

# FCC CERTIFICATION TEST REPORT

For  
FCC ID: X5B- PL7602E

Report Reference No..... : 15FAB04004 31

Date of issue..... : 2015-04-16

Testing Laboratory..... : ATT Product Service Co., Ltd.

Address..... : No. 3, ChangLianShan Industrial Park, ChangAn Town,  
DongGuan City, GuangDong, China.

Applicant's name ..... : PERFORMANCE DESIGNED PRODUCTS, LLC

Address..... : 14144 Ventura Blvd, Suite 200, Sherman Oaks, CA 91423  
U.S.A

Manufacturer..... : PERFORMANCE DESIGNED PRODUCTS, LLC

Test specification:

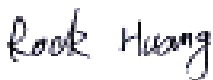
Test item description..... : Aferglow Wireless Controller for Wii

Trade Mark ..... : --

Model/Type reference ..... : PL-7602E

Ratings..... : I/P: DC 3V by battery supply (AA \* 2Pcs)

Responsible Engineer



(Rock Huang/Engineer)

Approved by



(King Wang/EMC Manger)

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## TEST REPORT DECLARE

|                             |   |                                                          |
|-----------------------------|---|----------------------------------------------------------|
| <b>Applicant</b>            | : | PERFORMANCE DESIGNED PRODUCTS, LLC                       |
| <b>Address</b>              | : | 14144 Ventura Blvd,Suite 200,Sherman Oaks,CA 91423 U.S.A |
| <b>Equipment under Test</b> | : | Aferglow Wireless Controller for Wii                     |
| <b>Model No</b>             | : | PL-7602E                                                 |
| <b>FCC ID</b>               | : | X5B- PL7602E                                             |
| <b>Manufacturer</b>         | : | PERFORMANCE DESIGNED PRODUCTS, LLC                       |
| <b>Address</b>              | : | 14144 Ventura Blvd,Suite 200,Sherman Oaks,CA 91423 U.S.A |

**Test Standard Used:** FCC Rules and Regulations Part 15 Subpart C: 2013

**Test procedure used:** ANSI C63.4: 2009, ANSI C63.10: 2013,

### We Declare:

The equipment described above is tested by ATT Product Service Co., Ltd and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and ATT Product Service Co., Ltd is assumed of full responsibility for the accuracy and completeness of these tests.

**After test and evaluation X/Y/Z axis of the EUT. will record worst case in this report.**  
**our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

|                      |                          |                        |            |
|----------------------|--------------------------|------------------------|------------|
| <b>Report No:</b>    | 15FAB04004 31            |                        |            |
| <b>Date of Test:</b> | 2015-04-01 to 2015-04-15 | <b>Date of Report:</b> | 2015-04-16 |

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of ATT Product Service Co., Ltd

## 1. SUMMARY OF TEST RESULTS

| The EUT have been tested according to the applicable standards as referenced below. |                        |         |
|-------------------------------------------------------------------------------------|------------------------|---------|
| Description of Test Item                                                            | Standard               | Results |
| 20dB Bandwidth                                                                      | FCC Part 15: 15.247    | PASS    |
| Carrier Frequency Separation Test                                                   | FCC Part 15: 15.247    | PASS    |
| Number Of Hopping Frequency                                                         | FCC Part 15: 15.247    | PASS    |
| Dwell Time Test                                                                     | FCC Part 15: 15.247    | PASS    |
| Peak Output Power                                                                   | FCC Part 15: 15.247    | PASS    |
| Band Edge                                                                           | FCC Part 15: 15.247    | PASS    |
| Spurious Emission                                                                   | FCC Part 15.205/15.209 | PASS    |
| Antenna requirement                                                                 | FCC Part 15: 15.203    | PASS    |
| Conducted Emission                                                                  | FCC Part 15.207        | N/A     |

Note: N/A: the EUT was powered by DC battery in normal use condition

## 2. GENERAL TEST INFORMATION

### 2.1. DESCRIPTION OF EUT

|                          |   |                                             |
|--------------------------|---|---------------------------------------------|
| EUT* Name                | : | Aferglow Wireless Controller for Wii        |
| Model Number             | : | PL-7602E                                    |
| EUT function description | : | Please reference user manual of this device |
| Power supply             | : | DC 3V by battery supply (AA * 2Pcs)         |
| Radio Technology         | : | 2.4GHz ISM band                             |
| Operation frequency      | : | 2402-2480MHz                                |
| Modulation               | : | GFSK                                        |
| Antenna Type             | : | built-in antenna, maximum PK gain:2.32dBi   |
| Date of Receipt          | : | 2015-04-01                                  |
| Sample Type              | : | Single production                           |

Note1: EUT is the ab. of equipment under test.

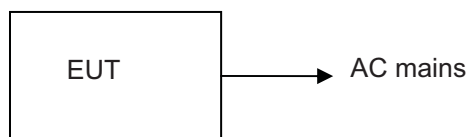
### 2.2. ACCESSORIES OF EUT

| Description of Accessories | Manufacturer | Model number or Type | Output. |
|----------------------------|--------------|----------------------|---------|
| /                          | /            | /                    | /       |

### 2.3. ASSISTANT EQUIPMENT USED FOR TEST

| Description of Assistant equipment | Manufacturer | Model number or Type | EMC Compliance   | SN      |
|------------------------------------|--------------|----------------------|------------------|---------|
| Notebook                           | lenovo       | 2743                 | FCC DOC approved | 2743NCC |

## 2.4. BLOCK DIAGRAM OF EUT CONFIGURATION FOR TEST



EUT was connected to control to a special test jig provided by manufacturer which has a Micro USB connector to connect to Notebook, and the Notebook will run a special test software to control EUT work in Continuous TX mode, and select test channel, wireless mode and data rate.

| Tested mode, channel, and data rate information                                                                                                                                  |                                |              |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|--------------------|
| Mode                                                                                                                                                                             | data rate (Mbps)<br>(see Note) | Channel      | Frequency<br>(MHz) |
| GFSK                                                                                                                                                                             | 1                              | Low :CH0     | 2402               |
|                                                                                                                                                                                  | 1                              | Middle: CH39 | 2441               |
|                                                                                                                                                                                  | 1                              | High: CH78   | 2480               |
| Note: 1.According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.<br>2. New battery is used during all test. |                                |              |                    |

## 2.5. TEST ENVIRONMENT CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

|                    |           |
|--------------------|-----------|
| Temperature range: | 21-25℃    |
| Humidity range:    | 40-75%    |
| Pressure range:    | 86-106kPa |

## 2.6. MEASUREMENT UNCERTAINTY

| Test Item                                                  | Uncertainty           |
|------------------------------------------------------------|-----------------------|
| Uncertainty for Conduction emission test                   | 2.44dB                |
| Uncertainty for Radiation Emission test (9KHz-30MHz)       | 3.21dB                |
| Uncertainty for Radiation Emission test<br>(30MHz-200MHz)  | 3.42 dB (Polarize: V) |
|                                                            | 3.52 dB (Polarize: H) |
| Uncertainty for Radiation Emission test<br>(200MHz-1GHz)   | 3.52 dB (Polarize: V) |
|                                                            | 3.54 dB (Polarize: H) |
| Uncertainty for Radiation Emission test<br>(1GHz to 25GHz) | 4.20 dB (Polarize: V) |
|                                                            | 4.20 dB (Polarize: H) |
| Uncertainty for radio frequency                            | 1×10-9                |
| Uncertainty for conducted RF Power                         | 0.65dB                |

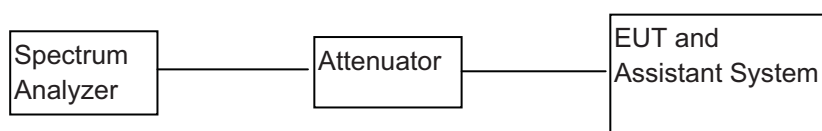
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3. 20dB BANDWIDTH

#### 3.1. TEST EQUIPMENT

| Item | Equipment         | Manufacturer  | Model No.   | Serial No.   | Cal Due.   | Cal. Interval |
|------|-------------------|---------------|-------------|--------------|------------|---------------|
| 1    | Spectrum analyzer | R&S           | FSU         | 1166.1660.26 | 2015/12/25 | 1 Year        |
| 2    | Attenuator        | Mini-Circuits | BW-S10W2    | 101109       | 2015/12/26 | 1 Year        |
| 3    | RF Cable          | Micable       | C10-01-01-1 | 100309       | 2015/12/26 | 1 Year        |

#### 3.2. BLOCK DIAGRAM OF TEST SETUP



#### 3.3. TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

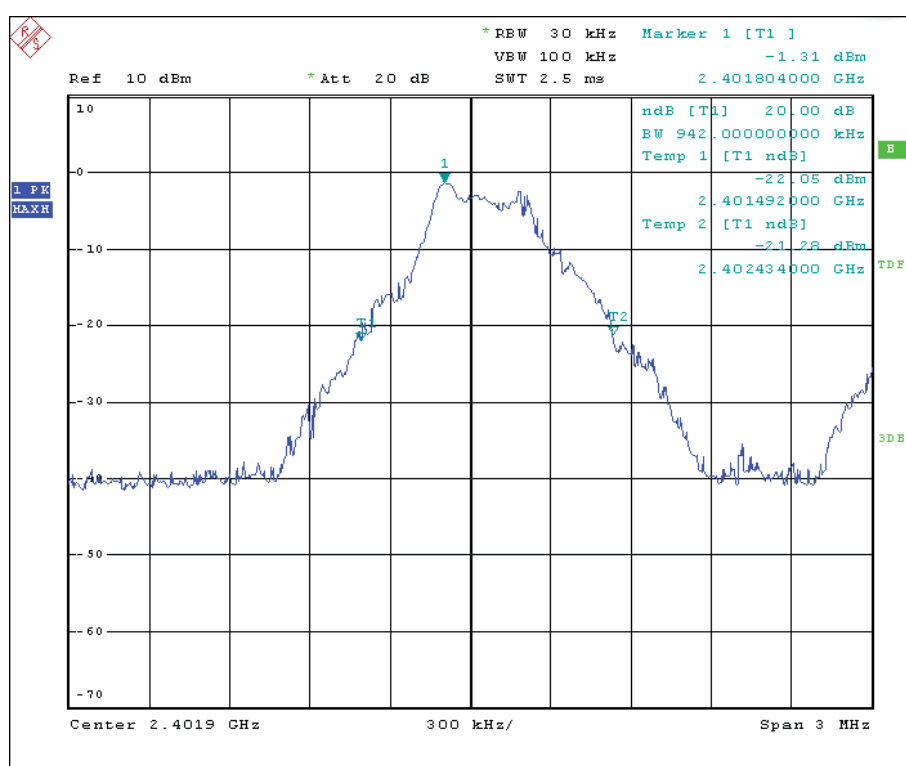
|                |          |
|----------------|----------|
| RBW:           | 30KHz    |
| VBW:           | 100KHz   |
| Detector Mode: | Peak     |
| Sweep time:    | auto     |
| Trace mode:    | Max hold |

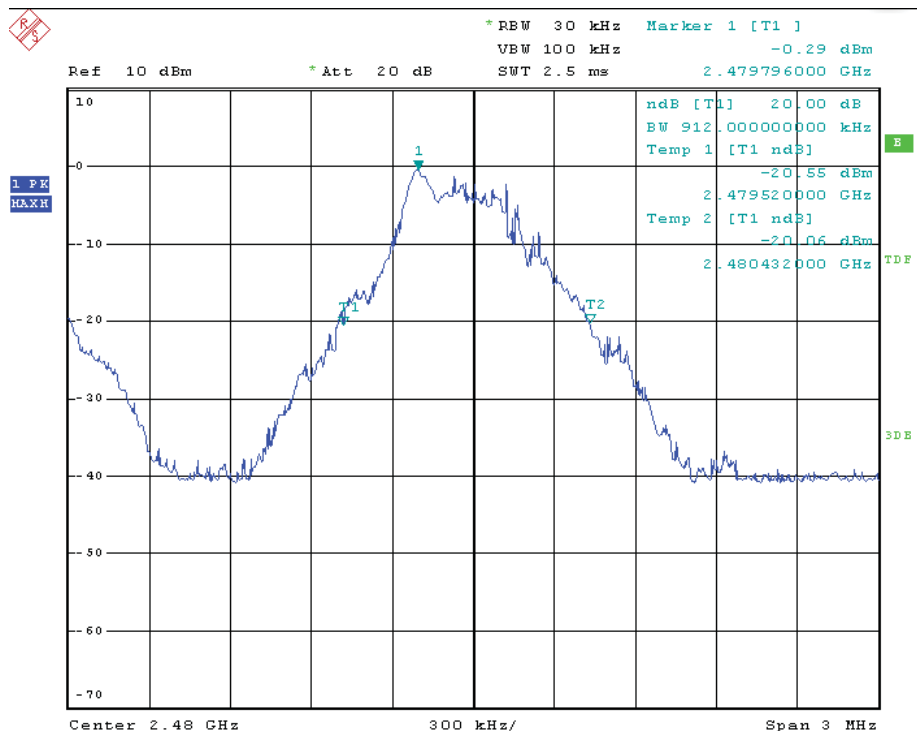
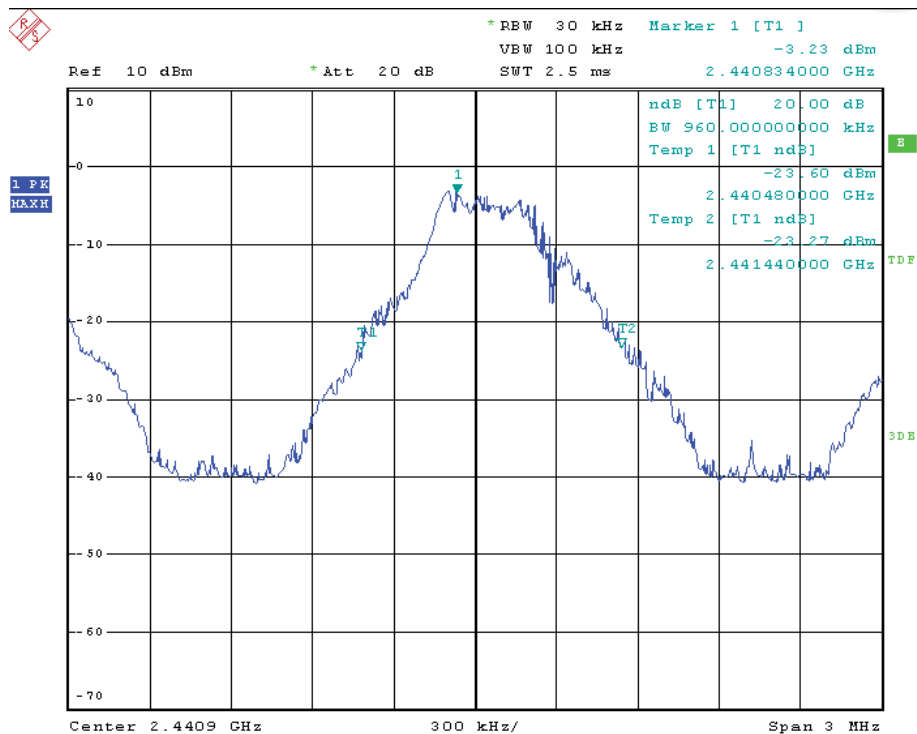
- (5) Allow the trace to stabilize, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

### 3.4. TEST RESULT

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) | Result |
|---------|-----------------|----------------------|--------|
| Low     | 2402            | 0.942                | Pass   |
| Middle  | 2441            | 0.96                 | Pass   |
| High    | 2480            | 0.912                | Pass   |

### 3.5. ORIGINAL TEST DATA





## **4. CARRIER FREQUENCY SEPARATION TEST**

### **4.1.THE REQUIREMENT FOR SECTION 15.247(A)(1)**

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly

ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

### **4.2.EUT CONFIGURATION ON MEASUREMENT**

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

### **4.3.OPERATING CONDITION OF EUT**

- (1) Setup the EUT and simulator as shown as Section 6.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.  
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

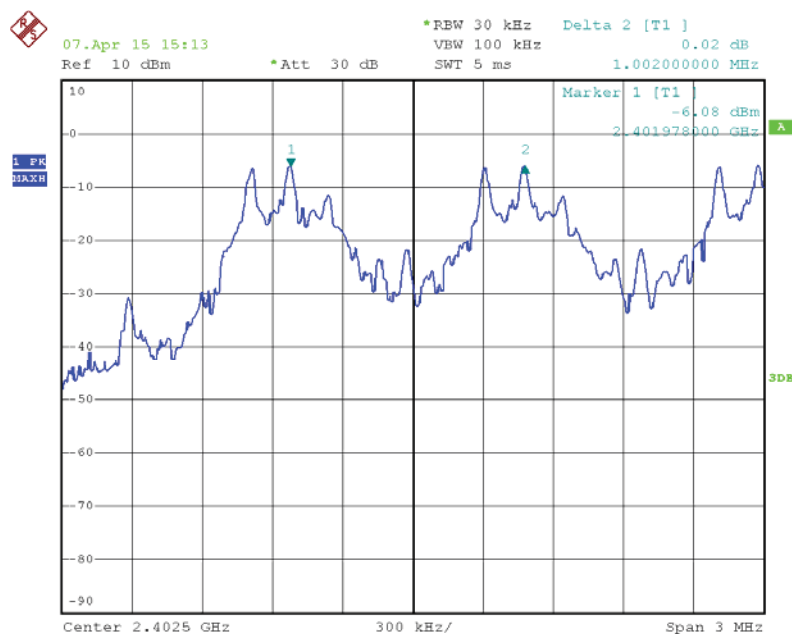
### **4.4.TEST PROCEDURE**

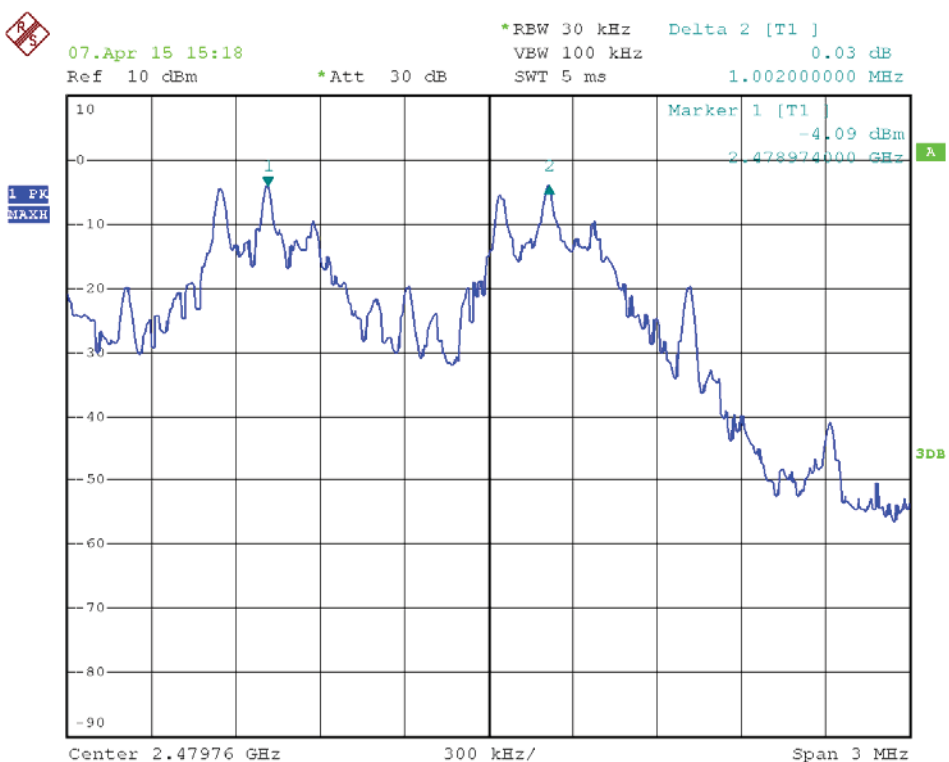
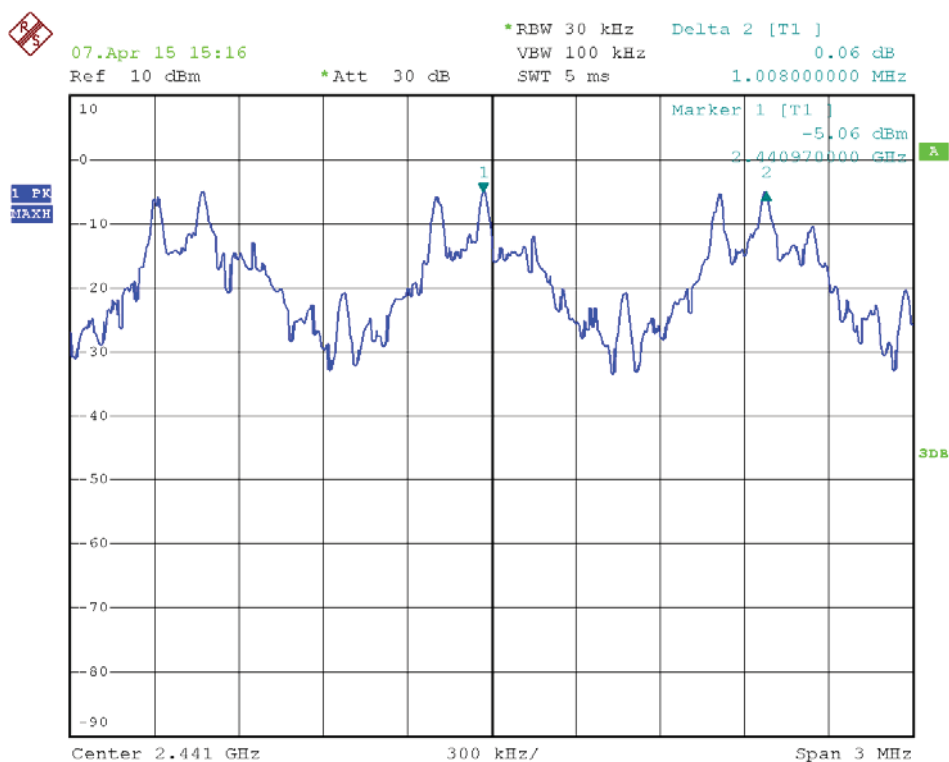
- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) .Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz. Adjust Span to 3 MHz.
- (3) Set the adjacent channel of the EUT maxhold another trace.
- (4) Measurement the channel separation

## 4.5.TEST RESULT

| Channel | Frequency (MHz) | Channel Separation(MHz) | Limit (MHz)                 | Result |
|---------|-----------------|-------------------------|-----------------------------|--------|
| Low     | 2402            | 1.002                   | 25KHz or 2/3*20dB bandwidth | PASS   |
| Middle  | 2441            | 1.008                   | 25KHz or 2/3*20dB bandwidth | PASS   |
| High    | 2479            | 1.002                   | 25KHz or 2/3*20dB bandwidth | PASS   |

The spectrum analyzer plots are attached as below.





## **5. NUMBER OF HOPPING FREQUENCY TEST**

### **5.1.THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)**

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

### **5.2.EUT CONFIGURATION ON MEASUREMENT**

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

### **5.3.OPERATING CONDITION OF EUT**

- (1) Setup the EUT and simulator as shown as Section 7.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it.

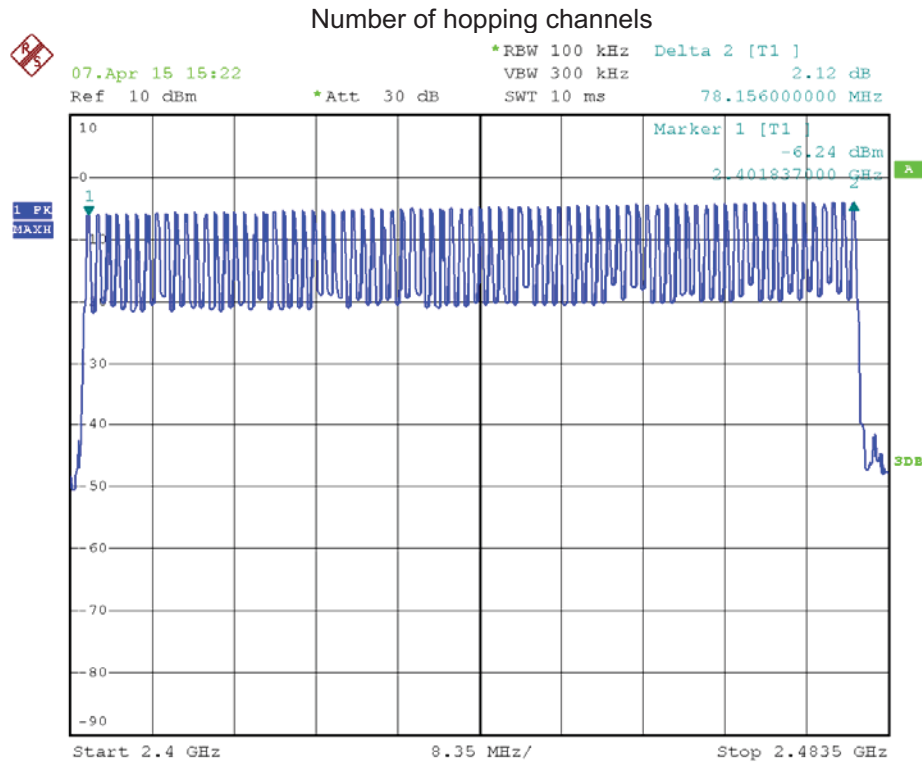
### **5.4.TEST PROCEDURE**

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set the spectrum analyzer as Span=83.5MHz, RBW=100 kHz, VBW=300 kHz.
- (3) Max hold, view and count how many channel in the band.

## 5.5.TEST RESULT

| Total number of hopping channel | Measurement result(CH) | Limit(CH) |
|---------------------------------|------------------------|-----------|
|                                 | 79                     | ≥15       |

The spectrum analyzer plots are attached as below



Channle information

| CH | Frequency | CH | Frequency | CH | Frequency | CH | Frequency | CH | Frequency |
|----|-----------|----|-----------|----|-----------|----|-----------|----|-----------|
| 0  | 2402      | 16 | 2418      | 32 | 2434      | 48 | 2450      | 64 | 2466      |
| 1  | 2403      | 17 | 2419      | 33 | 2435      | 49 | 2451      | 65 | 2467      |
| 2  | 2404      | 18 | 2420      | 34 | 2436      | 50 | 2452      | 66 | 2468      |
| 3  | 2405      | 19 | 2421      | 35 | 2437      | 51 | 2453      | 67 | 2469      |
| 4  | 2406      | 20 | 2422      | 36 | 2438      | 52 | 2454      | 68 | 2470      |
| 5  | 2407      | 21 | 2423      | 37 | 2439      | 53 | 2455      | 69 | 2471      |
| 6  | 2408      | 22 | 2424      | 38 | 2440      | 54 | 2456      | 70 | 2472      |
| 7  | 2409      | 23 | 2425      | 39 | 2441      | 55 | 2457      | 71 | 2473      |
| 8  | 2410      | 24 | 2426      | 40 | 2442      | 56 | 2458      | 72 | 2474      |
| 9  | 2411      | 25 | 2427      | 41 | 2443      | 57 | 2459      | 73 | 2475      |
| 10 | 2412      | 26 | 2428      | 42 | 2444      | 58 | 2460      | 74 | 2476      |
| 11 | 2413      | 27 | 2429      | 43 | 2445      | 59 | 2461      | 75 | 2477      |
| 12 | 2414      | 28 | 2430      | 44 | 2446      | 60 | 2462      | 76 | 2478      |
| 13 | 2415      | 29 | 2431      | 45 | 2447      | 61 | 2463      | 77 | 2479      |
| 14 | 2416      | 30 | 2432      | 46 | 2448      | 62 | 2464      | 78 | 2480      |
| 15 | 2417      | 31 | 2433      | 47 | 2449      | 63 | 2465      | -  | -         |

## 6. DWELL TIME TEST

### 6.1.THE REQUIREMENT FOR SECTION 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 6.2.EUT CONFIGURATION ON MEASUREMENT

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

### 6.3.OPERATING CONDITION OF EUT

- (1) Setup the EUT and simulator as shown as Section 8.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz.  
We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

### 6.4.TEST PROCEDURE

- (1) The transmitter output was connected to the spectrum analyzer through a low loss cable.
- (2) Set center frequency of spectrum analyzer = operating frequency.
- (3) Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=5ms, 10ms, 15ms.  
Get the pulse time.

## 6.5.TEST RESULT

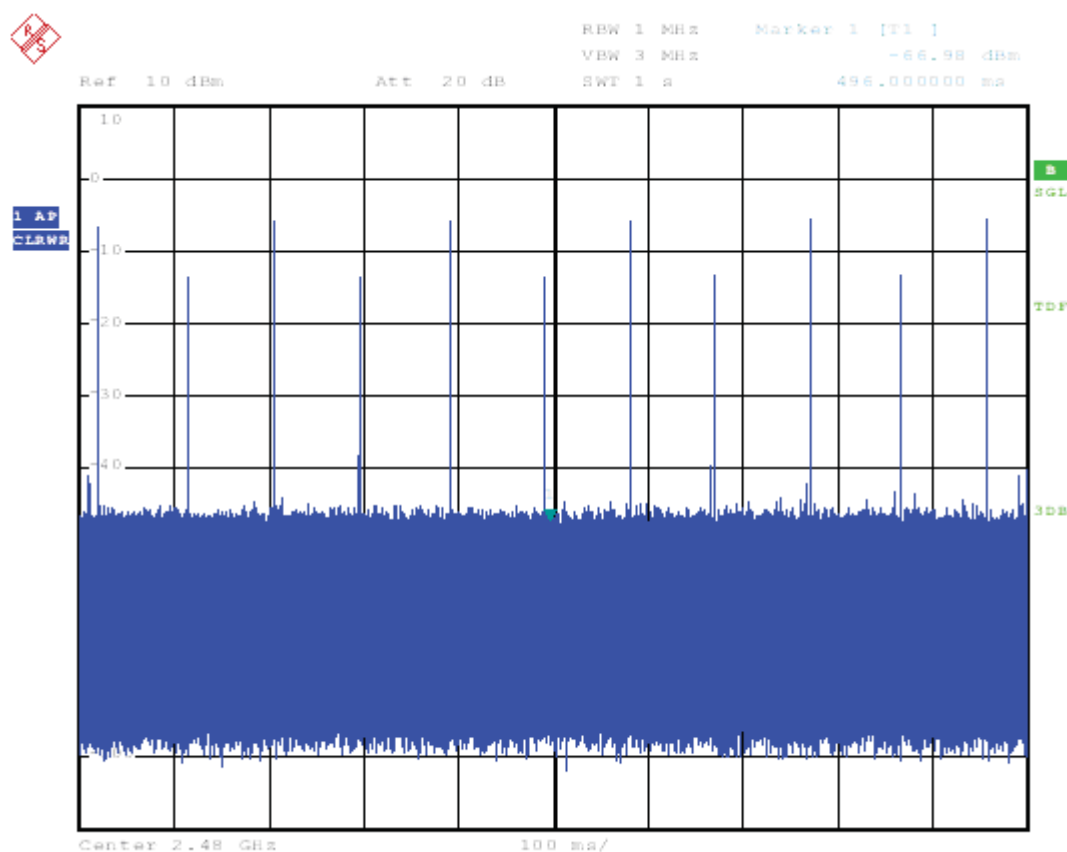
### Duty Cycle Correction During 1 Sec

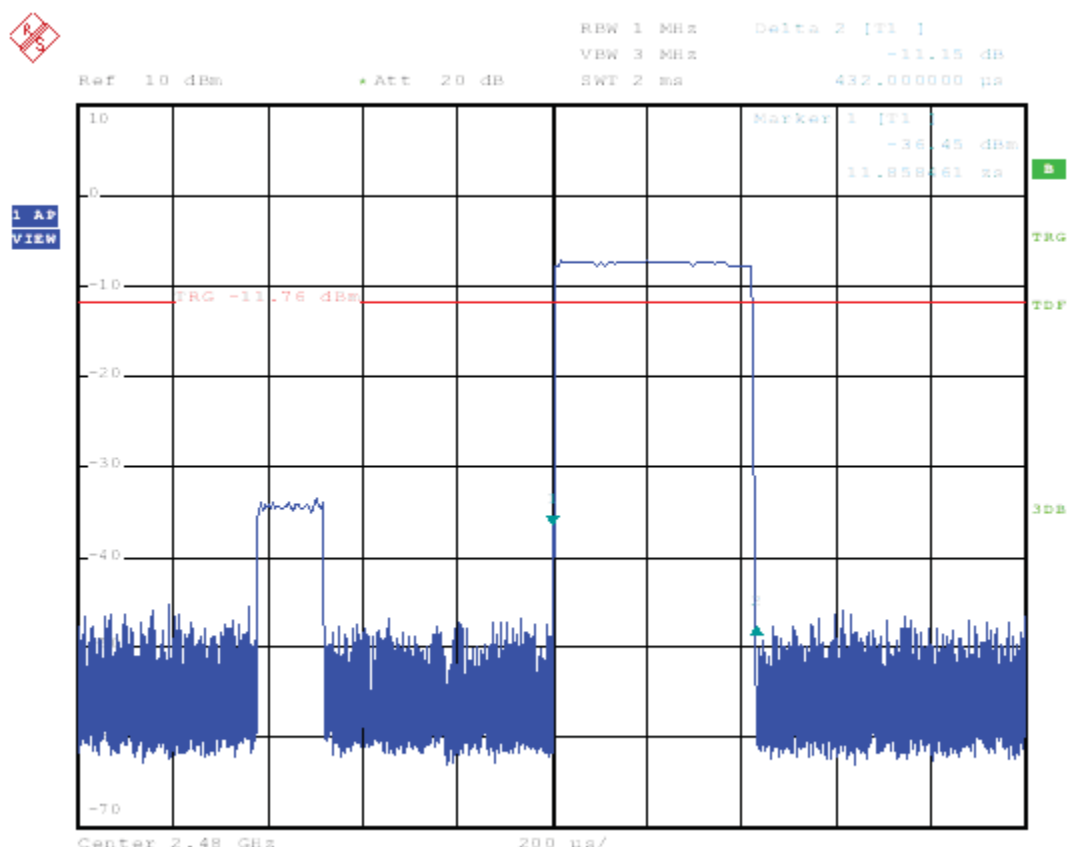
Each sample unit sends a different series of characters, but each pulse period (1 Sec) never exceeds a series of 11 sole (0.432msec) pulses. Assuming any combination of sole pulses may be obtained due to encoding the worst case transmit duty cycle would be considered  $11 \times 0.432\text{msec}$  per Sec is 4.752msec.

Figure A through B show the characteristics of the pulse train for one of these functions.

DWELL TIME =  $4.752 \times 31.6 = 150.2\text{ms} < 400\text{ms}$

The following figures showed the characteristics of the pulse train for one of these functions.





## 8. MAXMUM OUTPUT POWER

### 8.1TEST EQUIPMENT

Same with 3.1

### 8.2BLOCK DIAGRAM OF TEST SETUP

Same with 3.2

### 8.3LIMITS

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 8.4 TEST PROCEDURE

- (1) Configure EUT and assistant system according clause 2.4 and 3.2
- (2) Connect EUT's antenna output to spectrum analyzer by RF cable.
- (3) Configure EUT work in test mode as stated in clause 2.4.
- (4) Set the spectrum analyzer as follows:

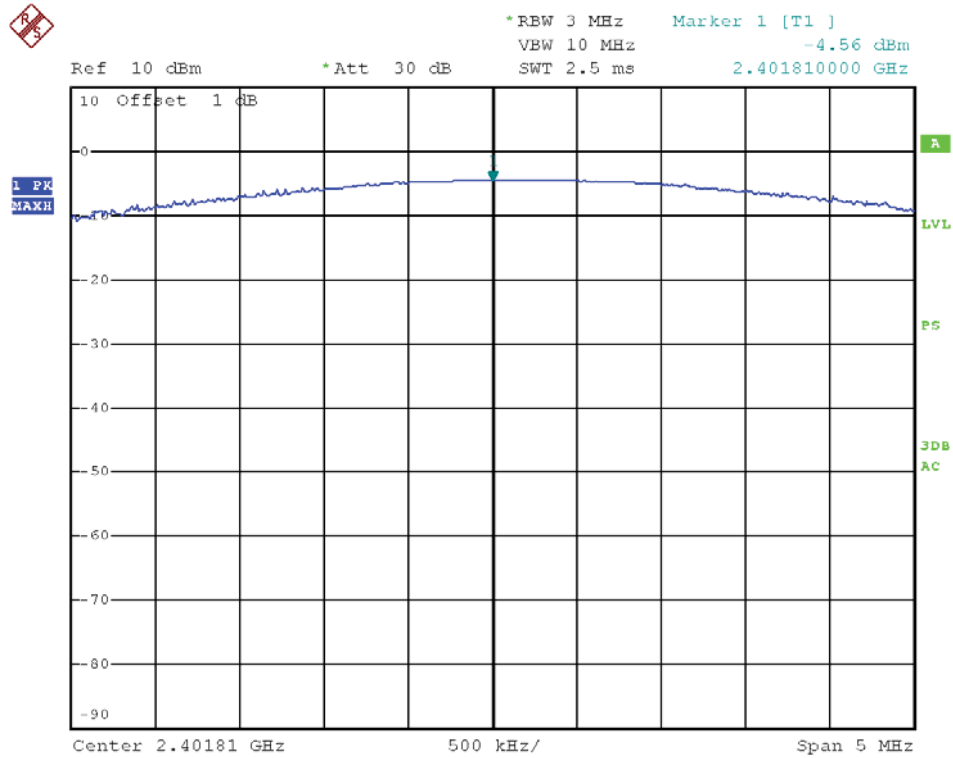
|                |                      |
|----------------|----------------------|
| RBW:           | 3MHz                 |
| VBW:           | 10MHz                |
| Span           | >1.5x 20dB bandwidth |
| Detector Mode: | Peak                 |
| Sweep time:    | auto                 |
| Trace mode     | Max hold             |

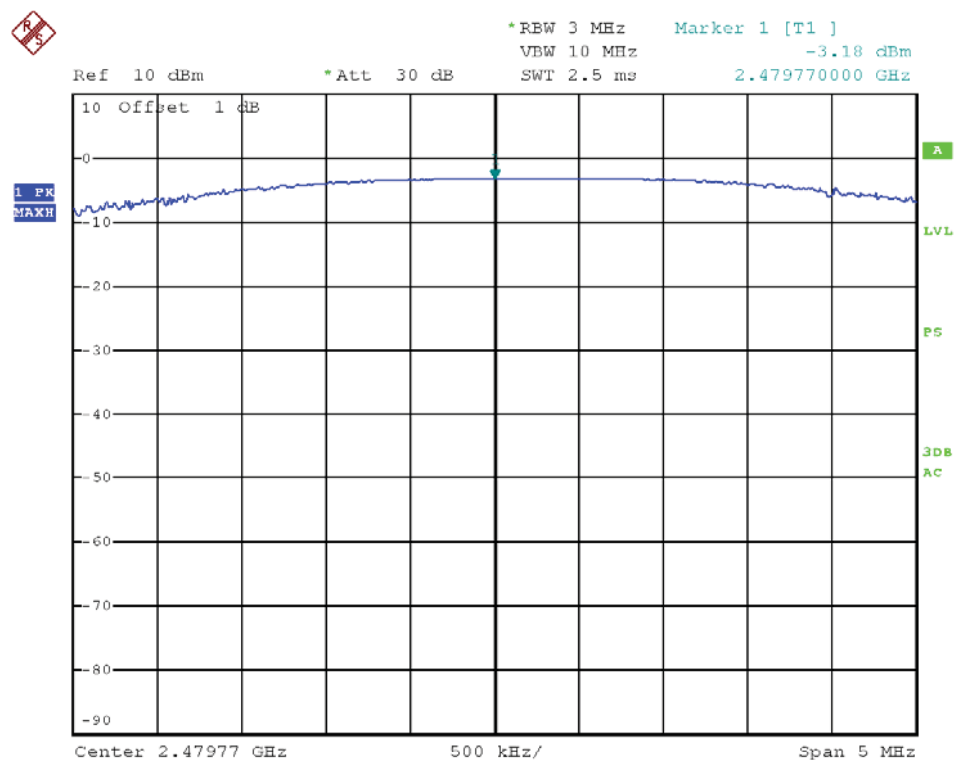
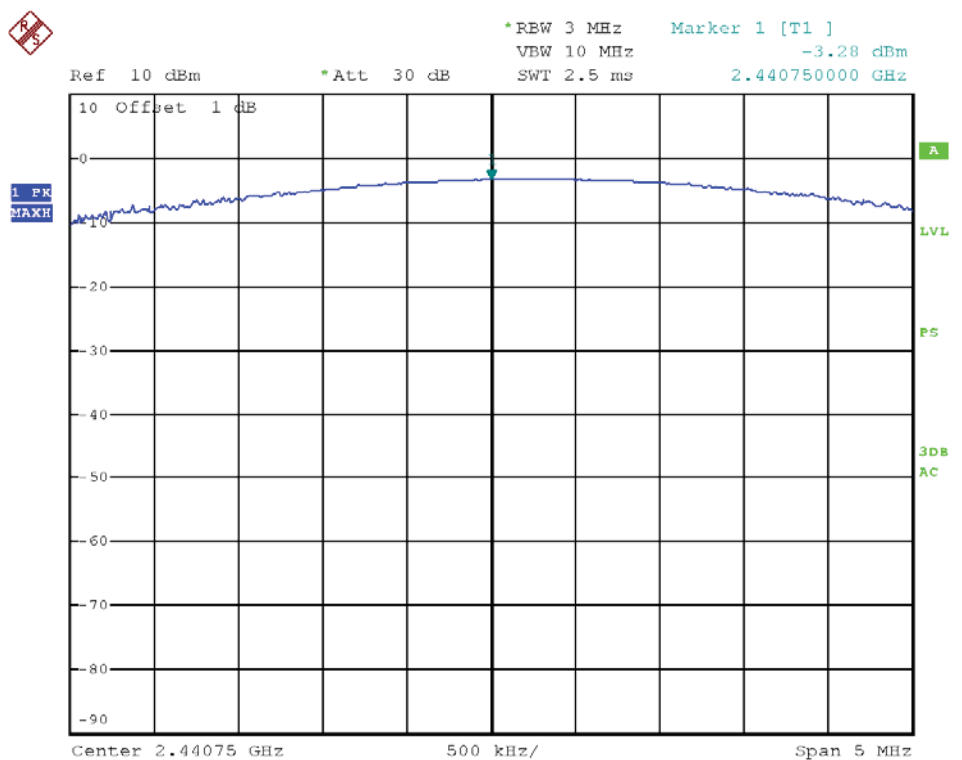
- (5) Allow the trace to stabilize, Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges measure out the Average and PK output power.

## 8.5 TEST RESULT

| EUT Set Mode | Data Rate<br>(Mbps) | Frequency<br>(MHz) | Result(dBm) |
|--------------|---------------------|--------------------|-------------|
|              |                     |                    | Peak        |
| Tx           | 1                   | 2402               | -4.56       |
|              |                     | 2441               | -3.28       |
|              |                     | 2480               | -3.18       |
| Limit: 21dBm |                     | Conclusion: PASS   |             |

## 8.6 ORIGINAL TEST DATA





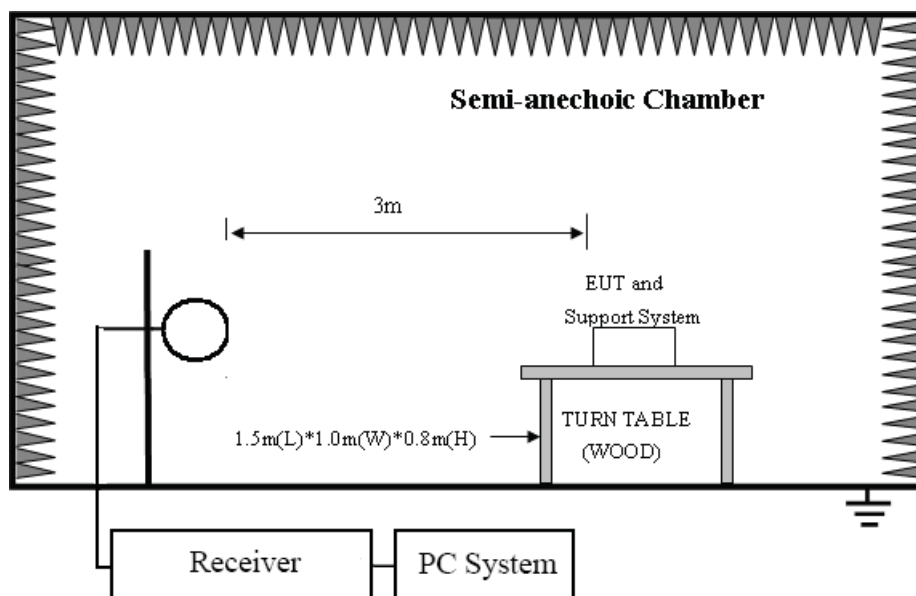
## 9.SPURIOUS EMISSION

### 9.1 TEST EQUIPMENT

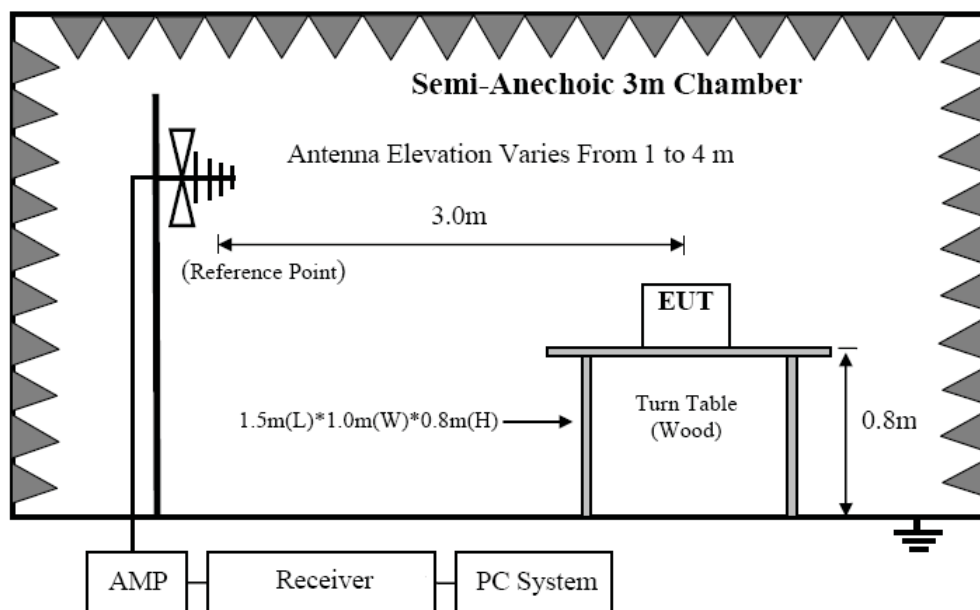
| Item | Equipment                  | Manufacturer | Model No.                   | Serial No.   | Cal Due.   | Cal. Interval |
|------|----------------------------|--------------|-----------------------------|--------------|------------|---------------|
| 1    | EMI Test Receiver          | R&S          | ESU8                        | 100316       | 2015/12/26 | 1 Year        |
| 2    | Spectrum analyzer          | R&S          | FSU                         | 1166.1660.26 | 2015/07/13 | 1 Year        |
| 3    | Loop antenna               | TESEQ        | HLA6120                     | 20129        | 2015/12/26 | 1 Year        |
| 4    | Trilog Broadband Antenna   | Schwarzbeck  | VULB9163                    | 9163-462     | 2015/12/26 | 1 Year        |
| 5    | Double Ridged Horn Antenna | R&S          | HF907                       | 100276       | 2015/12/26 | 1 Year        |
| 6    | Horn Antenna               | EMCO         | 3116                        | 00060095     | 2015/12/26 | 1 Year        |
| 7    | Pre-amplifier              | A.H.         | PAM-1840VH                  | 562          | 2015/12/26 | 1 Year        |
| 8    | Pre-amplifier              | R&S          | AFS33-18002<br>650-30-8P-44 | SEL0080      | 2015/12/26 | 1 Year        |
| 9    | RF Cable                   | R&S          | R01                         | 10403        | 2015/12/26 | 1 Year        |
| 10   | RF Cable                   | R&S          | R02                         | 10512        | 2015/12/26 | 1 Year        |

### 9.2 BLOCK DIAGRAM OF TEST SETUP

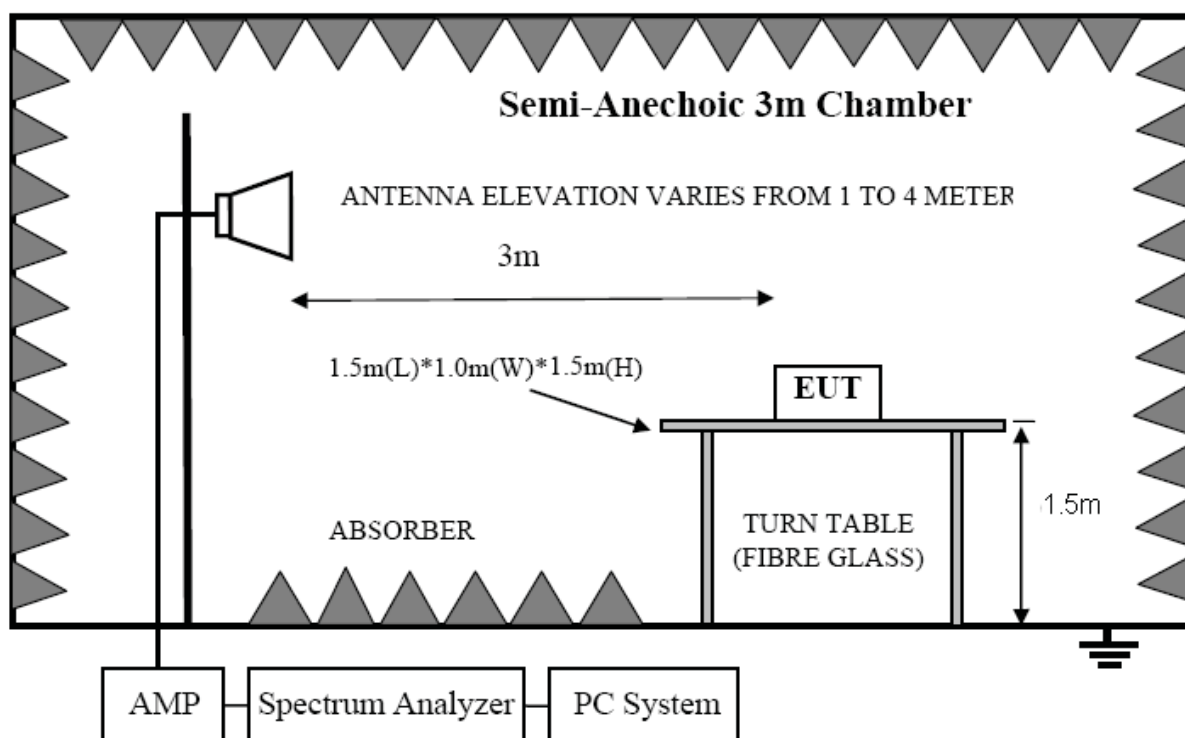
In 3m Anechoic Chamber Test Setup Diagram for 9KHz-30MHz



In 3m Anechoic Chamber Test Setup Diagram for 30MHz-1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

### 9.3LIMIT

#### 9.3.1 FCC 15.205 Restricted frequency band

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

#### 9.3.2 FCC 15.209 Limit.

| FREQUENCY<br>MHz | DISTANCE<br>Meters | FIELD STRENGTHS LIMIT                           |               |
|------------------|--------------------|-------------------------------------------------|---------------|
|                  |                    | μV/m                                            | dB(μV)/m      |
| 0.009 ~ 0.490    | 300                | 2400/F(KHz)                                     | 67.6-20log(F) |
| 0.490 ~ 1.705    | 30                 | 24000/F(KHz)                                    | 87.6-20log(F) |
| 1.705 ~ 30.0     | 30                 | 30                                              | 29.54         |
| 30 ~ 88          | 3                  | 100                                             | 40.0          |
| 88 ~ 216         | 3                  | 150                                             | 43.5          |
| 216 ~ 960        | 3                  | 200                                             | 46.0          |
| 960 ~ 1000       | 3                  | 500                                             | 54.0          |
| Above 1000       | 3                  | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) |               |

Note: (1) The emission limits shown in the above table are based on measurements employing a CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz and above 1000MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

(2) At frequencies below 30MHz, measurement may be performed at a distance closer then that specified, and the limit at closer measurement distance can be extrapolated by below formula:

$$\text{Limit}_{3m}(\text{dBuV/m}) = \text{Limit}_{30m}(\text{dBuV/m}) + 40\text{Log}(30m/3m)$$

### 9.3.3 Limit for this EUT

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 30dB below the fundamental emissions, or comply with 15.209 limits.

## 9.4 TEST PROCEDURE

- (1) EUT was placed on a non-metallic table, 80 cm for below 1G or 1.5m for above 1G above the ground plane inside a semi-anechoic chamber.
- (2) Setup EUT and assistant system according clause 2.4 and 7.2
- (3) Test antenna was located 3m from the EUT on an adjustable mast, and the antenna used as below table.

| Test frequency range | Test antenna used                      |
|----------------------|----------------------------------------|
| 9KHz-30MHz           | Active Loop antenna                    |
| 30MHz-1GHz           | Trilog Broadband Antenna               |
| 1GHz-18GHz           | Double Ridged Horn Antenna(1GHz-18GHz) |
| 18GHz-40GHz          | Horn Antenna(18GHz-40GHz)              |

According ANSI C63.10:2013 clause 6.4.4.2 and 6.5.3, for measurements below 30 MHz, the loop antenna was positioned with its plane vertical from the EUT and rotated about its vertical axis for maximum response at each azimuth position around the EUT. And the loop antenna also be positioned with its plane horizontal at the specified distance from the EUT. The center of the loop is 1 m above the ground. for measurement above 30MHz, the Trilog Broadband Antenna or Horn Antenna was located 3m from EUT, Measurements were made with the antenna positioned in both the horizontal and vertical planes of Polarization, and the measurement antenna was varied from 1 m to 4 m. in height above the reference ground plane to obtain the maximum signal strength.

- (4) Below pre-scan procedure was first performed in order to find prominent frequency spectrum radiated emissions from 9KHz to 25GHz:
  - (a) Scanning the peak frequency spectrum with the antenna specified in step (3), and the EUT was rotated X,Y,Z three axis , the antenna height was varied from 1m to 4m(Except loop antenna, it's fixed 1m above ground.) ,only worst case is reported.
  - (b) Change work frequency or channel of device if practicable.
  - (c) Change modulation type of device if practicable.
  - (d) Change power supply range from 85% to 115% of the rated supply voltage
  - (e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions.

Spectrum frequency from 9KHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 18GHz to 25GHz, so below final test was performed with frequency range from 9KHz to 18GHz.

- (5) For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.
- (6) The emissions from 9KHz to 1GHz were measured based on CISPR QP detector except for the frequency bands 9-90KHz, 110-490KHz, for emissions from 9KHz-90KHz, 110KHz-490KHz and above 1GHz were measured based on average detector, for emissions above 1GHz, peak emissions also be measured and need comply with Peak limit.
- (7) The emissions from 9KHz to 1GHz, QP or average values were measured with EMI receiver with below RBW

| Frequency band | RBW    |
|----------------|--------|
| 9KHz-150KHz    | 200Hz  |
| 150KHz-30MHz   | 9KHz   |
| 30MHz-1GHz     | 120KHz |

- (8) For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure(according ANSI C63.10:2013 clause 4.2.3.2.3 procedure for average measure). Peak detector is used for Peak and AV measurement both.

## 9.5 TEST RESULT

### **PASS. (See below detailed test result)**

All the emissions except fundamental emission from 9KHz to 25GHz were comply with 15.209 limit.

Note1: According exploratory test no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so the final test was performed with frequency range from 30MHz to 18GHz and recorded in below.

Note2: For below test data, when the limit tabular marked “/” means this frequency point is the fundamental emission and no need comply with this limit.

## Test Result

**EUT** : DDT 3m Chamber  
 : Aferglow Wireless Controller  
 : for Wii  
**Tested By** : Vito  
**Power Supply** : DC 3V  
**Model Number** : PL-7602E  
**Condition** : Temp:24.5'C,Humi:55%,  
 : Press:100.1kPa  
**Test Mode** : Keeping Tx  
**Memo** :  
**Antenna/Distance** : VULB 9163 /3m

| Frequency             | Receiver       |          | Rx Antenna  |             | Cable loss | Amplifier Gain | Corrected Amplitude | FCC 15.247     |             |
|-----------------------|----------------|----------|-------------|-------------|------------|----------------|---------------------|----------------|-------------|
| (MHz)                 | Reading (dBμV) | PK/QP/AV | Polar (H/V) | Factor (dB) | (dB)       | (dB)           | (dBμV/m)            | Limit (dBμV/m) | Margin (dB) |
| Low Channel (2402)    |                |          |             |             |            |                |                     |                |             |
| 2400.0                | 62.34          | PK       | H           | 28.00       | 3.57       | 31.95          | 61.96               | 74.00          | -12.04      |
| 2400.0                | 49.13          | AV       | H           | 28.00       | 3.57       | 31.95          | 48.75               | 54.00          | -5.25       |
| 2400.0                | 63.14          | PK       | V           | 28.00       | 3.57       | 31.95          | 62.76               | 74.00          | -11.24      |
| 2400.0                | 50.06          | AV       | V           | 28.00       | 3.57       | 31.95          | 49.68               | 54.00          | -4.32       |
| 4804.0                | 60.23          | PK       | H           | 32.30       | 5.91       | 31.78          | 66.66               | 74.00          | -7.34       |
| 4804.0                | 42.16          | AV       | H           | 32.30       | 5.91       | 31.78          | 48.59               | 54.00          | -5.41       |
| 4804.0                | 61.49          | PK       | V           | 32.30       | 5.91       | 31.78          | 67.92               | 74.00          | -6.08       |
| 4804.0                | 43.11          | AV       | V           | 32.30       | 5.91       | 31.78          | 49.54               | 54.00          | -4.46       |
| 7206.0                | 56.84          | PK       | H           | 36.30       | 6.34       | 30.97          | 68.51               | 74.00          | -5.49       |
| 7206.0                | 37.58          | AV       | H           | 36.30       | 6.34       | 30.97          | 49.25               | 54.00          | -4.75       |
| 7206.0                | 57.09          | PK       | V           | 36.30       | 6.34       | 30.97          | 68.76               | 74.00          | -5.24       |
| 7206.0                | 38.14          | AV       | V           | 36.30       | 6.34       | 30.97          | 49.81               | 54.00          | -4.19       |
| 9608.0                | 53.26          | PK       | H           | 37.90       | 8.01       | 30.86          | 68.31               | 74.00          | -5.69       |
| 9608.0                | 34.59          | AV       | H           | 37.90       | 8.01       | 30.86          | 49.64               | 54.00          | -4.36       |
| 9608.0                | 54.18          | PK       | V           | 37.90       | 8.01       | 30.86          | 69.23               | 74.00          | -4.77       |
| 9608.0                | 35.56          | AV       | V           | 37.90       | 8.01       | 30.86          | 50.61               | 54.00          | -3.39       |
| 288.3                 | 50.26          | QP       | H           | 14.20       | 2.74       | 27.60          | 39.60               | 46.00          | -6.40       |
| 288.3                 | 52.47          | QP       | V           | 14.20       | 2.74       | 27.60          | 41.81               | 46.00          | -4.19       |
| Middle Channel (2441) |                |          |             |             |            |                |                     |                |             |
| 4882.0                | 60.23          | PK       | H           | 32.90       | 6.34       | 31.78          | 67.69               | 74.00          | -6.31       |
| 4882.0                | 41.26          | AV       | H           | 32.90       | 6.34       | 31.78          | 48.72               | 54.00          | -5.28       |
| 4882.0                | 61.45          | PK       | V           | 32.90       | 6.34       | 31.78          | 68.91               | 74.00          | -5.09       |
| 4882.0                | 42.13          | AV       | V           | 32.90       | 6.34       | 31.78          | 49.59               | 54.00          | -4.41       |
| 7323.0                | 45.34          | PK       | H           | 37.10       | 6.72       | 30.97          | 58.19               | 74.00          | -15.81      |
| 7323.0                | 32.58          | AV       | H           | 37.10       | 6.72       | 30.97          | 45.43               | 54.00          | -8.57       |
| 7323.0                | 47.01          | PK       | V           | 37.10       | 6.72       | 30.97          | 59.86               | 74.00          | -14.14      |
| 7323.0                | 34.12          | AV       | V           | 37.10       | 6.72       | 30.97          | 46.97               | 54.00          | -7.03       |

|                     |       |    |   |       |      |       |       |       |        |
|---------------------|-------|----|---|-------|------|-------|-------|-------|--------|
| 9764                | 44.59 | PK | H | 38.60 | 8.43 | 30.86 | 60.76 | 74.00 | -13.24 |
| 9764                | 33.65 | AV | H | 38.60 | 8.43 | 30.86 | 49.82 | 54.00 | -4.18  |
| 9764                | 46.48 | PK | V | 38.60 | 8.43 | 30.86 | 62.65 | 74.00 | -11.35 |
| 9764                | 33.67 | AV | V | 38.60 | 8.43 | 30.86 | 49.84 | 54.00 | -4.16  |
| 288.2               | 47.56 | QP | H | 14.20 | 2.74 | 27.60 | 36.90 | 46.00 | -9.10  |
| 288.2               | 49.86 | QP | V | 14.20 | 2.74 | 27.60 | 39.20 | 46.00 | -6.80  |
| High Channel (2480) |       |    |   |       |      |       |       |       |        |
| 4960.0              | 55.38 | PK | H | 33.1  | 6.39 | 31.78 | 63.09 | 74    | -10.91 |
| 4960.0              | 41.12 | AV | H | 33.1  | 6.39 | 31.78 | 48.83 | 54    | -5.17  |
| 4960.0              | 60.57 | PK | V | 33.1  | 6.39 | 31.78 | 68.28 | 74    | -5.72  |
| 4960.0              | 42.28 | AV | V | 33.1  | 6.39 | 31.78 | 49.99 | 54    | -4.01  |
| 7440.0              | 52.21 | PK | H | 37.2  | 6.77 | 30.97 | 65.21 | 74    | -8.79  |
| 7440.0              | 35.33 | AV | H | 37.2  | 6.77 | 30.97 | 48.33 | 54    | -5.67  |
| 7440.0              | 54.59 | PK | V | 37.2  | 6.77 | 30.97 | 67.59 | 74    | -6.41  |
| 7440.0              | 36.41 | AV | V | 37.2  | 6.77 | 30.97 | 49.41 | 54    | -4.59  |
| 9920.0              | 50.75 | PK | H | 38.7  | 8.48 | 30.86 | 67.07 | 74    | -6.93  |
| 9920.0              | 32.93 | AV | H | 38.7  | 8.48 | 30.86 | 49.25 | 54    | -4.75  |
| 9920.0              | 52.15 | PK | V | 38.7  | 8.48 | 30.86 | 68.47 | 74    | -5.53  |
| 9920.0              | 34.24 | AV | V | 38.7  | 8.48 | 30.86 | 50.56 | 54    | -3.44  |
| 288.2               | 47.58 | QP | H | 14.2  | 2.74 | 27.6  | 36.92 | 46    | -9.08  |
| 288.2               | 49.63 | QP | V | 14.2  | 2.74 | 27.6  | 38.97 | 46    | -7.03  |

Note: 1. Result Level = Read Level + Antenna Factor + Cable loss - Amp Gain

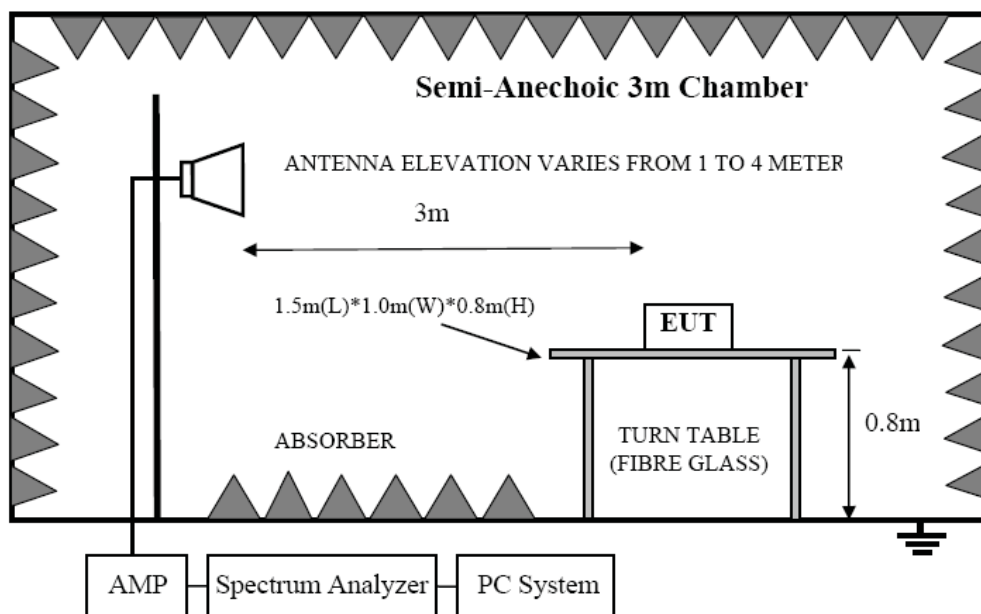
2. If Peak Result comply with QP limit, QP Result is deemed to comply with QP limit

## 10.BAND EDGE

### 10.1TEST EQUIPMENT

| Item | Equipment                  | Manufacturer | Model No. | Serial No.   | Cal Due.   | Cal. Interval |
|------|----------------------------|--------------|-----------|--------------|------------|---------------|
| 1    | EMI Test Receiver          | R&S          | ESU8      | 100316       | 2015/12/25 | 1 Year        |
| 2    | Spectrum analyzer          | R&S          | FSU       | 1166.1660.26 | 2015/07/13 | 1 Year        |
| 3    | Trilog Broadband Antenna   | Schwarzbeck  | VULB9163  | 9163-462     | 2015/12/26 | 1 Year        |
| 4    | Double Ridged Horn Antenna | R&S          | HF907     | 100276       | 2015/12/26 | 1 Year        |
| 5    | Pre-amplifier              | A.H.         | PAM0-0118 | 360          | 2015/12/26 | 1 Year        |
| 6    | RF Cable                   | R&S          | R01       | 10403        | 2015/12/26 | 1 Year        |
| 7    | RF Cable                   | R&S          | R02       | 10512        | 2015/12/26 | 1 Year        |

### 10.2 BLOCK DIAGRAM OF TEST SETUP



### 10.3LIMIT

All restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions outside operation frequency band 2400MHz to 2483.5MHz shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

### 10.4TEST PROCEDURE

Same with clause 8.4

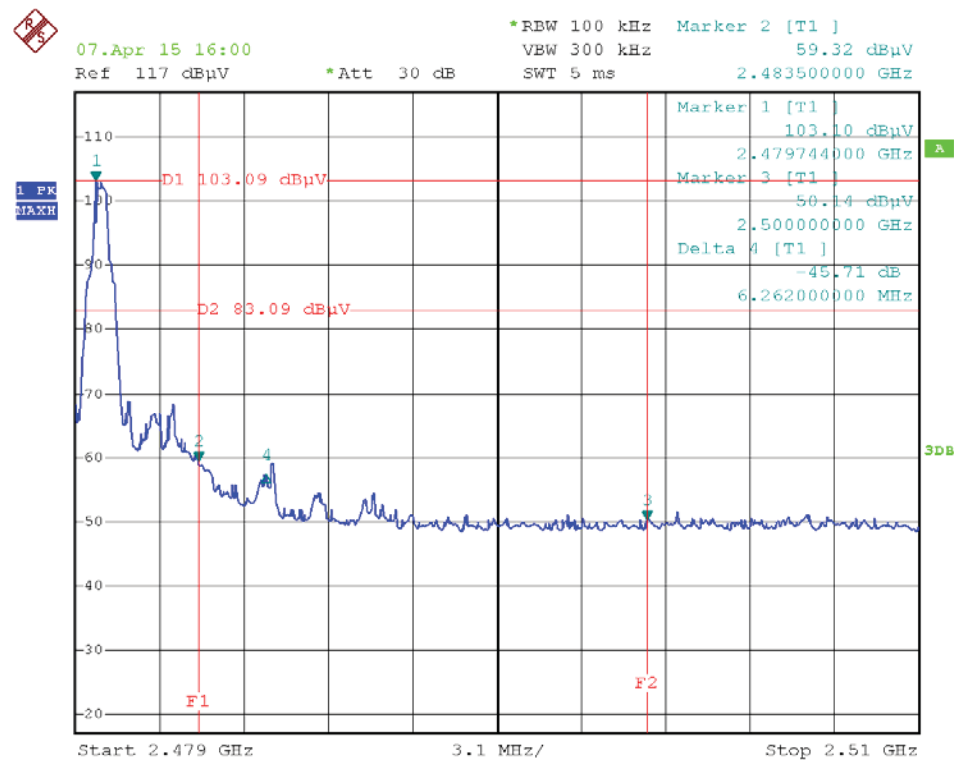
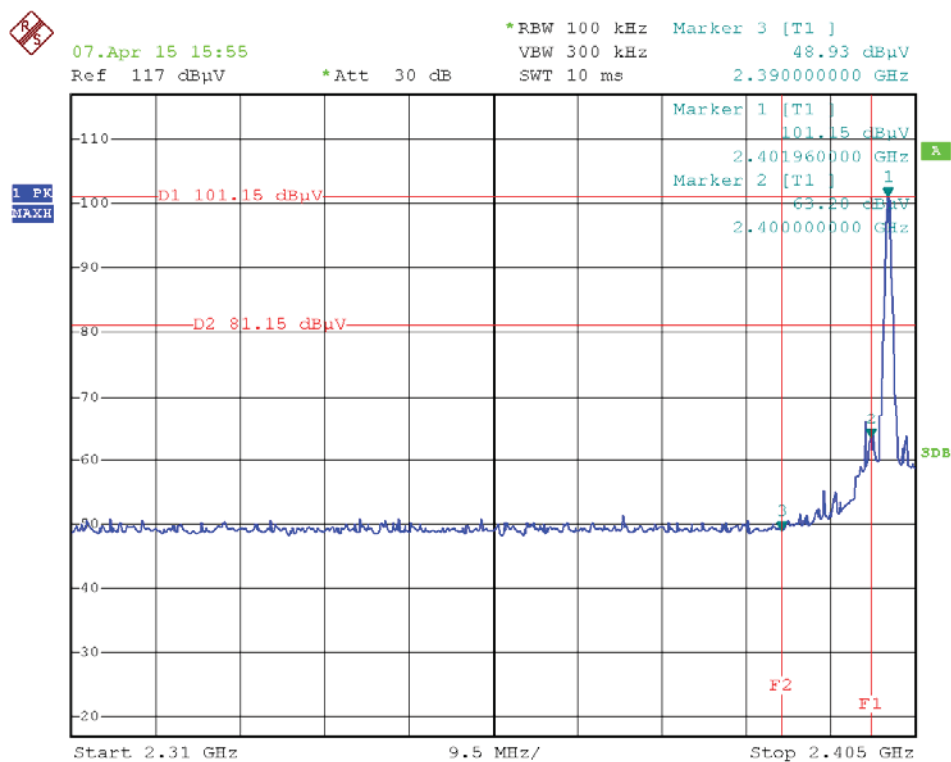
Remark: All restriction band have been tested, and only the worse case is shown in report.

### 10.5TEST RESULT

| Frequency       | Receiver       |          | Rx Antenna  |             | Cable loss | Amplifier Gain | Corrected Amplitude | FCC 15.247     |             |
|-----------------|----------------|----------|-------------|-------------|------------|----------------|---------------------|----------------|-------------|
| (MHz)           | Reading (dBμV) | PK/QP/AV | Polar (H/V) | Factor (dB) | (dB)       | (dB)           | (dBμV/m)            | Limit (dBμV/m) | Margin (dB) |
| Lowest Channel  |                |          |             |             |            |                |                     |                |             |
| 2390.0          | 63.28          | PK       | H           | 27.80       | 3.57       | 31.95          | 62.70               | 74.00          | -11.30      |
| 2390.0          | 49.56          | AV       | H           | 27.80       | 3.57       | 31.95          | 48.98               | 54.00          | -5.02       |
| 2390.0          | 64.43          | PK       | V           | 27.80       | 3.57       | 31.95          | 63.85               | 74.00          | -10.15      |
| 2390.0          | 50.02          | AV       | V           | 27.80       | 3.57       | 31.95          | 49.44               | 54.00          | -4.56       |
| Highest Channel |                |          |             |             |            |                |                     |                |             |
| 2483.5          | 62.02          | PK       | H           | 28.70       | 3.72       | 31.93          | 62.51               | 74.00          | -11.49      |
| 2483.5          | 46.15          | AV       | H           | 28.70       | 3.72       | 31.93          | 46.64               | 54.00          | -7.36       |
| 2483.5          | 64.58          | PK       | V           | 28.70       | 3.72       | 31.93          | 65.07               | 74.00          | -8.93       |
| 2483.5          | 47.09          | AV       | V           | 28.70       | 3.72       | 31.93          | 47.58               | 54.00          | -6.42       |

Note: 1. Result Level = Read Level + Antenna Factor + Cable Loss- Amplifier Gain

2. After test and evaluation hopping off mode and hopping on mode, will record worst case (hopping off mode) in this report.



## **11.ANTENNA REQUIREMENTS**

### **11.1 Limit**

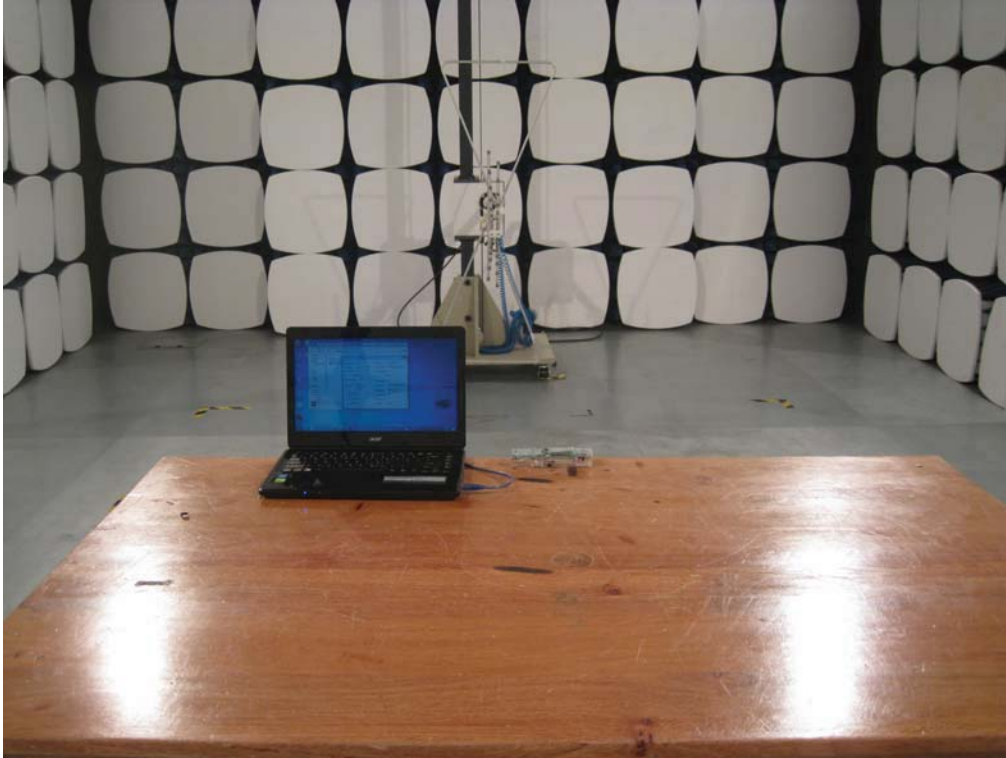
For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **11.2 RESULT**

The antennas used for this product are dipole antenna and other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 2.32dBi.

## 12 TEST SETUP PHOTOGRAPH

**Radiated Measurement Photos(Below 1GHz)**

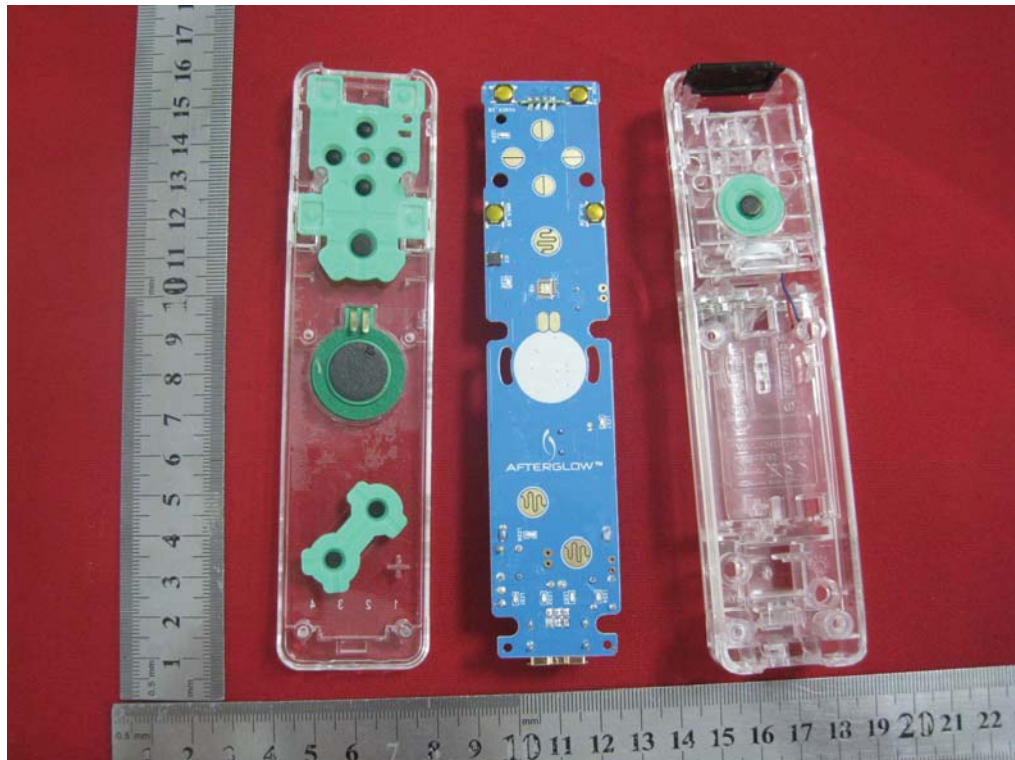
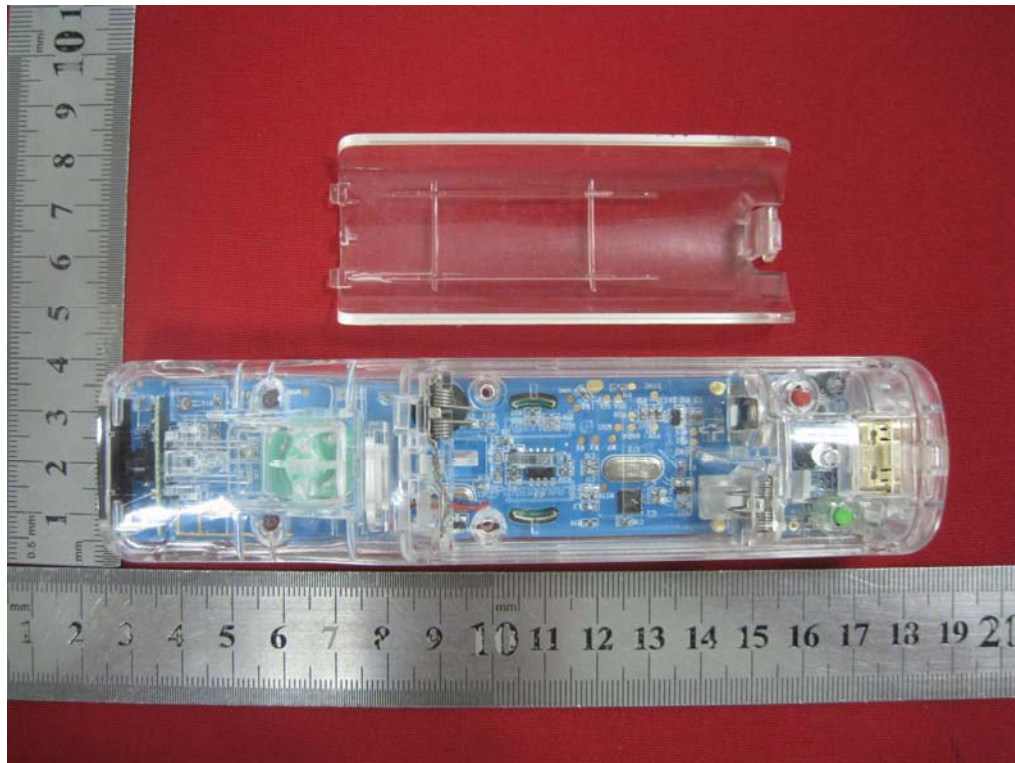


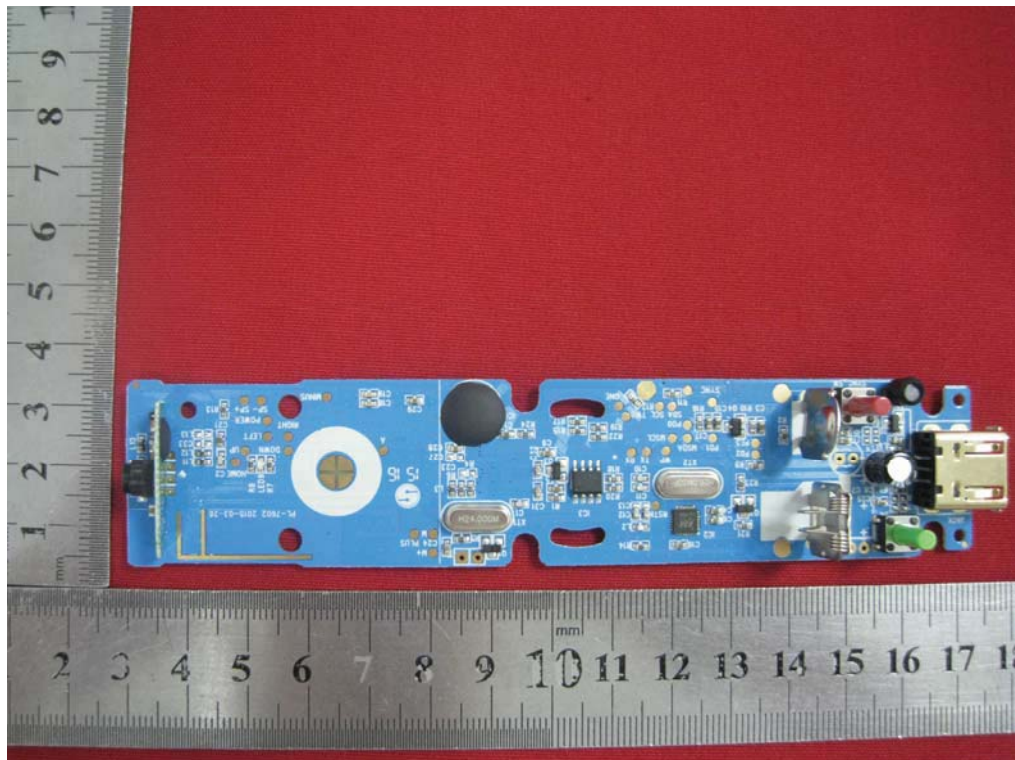
**Radiated Measurement Photos (Above 1GHz)**

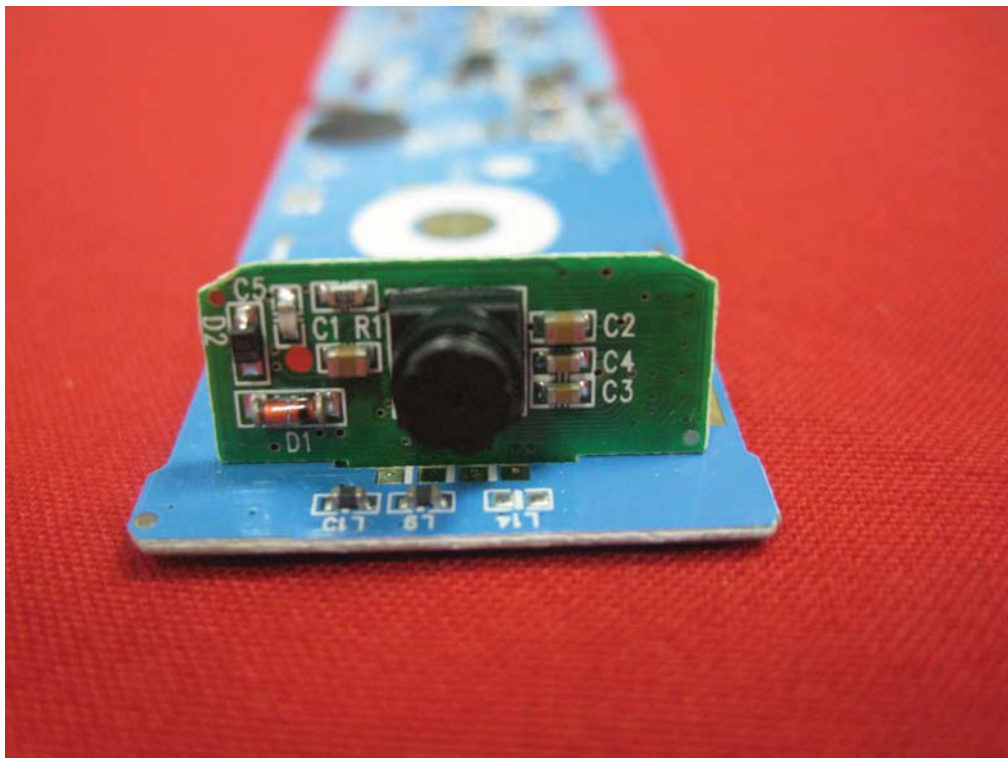


## 12 PHOTOS OF THE EUT









**END OF REPORT**