

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

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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/Assistant Administrator)

Signatory: 
 (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 (C1/AC) : **No. 1 Shielded Room &**
 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 = $ku_c(y)$

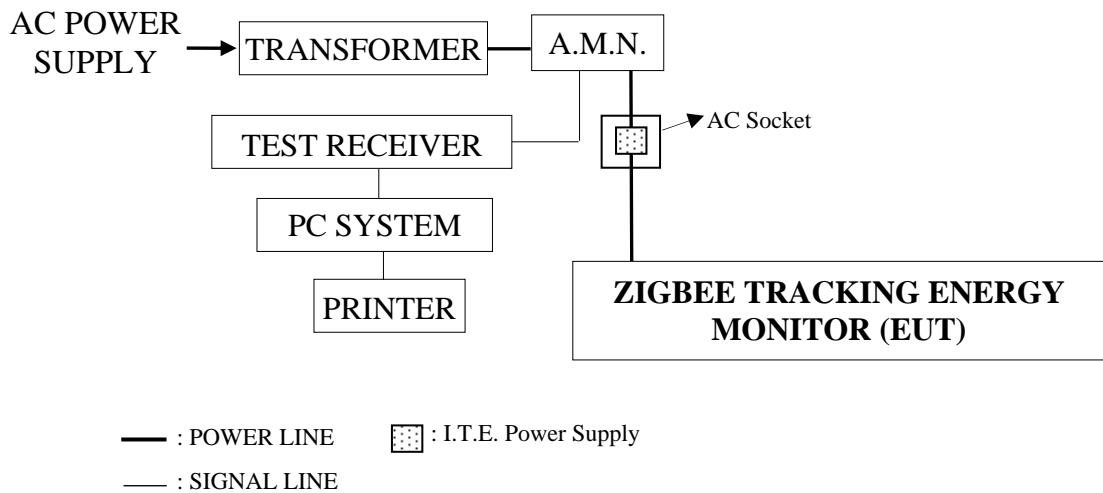
2. POWERLINE CONDUCTED EMISSION MEASUREMENT

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 μ V | 56 ~ 46 dB μ V |
| 500kHz ~ 5MHz | 56 dB μ V | 46 dB μ V |
| 5MHz ~ 30MHz | 60 dB μ V | 50 dB μ 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%

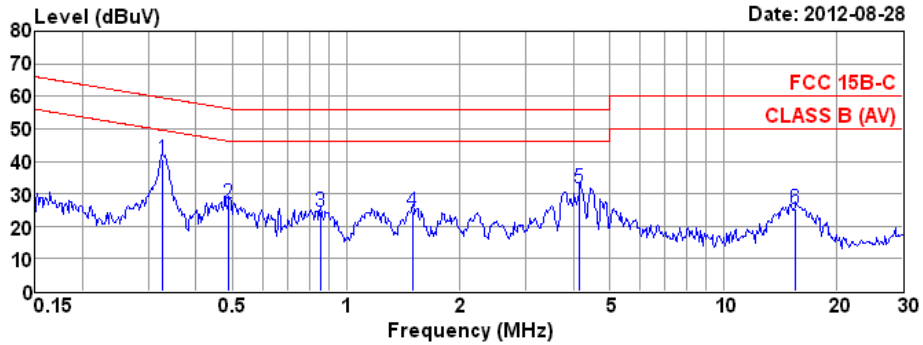
The details are as follows :

| Mode | Reference Test Data | |
|------|---------------------|------|
| | Neutral | Line |
| 1. | # 2 | # 1 |



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



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

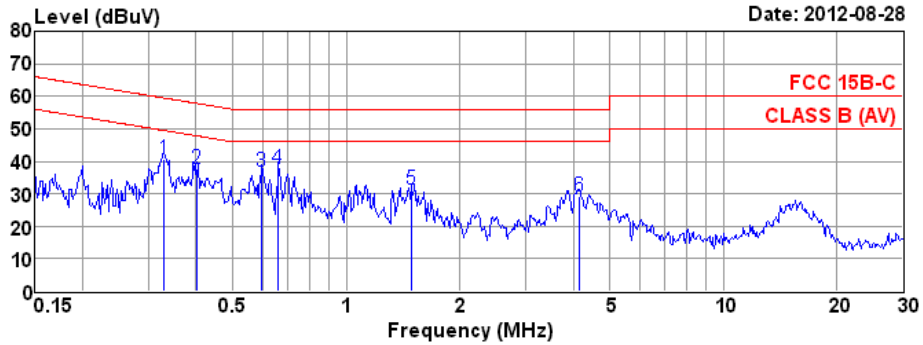
| | AMN. | Cable | Emission | | Limits | Margin | Remark | |
|-------------|---------------|-----------|----------------|----------------|----------|--------|--------|----|
| Freq. (MHz) | Factor (dB/m) | Loss (dB) | Reading (dBμV) | Level (dBμV/m) | (dBμV/m) | (dB) | | |
| 1 | 0.33 | 10.19 | 9.96 | 20.62 | 40.77 | 59.57 | 18.80 | QP |
| 2 | 0.49 | 10.16 | 9.98 | 7.14 | 27.28 | 56.19 | 28.91 | QP |
| 3 | 0.85 | 10.15 | 9.99 | 4.30 | 24.44 | 56.00 | 31.56 | 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.



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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

| | AMN. | Cable | Emission | | Limits | Margin | Remark | |
|-------------|---------------|-----------|----------------|----------------|----------|--------|--------|----|
| Freq. (MHz) | Factor (dB/m) | Loss (dB) | Reading (dBμV) | Level (dBμV/m) | (dBμV/m) | (dB) | | |
| 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)

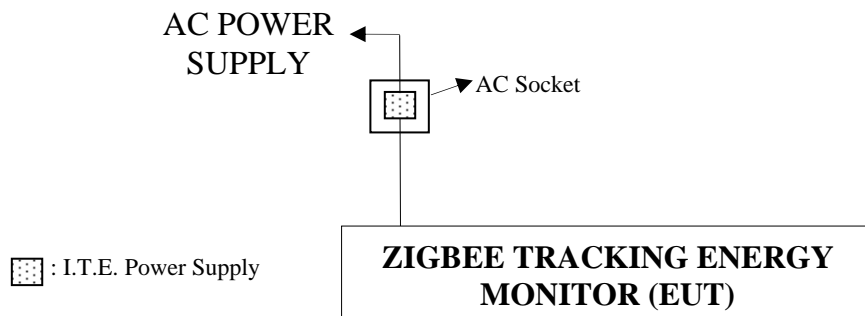
| Item | Type | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|------|----------------------|--------------|-----------------|------------|--------------|--------------|
| 1. | Spectrum Analyzer | Agilent | E4446A | US44300366 | Aug. 07, 12' | Aug. 06, 13' |
| 2. | Test Receiver | R & 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)

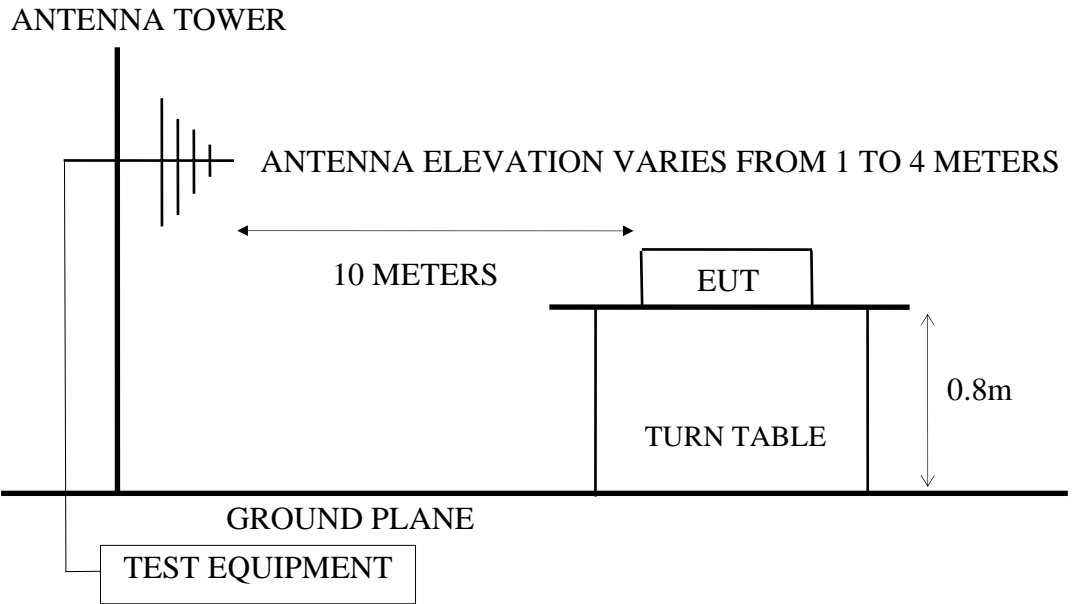
| Item | Type | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|------|-------------------|--------------|-----------|------------|--------------|--------------|
| 1. | Spectrum Analyzer | Agilent | E4446A | US44300366 | Aug. 07, 12' | Aug. 06, 13' |
| 2. | Pre-Amplifier | HP | 8449B | 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

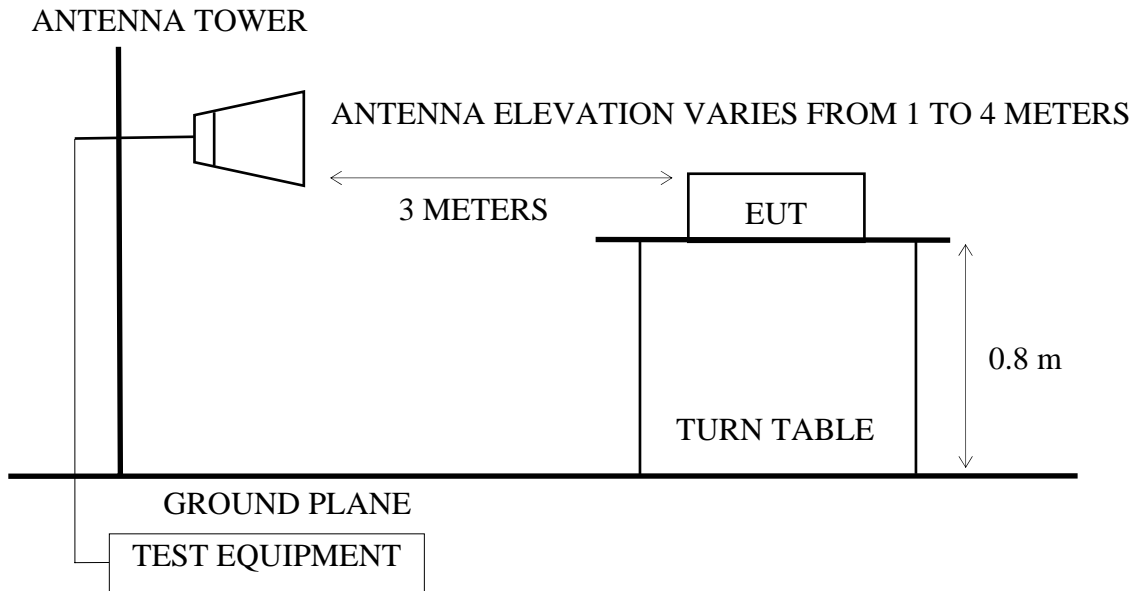
3.2.1. Block Diagram of connection between EUT and simulators



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 | |
|------------------|--------------------|---------------------------------------------------------------------------------|--------------------------|
| | | $\mu\text{V/m}$ | $\text{dB}\mu\text{V/m}$ |
| 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 $\text{dB}\mu\text{V/m}$ (Peak) 54.0 $\text{dB}\mu\text{V/m}$ (Average) | |

Remark : (1) Emission level ($\text{dB}\mu\text{V/m}$) = $20 \log$ Emission level ($\mu\text{V/m}$)

(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 $\text{dB}\mu\text{V/m}$ (Peak) |
| | 94 $\text{dB}\mu\text{V/m}$ (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 10th 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:

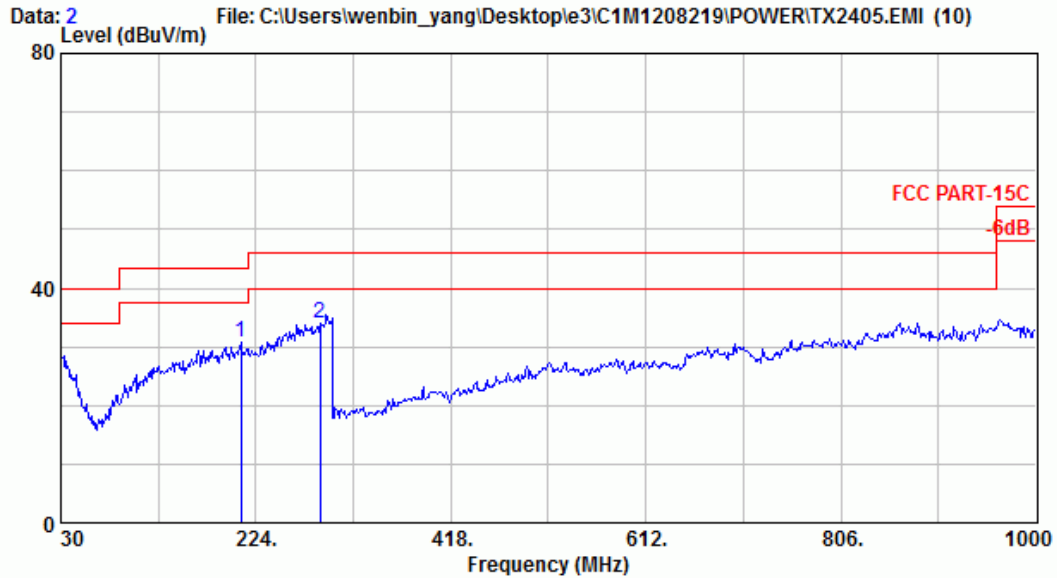
The EUT was measured during this section testing and all the test results are listed in section 3.7.3.

| 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



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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

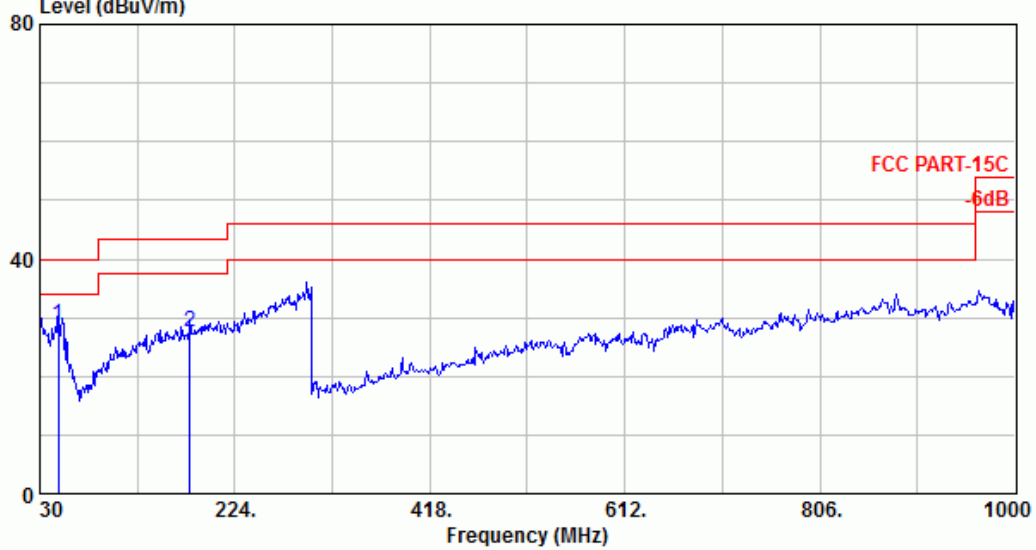
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|--------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 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.



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Data: 1 File: C:\Users\wenbin_yang\Desktop\3\C1M1208219\POWER\TX2405.EMI (10)



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

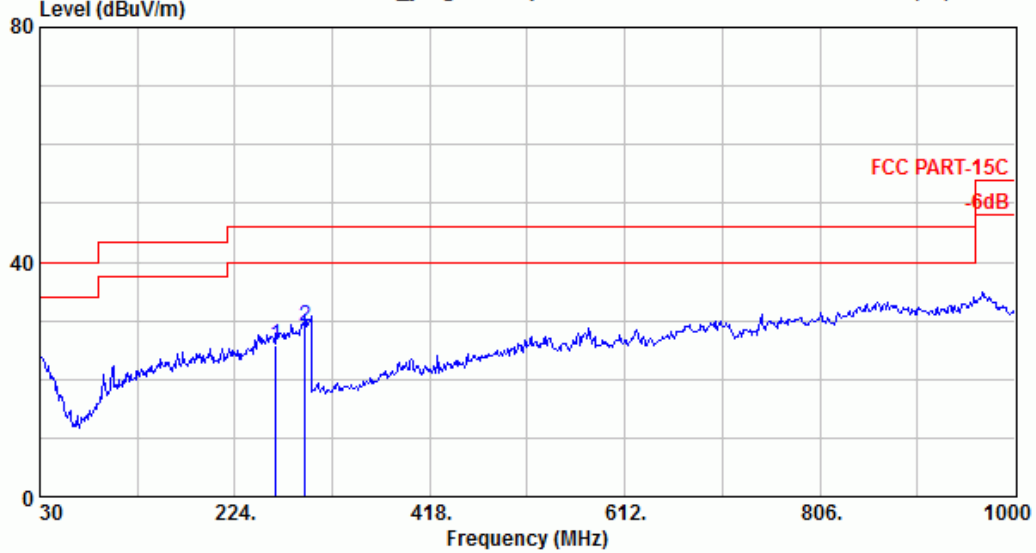
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|-----------------------|--------------------|-------------------|----------------------------|--------------------|----------------|--------|
| 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.



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Data: 1 File: C:\Users\wenbin_yang\Desktop\3\C1M1208219\POWER\TX2450.EMI (10)



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

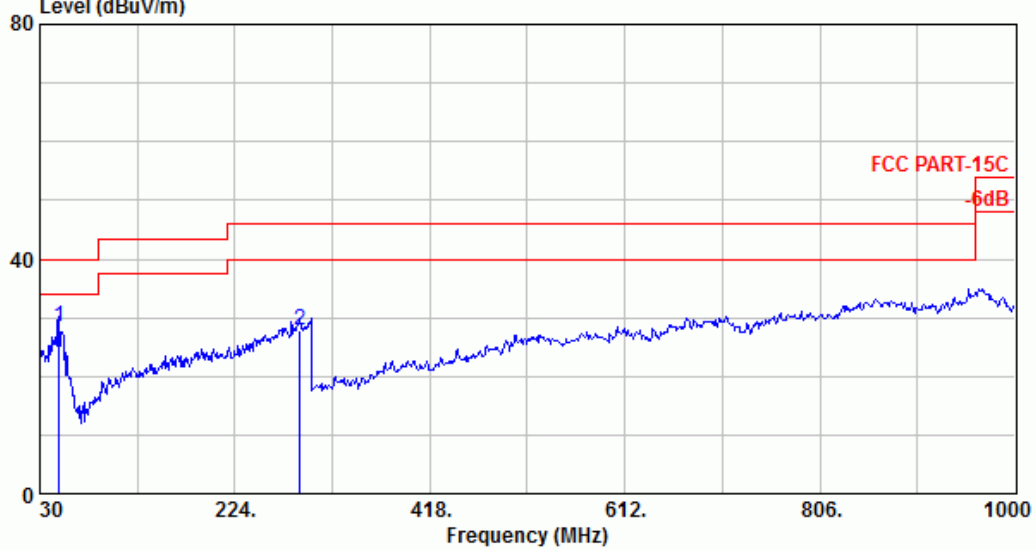
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|-----------------------|--------------------|-------------------|----------------------------|--------------------|----------------|--------|
| 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.



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Data: 2 File: C:\Users\wenbin_yang\Desktop\3\C1M1208219\POWER\TX2450.EMI (10)



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

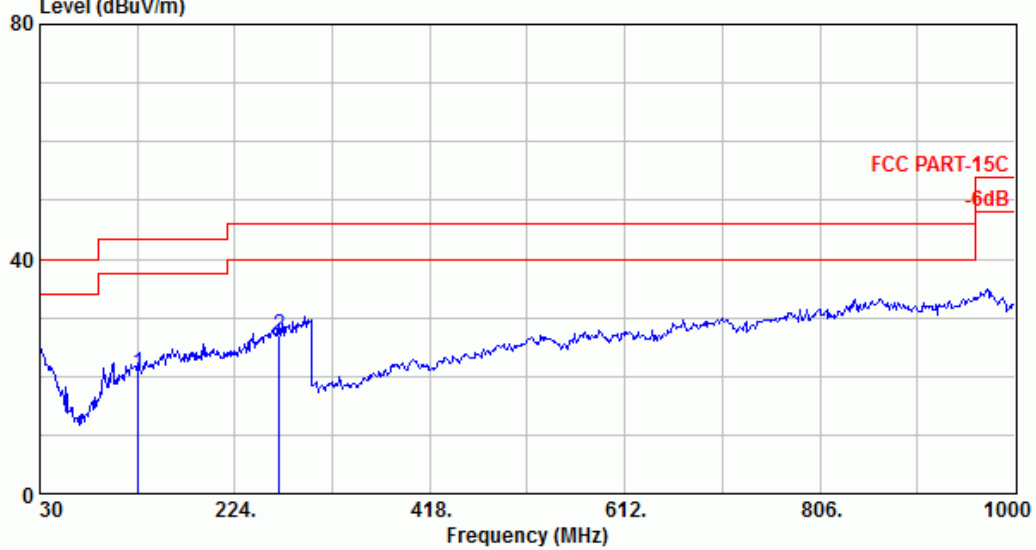
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|-----------------------|--------------------|-------------------|----------------------------|--------------------|----------------|--------|
| 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.



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Data: 2 File: C:\Users\wenbin_yang\Desktop\3\C1M1208219\POWER\TX2480.EMI (10)



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

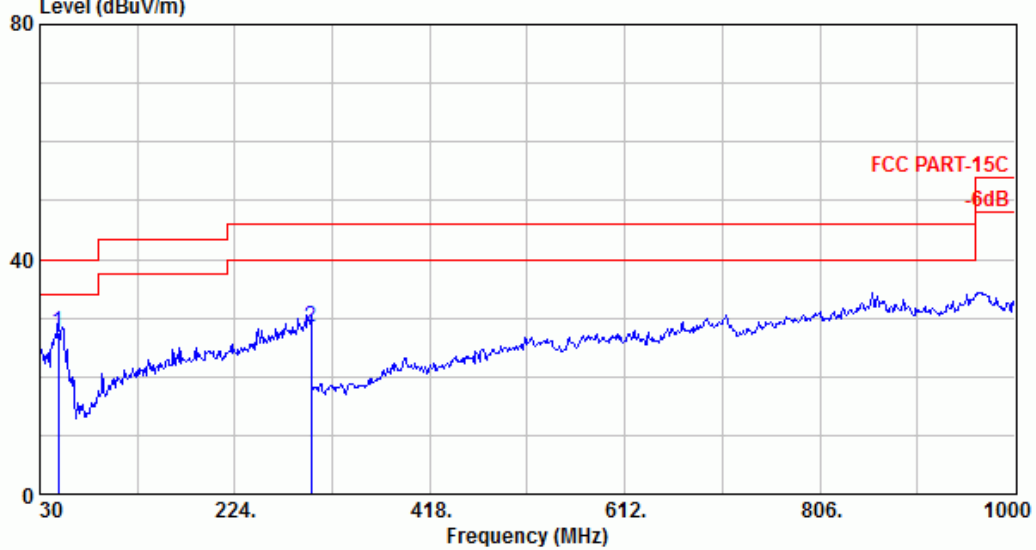
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|-----------------------|--------------------|-------------------|----------------------------|--------------------|----------------|--------|
| 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.



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Data: 1 File: C:\Users\wenbin_yang\Desktop\3\C1M1208219\POWER\TX2480.EMI (10)



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) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|---|----------------|--------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|--------|
| 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

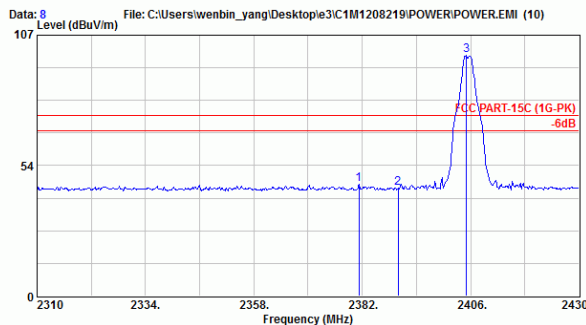
| | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|--------|--------------------------|-----------------------|-----------------|---------------------------------|------------------------------------|-----------------|-------------|
| Peak * | 2381.280 | 28.43 | 6.33 | 10.94 | 45.71 | 74.00 | 28.29 |

| | Emission Frequency (MHz) | Peak Value (dB/m) | Duty Cycle Factor (dB) | Average Value (dBμV/m) | Limit (dBμV/m) | Margin (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 = 20log (cumulative on/T) = 20log(0.865ms/20.90ms)=-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.



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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. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|-------------|--------------------|-----------------|----------------|-------------------------|-----------------|-------------|--------|
| 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

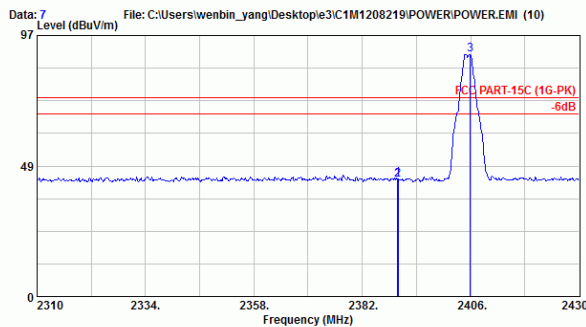
| | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Vertical (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|--------|--------------------------|-----------------------|-----------------|-------------------------------|------------------------------------|-----------------|-------------|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

| | Emission Frequency (MHz) | Peak Value (dB/m) | Duty Cycle Factor (dB) | Average Value (dBμV/m) | Limit (dBμV/m) | Margin (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.



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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) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/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

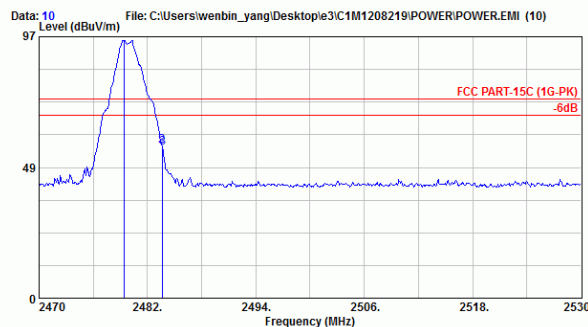
| | Emission Frequency (MHz) | Antenna Factor (dB/m) | Cable Loss (dB) | Meter Reading Horizontal (dBμV) | Emission Level Horizontal (dBμV/m) | Limits (dBμV/m) | Margin (dB) |
|--------|-----------------------------|--------------------------|--------------------|---------------------------------------|------------------------------------------|--------------------|----------------|
| Peak * | 2483.600 | 28.66 | 6.45 | 21.26 | 56.38 | 74.00 | 17.62 |

| | Emission Frequency (MHz) | Peak Value (dB/m) | Duty Cycle Factor (dB) | Average Value (dBμV/m) | Limit (dBμV/m) | Margin (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.



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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) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/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

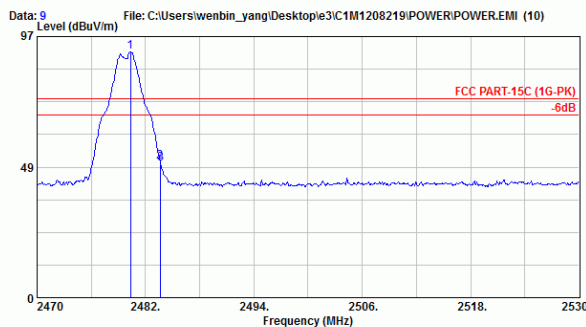
| | Emission Frequency | Antenna Factor | Cable Loss | Meter Reading Vertical | Emission Level Horizontal | Limits | Margin |
|--------|--------------------|----------------|------------|------------------------|---------------------------|----------|--------|
| | (MHz) | (dB/m) | (dB) | (dBμV) | (dBμV/m) | (dBμV/m) | (dB) |
| Peak * | 2483.600 | 28.66 | 6.45 | 15.33 | 50.45 | 74.00 | 23.55 |

| | Emission Frequency | Peak Value | Duty Cycle Factor | Average Value | Limit | Margin |
|-----------|--------------------|------------|-------------------|---------------|----------|--------|
| | (MHz) | (dB/m) | (dB) | (dBμV/m) | (dBμV/m) | (dB) |
| Average * | 2483.60 | 50.45 | -27.662 | 22.79 | 54.00 | 31.21 |

- 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.



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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

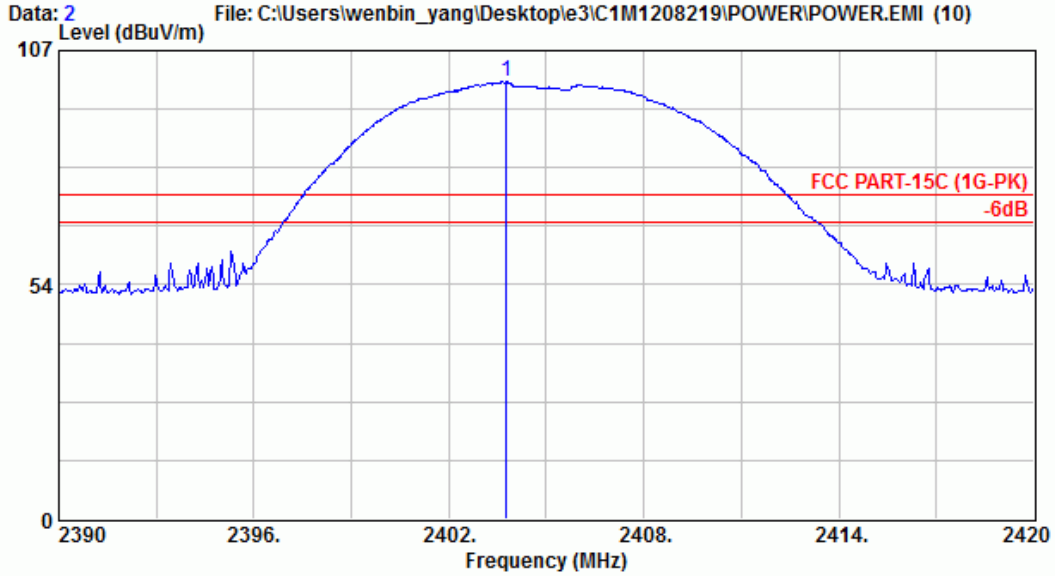
| | Freq. (MHz) | Ant. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|---|-------------|--------------------|-----------------|----------------|-------------------------|-----------------|-------------|--------|
| 1 | 2480.320 | 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



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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 (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remark |
|-------------|--------------------|-----------------|----------------|-------------------------|-----------------|-------------|--------|
| 1 2403.770 | 28.51 | 6.36 | 65.02 | 99.89 | 114.00 | -14.11 | Peak |

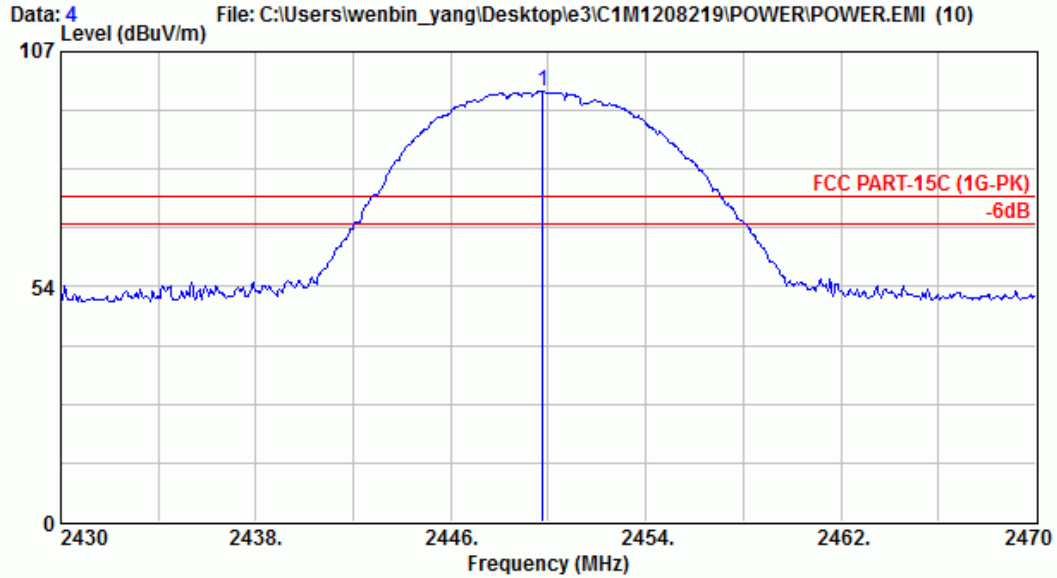
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB/m) | Duty Cycle Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/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.



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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. Factor (dB/m) | Cable Loss (dB) | Reading (dBμV) | Emission Level (dBμV/m) | Limits (dBμV/m) | Margin (dB) | Remarks |
|---|----------------|--------------------------|-----------------------|-------------------|-------------------------------|--------------------|----------------|---------|
| 1 | 2449.760 | 28.59 | 6.41 | 62.96 | 97.96 | 114.00 | -16.04 | Peak |

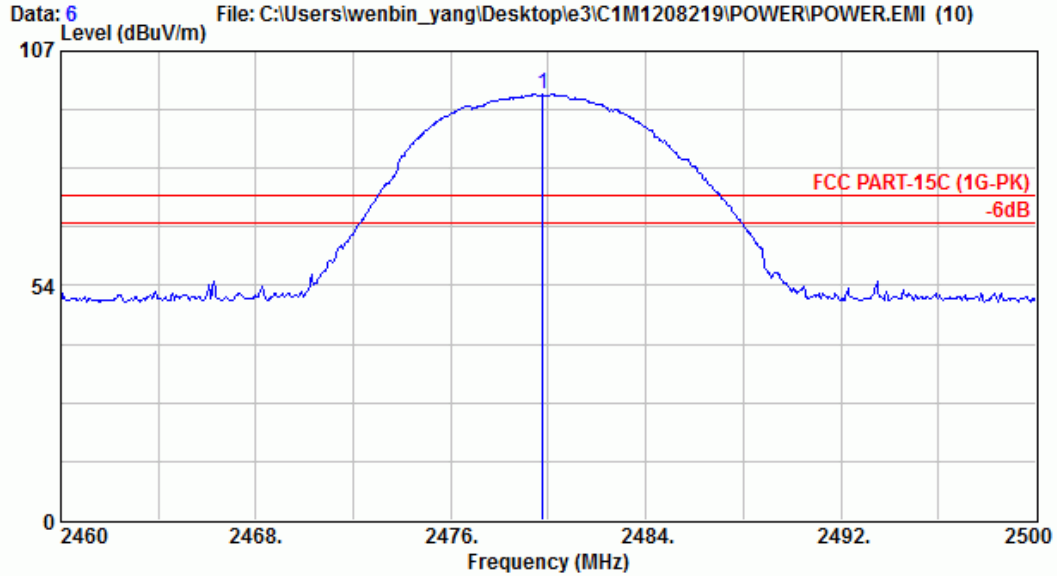
Remarks: 1. Emission Level= Antenna Factor + Cable Loss + Reading.
 2. The emission levels that are 20dB below the official limit are not reported.

| Emission Frequency (MHz) | Peak Value (dB/m) | Duty Cycle Factor (dB) | Average Value Vertical (dBμV/m) | Limit (dBμV/m) | Margin (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.



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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 (dB/m) | Cable Loss (dB) | Reading (dBµV) | Emission Level (dBµV/m) | Limits (dBµV/m) | Margin (dB) | Remark |
|-------------|--------------------|-----------------|----------------|-------------------------|-----------------|-------------|--------|
| 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 (dB) | Average Value Vertical (dBµV/m) | Limit (dBµV/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' |

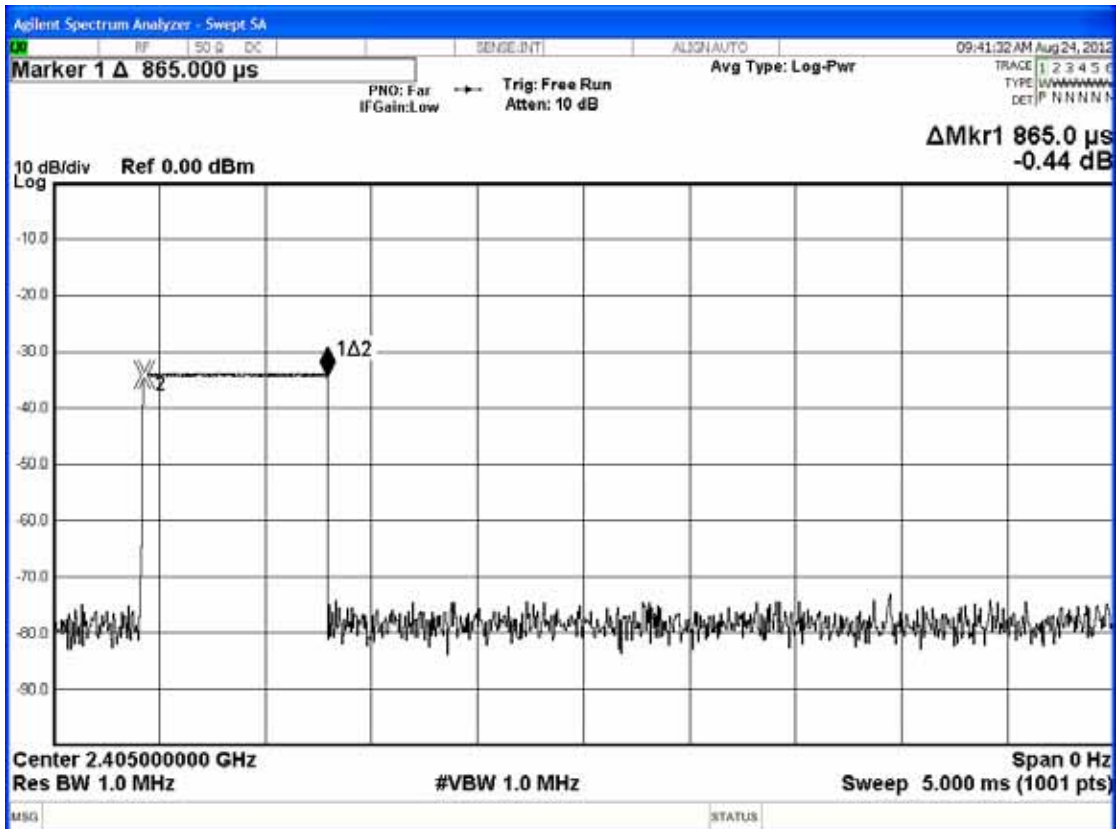
4.2. Block Diagram of Test Setup

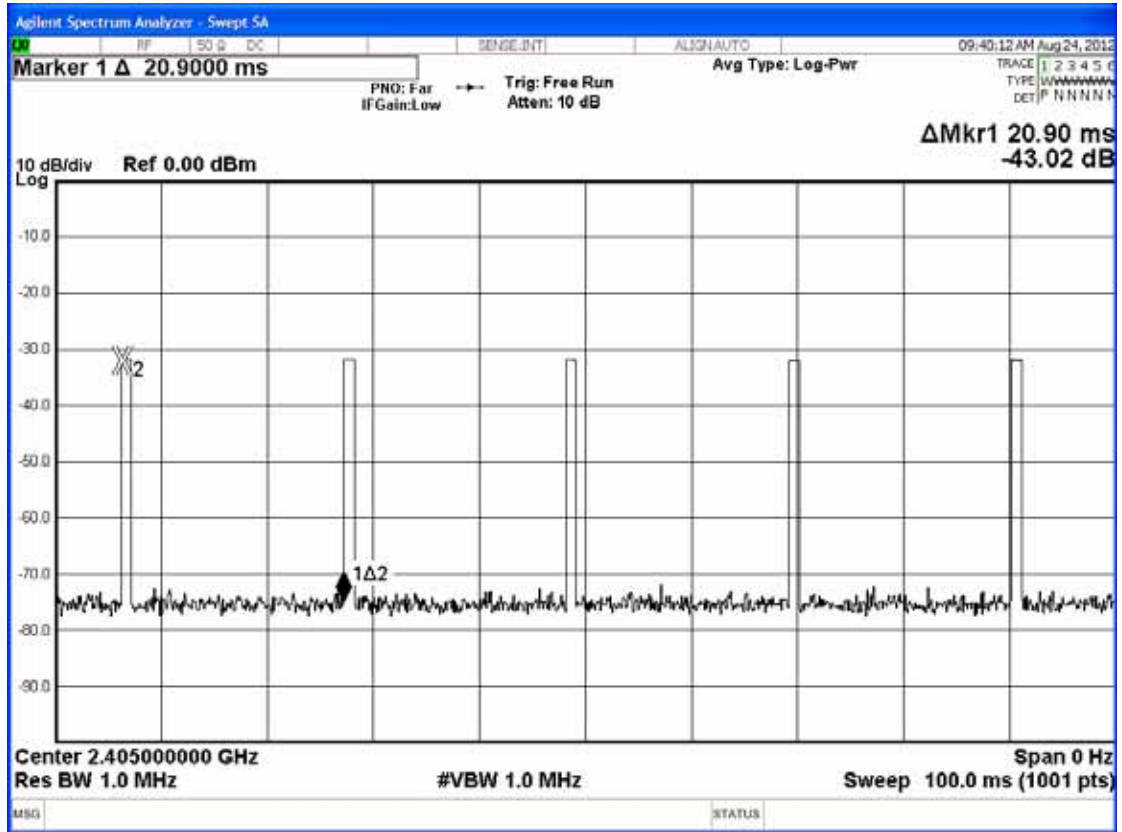


4.3. Test Results

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

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





$$T_{on} = 0.865ms$$

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

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

