

APPLICATION FOR CERTIFICATION

On Behalf of

Powertech Industrial Co., Ltd.

ZigBee Tracking Energy Monitor

Model No. : R9P0160000

FCC ID : NHS-R9P016

Prepared for : Powertech Industrial Co., Ltd.  
10F, No. 407, Chung Shan Rd., Sec 2  
Chung Ho City, New Taipei City, 235  
Taiwan, R.O.C.

Prepared by : AUDIX Technology Corporation  
EMC Department  
No. 53-11, Dingfu, Linkou Dist., New Taipei  
City 244, Taiwan, R.O.C.

Tel : (02) 2609-9301, 2609-2133  
Fax: (02) 2609-9303

File Number : C1M1208219  
Report Number : EM-F1010709  
Date of Test : Aug. 23 ~ 28, 2012  
Date of Report : Aug. 28, 2012

## TABLE OF CONTENTS

<u>Description</u>	<u>Page</u>
TEST REPORT CERTIFICATION .....	3
<b>1. GENERAL INFORMATION .....</b>	<b>4</b>
1.1. Description of Device (EUT).....	4
1.2. Tested Supporting System Details .....	5
1.3. Description of Test Facility .....	5
1.4. Measurement Uncertainty.....	5
<b>2. POWERLINE CONDUCTED EMISSION MEASUREMENT .....</b>	<b>6</b>
2.1. Test Equipment.....	6
2.2. Block Diagram of Test Setup.....	6
2.3. Powerline Conducted Emission Limit (§15.207).....	6
2.4. Operating Condition of EUT .....	7
2.5. Test Procedure .....	7
2.6. Powerline Conducted Emission Measurement Results.....	7
<b>3. RADIATED EMISSION MEASUREMENT .....</b>	<b>10</b>
3.1. Test Equipment.....	10
3.2. Block Diagram of Test Setup.....	10
3.3. Radiated Emission Limits (§15.209) .....	12
3.4. Fundamental Frequency Limits [§15.249(a)] .....	12
3.5. Operating Condition of EUT .....	12
3.6. Test Procedure .....	13
3.7. Radiated Emission Measurement Test Results.....	13
<b>4. DUTY CYCLE FACTOR .....</b>	<b>28</b>
4.1. Test Equipment.....	28
4.2. Block Diagram of Test Setup.....	28
4.3. Test Results.....	28
<b>5. DEVIATION TO TEST SPECIFICATIONS.....</b>	<b>30</b>
<b>6. PHOTOGRAPHS.....</b>	<b>31</b>
6.1. Photos of Powerline Conducted Emission Measurement .....	31
6.2. Photos of Radiated Emission Measurement at Semi-Anechoic Chamber .....	32

# TEST REPORT CERTIFICATION

Applicant : Powertech Industrial Co., Ltd.  
 Manufacturer : Dongguan Quan Sheng Electric Co., Ltd.  
 EUT Description : ZigBee Tracking Energy Monitor  
 FCC ID : NHS-R9P016  
 (A) Model No. : R9P0160000  
 (B) Serial No. : N/A  
 (C) Power Supply : DC 7.5V  
 (D) Test Voltage : AC 120V/60Hz (Via I.T.E. Power Supply)

Measurement Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C, Oct. 2011

(FCC CFR 47 Part 15C, §15.207, §15.249, §15.209)

AND ANSI C63.4/2003

The device described above was tested by AUDIX Technology Corporation to determine the maximum emission levels emanating from the device. The maximum emission levels were compared to the FCC Part 15 subpart C limits.

The measurement results are contained in this test report and AUDIX Technology Corporation is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT to be technically compliant with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of AUDIX Technology Corporation.

Date of Test : Aug. 23 ~ 28, 2012

Date of Report : Aug. 28, 2012

Producer : Annie Yu  
 (Annie Yu/Assistant Administrator)

Signatory: Leon Liu  
 (Leon Liu/Deputy General Manager)

## 1. GENERAL INFORMATION

### 1.1. Description of Device (EUT)

Description : ZigBee Tracking Energy Monitor

FCC ID : NHS-R9P016

Model Number : R9P0160000

Applicant : Powertech Industrial Co., Ltd.  
10F, No. 407, Chung Shan Rd., Sec 2  
Chung Ho City, New Taipei City, 235  
Taiwan, R.O.C.

Manufacturer : Dongguan Quan Sheng Electric Co., Ltd.  
Chu-Tang 2nd Industrial Park Hou-Chieh  
Town Dongguan Guangdong 523963 China.

Fundamental Range : 2405MHz ~ 2480MHz

Antenna Connector Requirement : Compliance with FCC §15.203

Frequency Channel : 16 channels

Radio Technology : OQPSK Modulation

Date of Receipt of Sample : Aug. 20, 2012

Date of Test : Aug. 23 ~ 28, 2012

## 1.2. Tested Supporting System Details

### 1.2.1. AC SOCKET

Model Number : N/A  
 Manufacturer : N/A  
 Power Cord : Non-Shielded, Detachable, 1.8m

## 1.3. Description of Test Facility

Name of Firm : **AUDIX Technology Corporation**  
**EMC Department**  
 No. 53-11, Dingfu, Linkou Dist., New Taipei City  
 244, Taiwan, R.O.C.

Test Facility & Location : **No. 1 Shielded Room &**  
 (C1/AC) No. 53-11, Dingfu, Linkou Dist., New Taipei City  
 244, Taiwan, R.O.C.

**Semi-Anechoic Chamber**  
 No. 53-11, Dingfu, Linkou Dist., New Taipei City  
 244, Taiwan, R.O.C.  
 Renewal on May 11, 2012  
 Federal Communication Commission  
 Registration Number: 90993

NVLAP Lab. Code : 200077-0

TAF Accreditation No : 1724

## 1.4. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conduction Test	150kHz~30MHz	±1.73dB
Radiation Test (Distance: 3m)	30MHz~300MHz	± 2.91dB
	300MHz~1000MHz	± 2.94dB
	Above 1GHz	± 5.02dB

Remark : Uncertainty =  $ku_c(y)$

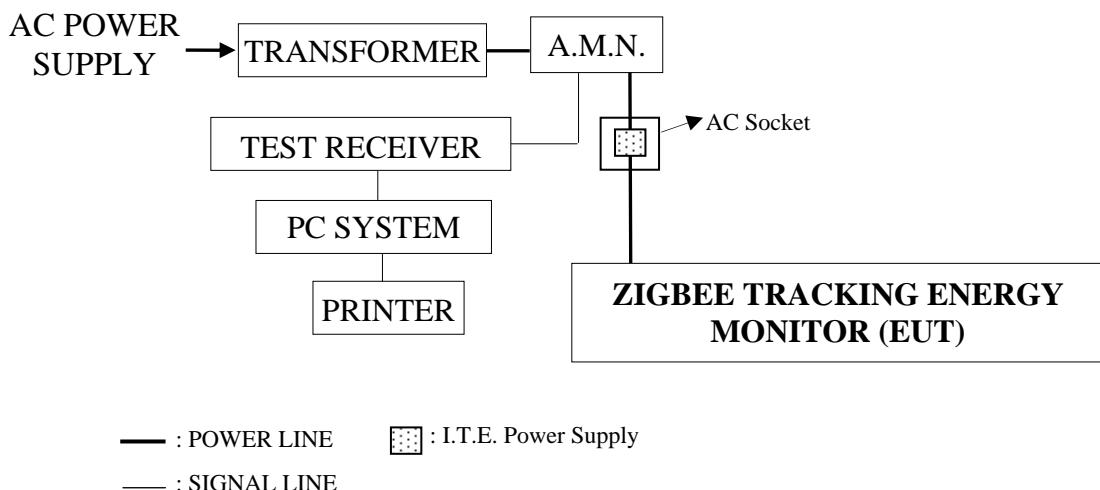
## 2. POWERLINE CONDUCTED EMISSION MEASUREMENT

### 2.1. Test Equipment

The following test equipment was used during the conducted emission measurement :  
(No. 1 Shielded Room)

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Test Receiver	R&S	ESCI	101276	Apr. 30, 12'	Apr. 29, 13'
2.	A.M.N.	R&S	ENV4200	100169	May 04, 12'	May 03, 13'

### 2.2. Block Diagram of Test Setup



### 2.3. Powerline Conducted Emission Limit (§15.207)

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB $\mu$ V	56 ~ 46 dB $\mu$ V
500kHz ~ 5MHz	56 dB $\mu$ V	46 dB $\mu$ V
5MHz ~ 30MHz	60 dB $\mu$ V	50 dB $\mu$ V

Remark1.: If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary.

2.: The lower limit applies at the band edges.

## 2.4. Operating Condition of EUT

- 2.4.1. Setup the **EUT (ZigBee Tracking Energy Monitor)** as shown on 2.2.
- 2.4.2. Turn on the power of all equipment.
- 2.4.3. The **EUT (ZigBee Tracking Energy Monitor)** was on transmitting function at work during all testing.

## 2.5. Test Procedure

The EUT (link to bulbs load) was put on table which was above the ground by 80cm and it's power cord was connected to power mains through an Artificial Mains Network (A.M.N.). This provided a 50 ohm coupling impedance for the measuring equipment. (Please refer to the block diagram of the test setup and photographs.) Both sides of A.C. line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions simulators of the interface cables should be manipulated according to ANSI C63.4-2003 during conducted measurement.

The bandwidth of the R & S Test Receiver ESCI was set at 9kHz.

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

All the final readings from Test Receiver were measured with the Quasi-Peak detector and Average detector. (Remark: If the Average limit is met when using a Quasi-Peak detector, the Average detector is unnecessary)

## 2.6. Powerline Conducted Emission Measurement Results

**PASSED.** All emissions not reported below are too low against the prescribed limits.

The EUT was measured during this section testing and all the test results are listed in next pages.

EUT : ZigBee Tracking Energy Monitor Model No. : R9P0160000

Test Date : Aug. 28, 2012      Temperature : 25      Humidity : 52%

The details are as follows :

## Mode

Mode	Neutral	Line
1.	# 2	# 1

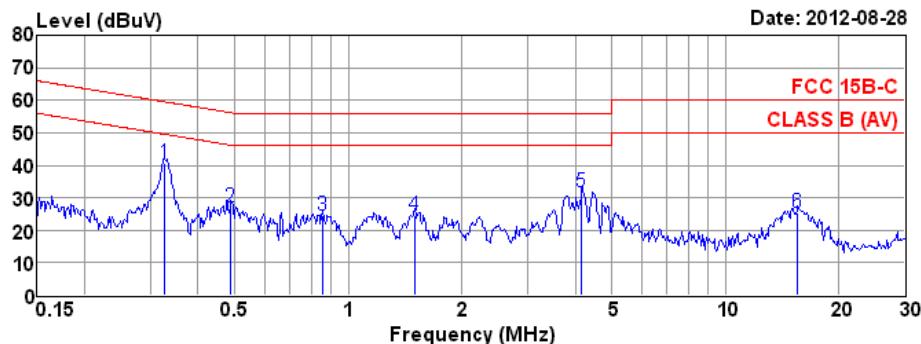


AUDIX TECHNOLOGY Corp. EMC Department  
No.53-11, Dinfu, Linkou Dist., New Taipei  
City 244, Taiwan R.O.C.  
Tel:+886-2-26092133 Fax:+886-2-26099303  
Email:emc@audixtech.com

Data: 2

File: D:\test data\REPORT\1C1M1208XXX\1C1M1208219-C-D.EM6 (2)

Date: 2012-08-28



Site no. : No.1 Shielded Room Data no. : 2  
 Dis. / Ant. : ENV4200 Ant. pol. : NEUTRAL  
 Limit : FCC 15B-C  
 Env. / Ins. : 25°C / 52% ESCI Engineer : Fate  
 EUT : R9P0160000  
 Power Rating : 120Vac/60Hz  
 Test Mode : OPERATING

Freq. (MHz)	AMN. Factor (dB/m)	Cable Loss (dB)	Reading (dB $\mu$ V)	Emission			
				Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1	0.33	10.19	9.96	20.62	40.77	59.57	QP
2	0.49	10.16	9.98	7.14	27.28	56.19	QP
3	0.85	10.15	9.99	4.30	24.44	56.00	QP
4	1.50	10.14	10.00	4.51	24.65	56.00	31.35 QP
5	4.16	10.14	10.02	11.48	31.64	56.00	24.36 QP
6	15.55	9.98	9.91	5.66	25.55	60.00	34.45 QP

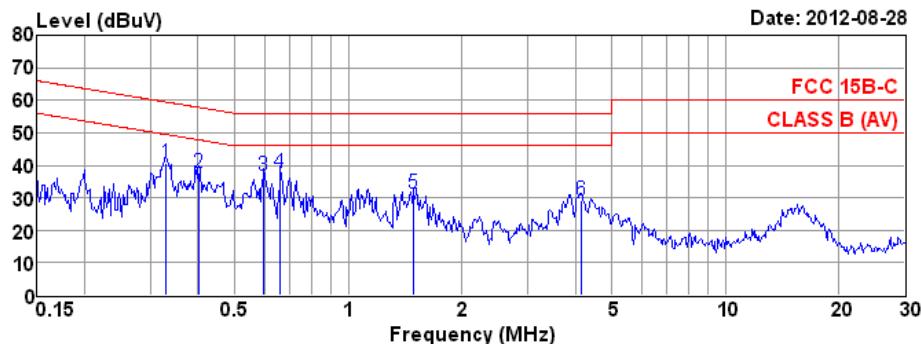
Remarks: 1. Emission Level= AMN Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official  
 limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Department  
No.53-11, Dinfu, Linkou Dist., New Taipei  
City 244, Taiwan R.O.C.  
Tel: +886-2-26092133 Fax: +886-2-26099303  
Email: emc@audixtech.com

Data: 1

File: D:\test data\REPORT\IC1M1208XXX\IC1M1208219-C-D.EM6 (2)



Site no. : No.1 Shielded Room Data no. : 1  
Dis. / Ant. : ENV4200 Ant. pol. : LINE  
Limit : FCC 15B-C  
Env. / Ins. : 25°C / 52% ESCI Engineer : Fate  
EUT : R9P0160000  
Power Rating : 120Vac/60Hz  
Test Mode : OPERATING

Freq. (MHz)	AMN. Factor (dB/m)	Cable Loss (dB)	Emission				
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1	0.33	10.21	9.96	20.53	40.70	59.49	18.79 QP
2	0.40	10.20	9.97	17.54	37.71	57.81	20.10 QP
3	0.60	10.19	9.99	16.83	37.01	56.00	18.99 QP
4	0.66	10.19	9.99	17.51	37.69	56.00	18.31 QP
5	1.49	10.18	10.00	10.96	31.14	56.00	24.86 QP
6	4.16	10.18	10.02	9.23	29.43	56.00	26.57 QP

Remarks: 1. Emission Level = AMN Factor + Cable Loss + Reading.  
2. The emission levels that are 20dB below the official limit are not reported.

### 3. RADIATED EMISSION MEASUREMENT

#### 3.1. Test Equipment

The following test equipment was used during the radiated emission measurement:

##### 3.1.1. For Frequency Range 30MHz~1000MHz (at Semi-Anechoic Chamber)

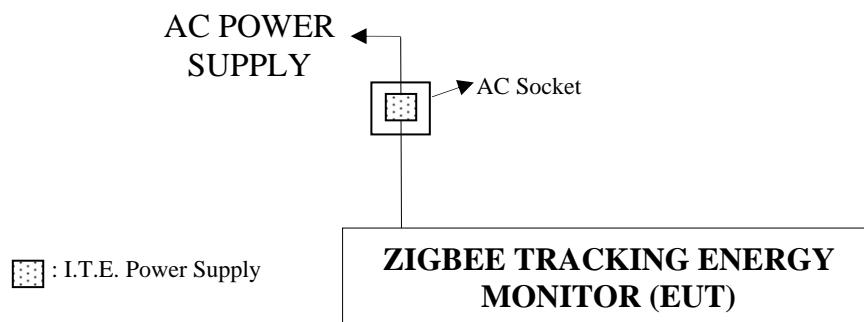
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Test Receiver	R & S	ESCS30	100265	Aug. 24, 12'	Aug. 23, 13'
3.	Pre-Amplifier	HP	8447D	2944A06305	Feb. 13, 12'	Feb. 11, 13'
4.	Biconical Antenna	CHASE	VBA6106A	1264	Mar. 03, 12'	Mar. 02, 13'
5.	Log Periodic Antenna	Schwarzbeck	UHALP91 08-A	0810	Mar. 03, 12'	Mar. 02, 13'

##### 3.1.2. For Frequency Above 1GHz (at Semi-Anechoic Chamber)

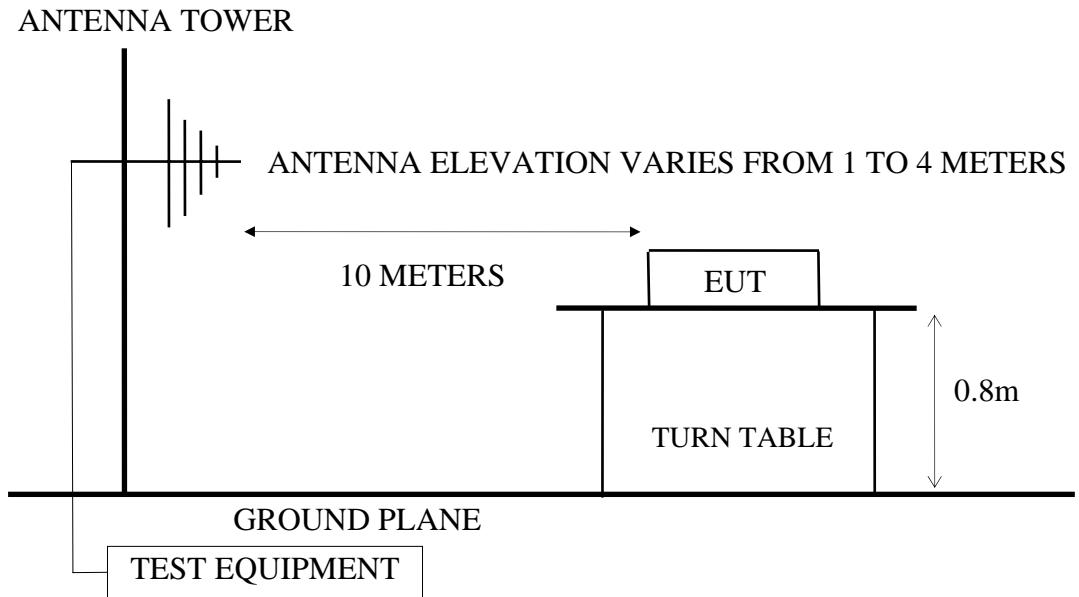
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E4446A	US44300366	Aug. 07, 12'	Aug. 06, 13'
2.	Pre-Amplifier	HP	8449B	3008A00529	Dec. 09, 11'	Dec. 08, 12'
3.	Horn Antenna	ETS-Lindgren	3115	00114104	Mar. 27, 12'	Mar. 26, 13'

#### 3.2. Block Diagram of Test Setup

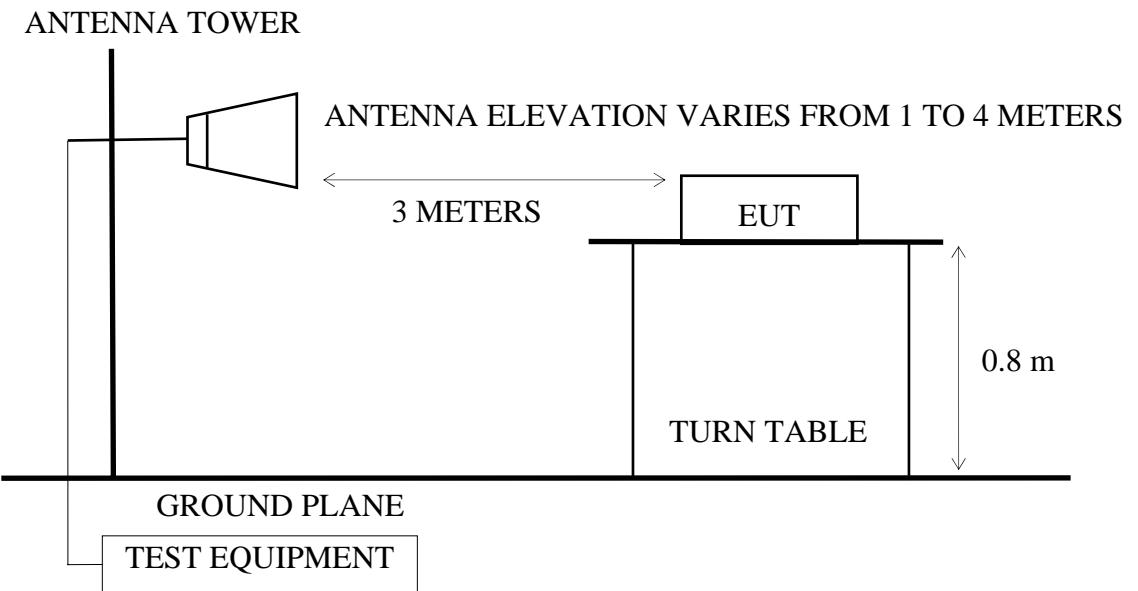
##### 3.2.1. Block Diagram of connection between EUT and simulators



## 3.2.2. Semi-Anechoic Chamber (10m) Setup Diagram for 30-1000MHz



## 3.2.3. Semi-Anechoic Chamber (3m) Setup Diagram for above 1GHz



### 3.3. Radiated Emission Limits (§15.209)

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMITS	
		µV/m	dBµV/m
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0
Above 1000	3	74.0 dBµV/m (Peak) 54.0 dBµV/m (Average)	

Remark : (1) Emission level (dBµV/m) = 20 log Emission level (µV/m)

- (2) The tighter limit applies at the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) The limits in this table are based on CFR 47 Part 15.205(a)(b) and Part 15.209 (a).
- (5) The over 1GHz limit, FCC limit is used based on CFR 47 Part 15.35 (b) and Part 15.205(b) & Part 15.209(e) and Part 15.207(c).

### 3.4. Fundamental Frequency Limits [§15.249(a)]

FUNDAMENTAL FREQUENCY MHz	LIMITS
2400-2485	114 dBµV/m (Peak)
	94 dBµV/m (Average)

### 3.5. Operating Condition of EUT

- 3.5.1. Setup the **EUT (ZigBee Tracking Energy Monitor)** as shown on 3.2.
- 3.5.2. Turn on the power of all equipment.
- 3.5.3. The EUT was set to continuously transmit signals at 2405Hz, 2450MHz and 2480MHz during testing.

### 3.6. Test Procedure

The EUT and its simulators were placed on a turn table which was 0.8 meter above the ground. The turn table rotated 360 degrees to determine the position of the maximum emission level. EUT was set to 3 meters away from the receiving antenna which was mounted on an antenna tower. The antenna moved up and down between 1 to 4 meters to find out the maximum emission level. Broadband antennas such as calibrated biconical and log-periodical antenna or horn antenna were used as a receiving antenna. Both horizontal and vertical polarization of the antenna were set on measurement. In order to find the maximum emission, all of the interface cables were manipulated according to FCC ANSI C63.4-2003 regulation.

The bandwidth of the R & S Test Receiver ESCS 30 was set at 120kHz.  
(For 30MHz to 1000MHz)

The resolution bandwidth and video bandwidth of test spectrum analyzer is 1MHz for peak detection (PK) at frequency above 1GHz.

The frequency range from 30MHz to 25GHz (Up to 10<sup>th</sup> harmonics from fundamental frequency) was checked.

Above 1GHz was measured with peak and average detector. For frequency from 2.68GHz to 25GHz, we checked it in 1 meter distance and with a shorter cable 2 meter instead of original's. There is no signal exist

### 3.7. Radiated Emission Measurement Test Results

**PASSED.** All emissions not reported below are too low against the prescribed limits.

EUT : ZigBee Tracking Energy Monitor                    Model No. : R9P0160000

Test Date : Aug. 23, 2012                    Temperature : 26                    Humidity : 61%

#### For Frequency Range 30MHz~1000MHz:

The EUT was measured during this section testing and all the test results are listed in section 3.7.1.

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	11	2405MHz	Transmit	# 2	# 1
2.	20	2450MHz		# 1	# 2
3.	26	2480MHz		# 2	# 1

\* Above all final readings were measured with Quasi-Peak detector.

**For Frequency above 1GHz:**

Mode	Chnnel	Frequency	Test Mode	Test Frequency Range
1.	11	2405MHz	Transmit	1000-2680MHz
2.				2680-4000MHz
3.				4000-5500MHz
4.				5500-18000MHz
5.				18000-25000MHz
6.	20	2450MHz	Transmit	1000-2680MHz
7.				2680-4000MHz
8.				4000-5500MHz
9.				5500-18000MHz
10.				18000-25000MHz
11.	26	2480MHz	Transmit	1000-2680MHz
12.				2680-4000MHz
13.				4000-5500MHz
14.				5500-18000MHz
15.				18000-25000MHz

Note: 1. Above all final readings were measured with Peak and Average detector.  
 2. The emissions (up to 25GHz) not reported are too low to be measured.

**For Restricted Bands:**

The EUT was tested in restricted bands and all the test results are listed in section 3.7.2. (The restricted bands defined in part 15.205(a))

Mode	Channel	Frequency	Test Mode	Reference Test Data	
				Horizontal	Vertical
1.	11	2405MHz	Transmit	# 8	# 7
2.	26	2480MHz		# 10	# 9

**For Fundamental Frequency:**

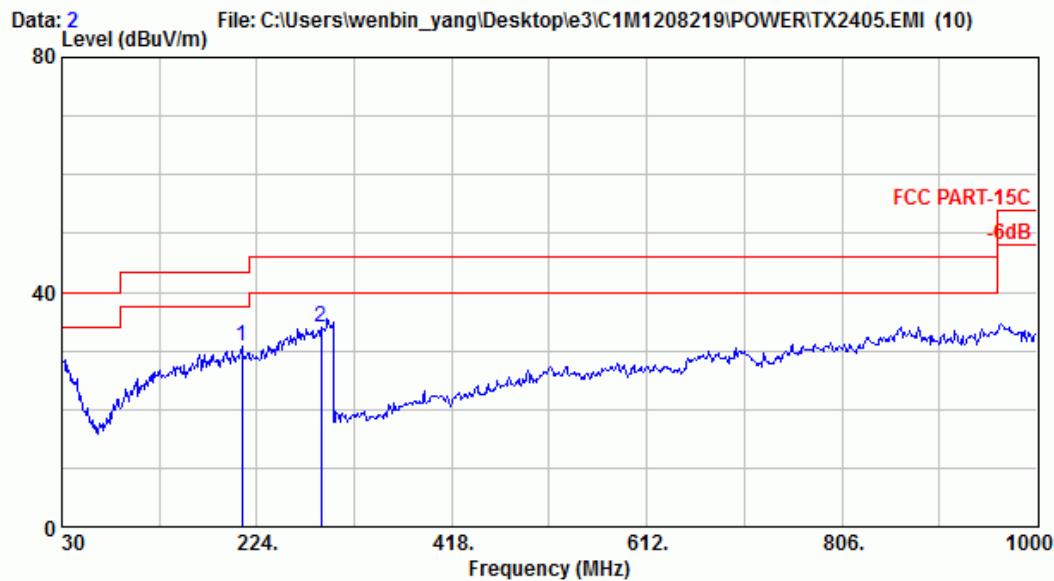
The EUT was measured during this section testing and all the test results are listed in section 3.7.3.

Mode	Channel	Frequency	Test Mode	Reference Test Data
1.	11	2405MHz	Transmit	# 2
2.	20	2450MHz		# 4
3.	26	2480MHz		# 6

## 3.7.1. Frequency Range 30-1000MHz



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:tttemc@tttemc.com.tw



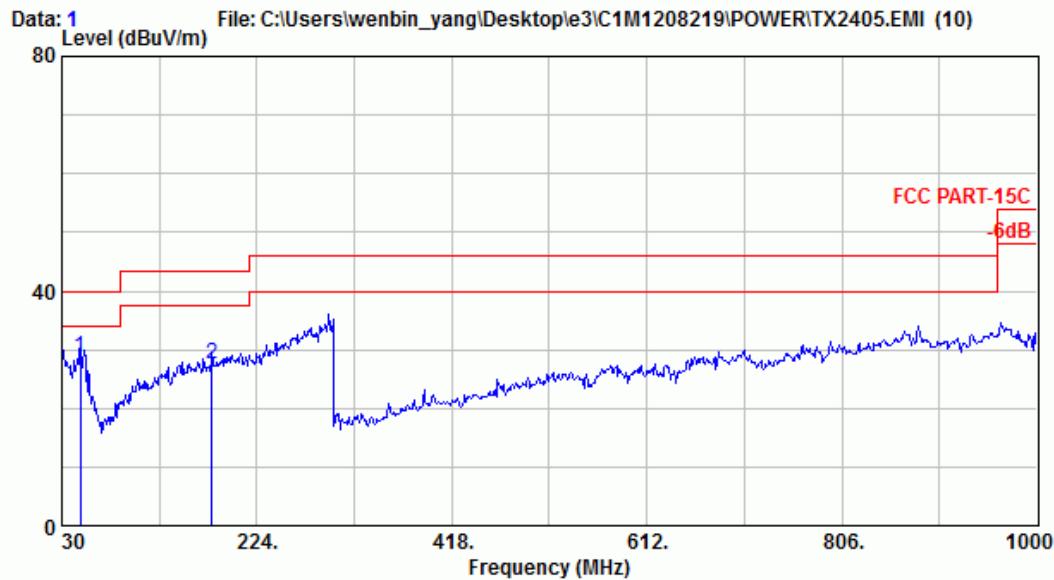
Site no. : A/C Chamber Data no. : 2  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2405

	Ant.	Cable	Emission				
Freq.	Factor	Loss	Reading	Level	Limits	Margin	Remark
(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
1	209.450	21.81	3.16	5.85	30.81	43.50	12.69 QP
2	288.020	25.85	3.80	4.35	34.00	46.00	12.00 QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:tttemc@tttemc.com.tw



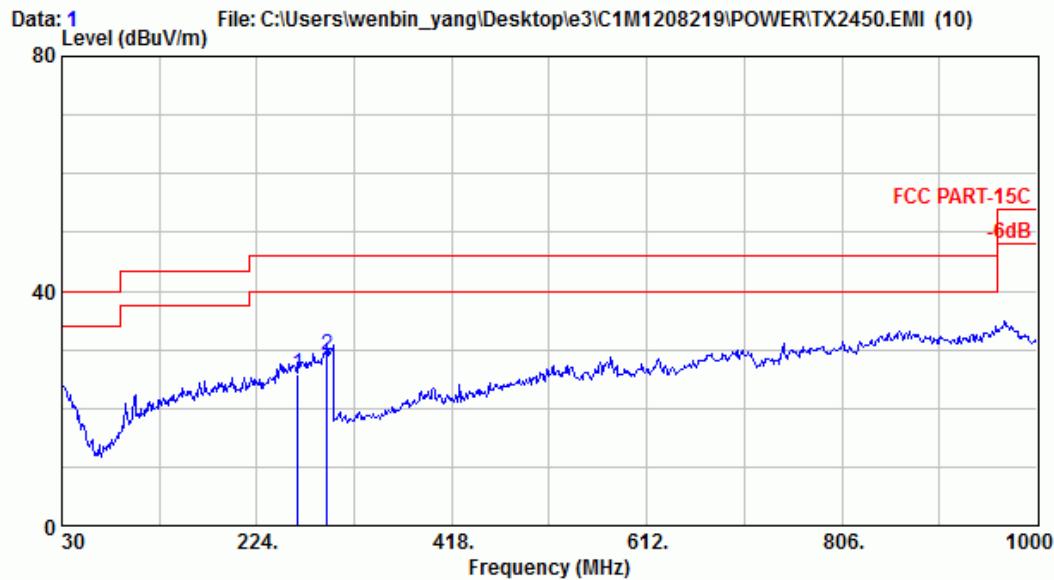
Site no. : A/C Chamber Data no. : 1  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2405

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Emission				
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 48.430	17.32	1.40	9.87	28.59	40.00	11.41	QP
2 179.380	21.30	2.90	3.38	27.59	43.50	15.91	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:ttmc@ttmc.com.tw



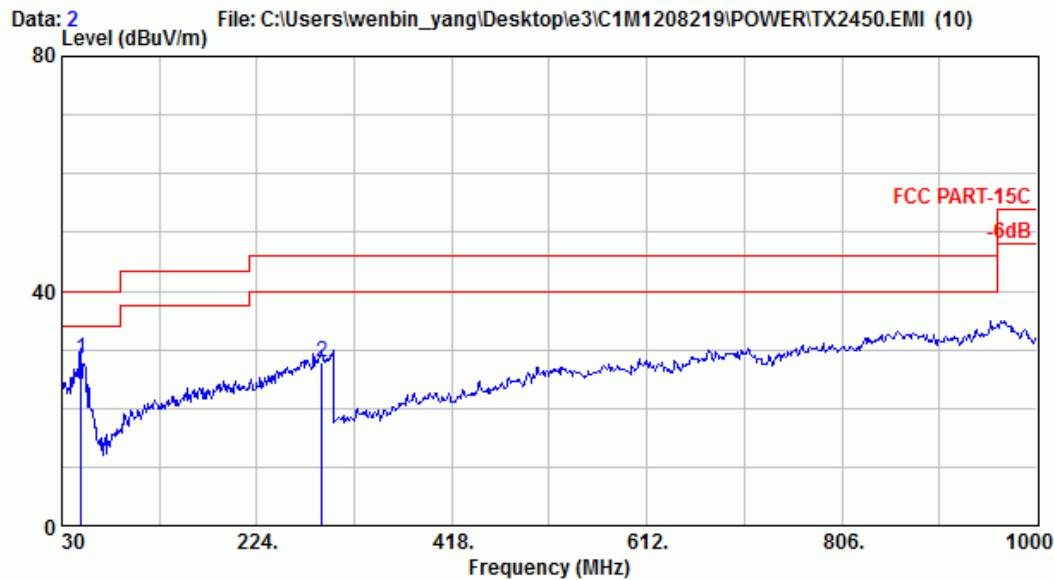
Site no. : A/C Chamber Data no. : 1  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2450

Freq. (MHz)	Ant. Factor	Cable Loss	Emission				Margin (dB)	Remark
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)			
1 264.740	24.62	3.70	-2.60	25.72	46.00	20.28	QP	
2 293.840	26.33	3.96	-1.23	29.06	46.00	16.94	QP	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:ttmc@ttmc.com.tw



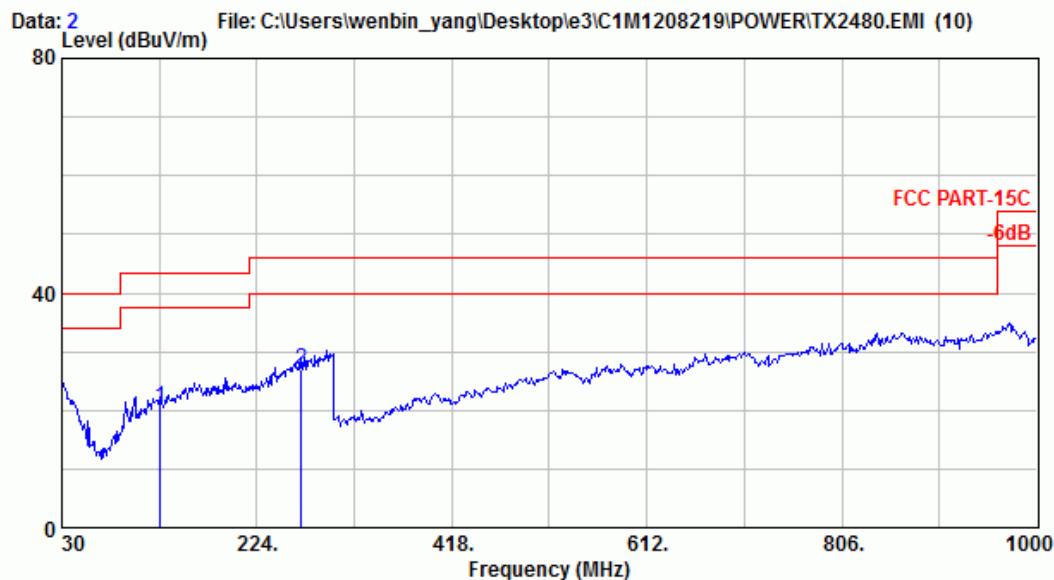
Site no. : A/C Chamber Data no. : 2  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2450

Freq. (MHz)	Ant. Factor	Cable Loss	Emission				Margin (dB)	Remark
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)			
1 49.400	16.83	1.50	10.00	28.33	40.00	11.67	QP	
2 288.990	25.97	3.80	-1.98	27.79	46.00	18.21	QP	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:ttmc@ttmc.com.tw



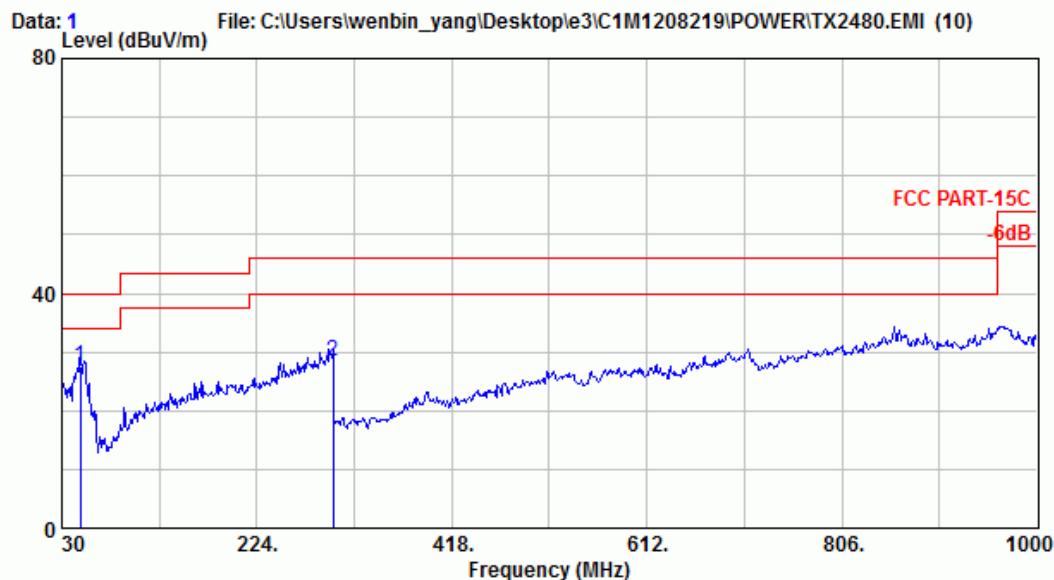
Site no. : A/C Chamber Data no. : 2  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2480

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Emission				
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 127.970	19.62	2.40	-1.64	20.38	43.50	23.12	QP
2 268.620	24.86	3.70	-1.46	27.10	46.00	18.90	QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:tttemc@tttemc.com.tw



Site no. : A/C Chamber Data no. : 1  
 Dis. / Ant. : 3m VBA6106A/UHALP9108A Ant. pol. : VERTICAL  
 Limit : FCC PART-15C  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2480

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Emission			
			Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
1 48.430	17.32	1.40	8.92	27.64	40.00	12.36 QP
2 299.660	26.77	3.90	-2.13	28.54	46.00	17.46 QP

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

## 3.7.2. Restricted Bands Measurement Results

Date of Test : Aug. 23, 2012 Temperature : 26

EUT : ZigBee Tracking Energy Monitor Humidity : 61%

Test Mode : Transmit, Channel: 11, Frequency: 2405MHz

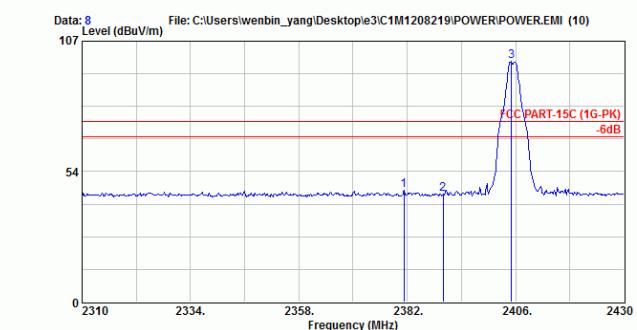
	Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Horizontal	Emission Level Horizontal	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Peak *	2381.280	28.43	6.33	10.94	45.71	74.00	28.29

	Emission Frequency	Peak Value	Duty Cycle Factor	Average Value	Limit	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Average *	2381.28	45.71	-27.662	18.05	54.00	35.95

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).  
 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.  
 4. Duty Cycle Correction Factor =  $20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 5. The pre-amplifier factor has been subtracted by test program actively.

AUDIX®

AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel: +886-2-26092133 Fax: +886-2-26099303  
 Email:ttmc@ttmc.com.tw



Site no. : A/C Chamber Data no. : 8  
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C (1G-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2405MHz

Freq.	Ant. Factor	Cable Loss	Emission Reading	Emission Level	Limits	Margin	Remark
(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
1 2381.280	28.43	6.33	10.94	45.71	74.00	28.29	Peak
2 2390.000	28.47	6.34	9.51	44.33	74.00	29.67	Peak
3 2405.040	28.51	6.36	63.78	98.65	74.00	-24.65	Peak

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

Date of Test : Aug. 23, 2012 Temperature : 26  
 EUT : ZigBee Tracking Energy Monitor Humidity : 61%  
 Test Mode : Transmit, Channel: 11, Frequency: 2405MHz

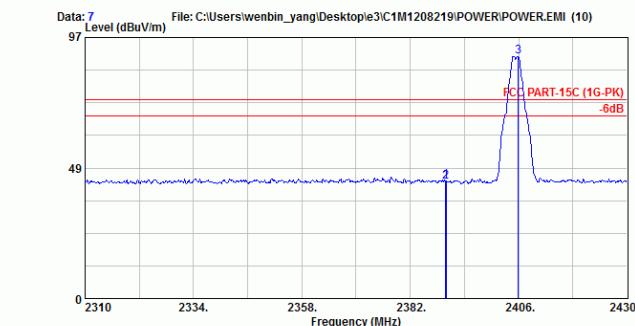
	Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Vertical	Emission Level Horizontal	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Peak *	2389.800	28.47	6.34	8.99	43.80	74.00	30.20

	Emission Frequency	Peak Value	Duty Cycle Factor	Average Value	Limit	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Average *	2389.80	43.80	-27.662	16.14	54.00	37.86

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Low frequency section (spurious in the restricted band 2310-2430MHz).  
 3. '\*' The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.  
 4. Duty Cycle Correction Factor =  $20\log(\text{cumulative on}/T) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 5. The pre-amplifier factor has been subtracted by test program actively.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tim-fu Tzun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel: +886-2-26092133 Fax: +886-2-26099303  
 Email: ttemc@ttemc.com.tw



Site no. : A/C Chamber Data no. : 7  
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL  
 Limit : FCC PART-15C (1G-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2405MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Emission Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 2389.800	28.47	6.34	8.99	43.80	74.00	30.20	Peak
2 2390.000	28.47	6.34	8.64	43.46	74.00	30.54	Peak
3 2405.880	28.51	6.36	55.18	90.05	74.00	-16.05	Peak X

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

Date of Test : Aug. 23, 2012 Temperature : 26  
 EUT : ZigBee Tracking Energy Monitor Humidity : 61%  
 Test Mode : Transmit, Channel: 26, Frequency: 2480MHz

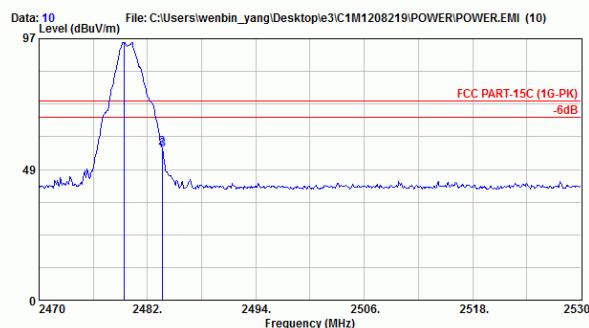
	Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Horizontal	Emission Level Horizontal	Limits	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Peak *	2483.600	28.66	6.45	21.26	56.38	74.00	17.62

	Emission Frequency	Peak Value	Duty Cycle Factor	Average Value	Limit	Margin
	(MHz)	(dB/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Average *	2483.60	56.38	-27.662	28.72	54.00	25.28

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Low frequency section (spurious in the restricted band 2470-2530MHz).  
 3. “\*” The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.  
 4. Duty Cycle Correction Factor =  $20\log(\text{cumulative on/T}) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 5. The pre-amplifier factor has been subtracted by test program actively.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tan-kuo Toun, Lin-kuo Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel: +86-2-26092133 Fax: +86-2-26099303  
 Email:itemc@itemc.com.tw



Site no. : A/C Chamber Data no. : 10  
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C (1G-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2480MHz

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 2479.420	28.66	6.44	60.60	95.70	74.00	-21.70	Peak
2 2483.600	28.66	6.45	21.26	56.38	74.00	17.62	Peak
3 2483.680	28.66	6.45	20.69	55.81	74.00	18.19	Peak

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

Date of Test : Aug. 23, 2012 Temperature : 26  
 EUT : ZigBee Tracking Energy Monitor Humidity : 61%  
 Test Mode : Transmit, Channel: 26, Frequency: 2480MHz

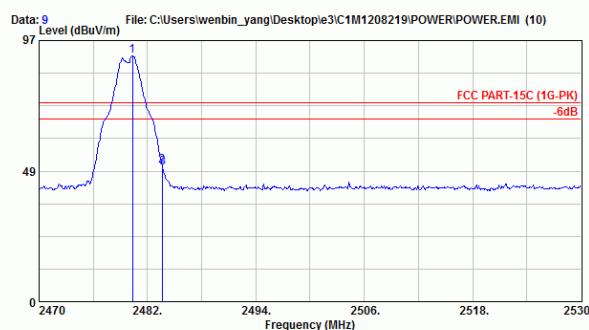
Emission Frequency	Antenna Factor	Cable Loss	Meter Reading Vertical	Emission Level Horizontal	Limits	Margin
(MHz)	(dB/m)	(dB)	(dB $\mu$ V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Peak *	2483.600	28.66	6.45	15.33	50.45	74.00

Emission Frequency	Peak Value	Duty Cycle Factor	Average Value	Limit	Margin
(MHz)	(dB/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
Average *	2483.60	50.45	-27.662	22.79	54.00

Remark : 1. Emission Level = Antenna Factor + Cable Loss + Meter Reading.  
 2. Low frequency section (spurious in the restricted band 2470-2530MHz).  
 3. \*\* The field strength of emission appearing within Part 15.205(a) shall not exceed the limits shown in section 15.209.  
 4. Duty Cycle Correction Factor =  $20\log(\text{cumulative on/T}) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 5. The pre-amplifier factor has been subtracted by test program actively.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-tu 13nd, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:emc@ttmc.com.tw



Site no. : A/C Chamber Data no. : 9  
 Dis. / Ant. : 3m 3115(4927) Ant. pol. : VERTICAL  
 Limit : FCC PART-15C (1g-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2480MHz

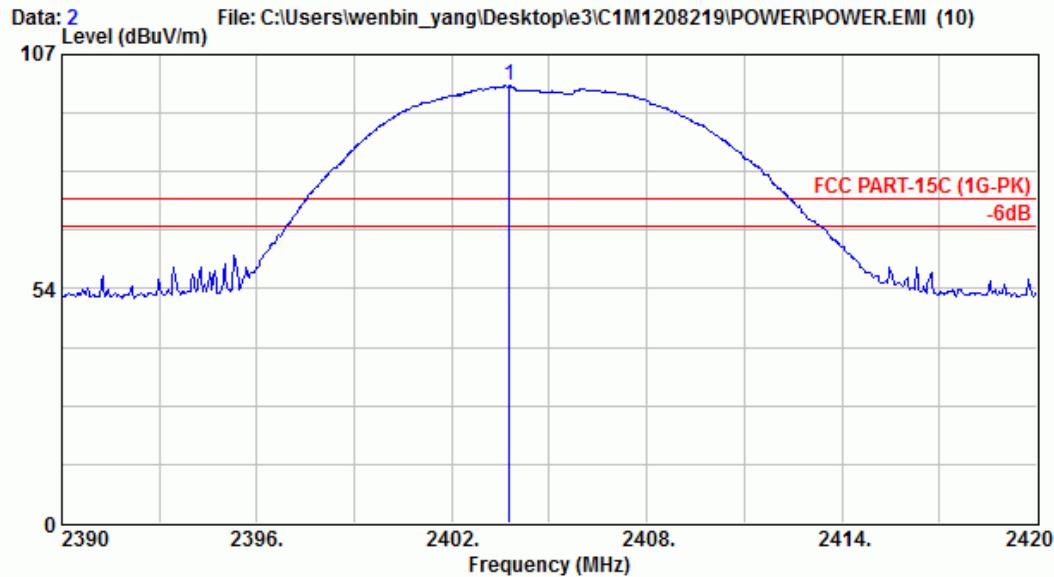
Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Meter Reading (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 2480.320	28.66	6.44	56.14	91.25	74.00	-17.25	Peak
2 2483.600	28.66	6.45	15.33	50.45	74.00	23.55	Peak
3 2483.680	28.66	6.45	14.50	49.61	74.00	24.39	Peak

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

## 3.7.3. Fundamental Frequency



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:tttemc@tttemc.com.tw



Site no. : A/C Chamber Data no. : 2  
 Dis. / Ant. : 3m 3115 (4927) Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C (1G-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2405MHz (power)

Freq. (MHz)	Ant. Factor (dB/m)	Cable Loss (dB)	Reading (dB $\mu$ V)	Emission		
				Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)
1 2403.770	28.51	6.36	65.02	99.89	114.00	-14.11 Peak

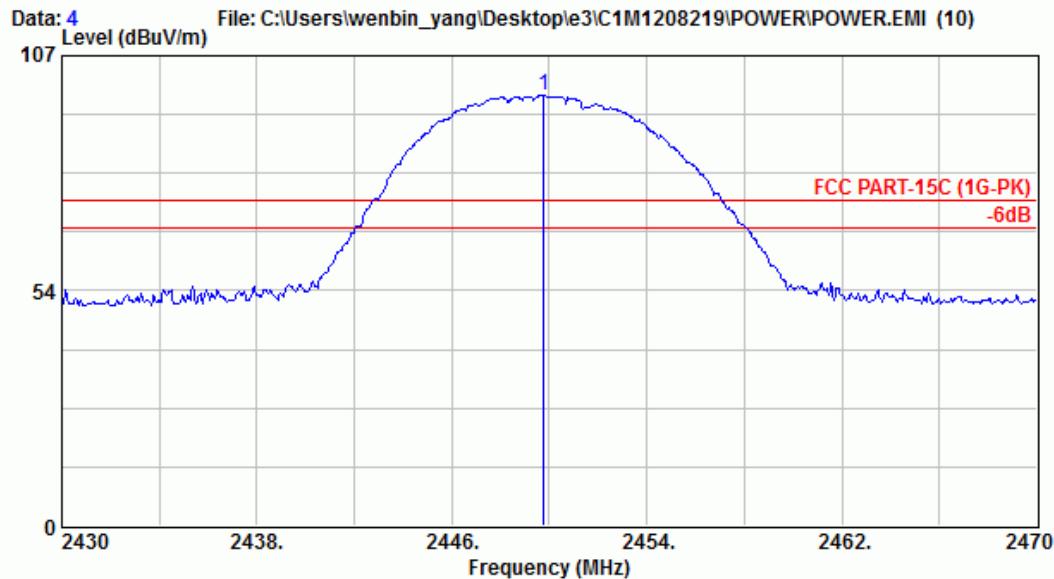
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor (dB)	Average Value Vertical (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2405.00	99.89	-27.662	72.23	94.00	21.77

Remarks: 1. Duty Cycle Correction Factor =  $20\log(\text{cumulative on}/T) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 "T" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 2. Average value=Peak value+ Duty Cycle Factor  
 3. All final readings of measurement were with Average values.  
 4. Vertical is the worst polarization, thus we don't list horizontal result.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
County, Taiwan R.O.C. Post Code:24443  
Tel:+886-2-26092133 Fax:+886-2-26099303  
Email:ttcmc@ttcmc.com.tw



Site no. : A/C Chamber Data no. : 4  
Dis. / Ant. : 3m 3115(4927) Ant. pol. : HORIZONTAL  
Limit : FCC PART-15C (1G-PK)  
Env. / Ins. : E4446A 26°C/61% Vic Fong  
EUT : R9P0160000  
Power Rating : AC120/60Hz  
Test Mode : TX2450MHz (power)

Freq. (MHz)	Ant. Cable			Emission			
	Factor	Loss (dB/m)	Reading (dB $\mu$ V)	Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Remark
1 2449.760	28.59	6.41	62.96	97.96	114.00	-16.04	Peak

Remarks: 1. Emission Level = Antenna Factor + Cable Loss + Reading.  
2. The emission levels that are 20dB below the official limit are not reported.

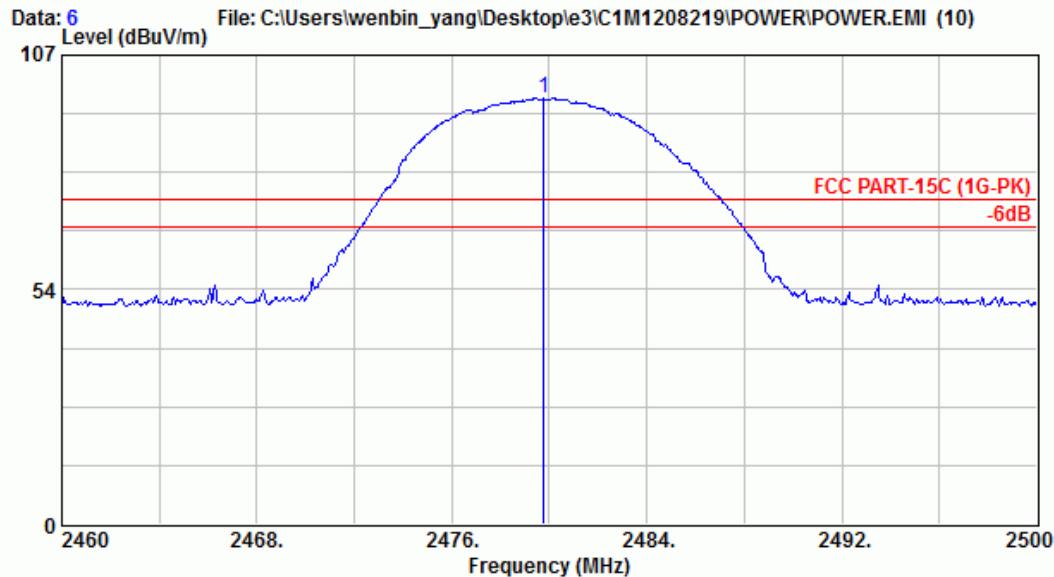
Emission Frequency	Peak Value	Duty Cycle	Average Value	Limit	Margin
(MHz)	(dB/m)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
2450.00	97.96	-27.662	70.30	94.00	23.70

Remarks: 1. Duty Cycle Correction Factor =  $20\log(\text{cumulative on}/T) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
“T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms

2. Average value = Peak value + Duty Cycle Factor
3. All final readings of measurement were with Average values.
4. Horizontal is the worst polarization, thus we don't list vertical result.



AUDIX TECHNOLOGY Corp. EMC Laboratory  
 No.53-11, Tin-fu Tsun, Lin-kou Hsiang, Taipei  
 County, Taiwan R.O.C. Post Code:24443  
 Tel:+886-2-26092133 Fax:+886-2-26099303  
 Email:tttemc@tttemc.com.tw



Site no. : A/C Chamber Data no. : 6  
 Dis. / Ant. : 3m 3115 (4927) Ant. pol. : HORIZONTAL  
 Limit : FCC PART-15C (1G-PK)  
 Env. / Ins. : E4446A 26°C/61% Vic Fong  
 EUT : R9P0160000  
 Power Rating : AC120/60Hz  
 Test Mode : TX2480MHz (power)

Freq. (MHz)	Ant. Factor	Cable Loss	Reading (dB $\mu$ V)	Emission			Margin (dB)	Remark
				Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)		
1 2479.760	28.66	6.44	62.01	97.11	114.00	-16.89	Peak	

Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.  
 2. The emission levels that are 20dB below the official limit are not reported.

Emission Frequency (MHz)	Peak Value (dB/m)	Duty Cycle Factor	Average Value Vertical (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
2480.00	97.11	-27.662	69.45	94.00	24.55

Remarks: 1. Duty Cycle Correction Factor =  $20\log(\text{cumulative on}/T) = 20\log(0.865\text{ms}/20.90\text{ms}) = -27.662$   
 “T” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms  
 2. Average value=Peak value+ Duty Cycle Factor  
 3. All final readings of measurement were with Average values.  
 4. Horizontal is the worst polarization, thus we don’t list vertical result.

## 4. DUTY CYCLE FACTOR

### 4.1. Test Equipment

The following test equipment was used during the duty cycle factor measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	N9030A-544	US51350140	Oct. 14, 11'	Oct. 13, 12'

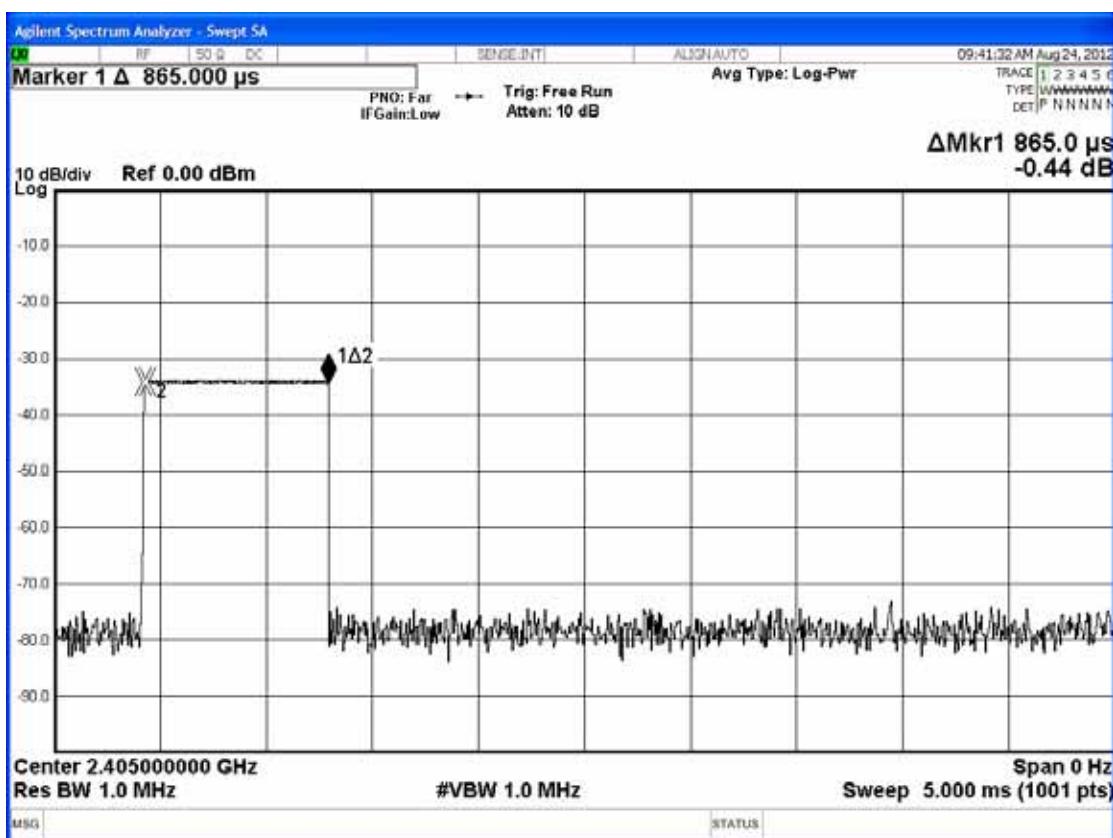
### 4.2. Block Diagram of Test Setup

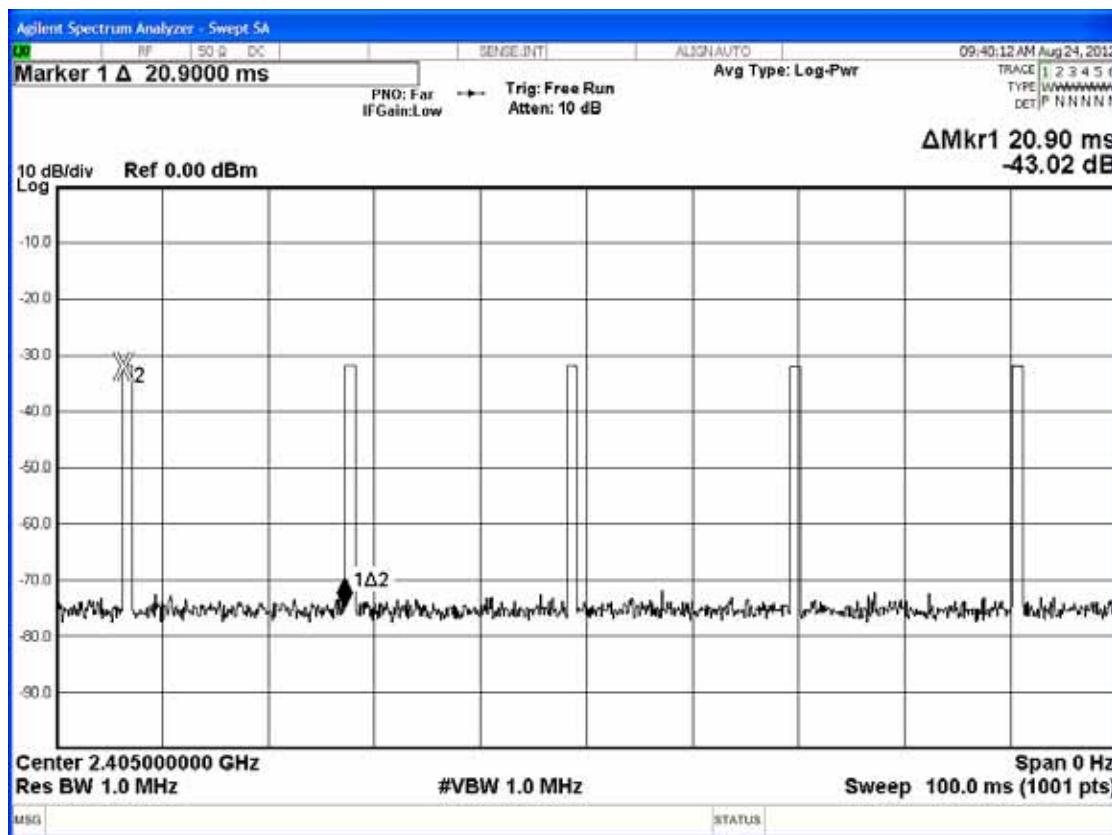


### 4.3. Test Results

**PASSED.** All the test results are attached in next pages.

Test Date: Aug. 24, 2012 Temperature : 24 Humidity : 60%





$$T_{on} = 0.865\text{ms}$$

$$T_{on} + T_{off} = 20.90\text{ms}$$

## 5. DEVIATION TO TEST SPECIFICATIONS

【NONE】

## 6. PHOTOGRAPHS

### 6.1. Photos of Powerline Conducted Emission Measurement



FRONT VIEW OF CONDUCTED MEASUREMENT



BACK VIEW OF CONDUCTED MEASUREMENT

## 6.2. Photos of Radiated Emission Measurement at Semi-Anechoic Chamber

### 6.2.1. For Frequency Range 30MHz~1GHz



### 6.2.2. For Frequency Above 1GHz

