



# FCC RF Test Report

**APPLICANT** : Sony Mobile Communications Inc.  
**EQUIPMENT** : GSM/WCDMA/LTE Phone+Bluetooth,  
DTS/UNII a/b/g/n and NFC  
**BRAND NAME** : Sony  
**FCC ID** : PY7-10710W  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

This is a variant report which is only valid together with the original test report. The product was received on Nov. 22, 2016 and testing was completed on Jan. 20, 2017. 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.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

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### SUMMARY OF TEST RESULT

| Report Section | FCC Rule           | Description  | Limit                 | Result | Remark                              |
|----------------|--------------------|--|-----------------------|--------|-------------------------------------|
| 3.1            | 15.247(b)          | Power Output Measurement                           | ≤ 30dBm               | Pass   | -                                   |
| 3.2            | 15.247(d)          | Radiated Band Edges and Radiated Spurious Emission | 15.209(a) & 15.247(d) | Pass   | Under limit 6.99 dB at 2483.560 MHz |
| 3.3            | 15.203 & 15.247(b) | Antenna Requirement                                | N/A                   | Pass   | -                                   |



# 1 General Description

## 1.1 Applicant

**Sony Mobile Communications Inc.**

4-12-3 Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan

## 1.2 Manufacturer

**Sony Mobile Communications Inc.**

4-12-3 Higashi-Shinagawa, Shinagawa-ku, Tokyo, 140-0002, Japan

## 1.3 Product Feature of Equipment Under Test

GSM/WCDMA/LTE, Bluetooth, DTS/UNII, a/b/g/n, GPS, and NFC

| Standards-related Product Specification |                                       |
|---|---------------------------------------|
| Antenna Type / Gain                     | PIFA Antenna type with gain -2.60 dBi |

**Remark:** This is a variant report. All the test cases were performed on original report which can be referred to Sporton Report Number FR6N2202-01C.

| EUT Information List |            |            |                            |
|----------------------|------------|------------|----------------------------|
| HW Version           | SW Version | S/N        | Performed Test Item        |
| A                    | 0.79       | RQ3003DPA5 | RF conducted measurement   |
|                      |            | RQ3003DQ82 | Radiated Spurious Emission |

| Accessory List      |                       |
|---------------------|-----------------------|
| <b>AC Adapter 1</b> | Model No. : UCH20     |
|                     | S/N : 1215W486600059  |
| <b>Earphone 1</b>   | Model No. : MH410c    |
|                     | S/N : 1632A86100002DB |
| <b>USB Cable</b>    | Model No. : UCB20     |
|                     | S/N : 1625A91B0003352 |

**Note:**

1. Above EUT list and accessory list used are electrically identical per declared by manufacturer.
2. Above the accessories list are used to exercise the EUT during test.
3. For other wireless features of this EUT, test report will be issued separately.

## 1.4 Modification of EUT

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



### 1.5 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation No. TW0007 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

|                           |  |
|---------------------------|--|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC.   |
| <b>Test Site Location</b> | No. 52, Hwa Ya 1 <sup>st</sup> 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 |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>  |
|                           | TH05-HY  |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

|                           |  |
|---------------------------|--|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC.   |
| <b>Test Site Location</b> | 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 |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>  |
|                           | 03CH11-HY  |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

### 1.6 Applicable Standards

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

- ♦ FCC Part 15 Subpart C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05
- ♦ ANSI C63.10-2013

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



## 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 (Y plane) were recorded in this report.

### 2.1 Carrier Frequency and Channel

| Frequency Band  | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|-----------------|---------|-------------|---------|-------------|
| 2400-2483.5 MHz | 1       | 2412        | 7       | 2442        |
|                 | 2       | 2417        | 8       | 2447        |
|                 | 3       | 2422        | 9       | 2452        |
|                 | 4       | 2427        | 10      | 2457        |
|                 | 5       | 2432        | 11      | 2462        |
|                 | 6       | 2437        | -       | -           |

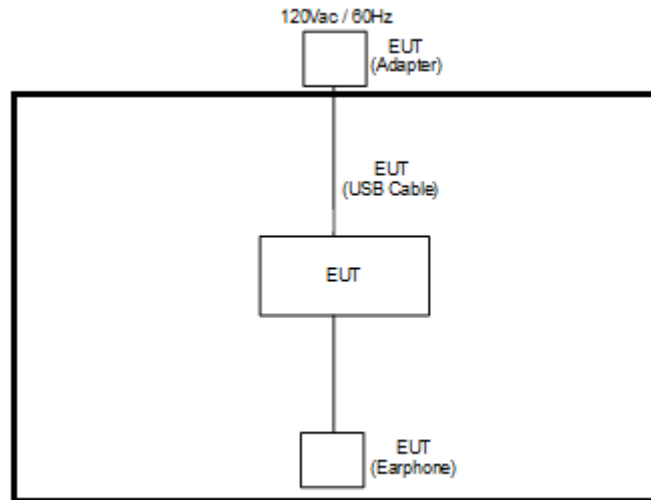
### 2.2 Test Mode

Final test mode of conducted test items and radiated spurious emissions are considering the modulation and worse data rates as below table.

| Modulation   | Data Rate |
|--------------|-----------|
| 802.11b      | 1 Mbps    |
| 802.11n HT20 | MCS0      |

## 2.3 Connection Diagram of Test System

<WLAN Tx Mode>



## 2.4 EUT Operation Test Setup

For RF test items, an engineering test program was provided and enabled to make EUT transmitting signals.



### 3 Test Result

#### 3.1 Output Power Measurement

##### 3.1.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

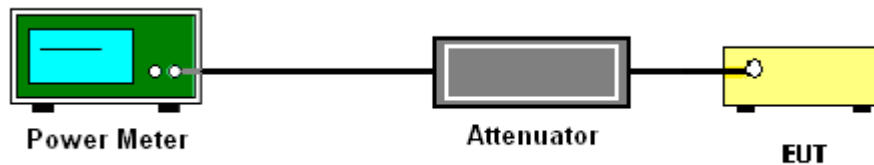
##### 3.1.2 Measuring Instruments

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

##### 3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v03r05 section 9.1.2 PKPM1 Peak power meter method.
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Measure the conducted output power and record the results in the test report.

##### 3.1.4 Test Setup



##### 3.1.5 Test Result of Peak Output Power

Please refer to Appendix A.

##### 3.1.6 Test Result of Average output Power (Reporting Only)

Please refer to Appendix A.



### 3.2 Radiated Band Edges and Spurious Emission Measurement

#### 3.2.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the FCC section 15.209 limits as below.

| 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                             |

#### 3.2.2 Measuring Instruments

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

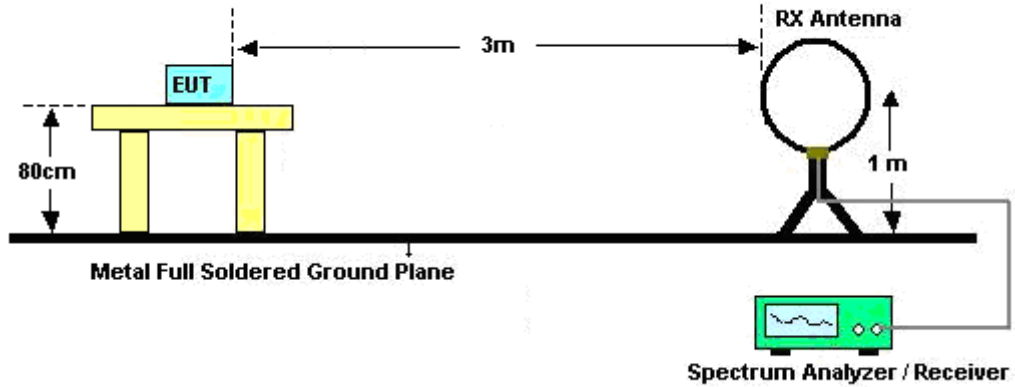


### 3.2.3 Test Procedures

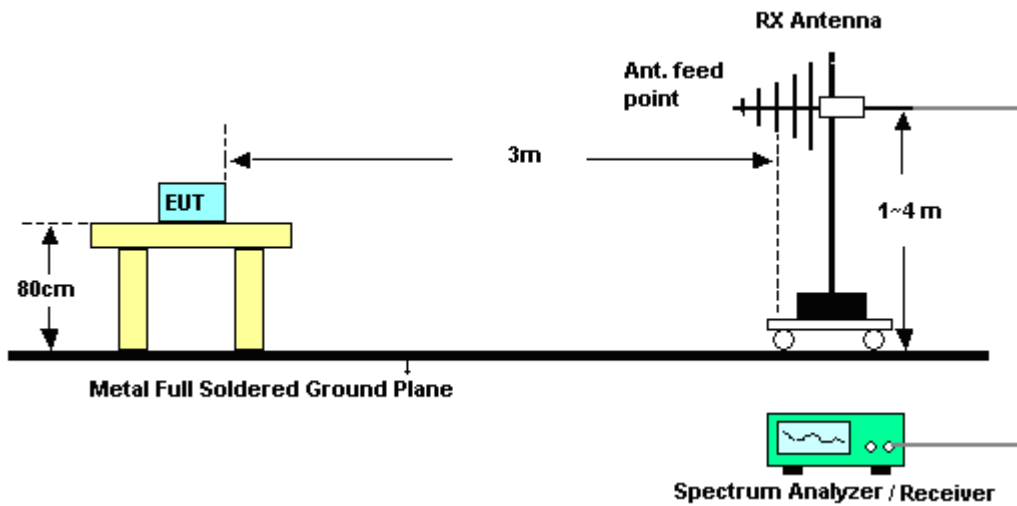
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r05.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. 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.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
7. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1$  GHz; VBW  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1$  GHz for peak measurement.  
For average measurement:
    - 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.

### 3.2.4 Test Setup

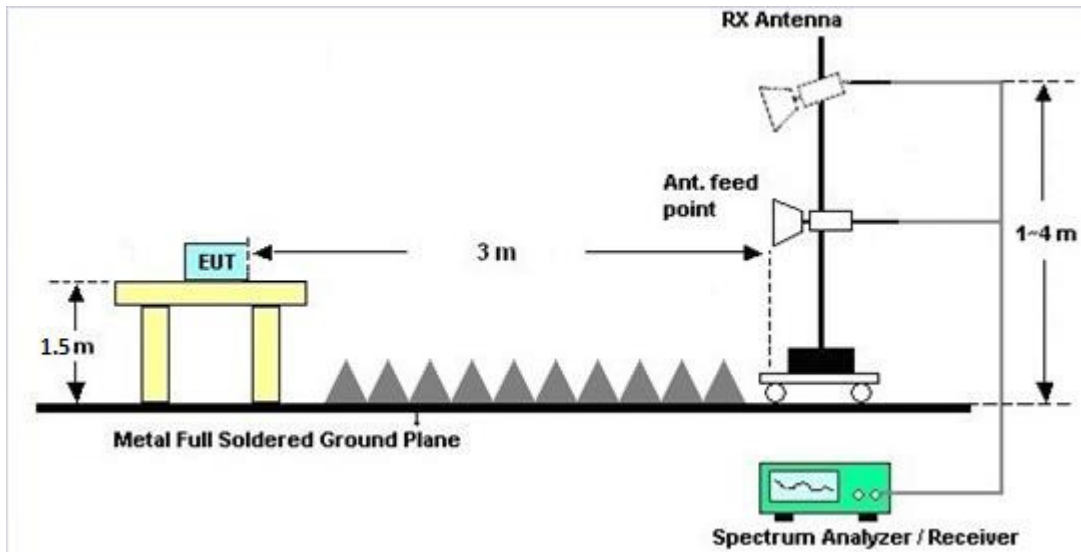
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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

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.

### 3.2.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B and C.

### 3.2.7 Duty Cycle

Please refer to Appendix D.

### 3.2.8 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

Please refer to Appendix B and C.



### **3.3 Antenna Requirements**

#### **3.3.1 Standard Applicable**

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. For the fixed point-to-point operation, the power shall be reduced by one dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the FCC rule.

#### **3.3.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

#### **3.3.3 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                             | 0932001                                | 300MHz~40GHz                     | Sep. 29, 2016    | Dec. 07, 2016~<br>Dec. 27, 2016 | Sep. 28, 2017 | Conducted<br>(TH05-HY)   |
| Power Sensor            | Anritsu            | MA2411B                             | 0846202                                | 300MHz~40GHz                     | Sep. 29, 2016    | Dec. 07, 2016~<br>Dec. 27, 2016 | Sep. 28, 2017 | Conducted<br>(TH05-HY)   |
| Hygrometer              | Testo              | 608-H2                              | 41410069                               | N/A                              | Aug. 28, 2016    | Dec. 07, 2016~<br>Dec. 27, 2016 | Aug. 27, 2017 | Conducted<br>(TH05-HY)   |
| RF Cable                | HUBER +<br>SUHNER  | SUCOFLEX<br>104                     | MY842095<br>21                         | 1GHz~26GHz                       | Dec. 02, 2016    | Dec. 07, 2016~<br>Dec. 27, 2016 | Dec. 01, 2017 | Conducted<br>(TH05-HY)   |
| Loop Antenna            | Rohde &<br>Schwarz | HFH2-Z2                             | 100315                                 | 9 kHz~30 MHz                     | Sep. 02, 2015    | Jan. 04, 2017~<br>Jan. 20, 2017 | Sep. 01, 2017 | Radiation<br>(03CH11-HY) |
| Bilog Antenna           | TESEQ              | CBL 6111D                           | 35414                                  | 30MHz~1GHz                       | Oct. 15, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Oct. 14, 2017 | Radiation<br>(03CH11-HY) |
| Horn Antenna            | SCHWARZBE<br>CK    | BBHA 9120 D                         | 9120D-152<br>2                         | 1GHz ~ 18GHz                     | Mar. 30, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Mar. 31, 2017 | Radiation<br>(03CH11-HY) |
| SHF-EHF Horn<br>Antenna | SCHWARZBE<br>CK    | BBHA 9170                           | BBHA9170<br>584                        | 18GHz- 40GHz                     | Nov. 08, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Nov. 07, 2017 | Radiation<br>(03CH11-HY) |
| Spectrum<br>Analyzer    | Keysight           | N9010A                              | MY523502<br>76                         | 10Hz ~ 44GHz                     | Mar. 21, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Mar. 20, 2017 | Radiation<br>(03CH11-HY) |
| Amplifier               | SONOMA             | 310N                                | 187312                                 | 9kHz~1GHz                        | Nov. 10, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Nov. 09, 2017 | Radiation<br>(03CH11-HY) |
| Preamplifier            | Keysight           | 83017A                              | MY532700<br>80                         | 1GHz~26.5GHz                     | Nov. 10, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Nov. 09, 2017 | Radiation<br>(03CH11-HY) |
| Preamplifier            | MITEQ              | TTA0204                             | 1872107                                | 2GHz~40GHz                       | Feb. 15, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Feb. 14, 2017 | Radiation<br>(03CH11-HY) |
| Hygrometer              | TECPEL             | DTN-303B                            | TP140325                               | N/A                              | Nov. 11, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Nov. 13, 2017 | Radiation<br>(03CH11-HY) |
| RF Cable                | HUBER +<br>SUHNER  | SUCOFLEX<br>104                     | MY9837/4<br>MY28419/<br>4MY28654<br>/4 | 9KHz~40GHz                       | Sep. 12, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Sep. 11, 2017 | Radiation<br>(03CH11-HY) |
| Controller              | EMEC               | EM 1000                             | N/A                                    | Control Turn<br>table & Ant Mast | N/A              | Jan. 04, 2017~<br>Jan. 20, 2017 | N/A           | Radiation<br>(03CH11-HY) |
| Antenna Mast            | EMEC               | AM-BS-4500-<br>B                    | N/A                                    | 1~4m                             | N/A              | Jan. 04, 2017~<br>Jan. 20, 2017 | N/A           | Radiation<br>(03CH11-HY) |
| Turn Table              | EMEC               | TT 2000                             | N/A                                    | 0~360 Degree                     | N/A              | Jan. 04, 2017~<br>Jan. 20, 2017 | N/A           | Radiation<br>(03CH11-HY) |
| Test Software           | Audix              | E3                                  | 6.2009-8-2<br>4                        | N/A                              | N/A              | Jan. 04, 2017~<br>Jan. 20, 2017 | N/A           | Radiation<br>(03CH11-HY) |
| Filter                  | Wainwright         | WLKX12-270<br>0-3000-18000<br>-60SS | SN3                                    | 2.7G High Pass                   | Sep. 19, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Sep. 18, 2017 | Radiation<br>(03CH11-HY) |
| Filter                  | Wainwright         | WLK10-4630-<br>5093-11000-4<br>0SS  | SN1                                    | 4.5G High Pass                   | Sep. 19, 2016    | Jan. 04, 2017~<br>Jan. 20, 2017 | Sep. 18, 2017 | Radiation<br>(03CH11-HY) |



## 5 Uncertainty of Evaluation

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

|   |      |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.20 |
|---|------|

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

|   |      |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.50 |
|---|------|

### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

|   |      |
|---|------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.20 |
|---|------|



**Appendix A. Test Result of Conducted Test Items**

|                |                      |                    |       |    |
|----------------|----------------------|--------------------|-------|----|
| Test Engineer: | Derek Hsu            | Temperature:       | 21~25 | °C |
| Test Date:     | 2016/12/7~2016/12/27 | Relative Humidity: | 51~54 | %  |

**TEST RESULTS DATA**  
**Peak Power Table**

| 2.4GHz Band |           |     |     |             |                            |                             |          |                  |                        |            |
|-------------|-----------|-----|-----|-------------|----------------------------|-----------------------------|----------|------------------|------------------------|------------|
| Mod.        | Data Rate | NTX | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) | DG (dBi) | EIRP Power (dBm) | EIRP Power Limit (dBm) | Pass /Fail |
| 11b         | 1Mbps     | 1   | 1   | 2412        | 20.35                      | 30.00                       | -2.60    | 17.75            | 36.00                  | Pass       |
| 11b         | 1Mbps     | 1   | 6   | 2437        | 20.58                      | 30.00                       | -2.60    | 17.98            | 36.00                  | Pass       |
| 11b         | 1Mbps     | 1   | 11  | 2462        | 20.46                      | 30.00                       | -2.60    | 17.86            | 36.00                  | Pass       |
| 11g         | 6Mbps     | 1   | 1   | 2412        | 21.60                      | 30.00                       | -2.60    | 19.00            | 36.00                  | Pass       |
| 11g         | 6Mbps     | 1   | 6   | 2437        | 22.20                      | 30.00                       | -2.60    | 19.60            | 36.00                  | Pass       |
| 11g         | 6Mbps     | 1   | 11  | 2462        | 21.79                      | 30.00                       | -2.60    | 19.19            | 36.00                  | Pass       |
| HT20        | MCS0      | 1   | 1   | 2412        | 21.41                      | 30.00                       | -2.60    | 18.81            | 36.00                  | Pass       |
| HT20        | MCS0      | 1   | 6   | 2437        | 22.07                      | 30.00                       | -2.60    | 19.47            | 36.00                  | Pass       |
| HT20        | MCS0      | 1   | 11  | 2462        | 21.40                      | 30.00                       | -2.60    | 18.80            | 36.00                  | Pass       |

**TEST RESULTS DATA**  
**Average Power Table**  
**(Reporting Only)**

| 2.4GHz Band |           |                 |     |             |                  |                               |
|-------------|-----------|-----------------|-----|-------------|------------------|-------------------------------|
| Mod.        | Data Rate | N <sub>TX</sub> | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
| 11b         | 1Mbps     | 1               | 1   | 2412        | 0.00             | 17.70                         |
| 11b         | 1Mbps     | 1               | 6   | 2437        | 0.00             | 17.84                         |
| 11b         | 1Mbps     | 1               | 11  | 2462        | 0.00             | 17.80                         |
| 11g         | 6Mbps     | 1               | 1   | 2412        | 0.12             | 13.32                         |
| 11g         | 6Mbps     | 1               | 6   | 2437        | 0.12             | 13.33                         |
| 11g         | 6Mbps     | 1               | 11  | 2462        | 0.12             | 13.13                         |
| HT20        | MCS0      | 1               | 1   | 2412        | 0.13             | 12.53                         |
| HT20        | MCS0      | 1               | 6   | 2437        | 0.13             | 12.88                         |
| HT20        | MCS0      | 1               | 11  | 2462        | 0.13             | 12.52                         |



## Appendix B. Radiated Spurious Emission

|                 |                             |                     |         |
|-----------------|-----------------------------|---------------------|---------|
| Test Engineer : | JC Liao, Jacky Hung, Ken Wu | Temperature :       | 20~24°C |
|                 |                             | Relative Humidity : | 50~58%  |

### 2.4GHz 2400~2483.5MHz

#### WIFI 802.11b (Band Edge @ 3m)

| WIFI Ant. 1                 | Note  | Frequency ( MHz ) | Level ( dBμV/m ) | Over Limit ( dB ) | Limit Line ( dBμV/m ) | Read Level ( dBμV ) | Antenna Factor ( dB/m ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. ( P/A ) | Pol. ( H/V ) |
|-----------------------------|---|-------------------|------------------|-------------------|-----------------------|---------------------|-------------------------|-------------------|----------------------|----------------|-------------------|-------------------|--------------|
| 802.11b<br>CH 11<br>2462MHz | *   | 2462              | 105.6            | -                 | -                     | 102.8               | 27.4                    | 8.98              | 33.58                | 212            | 27                | P                 | H            |
|                             | *   | 2462              | 102.01           | -                 | -                     | 99.21               | 27.4                    | 8.98              | 33.58                | 212            | 27                | A                 | H            |
|                             |   | 2483.68           | 53.85            | -20.15            | 74                    | 51                  | 27.45                   | 8.98              | 33.58                | 212            | 27                | P                 | H            |
|                             |   | 2483.52           | 44.68            | -9.32             | 54                    | 41.83               | 27.45                   | 8.98              | 33.58                | 212            | 27                | A                 | H            |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |
|                             | *   | 2462              | 106.48           | -                 | -                     | 103.68              | 27.4                    | 8.98              | 33.58                | 204            | 87                | P                 | V            |
|                             | *   | 2462              | 102.64           | -                 | -                     | 99.84               | 27.4                    | 8.98              | 33.58                | 204            | 87                | A                 | V            |
|                             |   | 2491.12           | 54.75            | -19.25            | 74                    | 51.85               | 27.5                    | 8.98              | 33.58                | 204            | 87                | P                 | V            |
|                             |   | 2483.52           | 44.44            | -9.56             | 54                    | 41.59               | 27.45                   | 8.98              | 33.58                | 204            | 87                | A                 | V            |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | V            |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | V            |
| Remark                      | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   |              |



2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

| WIFI Ant. 1                 | Note  | Frequency ( MHz ) | Level ( dBμV/m ) | Over Limit ( dB ) | Limit Line ( dBμV/m ) | Read Level ( dBμV ) | Antenna Factor ( dB/m ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. ( P/A ) | Pol. ( H/V ) |   |
|-----------------------------|---|-------------------|------------------|-------------------|-----------------------|---------------------|-------------------------|-------------------|----------------------|----------------|-------------------|-------------------|--------------|---|
| 802.11b<br>CH 11<br>2462MHz |   | 4924              | 40.82            | -33.18            | 74                    | 48.98               | 31.88                   | 11                | 51.04                | 100            | 0                 | P                 | H            |   |
|                             |   | 7386              | 38.97            | -35.03            | 74                    | 39.22               | 37.38                   | 12.88             | 50.51                | 100            | 0                 | P                 | H            |   |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |   |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |   |
|                             |   |                   | 4924             | 38.19             | -35.81                | 74                  | 46.35                   | 31.88             | 11                   | 51.04          | 100               | 0                 | P            | V |
|                             |   |                   | 7386             | 37.19             | -36.81                | 74                  | 37.44                   | 37.38             | 12.88                | 50.51          | 100               | 0                 | P            | V |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   |              | V |
|                             |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   |              | V |
| Remark                      | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   |              |   |



**2.4GHz 2400~2483.5MHz  
WIFI 802.11n HT20 (Band Edge @ 3m)**

| WIFI Ant. 1                | Note  | Frequency ( MHz ) | Level ( dBμV/m ) | Over Limit ( dB ) | Limit Line ( dBμV/m ) | Read Level ( dBμV ) | Antenna Factor ( dB/m ) | Cable Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Peak Avg. ( P/A ) | Pol. ( H/V ) |
|----------------------------|---|-------------------|------------------|-------------------|-----------------------|---------------------|-------------------------|-------------------|----------------------|----------------|-------------------|-------------------|--------------|
| 802.11n HT20 CH 11 2462MHz | *   | 2462              | 103.99           | -                 | -                     | 101.19              | 27.4                    | 8.98              | 33.58                | 256            | 59                | P                 | H            |
|                            | *   | 2462              | 95.53            | -                 | -                     | 92.73               | 27.4                    | 8.98              | 33.58                | 256            | 59                | A                 | H            |
|                            |   | 2483.56           | 57.92            | -16.08            | 74                    | 55.07               | 27.45                   | 8.98              | 33.58                | 256            | 59                | P                 | H            |
|                            |   | 2483.52           | 46.81            | -7.19             | 54                    | 43.96               | 27.45                   | 8.98              | 33.58                | 256            | 59                | A                 | H            |
|                            |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |
|                            |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   | H            |
|                            | *   | 2462              | 104.58           | -                 | -                     | 101.78              | 27.4                    | 8.98              | 33.58                | 295            | 81                | P                 | V            |
|                            | *   | 2462              | 95.92            | -                 | -                     | 93.12               | 27.4                    | 8.98              | 33.58                | 295            | 81                | A                 | V            |
|                            |   | 2484.56           | 58.59            | -15.41            | 74                    | 55.74               | 27.45                   | 8.98              | 33.58                | 295            | 81                | P                 | V            |
|                            |   | 2483.56           | 47.01            | -6.99             | 54                    | 44.16               | 27.45                   | 8.98              | 33.58                | 295            | 81                | A                 | V            |
|                            |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   | V                 |              |
|                            |   |                   |                  |                   |                       |                     |                         |                   |                      |                |                   | V                 |              |
| <b>Remark</b>              | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                   |                  |                   |                       |                     |                         |                   |                      |                |                   |                   |              |



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

Table with 14 columns: WIFI Ant. 1, Note, Frequency (MHz), Level (dBµV/m), Over Limit (dB), Limit Line (dBµV/m), Read Level (dBµV), Antenna Factor (dB/m), Cable Loss (dB), Preamp Factor (dB), Ant Pos (cm), Table Pos (deg), Peak Avg. (P/A), Pol. (H/V). Rows include data for 802.11n HT20 CH 11 at 4924 and 7386 MHz, and a Remark section.



**Emission below 1GHz  
2.4GHz WIFI 802.11b (LF)**

| WIFI                    | Note   | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |   |
|-------------------------|--|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
| Ant.                    |  |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |   |
| 1                       |  | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |   |
| 2.4GHz<br>802.11b<br>LF |  | 31.08     | 23.23      | -16.77 | 40         | 29.25    | 25.18    | 1.29   | 32.49  |        |         | P       | H       |   |
|                         |  | 98.31     | 21.89      | -21.61 | 43.5       | 37       | 15.86    | 1.51   | 32.48  |        |         | P       | H       |   |
|                         |  | 166.08    | 25.78      | -17.72 | 43.5       | 40.23    | 16.3     | 2      | 32.75  |        |         | P       | H       |   |
|                         |  | 633.2     | 27.46      | -18.54 | 46         | 30.09    | 26.03    | 3.8    | 32.46  |        |         | P       | H       |   |
|                         |  | 773.2     | 29.84      | -16.16 | 46         | 30.03    | 27.98    | 4.09   | 32.26  |        |         | P       | H       |   |
|                         |  | 955.2     | 33.35      | -12.65 | 46         | 29.22    | 30.59    | 4.69   | 31.15  | 100    | 58      | P       | H       |   |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | H |
|                         |  |           | 40.53      | 32.58  | -7.42      | 40       | 44.04    | 19.74  | 1.29   | 32.49  | 100     | 0       | P       | V |
|                         |  |           | 98.31      | 19.9   | -23.6      | 43.5     | 35.01    | 15.86  | 1.51   | 32.48  |         |         | P       | V |
|                         |  |           | 164.73     | 24.29  | -19.21     | 43.5     | 38.64    | 16.4   | 2      | 32.75  |         |         | P       | V |
|                         |  |           | 625.5      | 26.79  | -19.21     | 46       | 29.5     | 25.95  | 3.8    | 32.46  |         |         | P       | V |
|                         |  |           | 818.7      | 31.02  | -14.98     | 46       | 30.32    | 28.52  | 4.26   | 32.08  |         |         | P       | V |
|                         |  |           | 941.9      | 33.1   | -12.9      | 46       | 29.3     | 30.38  | 4.69   | 31.27  |         |         | P       | V |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | V |
|                         |  |           |            |        |            |          |          |        |        |        |         |         |         | V |
|                         |  |           |            |        |            |          |          |        |        |        |         |         | V       |   |
|                         |  |           |            |        |            |          |          |        |        |        |         |         | V       |   |
|                         |  |           |            |        |            |          |          |        |        |        |         |         | V       |   |
|                         |  |           |            |        |            |          |          |        |        |        |         |         | V       |   |
|                         |  |           |            |        |            |          |          |        |        |        |         |         | V       |   |
| <b>Remark</b>           | 1. No other spurious found.<br>2. All results are PASS against limit line. |           |            |        |            |          |          |        |        |        |         |         |         |   |







**Note symbol**

|     |  |
|-----|--|
| *   | <b>Fundamental Frequency</b> which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency. |
| !   | Test result is <b>over limit</b> line.   |
| P/A | <b>Peak</b> or <b>Average</b>  |
| H/V | <b>Horizontal</b> or <b>Vertical</b>   |



A calculation example for radiated spurious emission is shown as below:

| WIFI    | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Cable  | Preamp | Ant    | Table   | Peak    | Pol.    |
|---------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
| Ant.    |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
| 1       |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| 802.11b |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
| CH 01   |      |           |            |        |            |          |          |        |        |        |         |         |         |
| 2412MHz |      | 2390      | 43.54      | -10.46 | 54         | 42.6     | 32.22    | 4.58   | 35.86  | 103    | 308     | A       | H       |

- Level(dBμV/m) =  
Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)  
= 55.45 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

- Level(dBμV/m)  
= Antenna Factor(dB/m) + Cable Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)  
= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)  
= 43.54 (dBμV/m)
- Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 43.54(dBμV/m) – 54(dBμV/m)  
= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.



## Appendix C. Radiated Spurious Emission Plots

|                        |                             |                            |         |
|------------------------|-----------------------------|----------------------------|---------|
| <b>Test Engineer :</b> | JC Liao, Jacky Hung, Ken Wu | <b>Temperature :</b>       | 20~24°C |
|                        |                             | <b>Relative Humidity :</b> | 50~58%  |

### Note symbol

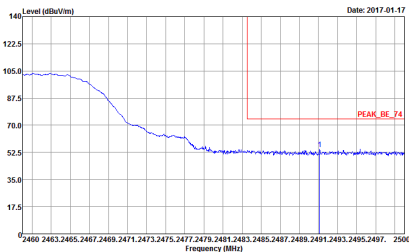
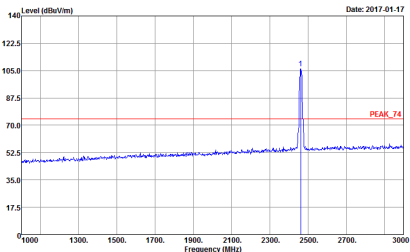
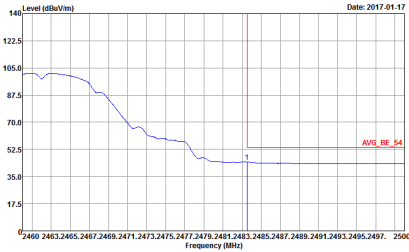
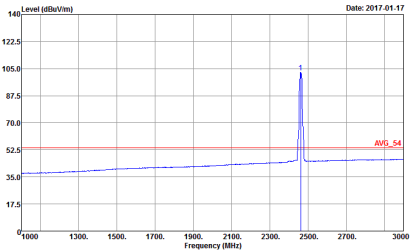
|    |                              |
|----|------------------------------|
| -L | <b>Low channel location</b>  |
| -R | <b>High channel location</b> |



2.4GHz 2400~2483.5MHz
WIFI 802.11b (Band Edge @ 3m)

Table with 4 columns: WIFI, ANT, Peak, Avg. and 2 main plot columns: Horizontal, Fundamental. Each plot shows Level (dBuV/m) vs Frequency (MHz) with specific peak and average markers.



| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m  |   |
|------|---|---|
| ANT  | 802.11b CH11 2462MHz  |   |
| 1    | Vertical  | Fundamental   |
| Peak |  <p>Site : 03CH11-HY<br/>Condition : PEAK_BE_74 3m HORN 9120D-HF VERTICAL</p>  |  <p>Site : 03CH11-HY<br/>Condition : PEAK_74 3m HORN 9120D-HF VERTICAL</p>  |
| Avg. |  <p>Site : 03CH11-HY<br/>Condition : AVG_BE_54 3m HORN 9120D-HF VERTICAL</p> |  <p>Site : 03CH11-HY<br/>Condition : AVG_54 3m HORN 9120D-HF VERTICAL</p> |



2.4GHz 2400~2483.5MHz  
 WIFI 802.11n HT20 (Band Edge @ 3m)

| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m  |  |
|------|---|--|
| ANT  | 802.11n HT20 CH11 2462MHz   |  |
| 1    | Horizontal  | Fundamental  |
| Peak | <p>Site : 03CH11-HY<br/>         Condition : PEAK_BE_74 3m HORN 9120D-HF HORIZONTAL</p> | <p>Site : 03CH11-HY<br/>         Condition : PEAK_74 3m HORN 9120D-HF HORIZONTAL</p> |
| Avg. | <p>Site : 03CH11-HY<br/>         Condition : AVG_BE_54 3m HORN 9120D-HF HORIZONTAL</p>  | <p>Site : 03CH11-HY<br/>         Condition : AVG_54 3m HORN 9120D-HF HORIZONTAL</p>  |



| WIFI | 2.4GHz 2400~2483.5MHz Band Edge @ 3m   |   |
|------|--|---|
| ANT  | 802.11n HT20 CH11 2462MHz  |   |
| 1    | Vertical   | Fundamental   |
| Peak | <p>Site : 03CH11-HY<br/>Condition : PEAK_BE_74 3m HORN 91200-HF VERTICAL</p> | <p>Site : 03CH11-HY<br/>Condition : PEAK_74 3m HORN 91200-HF VERTICAL</p> |
| Avg. | <p>Site : 03CH11-HY<br/>Condition : AVG_BE_54 3m HORN 91200-HF VERTICAL</p>  | <p>Site : 03CH11-HY<br/>Condition : AVG_54 3m HORN 91200-HF VERTICAL</p>  |





2.4GHz 2400~2483.5MHz
WIFI 802.11b (Harmonic @ 3m)

Table with 2 columns: Horizontal and Vertical. It contains two graphs showing Level (dBuV/m) vs Frequency (MHz) for Peak and Avg. values. The graphs show two peaks labeled 1 and 2, and two horizontal lines labeled PEAK\_74 and AVG\_54.



2.4GHz 2400~2483.5MHz
WIFI 802.11n HT20 (Harmonic @ 3m)

Table with 3 columns: WIFI, ANT, and antenna orientation (Horizontal/Vertical). It contains two spectral plots showing Level (dBuV/m) vs Frequency (MHz) for Peak and Avg. values. The plots show two peaks at approximately 5.2 GHz and 6.8 GHz.



Emission below 1GHz  
2.4GHz WIFI 802.11b (LF)

| WIFI         | 2.4GHz 2400~2483.5MHz  |  |
|--------------|--|--|
| ANT          | 802.11b LF   |  |
| 1            | Horizontal   | Vertical   |
| QP /<br>Peak | <p>Site : 03CH11-HY<br/>Condition : QP 3m BE-LOG 6111D-LF_ETC HORIZONTAL</p> | <p>Site : 03CH11-HY<br/>Condition : QP 3m BE-LOG 6111D-LF_ETC VERTICAL</p> |



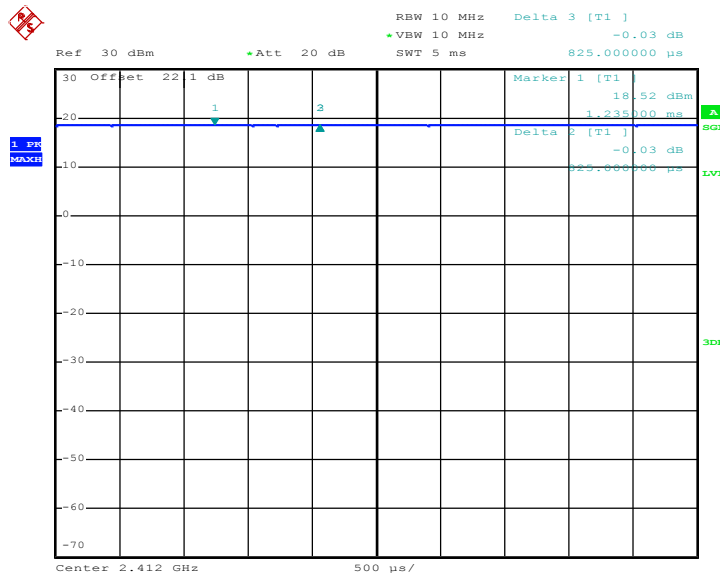
Emission below 1GHz  
2.4GHz WIFI 802.11n HT20 (LF)

| WIFI         | 2.4GHz 2400~2483.5MHz  |  |
|--------------|--|--|
| ANT          | 802.11n HT20 LF  |  |
| 1            | Horizontal   | Vertical   |
| QP /<br>Peak | <p>Site : 03CH11-HY<br/>Condition : QP 3m BE-LOG 6111D-LF_ETC HORIZONTAL</p> | <p>Site : 03CH11-HY<br/>Condition : QP 3m BE-LOG 6111D-LF_ETC VERTICAL</p> |

## Appendix D. Duty Cycle Plots

| Band         | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting |
|--------------|---------------|-------|----------|-------------|
| 802.11b      | 100.00        | -     | -        | 10Hz        |
| 802.11n HT20 | 97.02         | 1300  | 0.77     | 1kHz        |

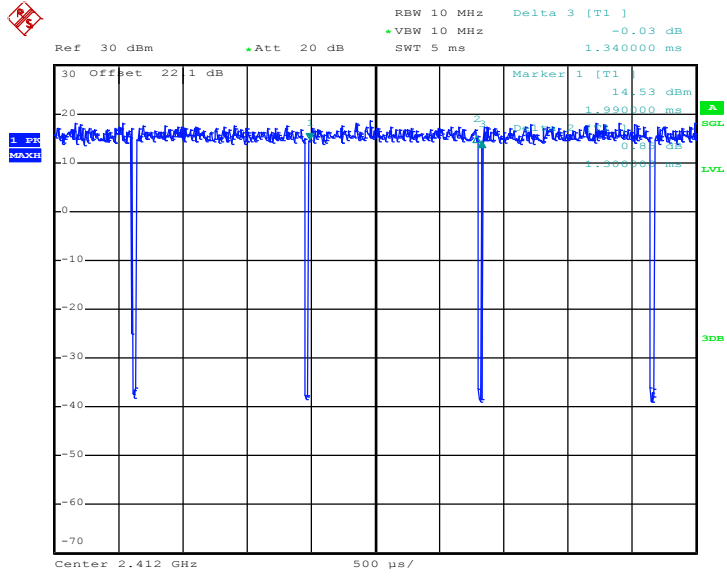
### 802.11b



Date: 7.DEC.2016 00:40:32



802.11n HT20



Date: 7.DEC.2016 00:47:17



## **Appendix E. Original Report**

Please refer to Sporton report number FR6N2202-01C