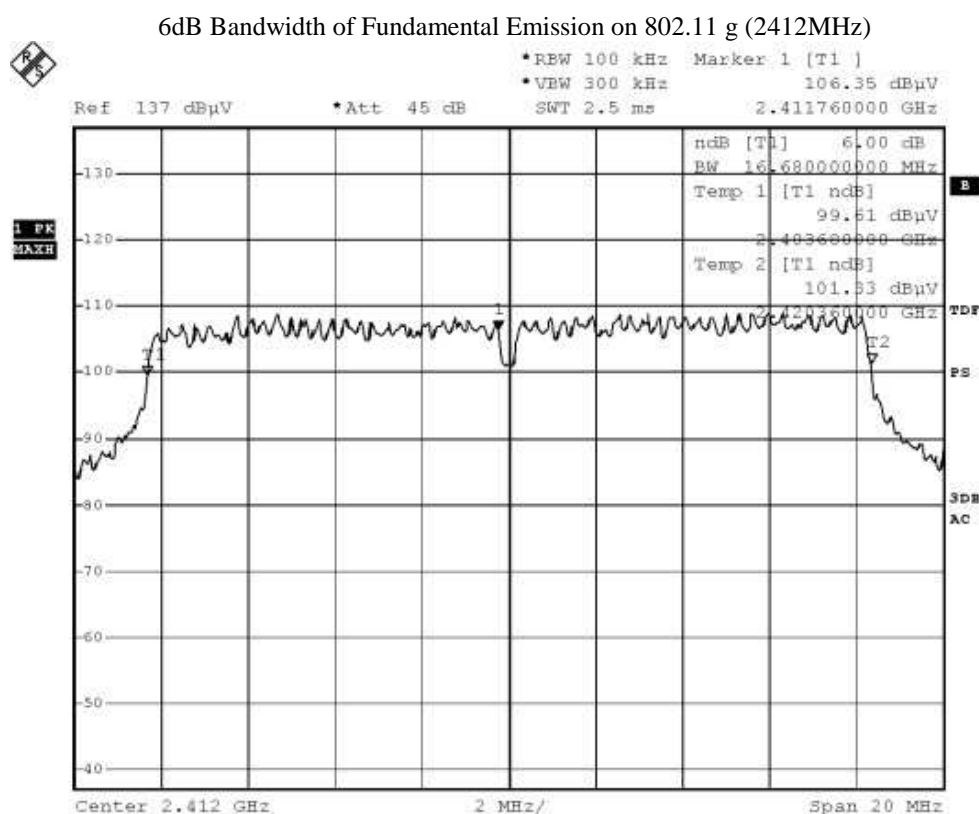
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**Limits for 6dB Spectrum Bandwidth Measurement:**

Center Frequency [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2412.0	16.68	> 500



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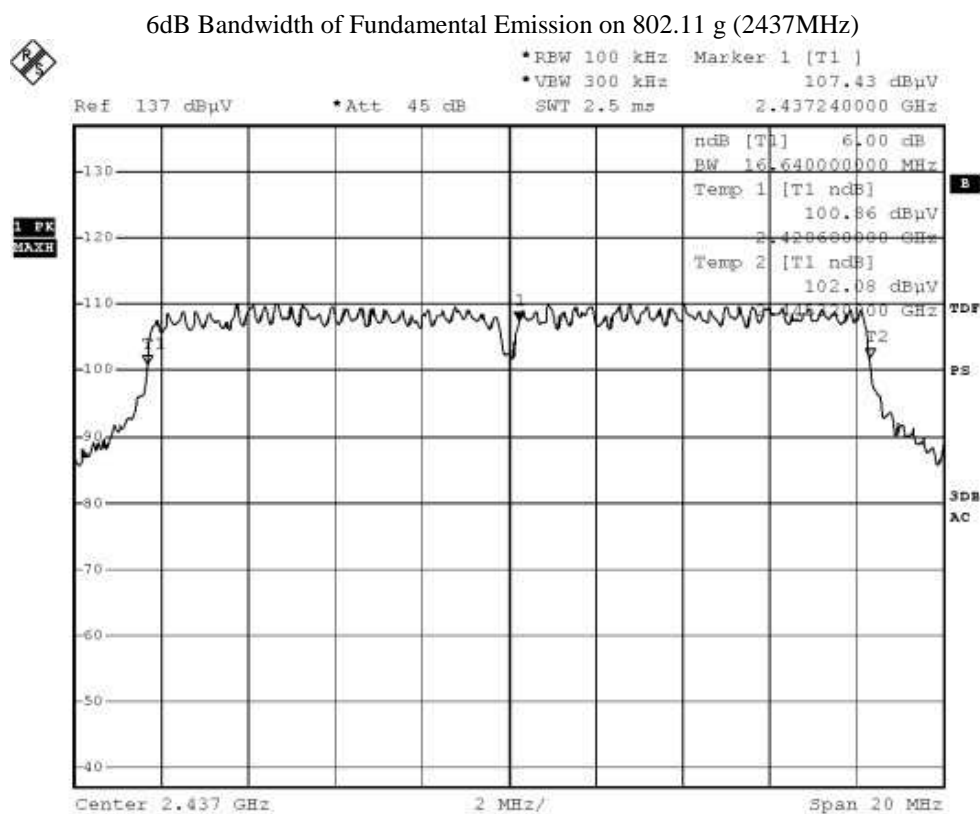
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### Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2437.0	16.64	> 500



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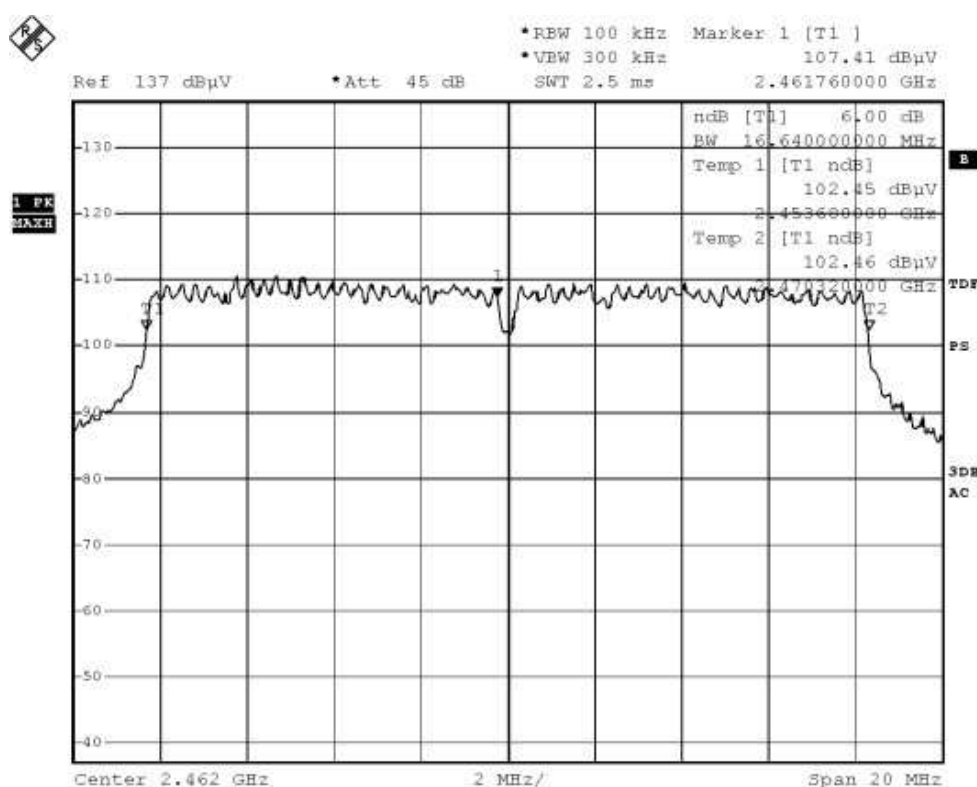
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### Limits for 6dB Spectrum Bandwidth Measurement:

Frequency Range [MHz]	6dB Bandwidth [MHz]	FCC Limits [kHz]
2462.0	16.64	> 500

6dB Bandwidth of Fundamental Emission on 802.11 g (2462MHz)



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### **3.1.5 Band Edges Measurement**

Test Requirement:	FCC 47CFR 15.247
Test Method:	ANSI C63.4:2009
Test Date:	2012-11-26
Mode of Operation:	WiFi mode

#### **Test Method:**

The band edge is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. The RBW and VBW are set to 100kHz for this measurement.

#### **Test Setup:**

As Test Setup of clause 3.1.2 in this test report.

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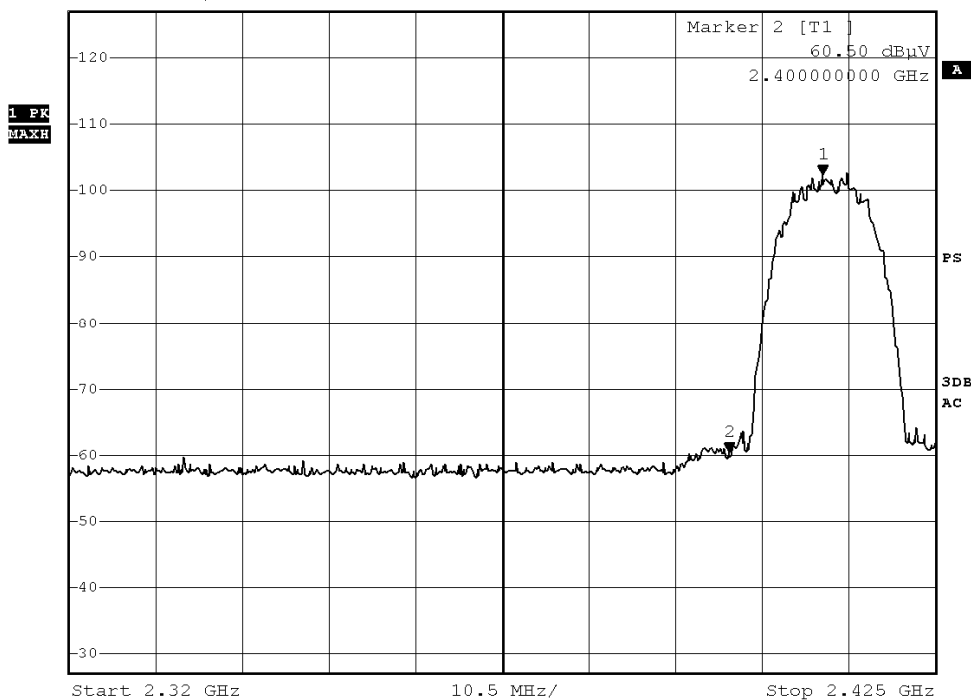
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### Band-edge Compliance of RF Emissions – Lowest (802.11b)



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 102.50 dBµV  
Ref 127 dBµV \*Att 35 dB \*SWT 200 ms 2.411350000 GHz



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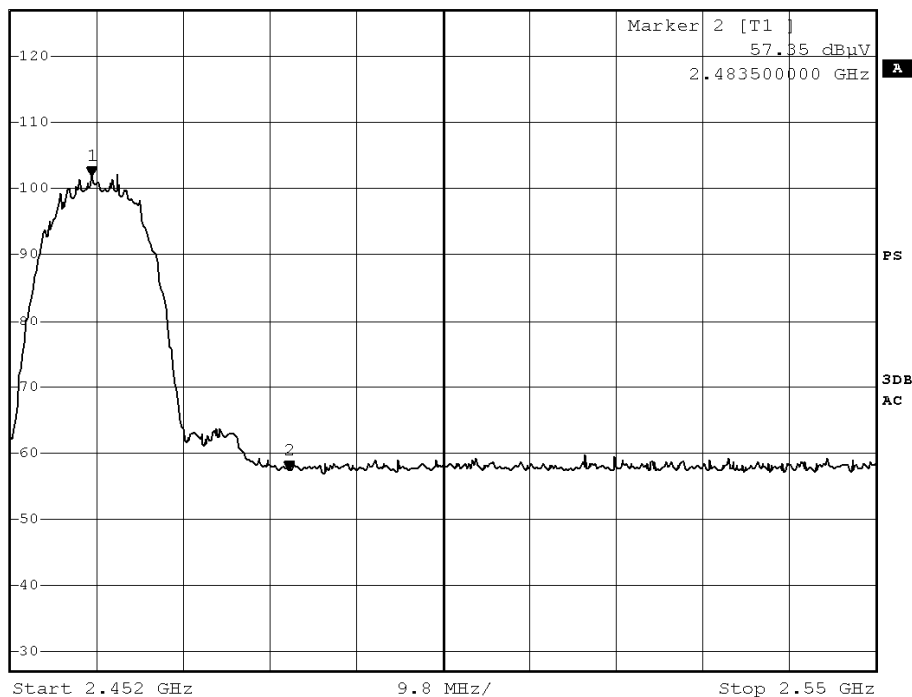
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### Band-edge Compliance of RF Emissions – Highest (802.11b)



Ref 127 dB $\mu$ V      \*Att 35 dB      \*RBW 100 kHz      Marker 1 [T1 ]  
\*VBW 300 kHz      101.92 dB $\mu$ V  
\*SWT 200 ms      2.461200000 GHz



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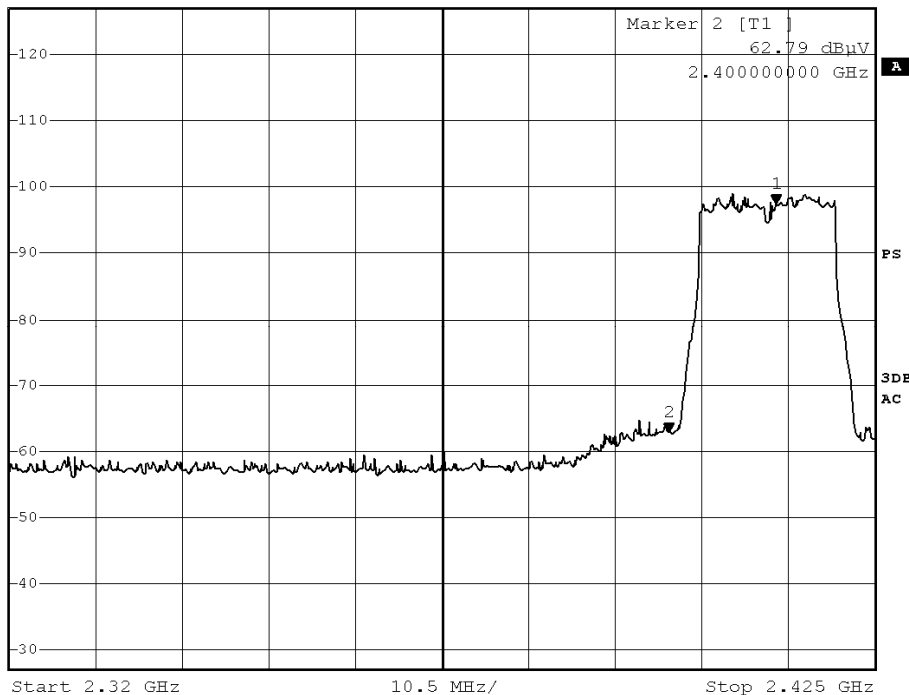
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## Band-edge Compliance of RF Emissions – Lowest (802.11g)



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 97.50 dBμV  
\*SWT 200 ms 2.413000000 GHz

Ref 127 dBμV \*Att 35 dB



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### Band-edge Compliance of RF Emissions – Highest (802.11g)



Ref 127 dB $\mu$ V      \*Att 35 dB      \*RBW 100 kHz      Marker 1 [T1 ]  
\*VEW 300 kHz      101.48 dB $\mu$ V  
\*SWT 200 ms      2.457488000 GHz



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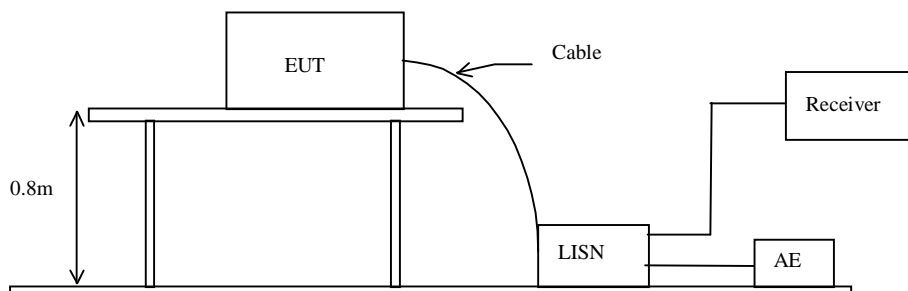
### 3.1.6 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement: FCC 47CFR 15.207  
Test Method: ANSI C63.4:2009  
Test Date: 2012-11-22  
Mode of Operation: WiFi mode

#### Test Method:

The test was performed in accordance with ANSI C63.4:2009, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

#### Test Setup:



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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

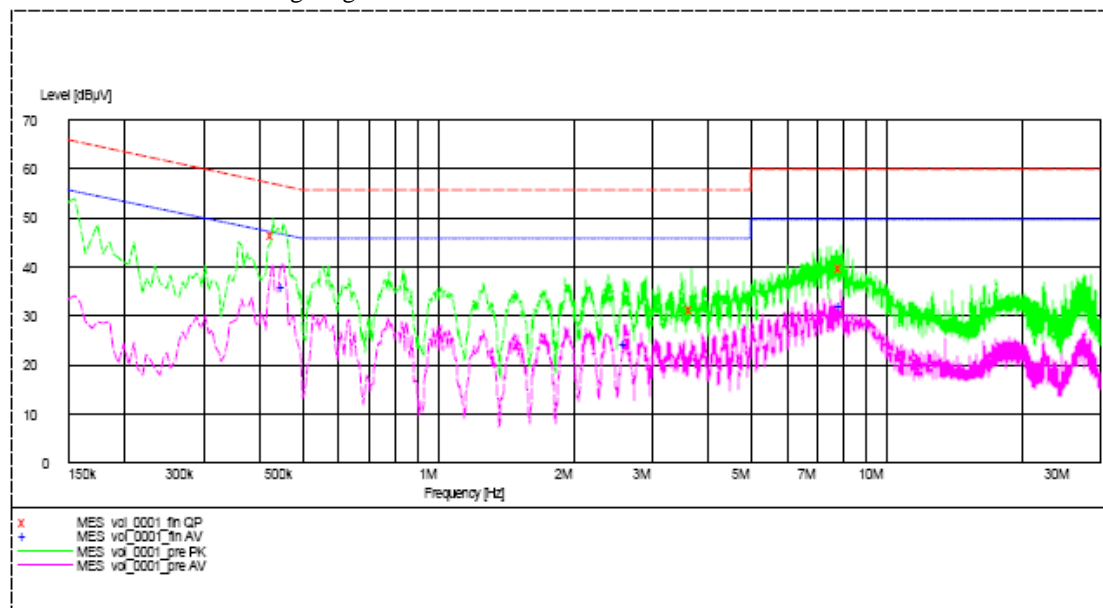
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of WiFi mode (L): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Live	0.455	-*-	-*-	36.1	47.0
Live	2.640	-*-	-*-	24.3	46.0
Live	7.950	-*-	-*-	32.2	50.0
Live	0.430	46.7	57.0	-*-	-*-
Live	3.700	31.4	56.0	-*-	-*-
Live	7.950	40.1	60.0	-*-	-*-

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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

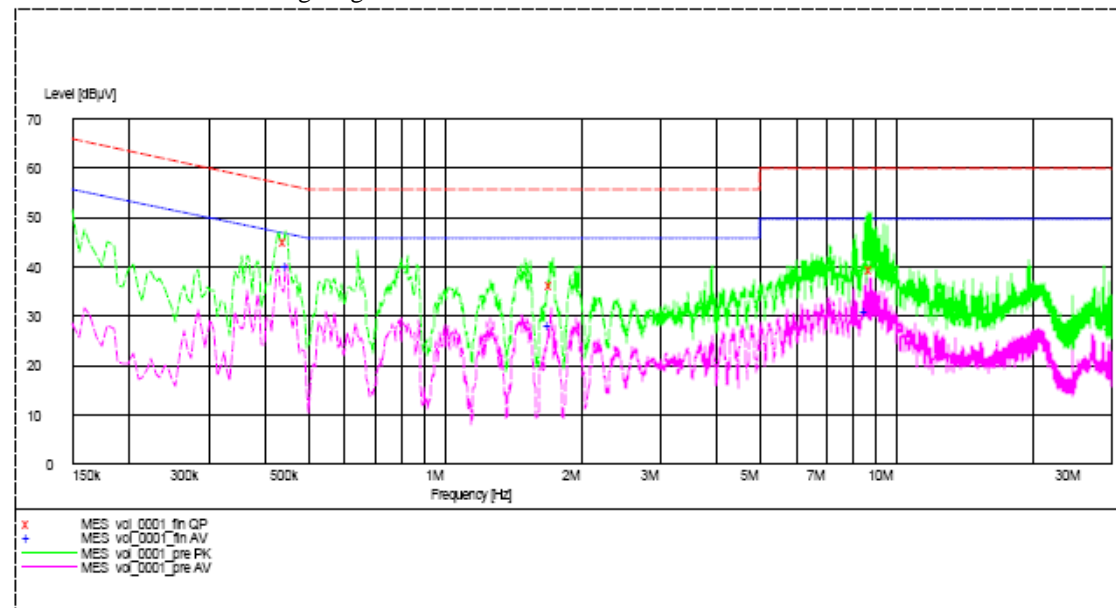
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of WiFi mode (N): PASS

Please refer to the following diagram for individual results.



Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Neutral	0.450	-*-	-*-	40.2	47.0
Neutral	1.720	-*-	-*-	28.2	46.0
Neutral	8.615	-*-	-*-	31.1	50.0
Neutral	0.445	45.1	57.0	-*-	-*-
Neutral	1.735	36.2	56.0	-*-	-*-
Neutral	8.810	39.7	60.0	-*-	-*-

Remark:

Calculated measurement uncertainty : 3.25dB

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### **RF Exposure**

Test Requirement: FCC 47CFR 15.247(i)

Test Date: 2012-12-06

Mode of Operation: WiFi mode

### **Test Method:**

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

### **Test Results:**

The EUT complied with the requirement(s) of this section.

EUT meets the requirements of these sections as proven through MPE calculation

The MPE calculation for EUT @ 20cm

Based on the highest P = 2.51 mW

$$\begin{aligned} P_d &= PG / 4\pi R^2 = (2.51 \times 1.413) / 12.566 \times (20)^2 \\ &= (3.54663) / 12.566 \times 400 = 3.54663 / 5026.4 \\ &= 0.000706 \text{ mW/cm}^2 \end{aligned}$$

where:

\*P<sub>d</sub> = power density in mW/cm<sup>2</sup>

\* G = Antenna numeric gain (1.413); Log G = g/10 ( g = 1.5dBi ).

\* P = Conducted RF power to antenna (2.51 mW).

\* R = Minimum allowable distance.(20 cm)

\*The power density P<sub>d</sub> = 0.000706 mW/cm<sup>2</sup> is less than 1 mW/cm<sup>2</sup> (listed MPE limit)

\*The SAR evaluation is not needed ( this is a desk top device, R > 20 cm )

\* The EUT( antenna ) must be 0.2 meters away from the General Population.

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### **Antenna Requirement**

#### **Test Requirements: § 15.203**

#### **Test Specification:**

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. 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.

#### **Test Results:**

This is PCB layout internal antenna. There is no external antenna, the antenna gain = 1.5dBi. All component install on inside of EUT. User unable to remove or changed the Antenna.

#### **Frequency List for 802.11 b/g**

**For both 20MHz bandwidth systems, use Channel 1-Channel 11.**

Item	Frequency (MHz)	Item	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	—	—

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### Appendix A

#### List of Measurement Equipment

##### Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2012/10/25	2013/10/25
EM174	BICONILOG ANTENNA	EMCO	3142B	1671	2012/05/31	2014/05/31
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2012/05/03	2013/05/03
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2012/01/25	2014/01/25
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2011/09/14	2013/09/14
EM293	MXA SIGNAL ANALYZER	AGILENT TECHNOLOGIES	MY50510152	N/A	2011/11/10	2012/11/10
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2012/01/24	2014/01/24

##### Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM197	LISN	EMCO	4825/2	1193	2012/05/16	2013/05/16
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2012/05/03	2013/05/03
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2012/01/27	2013/01/27
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/01/27	2013/01/27

Remarks:-

CM Corrective Maintenance

N/A Not Applicable

TBD To Be Determined

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### Appendix B

#### Photographs of EUT

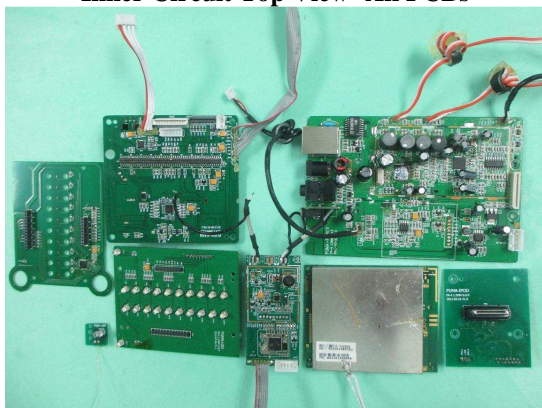
**Front View of the product**



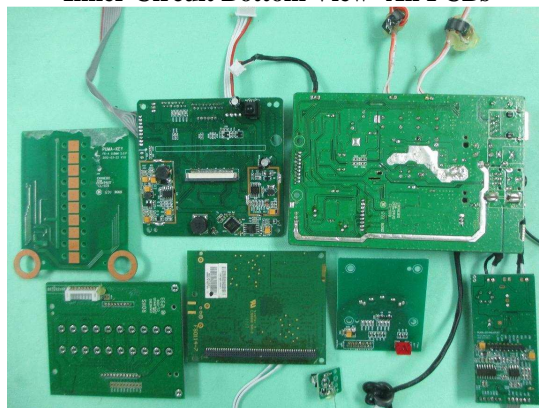
**Rear View of the product**



**Inner Circuit Top View- All PCBs**



**Inner Circuit Bottom View- All PCBs**



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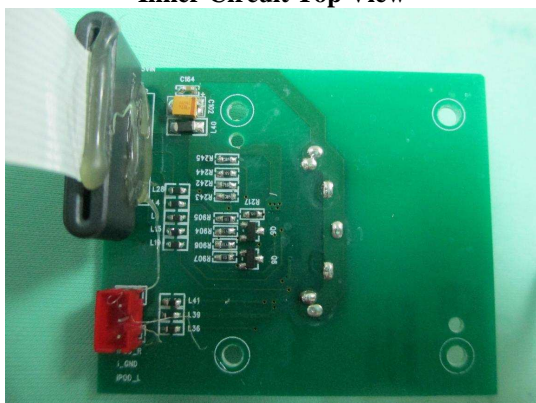
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### Photographs of EUT

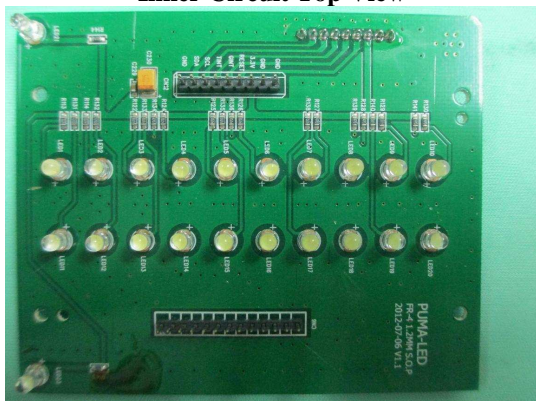
**Inner Circuit Top View**



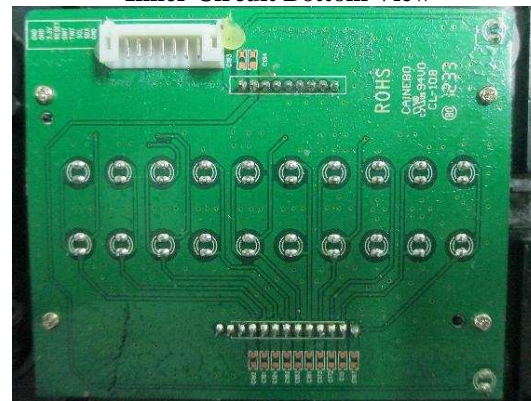
**Inner Circuit Bottom View**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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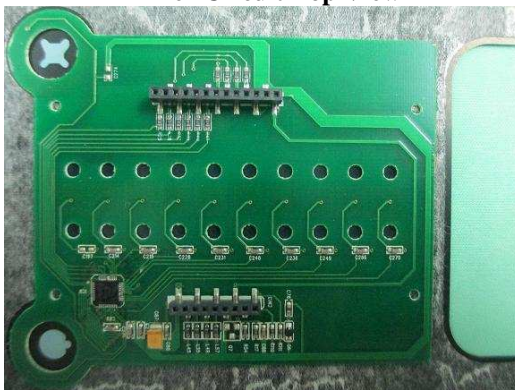
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### Photographs of EUT

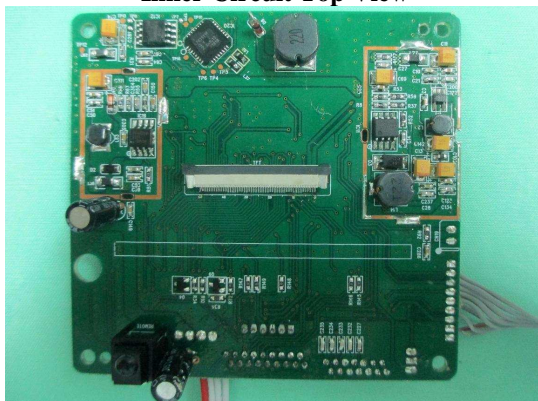
**Inner Circuit Top View**



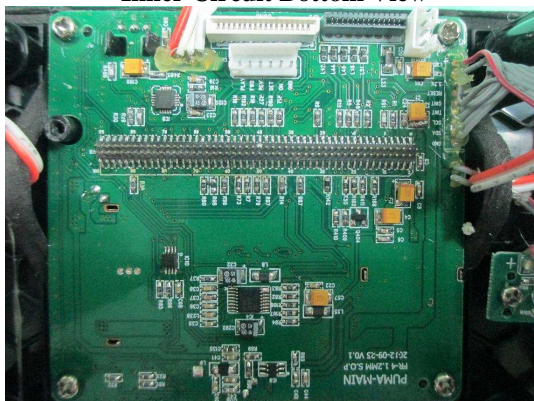
**Inner Circuit Bottom View**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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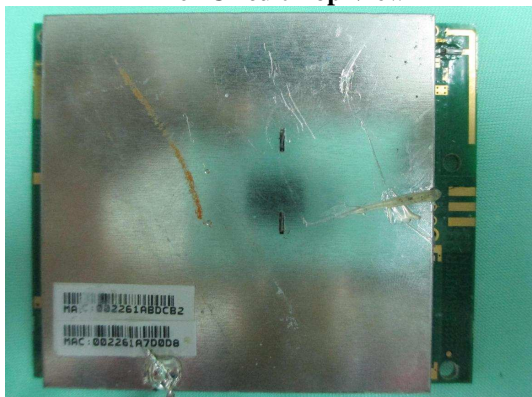
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### Photographs of EUT

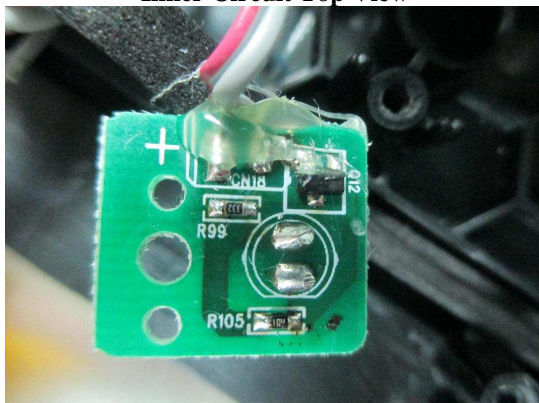
**Inner Circuit Top View**



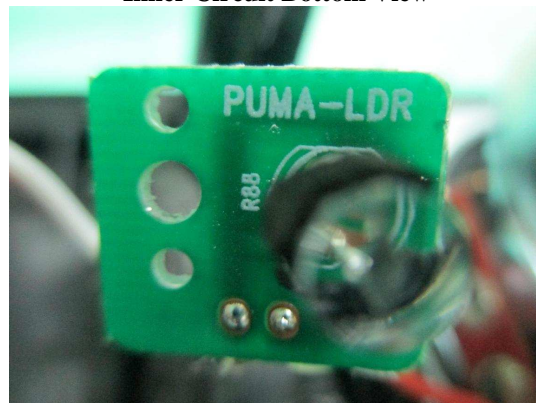
**Inner Circuit Bottom View**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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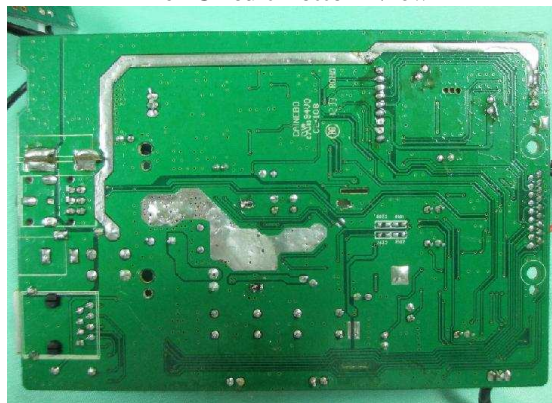
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### Photographs of EUT

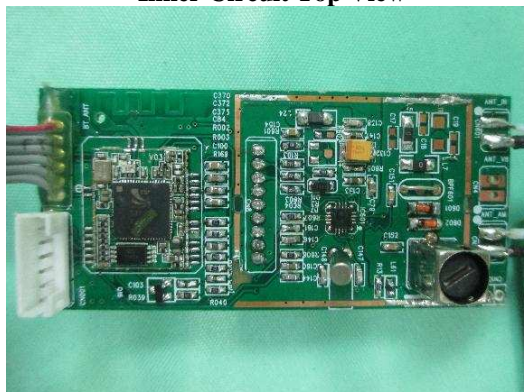
**Inner Circuit Top View**



**Inner Circuit Bottom View**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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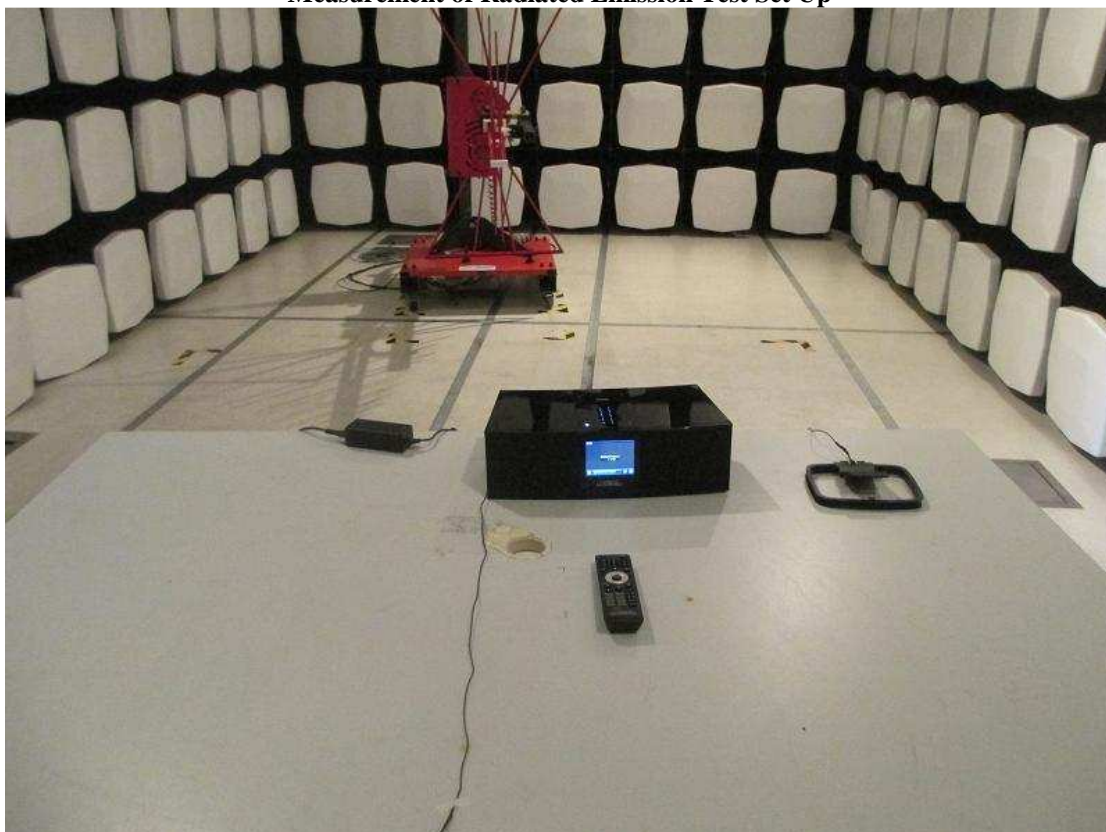
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### **Photographs of EUT**

#### **Measurement of Radiated Emission Test Set Up**



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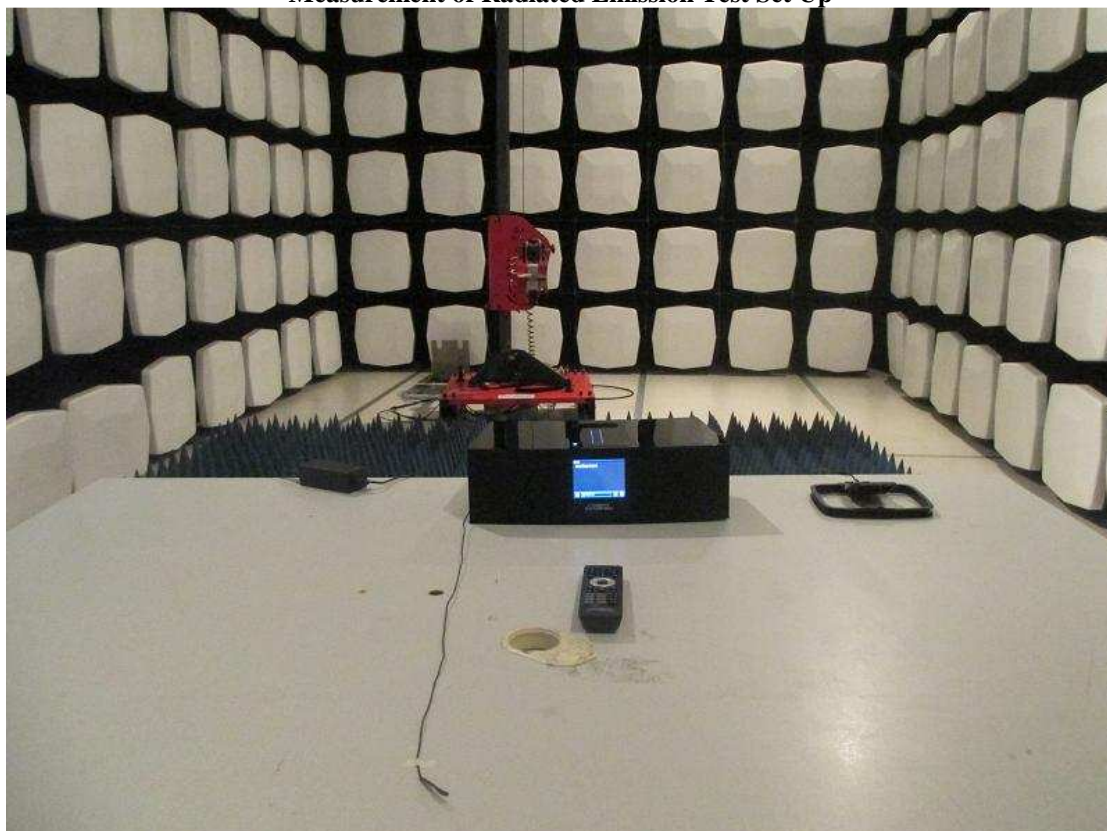
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### **Photographs of EUT**

**Measurement of Radiated Emission Test Set Up**



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### **Photographs of EUT**

#### **Measurement of Conducted Emission Test Set Up**



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