



# Variant FCC RF Test Report

**APPLICANT** : Honeywell International Inc.  
**EQUIPMENT** : Dolphin 7800  
**BRAND NAME** : Honeywell  
**MODEL NAME** : Dolphin® 7800  
**FCC ID** : HD57800LW  
**STANDARD** : FCC Part 15 Subpart E §15.407  
**CLASSIFICATION** : (NII) Unlicensed National Information Infrastructure

This is a variant report which is only valid together with the original test report. The product was received on Oct. 06, 2015 and testing was completed on Nov. 02, 2015. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

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Reviewed by: Joseph Lin / Supervisor

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Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

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FCC ID : HD57800LW

Page Number : 1 of 25

Report Issued Date : Nov. 23, 2015

Report Version : Rev. 02

Report Template No.: BU5-FR15EWLB4 AC MA Version 1.0



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## REVISION HISTORY

| REPORT NO.  | VERSION | DESCRIPTION                                                                                                                                                                                    | ISSUED DATE   |
|-------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| FR162005-21 | Rev. 01 | This is a variant report by updating the standard. The original report which can be referred to Sporton Report Number FR162005-01.                                                             | Nov. 16, 2015 |
| FR162005-21 | Rev. 02 | Adding WLAN Band 1~3 which is including 5600MHz ~ 5650MHz. Since the change of adding 5600MHz ~ 5650MHz is no need to be tested, all the test cases were performed with Band 4 (for new rule). | Nov. 23, 2015 |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |
|             |         |                                                                                                                                                                                                |               |



## SUMMARY OF TEST RESULT

| Report Section | FCC Rule           | Description                            | Limit                          | Result | Remark                              |
|----------------|--------------------|----------------------------------------|--------------------------------|--------|-------------------------------------|
| 3.1            | 15.403(i)          | 6dB, 26dB, and 99% Occupied Bandwidth  | > 500kHz                       | Pass   | -                                   |
| 3.2            | 15.407(a)          | Maximum Conducted Output Power         | ≤ 30 dBm                       | Pass   | -                                   |
| 3.3            | 15.407(a)          | Power Spectral Density                 | ≤ 30 dBm/500kHz                | Pass   | -                                   |
| 3.4            | 15.407(b)          | Unwanted Emissions                     | ≤ -17, -27 dBm/MHz & 15.209(a) | Pass   | Under limit 2.59 dB at 5724.920 MHz |
| 3.5            | 15.407(g)          | Frequency Stability                    | Within Operation Band          | Pass   | -                                   |
| 3.6            | 15.407(c)          | Automatically Discontinue Transmission | Discontinue Transmission       | Pass   | -                                   |
| 3.7            | 15.203 & 15.407(a) | Antenna Requirement                    | N/A                            | Pass   | -                                   |

**Remark:**

1. The radiated emission test worse cases were performed on FR162005-20.
2. The similarity between these devices only difference is the integrated WWAN module.



# 1 General Description

## 1.1 Applicant

Honeywell International Inc.

9680 Old Bailes Road, Fort Mill, SC 29707 USA

## 1.2 Manufacturer

Honeywell International Inc.

9680 Old Bailes Road, Fort Mill, SC 29707 USA

## 1.3 Feature of Equipment Under Test

| Product Feature                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| Equipment                       | Dolphin 7800                                                      |
| Brand Name                      | Honeywell                                                         |
| Model Name                      | Dolphin® 7800                                                     |
| FCC ID                          | HD57800LW                                                         |
| Sample 1                        | EUT with Keypad 1 (QWERTY keypad, 46 keys)                        |
| Sample 2                        | EUT with Keypad 2 (Numeric keypad, 30 keys with LED backlight)    |
| EUT supports Radios application | GSM/EGPRS/WCDMA/HSPA<br>WLAN 11a/b/g/n HT20<br>Bluetooth v2.1 EDR |
| HW Version                      | 010                                                               |
| SW Version                      | 01                                                                |
| EUT Stage                       | Production Unit                                                   |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Product Specification of Equipment Under Test

| Product Specification subjective to this standard |                                                                                          |
|---------------------------------------------------|------------------------------------------------------------------------------------------|
| Tx/Rx Channel Frequency Range                     | 5180 MHz ~ 5240 MHz<br>5260 MHz ~ 5320 MHz<br>5500 MHz ~ 5700 MHz<br>5745 MHz ~ 5825 MHz |
| Maximum Output Power                              | 802.11a : 15.06 dBm / 0.0321 W<br>802.11n HT20 : 15.02 dBm / 0.0318 W                    |
| 99% Occupied Bandwidth                            | 802.11a : 18.05 MHz<br>802.11n HT20 : 19.15 MHz                                          |
| Type of Modulation                                | OFDM (BPSK / QPSK / 16QAM / 64QAM)                                                       |
| Antenna Type                                      | PIFA Antenna                                                                             |
| Antenna Gain                                      | 1.60 dBi                                                                                 |

## 1.5 Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

|                    |                                                                                                                                                      |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Site          | SPORTON INTERNATIONAL INC.                                                                                                                           |
| Test Site Location | No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park,<br>Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| Test Site No.      | Sporton Site No.                                                                                                                                     |
|                    | TH05-HY                                                                                                                                              |

|                    |                                                                                                                                        |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| Test Site          | SPORTON INTERNATIONAL INC.                                                                                                             |
| Test Site Location | No.58, Aly. 75, Ln. 564, Wenhua 3rd Rd. Guishan Dist,<br>Taoyuan City, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| Test Site No.      | Sporton Site No.                                                                                                                       |
|                    | 03CH12-HY                                                                                                                              |

**Note:** The test site complies with ANSI C63.4 2009 requirement.

## 1.7 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart E
- FCC KDB 789033 D02 General UNII Test Procedures New Rules v01
- ANSI C63.10-2009

### Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry tracking number 961829.

## 2 Test Configuration of Equipment Under Test

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiated emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

The final configuration from all the combinations and the worst-case data rates were investigated by measuring the maximum power across all the data rates and modulation modes under section 2.2.

Based on the worst configuration found above, the RF power setting is set individually to meet FCC compliance limit for the final conducted and radiated tests shown in section 2.3.

### 2.1 Carrier Frequency and Channel

| Frequency Band                    | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------------------------|---------|-------------|---------|-------------|
| 5150-5250 MHz<br>Band 1 (U-NII-1) | 36      | 5180        | 44      | 5220        |
|                                   | 40      | 5200        | 48      | 5240        |

| Frequency Band                     | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|------------------------------------|---------|-------------|---------|-------------|
| 5250-5350 MHz<br>Band 2 (U-NII-2A) | 52      | 5260        | 60      | 5300        |
|                                    | 56      | 5280        | 64      | 5320        |

| Frequency Band                     | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|------------------------------------|---------|-------------|---------|-------------|
| 5470-5725 MHz<br>Band 3 (U-NII-2C) | 100     | 5500        | 124     | 5620        |
|                                    | 104     | 5520        | 128     | 5640        |
|                                    | 108     | 5540        | 132     | 5660        |
|                                    | 112     | 5560        | 136     | 5680        |
|                                    | 116     | 5580        | 140     | 5700        |
|                                    | 120     | 5600        |         |             |

| Frequency Band                       | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|--------------------------------------|---------|-------------|---------|-------------|
| 5725-5850 MHz<br>Band 4<br>(U-NII-3) | 149     | 5745        | 157     | 5785        |
|                                      | 151     | 5755        | 159     | 5795        |
|                                      | 153     | 5765        | 161     | 5805        |
|                                      | 155     | 5775        | 165     | 5825        |

## 2.2 Pre-Scanned RF Power

Preliminary tests were performed in different data rate and data rate associated with the highest power were chosen for full test in the following tables.

| 5GHz 802.11a mode   |        |        |         |         |         |         |         |         |
|---------------------|--------|--------|---------|---------|---------|---------|---------|---------|
| Data Rate (MHz)     | 6M bps | 9M bps | 12M bps | 18M bps | 24M bps | 36M bps | 48M bps | 54M bps |
| Average Power (dBm) | 15.06  | 15.05  | 15.04   | 15.01   | 15.05   | 15.02   | 15.05   | 14.94   |

| 5GHz 802.11n HT20 mode |       |       |       |       |       |       |       |       |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Data Rate (MHz)        | MCS0  | MCS1  | MCS2  | MCS3  | MCS4  | MCS5  | MCS6  | MCS7  |
| Average Power (dBm)    | 15.02 | 15.01 | 15.00 | 15.01 | 15.00 | 14.87 | 14.91 | 13.80 |

## 2.3 Test Mode

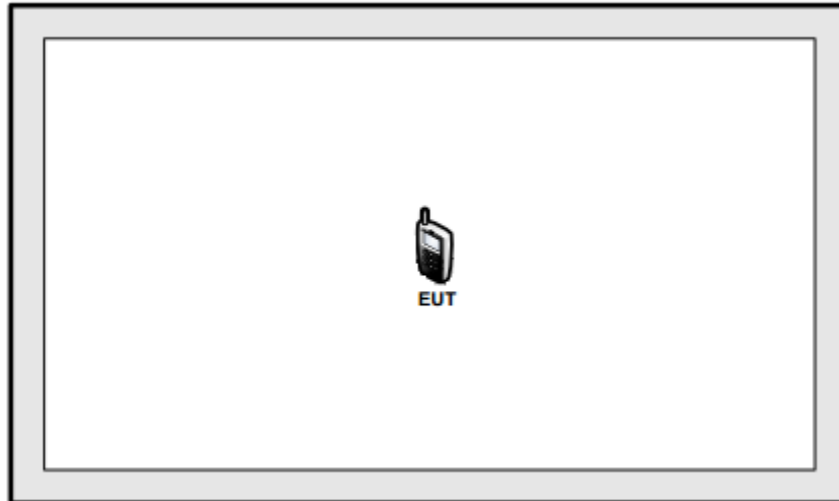
Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates from the power table described in section 2.2.

| Modulation   | Data Rate |
|--------------|-----------|
| 802.11a      | 6 Mbps    |
| 802.11n HT20 | MCS0      |

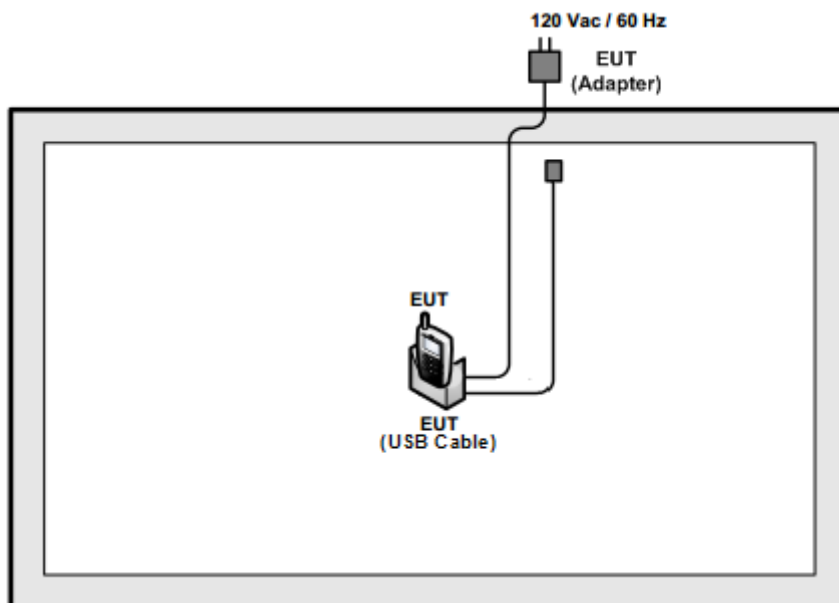
| Ch. # |        | Band IV : 5725-5850 MHz |              |
|-------|--------|-------------------------|--------------|
|       |        | 802.11a                 | 802.11n HT20 |
| L     | Low    | 149                     | 149          |
| M     | Middle | 157                     | 157          |
| H     | High   | 165                     | 165          |

## 2.4 Connection Diagram of Test System

<WLAN Tx Mode>



<WLAN Tx Mode with Adapter and USB Cable>



## 2.5 EUT Operation Test Setup

For WLAN function, programmed RF utility, "FCC Tx tool" installed in the EUT provide functions like channel selection and power level for continuous transmitting and receiving signals.



## 2.6 Measurement Results Explanation Example

**For all conducted test items:**

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example :

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 4.2 + 10 = 14.2 \text{ (dB)}\end{aligned}$$

### **3 Test Result**

#### **3.1 6dB and 26dB and 99% Occupied Bandwidth Measurement**

##### **3.1.1 Description of 6dB and 26dB and 99% Occupied Bandwidth**

The minimum 6 dB bandwidth shall be at least 500 kHz.

26dB and 99% Occupied bandwidth are reporting only.

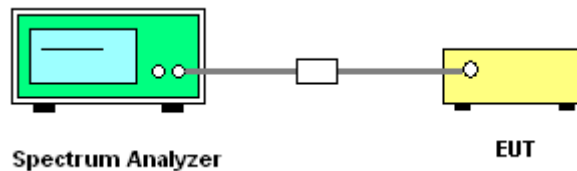
##### **3.1.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

##### **3.1.3 Test Procedures**

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.  
Section C) Emission bandwidth for the band 5.725-5.85GHz
2. Set RBW = 100kHz.
3. Set the VBW  $\geq 3 \times$  RBW.
4. Detector = Peak.
5. Trace mode = max hold
6. Measure the maximum width of the emission that is 6 dB down from the peak of the emission.
7. Measure and record the results in the test report.

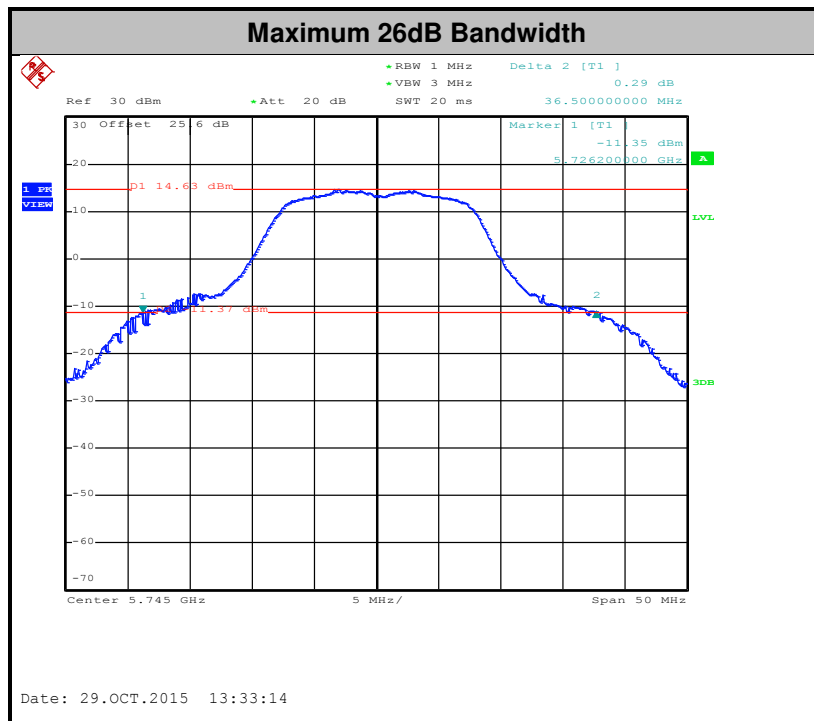
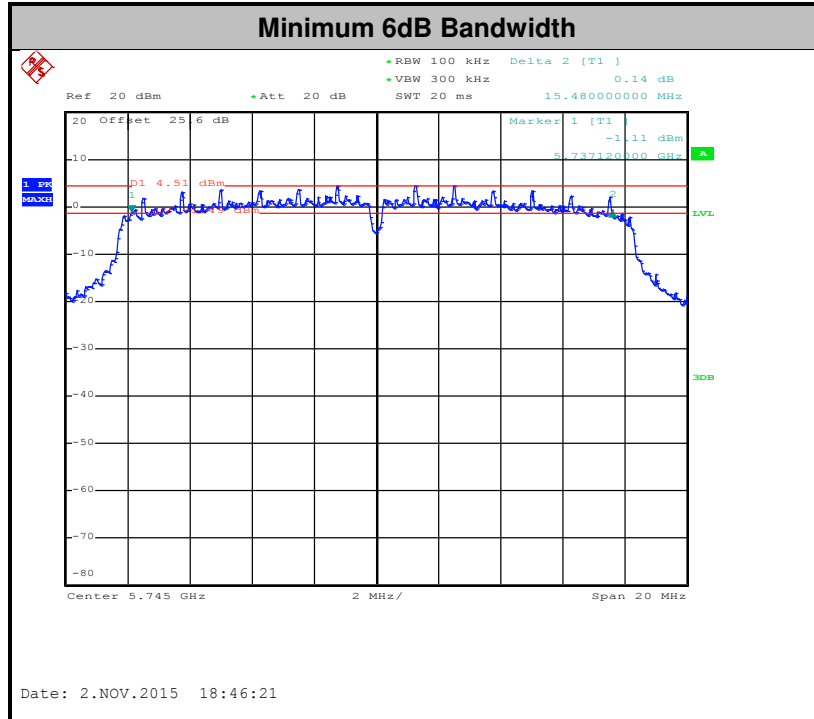
##### **3.1.4 Test Setup**

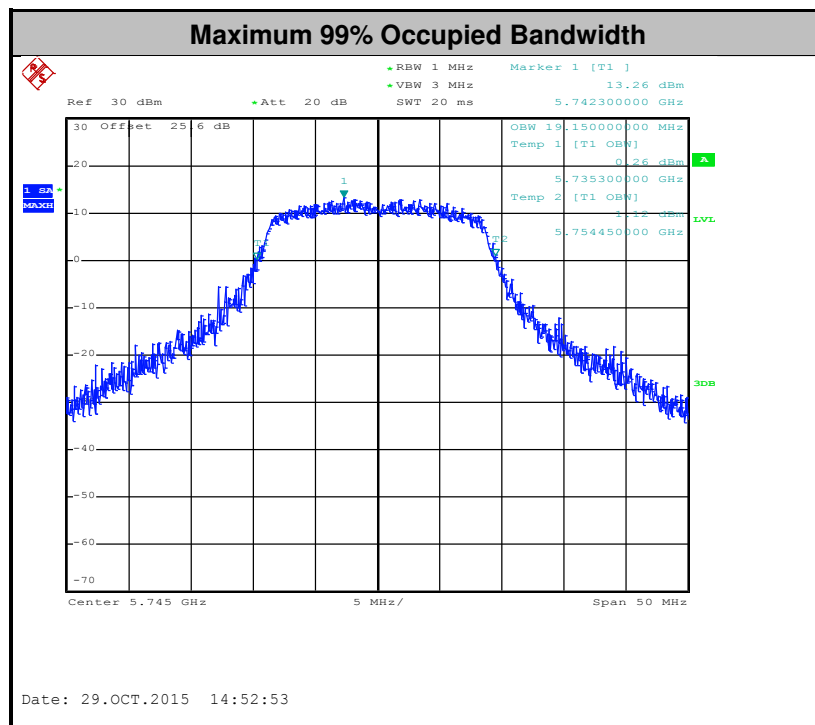




### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.





**Note:** The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

## **3.2 Maximum Conducted Output Power Measurement**

### **3.2.1 Limit of Maximum Conducted Output Power**

For the band 5.725–5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **3.2.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

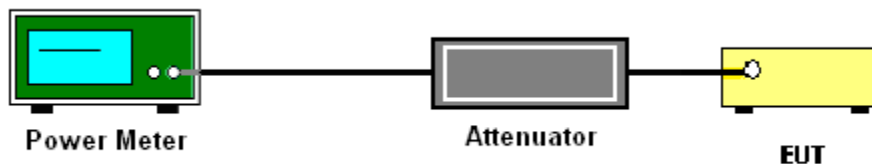
### **3.2.3 Test Procedures**

The testing follows Method PM of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

Method PM (Measurement using an RF average power meter):

1. Measurement is performed using a wideband RF power meter.
2. The EUT is configured to transmit continuously with a consistent duty cycle at its maximum power control level.
3. Measure the average power of the transmitter, and the average power is corrected with duty factor,  $10 \log(1/x)$ , where x is the duty cycle.

### **3.2.4 Test Setup**



### **3.2.5 Test Result of Maximum Conducted Output Power**

Please refer to Appendix A.



### **3.3 Power Spectral Density Measurement**

#### **3.3.1 Limit of Power Spectral Density**

For the band 5.725–5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band.

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **3.3.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

#### **3.3.3 Test Procedures**

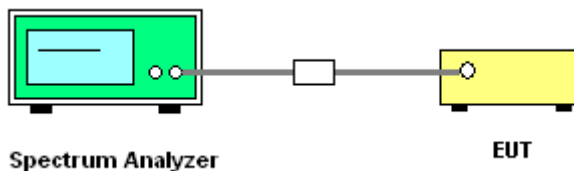
The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.  
Section F) Maximum power spectral density.

##### **# Method SA-2 #**

(trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction).

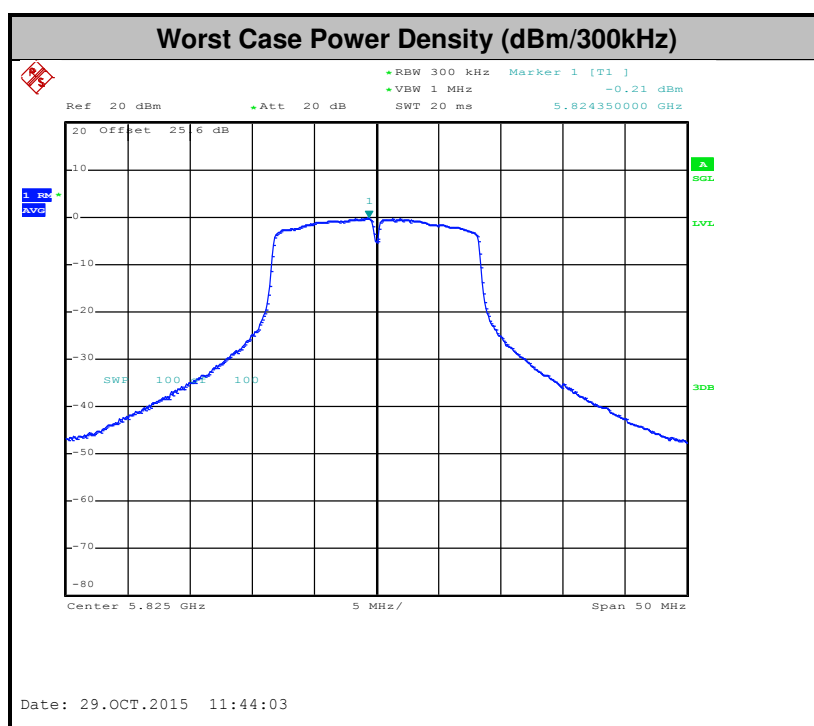
1. The testing follows Method SA-2 of FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.
  - Measure the duty cycle.
  - Set span to encompass the entire emission bandwidth (EBW) of the signal.
  - Set RBW = 300 kHz.
  - Set VBW  $\geq$  1 MHz.
  - Number of points in sweep  $\geq$  2 Span / RBW.
  - Sweep time = auto.
  - Detector = RMS
  - Trace average at least 100 traces in power averaging mode.
  - Add  $10 \log(500\text{kHz}/\text{RBW})$  to the test result.
  - Add  $10 \log(1/x)$ , where  $x$  is the duty cycle, to the measured power in order to compute the average power during the actual transmission times. For example, add  $10 \log(1/0.25) = 6 \text{ dB}$  if the duty cycle is 25 percent.
2. The RF output of EUT was connected to the spectrum analyzer by a low loss cable.
3. Each plot has already offset with cable loss, and attenuator loss. Measure the PPSD and record it.

### 3.3.4 Test Setup



### 3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.



### 3.4 Unwanted Emissions Measurement

This section as specified in FCC Part 15.407(b) is to measure unwanted emissions through radiated measurement for band edge spurious emissions and out of band emissions measurement. The unwanted emissions shall comply with 15.407(b)(1) to (6), and restricted bands per FCC Part 15.205.

#### 3.4.1 Limit of Unwanted Emissions

- (1) For transmitters operating in the 5725-5850 MHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz (78.3dBμV/m); for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz (68.3dBμV/m).
- (2) Unwanted spurious emissions fallen in restricted bands per FCC Part 15.205 shall comply with the general field strength limits set forth in § 15.209 as below table,

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009 – 0.490   | 2400/F(kHz)                       | 300                           |
| 0.490 – 1.705   | 24000/F(kHz)                      | 30                            |
| 1.705 – 30.0    | 30                                | 30                            |
| 30 – 88         | 100                               | 3                             |
| 88 – 216        | 150                               | 3                             |
| 216 - 960       | 200                               | 3                             |
| Above 960       | 500                               | 3                             |

**Note:** The following formula is used to convert the EIRP to field strength.

$$E = \frac{1000000\sqrt{30P}}{3} \quad \mu\text{V/m, where P is the eirp (Watts)}$$

| EIRP (dBm) | Field Strength at 3m (dBμV/m) |
|------------|-------------------------------|
| -17        | 78.3                          |
| - 27       | 68.3                          |

- (3) KDB 789033 D02 General UNII Test Procedures New Rules v01 G)2)c) As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.

### 3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.4.3 Test Procedures

1. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v01.

Section G) Unwanted emissions measurement.

(1) Procedure for Unwanted Emissions Measurements Below 1000MHz

- RBW = 120 kHz
- VBW = 300 kHz
- Detector = Peak
- Trace mode = max hold

(2) Procedure for Peak Unwanted Emissions Measurements Above 1000 MHz

- RBW = 1 MHz
- VBW  $\geq$  3 MHz
- Detector = Peak
- Sweep time = auto
- Trace mode = max hold

(3) Procedures for Average Unwanted Emissions Measurements Above 1000MHz

- RBW = 1 MHz
- VBW = 10 Hz, when duty cycle is no less than 98 percent.
- VBW  $\geq$  1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

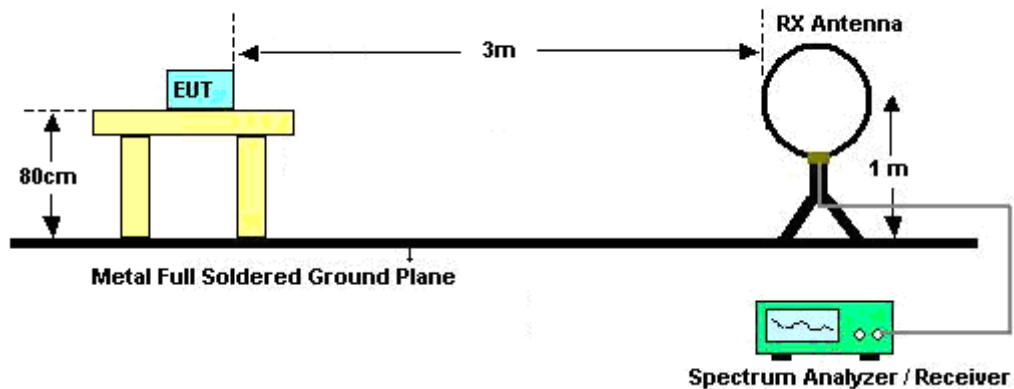
| Band         | Duty Cycle (%) | T(us)   | 1/T(kHz) | VBW Setting |
|--------------|----------------|---------|----------|-------------|
| 802.11a      | 83.18          | 5340.00 | 0.19     | 300Hz       |
| 802.11n HT20 | 83.33          | 5000.00 | 0.20     | 300Hz       |

2. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
3. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
4. The antenna is a broadband antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then adjust the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.

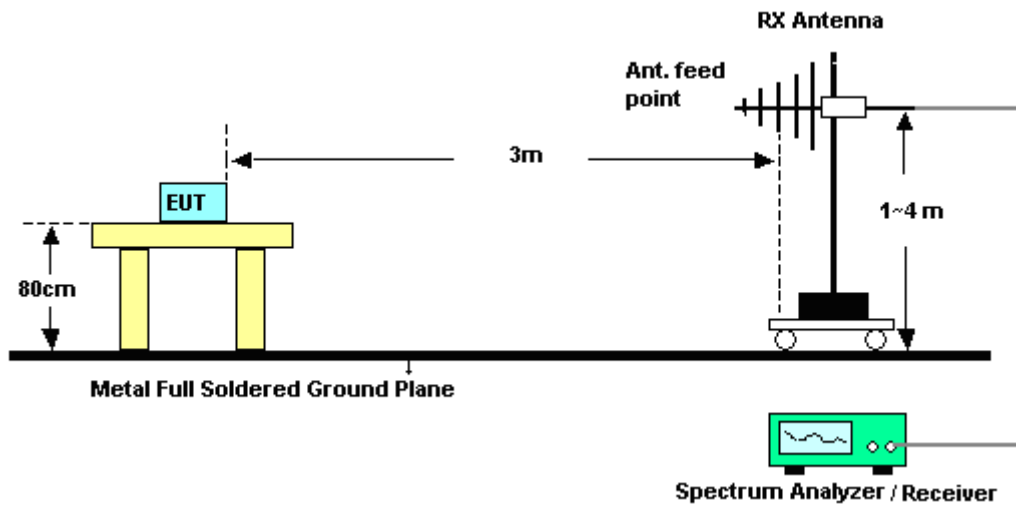
7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

### 3.4.4 Test Setup

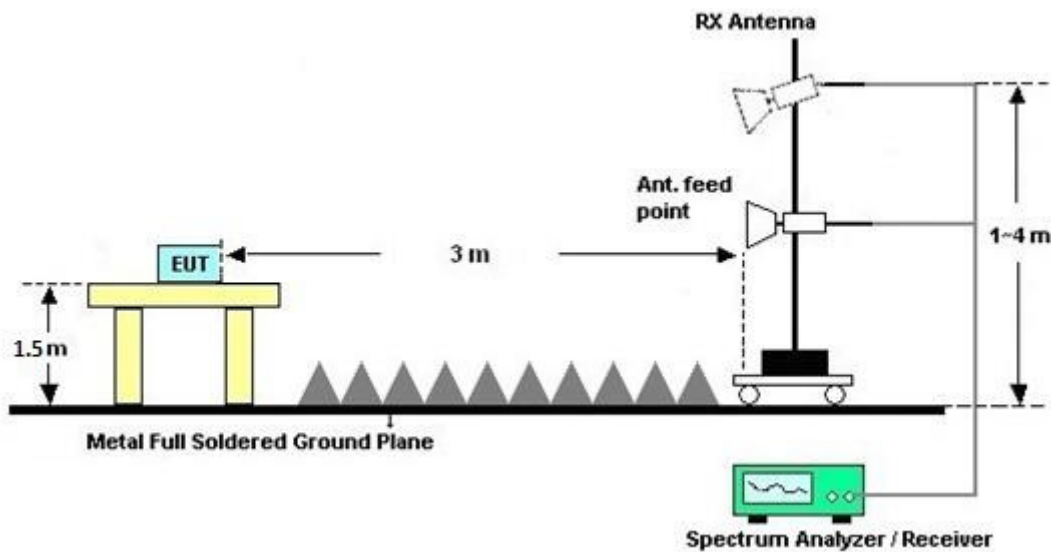
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.4.5 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

### 3.4.6 Test Result of Radiated Band Edges

Please refer to Appendix B.

### 3.4.7 Test Result of Unwanted Radiated Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix B.

## 3.5 Frequency Stability Measurement

### 3.5.1 Limit of Frequency Stability

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

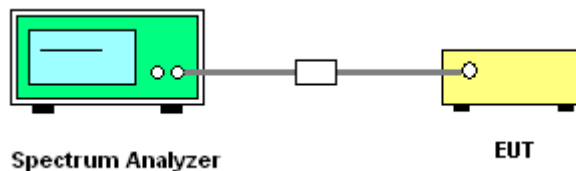
### 3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

### 3.5.3 Test Procedures

1. To ensure emission at the band edge is maintained within the authorized band, those values shall be measured by radiation emissions at upper and lower frequency points, and finally compensated by frequency deviation as procedures below.
2. The EUT was operated at the maximum output power, and connected to the spectrum analyzer, which is set to maximum hold function and peak detector. The peak value of the power envelope was measured and noted. The upper and lower frequency points were respectively measured relatively 10dB lower than the measured peak value.
3. The frequency deviation was calculated by adding the upper frequency point and the lower frequency point divided by two. Those detailed values of frequency deviation are provided in table below.

### 3.5.4 Test Setup



### 3.5.5 Test Result of Frequency Stability

Please refer to Appendix A.



## **3.6 Automatically Discontinue Transmission**

### **3.6.1 Limit of Automatically Discontinue Transmission**

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization to describe how this requirement is met.

### **3.6.2 Measuring Instruments**

The measuring equipment is listed in the section 4 of this test report.

### **3.6.3 Test Result of Automatically Discontinue Transmission**

While the EUT is not transmitting any information, the EUT can automatically discontinue transmission and become standby mode for power saving. The EUT can detect the controlling signal of ACK message transmitting from remote device and verify whether it shall resend or discontinue transmission.



## **3.7 Antenna Requirements**

### **3.7.1 Standard Applicable**

According to FCC 47 CFR Section 15.407(a)(1)(2), if transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### **3.7.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.7.3 Antenna Gain**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.



## 4 List of Measuring Equipment

| Instrument                | Manufacturer    | Model No.                  | Serial No.  | Characteristics   | Calibration Date | Test Date                        | Due Date      | Remark                   |
|---------------------------|-----------------|----------------------------|-------------|-------------------|------------------|----------------------------------|---------------|--------------------------|
| Power Meter               | Anritsu         | ML2495A                    | 1218006     | 300MHz~40GHz      | Oct. 07, 2015    | Oct. 23, 2015 ~<br>Nov. 02, 2015 | Oct. 06, 2016 | Conducted<br>(TH05-HY)   |
| Power Sensor              | Anritsu         | MA2411B                    | 1207363     | 300MHz~40GHz      | Oct. 07, 2015    | Oct. 23, 2015 ~<br>Nov. 02, 2015 | Oct. 06, 2016 | Conducted<br>(TH05-HY)   |
| Spectrum Analyzer         | Rohde & Schwarz | FSP40                      | 100055      | 9kHz-40GHz        | Jun. 18, 2015    | Oct. 23, 2015 ~<br>Nov. 02, 2015 | Jun. 17, 2016 | Conducted<br>(TH05-HY)   |
| Programmable Power Supply | GW Instek       | PSS-2005                   | EL890089    | 1V~20V<br>0.5A~5A | Jan. 14, 2015    | Oct. 23, 2015 ~<br>Nov. 02, 2015 | Jan. 13, 2016 | Conducted<br>(TH05-HY)   |
| Temperature Chamber       | ESPEC           | SH-641                     | 92013720    | -40°C~90°C        | Sep. 08, 2015    | Oct. 23, 2015 ~<br>Nov. 02, 2015 | Sep. 07, 2016 | Conducted<br>(TH05-HY)   |
| Preamplifier              | MITEQ           | AMF-7D-0010<br>1800-30-10P | 1815698     | 1GHz~18GHz        | Dec. 12, 2014    | Oct. 16, 2015~<br>Oct. 21, 2015  | Dec. 11, 2015 | Radiation<br>(03CH12-HY) |
| Bilog Antenna             | TESEQ           | CBL 6111D                  | 35414       | 30MHz~1GHz        | Oct. 24, 2014    | Oct. 16, 2015~<br>Oct. 21, 2015  | Oct. 23, 2015 | Radiation<br>(03CH12-HY) |
| Antenna Mast              | EMEC            | AM-BS-4500-B               | N/A         | 1m~4m             | N/A              | Oct. 16, 2015~<br>Oct. 21, 2015  | N/A           | Radiation<br>(03CH12-HY) |
| Turn Table                | EMEC            | TT2000                     | N/A         | 0-360 degree      | N/A              | Oct. 16, 2015~<br>Oct. 21, 2015  | N/A           | Radiation<br>(03CH12-HY) |
| Spectrum Analyzer         | Keysight        | N9010A                     | MY54200485  | 10Hz ~ 44GHZ      | Sep. 24, 2015    | Oct. 16, 2015~<br>Oct. 21, 2015  | Dec. 14, 2015 | Radiation<br>(03CH12-HY) |
| Horn Antenna              | SCHWARZBECK     | BBHA 9120D                 | 9120D-1328  | 1GHz ~ 18GHz      | Nov. 05, 2014    | Oct. 16, 2015~<br>Oct. 21, 2015  | Nov. 04, 2015 | Radiation<br>(03CH12-HY) |
| Preamplifier              | COM-POWER       | PA-103A                    | 161075      | 10MHz~1GHz        | Apr. 09, 2015    | Oct. 16, 2015~<br>Oct. 21, 2015  | Apr. 08, 2016 | Radiation<br>(03CH12-HY) |
| Horn Antenna              | SCHWARZBECK     | BBHA 9170                  | BBHA9170584 | 18GHz- 40GHz      | Nov. 03, 2014    | Oct. 16, 2015~<br>Oct. 21, 2015  | Nov. 02, 2015 | Radiation<br>(03CH12-HY) |
| Loop Antenna              | TESEQ           | HLA 6120                   | 31244       | 9kHz~30MHz        | Feb. 02, 2015    | Oct. 16, 2015~<br>Oct. 21, 2015  | Feb. 01, 2016 | Radiation<br>(03CH12-HY) |
| Preamplifier              | MITEQ           | JS44-1800400<br>0-33-8P    | 1840917     | 18GHz ~40GHz      | Jun. 02, 2015    | Oct. 16, 2015~<br>Oct. 21, 2015  | Jun. 01, 2016 | Radiation<br>(03CH12-HY) |
| Preamplifier              | Agilent         | 8449B                      | 3008A02375  | 1GHz~ 26.5GHz     | Jan. 15, 2015    | Oct. 16, 2015~<br>Oct. 21, 2015  | Jan. 14, 2016 | Radiation<br>(03CH12-HY) |



## 5 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                             |     |
|-----------------------------------------------------------------------------|-----|
| Measuring Uncertainty for a Level of<br>Confidence of 95% ( $U = 2U_c(y)$ ) | 5.1 |
|-----------------------------------------------------------------------------|-----|



## **Appendix A. Conducted Test Results**