



# FCC RF Test Report

**APPLICANT** : Motorola Mobility LLC  
**EQUIPMENT** : Mobile Cellular Phone  
**BRAND NAME** : Motorola  
**MODEL NAME** : XT1929-8  
**FCC ID** : IHDT56XE3  
**STANDARD** : FCC Part 15 Subpart C §15.247  
**CLASSIFICATION** : (DTS) Digital Transmission System

This is a variant report. The product was received on Jan. 18, 2018 and testing was completed on Mar. 14, 2018. 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.**

**No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.**

**SPORTON INTERNATIONAL INC.**

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID: IHDT56XE3

Page Number : 1 of 19

Report Issued Date : Mar. 16, 2018

Report Version : Rev. 01

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## REVISION HISTORY

| REPORT NO.   | VERSION | DESCRIPTION             | ISSUED DATE   |
|--------------|---------|-------------------------|---------------|
| FR811821-07B | Rev. 01 | Initial issue of report | Mar. 16, 2018 |
|              |         |                         |               |
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## SUMMARY OF TEST RESULT

| Report Section                                                                                | FCC Rule           | Description                                | Limit                          | Result       | Remark                                   |
|-----------------------------------------------------------------------------------------------|--------------------|--------------------------------------------|--------------------------------|--------------|------------------------------------------|
| -                                                                                             | 15.247(a)(2)       | 6dB Bandwidth                              | $\geq 0.5\text{MHz}$           | Not Required | -                                        |
| -                                                                                             | -                  | 99% Bandwidth                              | -                              | Not Required | -                                        |
| 3.1                                                                                           | 15.247(b)(3)       | Peak Output Power                          | $\leq 30\text{dBm}$            | Pass         | -                                        |
| -                                                                                             | 15.247(e)          | Power Spectral Density                     | $\leq 8\text{dBm}/3\text{kHz}$ | Not Required | -                                        |
| -                                                                                             | 15.247(d)          | Conducted Band Edges and Spurious Emission | $\leq 20\text{dBc}$            | Not Required | -                                        |
| 3.2                                                                                           | 15.247(d)          | Radiated Band Edges and Spurious Emission  | 15.209(a) & 15.247(d)          | Pass         | Under limit<br>5.14 dB at<br>171.750 MHz |
| -                                                                                             | 15.207             | AC Conducted Emission                      | 15.207(a)                      | Not Required | -                                        |
| 3.3                                                                                           | 15.203 & 15.247(b) | Antenna Requirement                        | N/A                            | Pass         | -                                        |
| <b>Remark:</b> Not required means after assessing, test items are not necessary to carry out. |                    |                                            |                                |              |                                          |



# 1 General Description

## 1.1 Applicant

Motorola Mobility LLC

222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

## 1.2 Manufacturer

Motorola Mobility LLC

222 W,Merchandise Mart Plaza, Chicago IL 60654 USA

## 1.3 Product Feature of Equipment Under Test

| Product Feature                 |                                                                                                                                      |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                       | Mobile Cellular Phone                                                                                                                |
| Brand Name                      | Motorola                                                                                                                             |
| Model Name                      | XT1929-8                                                                                                                             |
| FCC ID                          | IHDT56XE3                                                                                                                            |
| Sample 1                        | EUT with Dual SIM                                                                                                                    |
| Sample 2                        | EUT with Single SIM                                                                                                                  |
| IMEI Code                       | <b>Conducted</b> IMEI 1: 354105090012138<br>IMEI 2: 354105090012146                                                                  |
|                                 | <b>Radiation:</b> IMEI 1: 354105090023036<br>IMEI 2: 354105090023044                                                                 |
| EUT supports Radios application | GSM/EGPRS/WCDMA/HSPA/LTE/GNSS/NFC<br>WLAN 11b/g/n HT20<br>WLAN 11a/n HT20/HT40<br>WLAN 11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE |
| HW Version                      | DVT2                                                                                                                                 |
| EUT Stage                       | Identical Prototype                                                                                                                  |

### Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. This is a variant report. All the test cases were performed on original report which can be referred to Sporton Report Number FR811821-02B.



| Accessory List  |                                       |
|-----------------|---------------------------------------|
| AC Adapter 1    | Brand Name : Motorola                 |
|                 | Model Name : SC-23 SPN5971A           |
|                 | Manufacturer : Salom                  |
| AC Adapter 2    | Brand Name : Motorola                 |
|                 | Model Name : SC-23 SPN5989A           |
|                 | Manufacturer : Chenyang               |
| AC Adapter 3    | Brand Name : Motorola                 |
|                 | Model Name : SC-24 SPN5972A           |
|                 | Manufacturer : Salom                  |
| AC Adapter 4    | Brand Name : Motorola                 |
|                 | Model Name : SC-24 SPN5990A           |
|                 | Manufacturer : Chenyang               |
| Battery         | Brand Name : Motorola                 |
|                 | Model Name : JS40                     |
|                 | Manufacturer : SUNWODA                |
| Earphone        | Brand Name : Motorola                 |
|                 | Model Name : SH38C16618               |
| C2Audio Cable 1 | Brand Name : Motorola                 |
|                 | Model Name : SC18C27844               |
|                 | Manufacturer : Luxshare               |
| C2Audio Cable 2 | Brand Name : Motorola                 |
|                 | Model Name : SC18C27845               |
|                 | Manufacturer : Cabletech              |
| USB Cable 1     | Brand Name : Cabletech                |
|                 | Model Name : SKN6473A                 |
| USB Cable 2     | Brand Name : FOXLINK                  |
|                 | Model Name : SKN6473A 17195-C 0403532 |
| USB Cable 3     | Brand Name : SAIBAO                   |
|                 | Model Name : SKN6473A 17214-C 1127044 |
| USB Cable 4     | Brand Name : Luxshare                 |
|                 | Model Name : SKN6473A 17227-C 1126538 |

## 1.4 Product Specification of Equipment Under Test

| Standards-related Product Specification  |                                                                                            |
|------------------------------------------|--------------------------------------------------------------------------------------------|
| <b>Tx/Rx Frequency Range</b>             | 2402 MHz ~ 2480 MHz                                                                        |
| <b>Number of Channels</b>                | 40                                                                                         |
| <b>Carrier Frequency of Each Channel</b> | 40 Channel(37 hopping + 3 advertising channel)                                             |
| <b>Maximum Output Power to Antenna</b>   | Bluetooth LE (1Mbps) : 12.85 dBm (0.0193 W)<br>Bluetooth LE (2Mbps) : 12.77 dBm (0.0189 W) |
| <b>Antenna Type / Gain</b>               | Internal Antenna with gain -5.00 dBi                                                       |
| <b>Type of Modulation</b>                | Bluetooth LE : GFSK                                                                        |

## 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. TW1190 and 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><br>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: +886-3-327-3456<br>FAX: +886-3-328-4978 |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b><br>03CH12-HY                                                                                                   |

**Note:** The test site complies with ANSI C63.4 2014 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 C §15.247
- ♦ FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04
- ♦ 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

### 2.1 Carrier Frequency Channel

| Frequency Band  | Channel | Freq.<br>(MHz) | Channel | Freq.<br>(MHz) |
|-----------------|---------|----------------|---------|----------------|
| 2400-2483.5 MHz | 0       | 2402           | 21      | 2444           |
|                 | 1       | 2404           | 22      | 2446           |
|                 | 2       | 2406           | 23      | 2448           |
|                 | 3       | 2408           | 24      | 2450           |
|                 | 4       | 2410           | 25      | 2452           |
|                 | 5       | 2412           | 26      | 2454           |
|                 | 6       | 2414           | 27      | 2456           |
|                 | 7       | 2416           | 28      | 2458           |
|                 | 8       | 2418           | 29      | 2460           |
|                 | 9       | 2420           | 30      | 2462           |
|                 | 10      | 2422           | 31      | 2464           |
|                 | 11      | 2424           | 32      | 2466           |
|                 | 12      | 2426           | 33      | 2468           |
|                 | 13      | 2428           | 34      | 2470           |
|                 | 14      | 2430           | 35      | 2472           |
|                 | 15      | 2432           | 36      | 2474           |
|                 | 16      | 2434           | 37      | 2476           |
|                 | 17      | 2436           | 38      | 2478           |
|                 | 18      | 2438           | 39      | 2480           |
|                 | 19      | 2440           | -       | -              |
|                 | 20      | 2442           | -       | -              |

## 2.2 Test Mode

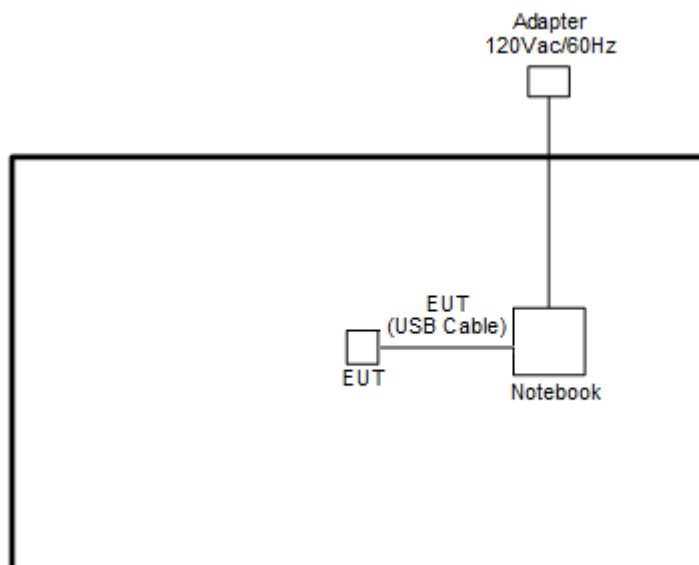
- a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever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

The following summary table is showing all test modes to demonstrate in compliance with the standard.

| Summary table of Test Cases                                                                              |                                          |
|----------------------------------------------------------------------------------------------------------|------------------------------------------|
| Test Item                                                                                                | Data Rate / Modulation                   |
|                                                                                                          | Bluetooth – LE / GFSK                    |
| Conducted TCs                                                                                            | Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps |
|                                                                                                          | Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps |
|                                                                                                          | Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps |
| Radiated TCs                                                                                             | Mode 1: Bluetooth Tx CH39_2480 MHz_2Mbps |
| <b>Remark:</b> For Radiated Test Cases, The tests were performance with USB Cable 1 Type C and Sample 1. |                                          |

## 2.3 Connection Diagram of Test System

<Bluetooth – LE Tx Mode>



## 2.4 Support Unit used in test configuration and system

| Item | Equipment | Trade Name | Model Name | FCC ID  | Data Cable | Power Cord                                                 |
|------|-----------|------------|------------|---------|------------|------------------------------------------------------------|
| 1.   | Notebook  | Lenovo     | E335       | FCC DoC | N/A        | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |

## 2.5 EUT Operation Test Setup

The RF test items, utility “QRCT” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous 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 is 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.

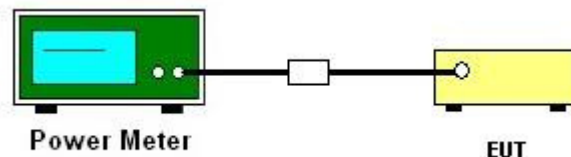
##### 3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

##### 3.1.3 Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB No. 558074 DTS D01 Meas. Guidance v04 section 9.1.3 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 Edges and Spurious Emission

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 limits as below.

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(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 section 4.0 of List of Measuring Equipment of this test report is used for test.

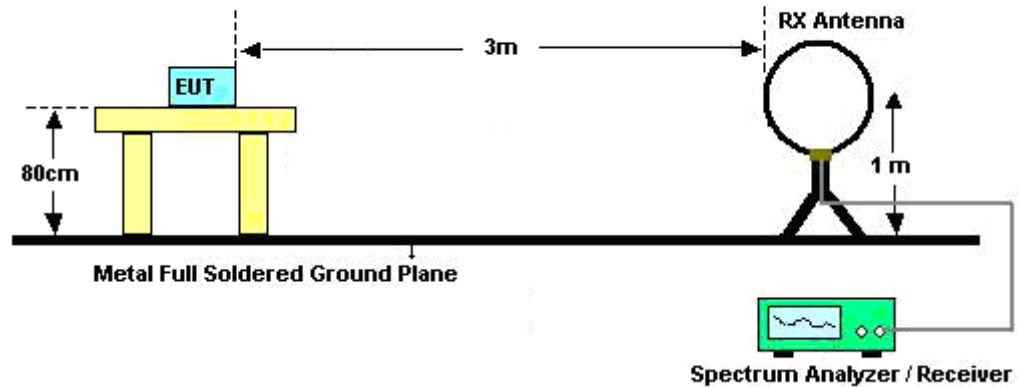


### 3.2.3 Test Procedures

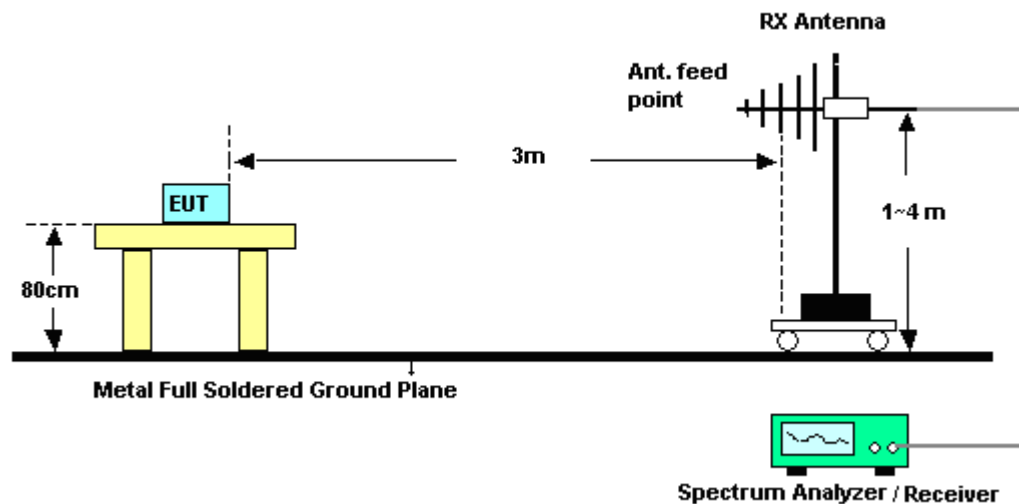
1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v04.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test 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 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.
8. Use the following spectrum analyzer settings:
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Set RBW=100 kHz for  $f < 1 \text{ GHz}$ ;  $\text{VBW} \geq \text{RBW}$ ; Sweep = auto; Detector function = peak; Trace = max hold;
  - (3) Set RBW = 1 MHz, VBW= 3MHz for  $f \geq 1 \text{ GHz}$  for peak measurement.  
For average measurement:
    - $\text{VBW} = 10 \text{ Hz}$ , when duty cycle is no less than 98 percent.
    - $\text{VBW} \geq 1/T$ , 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

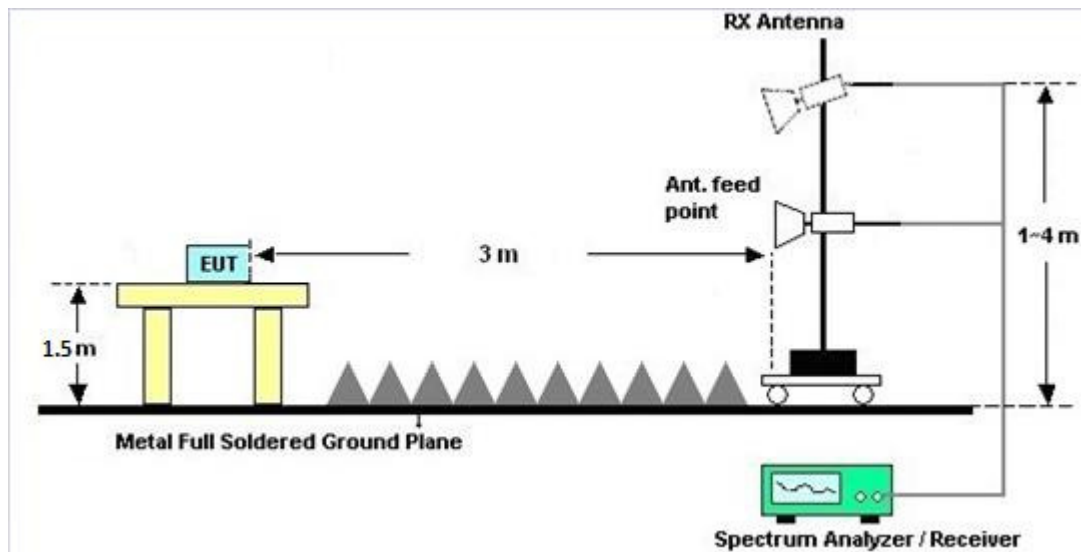
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



**For radiated emissions above 1GHz**



### 3.2.5 Test Results of Radiated Spurious Emissions (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 was not reported.

There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

### 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 ~ 10th 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. 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 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            | N/A                                 | Sep. 26, 2017    | Feb. 07, 2018~<br>Feb. 26, 2018 | Sep. 25, 2018 | Conducted<br>(TH05-HY)   |
| Power Sensor      | Anritsu            | MA2411B                 | 0846202            | 300MHz~40GHz<br>z                   | Sep. 26, 2017    | Feb. 07, 2018~<br>Feb. 26, 2018 | Sep. 25, 2018 | Conducted<br>(TH05-HY)   |
| Spectrum Analyzer | Rohde & Schwarz    | FSP30                   | 101067             | 9kHz ~ 30GHz                        | Nov. 13, 2017    | Feb. 07, 2018~<br>Feb. 26, 2018 | Nov. 12, 2018 | Conducted<br>(TH05-HY)   |
| Amplifier         | MITEQ              | TTA1840-35-HG           | 1871923            | 18GHz~40GHz,<br>VSWR : 2.5:1<br>max | Jul. 18, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Jul. 17, 2018 | Radiation<br>(03CH12-HY) |
| Bilog Antenna     | TESEQ              | CBL<br>6111D&N-6-0<br>6 | 35414&AT-<br>N0602 | 30MHz~1GHz                          | Oct. 14, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Oct. 13, 2018 | Radiation<br>(03CH12-HY) |
| Loop Antenna      | Rohde & Schwarz    | HFH2-Z2                 | 100488             | 9 kHz~30 MHz                        | Nov. 23, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Nov. 22, 2019 | Radiation<br>(03CH12-HY) |
| EMI Test Receiver | Rohde & Schwarz    | ESU26                   | 100390             | 20Hz~26.5GHz                        | Dec. 25, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Dec. 24, 2018 | Radiation<br>(03CH12-HY) |
| Horn Antenna      | SCHWARZBECK        | BBHA 9120D              | 9120D-132<br>8     | 1GHz ~ 18GHz                        | Oct. 20, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Oct. 19, 2018 | Radiation<br>(03CH12-HY) |
| Preamplifier      | COM-POWER          | PA-103                  | 161075             | 10MHz~1GHz                          | Mar. 23, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Mar. 22, 2018 | Radiation<br>(03CH12-HY) |
| Preamplifier      | Keysight           | 83017A                  | MY532701<br>48     | 1GHz~26.5GHz                        | Jan. 15, 2018    | Mar. 08, 2018~<br>Mar. 14, 2018 | Jan. 14, 2019 | Radiation<br>(03CH12-HY) |
| Preamplifier      | MITEQ              | AMF-7D-0010<br>1800     | 2025787            | 1GHZ~18GHZ                          | Feb. 13, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Feb. 12, 2019 | Radiation<br>(03CH12-HY) |
| Antenna Mast      | EMEC               | AM-BS-4500-B            | N/A                | 1m~4m                               | N/A              | Mar. 08, 2018~<br>Mar. 14, 2018 | N/A           | Radiation<br>(03CH12-HY) |
| Turn Table        | EMEC               | TT2000                  | N/A                | 0~360 Degree                        | N/A              | Mar. 08, 2018~<br>Mar. 14, 2018 | N/A           | Radiation<br>(03CH12-HY) |
| Attenuator        | Fairview Microwave | SA18S5W-10              | n/a                | 10db                                | Mar. 24, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Mar. 23, 2018 | Radiation<br>(03CH12-HY) |
| Spectrum Analyzer | Keysight           | N9010A                  | MY542004<br>86     | 10Hz~44GHz                          | Oct. 19, 2017    | Mar. 08, 2018~<br>Mar. 14, 2018 | Oct. 18, 2018 | Radiation<br>(03CH12-HY) |



## 5 Uncertainty of Evaluation

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

|                                                                            |      |
|----------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence<br>of 95% ( $U = 2Uc(y)$ ) | 5.10 |
|----------------------------------------------------------------------------|------|

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

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

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

|                                                                            |      |
|----------------------------------------------------------------------------|------|
| Measuring Uncertainty for a Level of Confidence<br>of 95% ( $U = 2Uc(y)$ ) | 4.70 |
|----------------------------------------------------------------------------|------|

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

|                |                        |                    |       |    |
|----------------|------------------------|--------------------|-------|----|
| Test Engineer: | Luffy Lin /Shiming Liu | Temperature:       | 21~25 | °C |
| Test Date:     | 2018/2/7~2018/2/27     | Relative Humidity: | 51~54 | %  |

&lt;For 1Mbps&gt;

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

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) |
|------|-----------|-----|-----|-------------|----------------------------|-----------------------------|
| BLE  | 1Mbps     | 1   | 0   | 2402        | 12.85                      | 30.00                       |
| BLE  | 1Mbps     | 1   | 19  | 2440        | 11.62                      | 30.00                       |
| BLE  | 1Mbps     | 1   | 39  | 2480        | 11.47                      | 30.00                       |

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

| Mod. | Data Rate | NTX | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
|------|-----------|-----|-----|-------------|------------------|-------------------------------|
| BLE  | 1Mbps     | 1   | 0   | 2402        | 2.09             | 12.74                         |
| BLE  | 1Mbps     | 1   | 19  | 2440        | 2.09             | 11.55                         |
| BLE  | 1Mbps     | 1   | 39  | 2480        | 2.09             | 11.41                         |

&lt;For 2Mbps&gt;

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

| Mod.   | Data Rate | N <sub>TX</sub> | CH. | Freq. (MHz) | Peak Conducted Power (dBm) | Conducted Power Limit (dBm) |
|--------|-----------|-----------------|-----|-------------|----------------------------|-----------------------------|
| BLE5.0 | 2Mbps     | 1               | 0   | 2402        | 12.77                      | 30.00                       |
| BLE5.0 | 2Mbps     | 1               | 19  | 2440        | 11.63                      | 30.00                       |
| BLE5.0 | 2Mbps     | 1               | 39  | 2480        | 11.61                      | 30.00                       |

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

| Mod.   | Data Rate | N <sub>TX</sub> | CH. | Freq. (MHz) | Duty Factor (dB) | Average Conducted Power (dBm) |
|--------|-----------|-----------------|-----|-------------|------------------|-------------------------------|
| BLE5.0 | 2Mbps     | 1               | 0   | 2402        | 4.62             | 12.32                         |
| BLE5.0 | 2Mbps     | 1               | 19  | 2440        | 4.62             | 11.08                         |
| BLE5.0 | 2Mbps     | 1               | 39  | 2480        | 4.62             | 10.91                         |



## Appendix B. Radiated Spurious Emission

|                 |                                   |                     |         |
|-----------------|-----------------------------------|---------------------|---------|
| Test Engineer : | Watt Tseng, Karl Hou, and Nick Yu | Temperature :       | 22~23°C |
|                 |                                   | Relative Humidity : | 59~61%  |

&lt;For 2Mbps&gt;

2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

| BLE                     | Note                                                         | Frequency | Level      | Over Limit | Limit Line | Read Level | Antenna Factor | Path Loss | Preamp Factor | Ant Pos | Table Pos | Peak Avg. | Pol.    |
|-------------------------|--------------------------------------------------------------|-----------|------------|------------|------------|------------|----------------|-----------|---------------|---------|-----------|-----------|---------|
|                         |                                                              | ( MHz )   | ( dBμV/m ) | ( dB )     | ( dBμV/m ) | ( dBμV )   | ( dB/m )       | ( dB )    | ( dB )        | ( cm )  | ( deg )   | ( P/A )   | ( H/V ) |
| BLE<br>CH 39<br>2480MHz | *                                                            | 2480      | 103.07     | -          | -          | 93.15      | 27.36          | 14.12     | 31.56         | 298     | 53        | P         | H       |
|                         | *                                                            | 2480      | 101.81     | -          | -          | 91.89      | 27.36          | 14.12     | 31.56         | 298     | 53        | A         | H       |
|                         |                                                              | 2483.88   | 57.13      | -16.87     | 74         | 47.19      | 27.36          | 14.14     | 31.56         | 298     | 53        | P         | H       |
|                         |                                                              | 2483.52   | 45.54      | -8.46      | 54         | 35.6       | 27.36          | 14.14     | 31.56         | 298     | 53        | A         | H       |
|                         |                                                              |           |            |            |            |            |                |           |               |         |           |           | H       |
|                         |                                                              |           |            |            |            |            |                |           |               |         |           |           | H       |
|                         | *                                                            | 2480      | 104.49     | -          | -          | 94.57      | 27.36          | 14.12     | 31.56         | 212     | 86        | P         | V       |
|                         | *                                                            | 2480      | 102.78     | -          | -          | 92.86      | 27.36          | 14.12     | 31.56         | 212     | 86        | A         | V       |
|                         |                                                              | 2483.52   | 57.56      | -16.44     | 74         | 47.62      | 27.36          | 14.14     | 31.56         | 212     | 86        | P         | V       |
|                         |                                                              | 2483.52   | 45.43      | -8.57      | 54         | 35.49      | 27.36          | 14.14     | 31.56         | 212     | 86        | A         | V       |
|                         |                                                              |           |            |            |            |            |                |           |               |         |           |           | V       |
|                         |                                                              |           |            |            |            |            |                |           |               |         |           |           | V       |
| Remark                  | 1. No other spurious found.                                  |           |            |            |            |            |                |           |               |         |           |           |         |
|                         | 2. All results are PASS against Peak and Average limit line. |           |            |            |            |            |                |           |               |         |           |           |         |

**2.4GHz 2400~2483.5MHz****BLE (Harmonic @ 3m)**

| BLE                     | Note                                                                                        | Frequency<br>( MHz ) | Level<br>( dBμV/m ) | Over<br>Limit<br>( dB ) | Limit<br>Line<br>( dBμV/m ) | Read<br>Level<br>( dBμV ) | Antenna<br>Factor<br>( dB/m ) | Path<br>Loss<br>( dB ) | Preamp<br>Factor<br>( dB ) | Ant<br>Pos<br>( cm ) | Table<br>Pos<br>( deg ) | Peak<br>Avg.<br>( P/A ) | Pol.<br>( H/V ) |
|-------------------------|---------------------------------------------------------------------------------------------|----------------------|---------------------|-------------------------|-----------------------------|---------------------------|-------------------------------|------------------------|----------------------------|----------------------|-------------------------|-------------------------|-----------------|
| BLE<br>CH 39<br>2480MHz |                                                                                             | 4960                 | 40.1                | -33.9                   | 74                          | 66.35                     | 31.63                         | 6.75                   | 64.63                      | 100                  | 0                       | P                       | H               |
|                         |                                                                                             | 7440                 | 44.75               | -29.25                  | 74                          | 65.09                     | 36.47                         | 8.07                   | 64.88                      | 100                  | 0                       | P                       | H               |
|                         |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                         |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | H               |
|                         |                                                                                             | 4960                 | 39.33               | -34.67                  | 74                          | 65.58                     | 31.63                         | 6.75                   | 64.63                      | 100                  | 0                       | P                       | V               |
|                         |                                                                                             | 7440                 | 43.73               | -30.27                  | 74                          | 64.07                     | 36.47                         | 8.07                   | 64.88                      | 100                  | 0                       | P                       | V               |
|                         |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
|                         |                                                                                             |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         | V               |
| Remark                  | 1. No other spurious found.<br>2. All results are PASS against Peak and Average limit line. |                      |                     |                         |                             |                           |                               |                        |                            |                      |                         |                         |                 |

## Emission below 1GHz

## 2.4GHz BLE (LF)

| BLE                         | Note                                                                       | Frequency | Level      | Over   | Limit      | Read   | Antenna  | Path   | Preamp | Ant    | Table   | Peak  | Pol.  |   |
|-----------------------------|----------------------------------------------------------------------------|-----------|------------|--------|------------|--------|----------|--------|--------|--------|---------|-------|-------|---|
|                             |                                                                            |           |            | Limit  | Line       | Level  | Factor   | Loss   | Factor | Pos    | Pos     | Avg.  |       |   |
|                             |                                                                            | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | (dBμV) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | (P/A) | (H/V) |   |
| 2.4GHz<br><br>BLE<br><br>LF |                                                                            | 65.1      | 32.19      | -7.81  | 40         | 50.11  | 11.79    | 0.72   | 30.43  | -      | -       | P     | H     |   |
|                             |                                                                            | 71.58     | 32         | -8     | 40         | 49.54  | 12.16    | 0.73   | 30.43  | -      | -       | P     | H     |   |
|                             |                                                                            | 171.75    | 38.36      | -5.14  | 43.5       | 52.19  | 15.22    | 1.26   | 30.31  | 100    | 0       | P     | H     |   |
|                             |                                                                            | 347.6     | 31.86      | -14.14 | 46         | 40.22  | 20.12    | 1.58   | 30.06  | -      | -       | P     | H     |   |
|                             |                                                                            | 374.9     | 30.53      | -15.47 | 46         | 38.14  | 20.81    | 1.6    | 30.02  | -      | -       | P     | H     |   |
|                             |                                                                            | 723.5     | 29.57      | -16.43 | 46         | 29.75  | 27.02    | 2.28   | 29.48  | -      | -       | P     | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | H     |   |
|                             |                                                                            | 32.16     | 31.9       | -8.1   | 40         | 38.43  | 23.24    | 0.44   | 30.21  | -      | -       | P     | V     |   |
|                             |                                                                            | 67.53     | 33.65      | -6.35  | 40         | 51.45  | 11.9     | 0.73   | 30.43  | -      | -       | P     | V     |   |
|                             |                                                                            | 118.56    | 37.34      | -6.16  | 43.5       | 49.59  | 17.21    | 0.92   | 30.38  | 100    | 0       | P     | V     |   |
|                             |                                                                            | 409.2     | 26.58      | -19.42 | 46         | 32.8   | 22.08    | 1.66   | 29.96  | -      | -       | P     | V     |   |
|                             |                                                                            | 482       | 27.46      | -18.54 | 46         | 31.98  | 23.47    | 1.83   | 29.82  | -      | -       | P     | V     |   |
|                             |                                                                            | 565.3     | 28.56      | -17.44 | 46         | 30.35  | 25.89    | 2.03   | 29.71  | -      | -       | P     | V     |   |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       |       | V |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       |       | V |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       |       | V |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       |       | V |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       |       | V |
|                             |                                                                            |           |            |        |            |        |          |        |        |        |         |       | V     |   |
| Remark                      | 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>P</b> eak or <b>A</b> verage                                                                                                                          |
| H/V | <b>H</b> orizontal or <b>V</b> ertical                                                                                                                   |



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

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |      |           |            | Limit  | Line       | Level    | Factor   | Loss   | Factor | Pos    | Pos     | Avg.    |         |
|                         |      | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |
| BLE<br>CH 00<br>2402MHz |      | 2390      | 55.45      | -18.55 | 74         | 54.51    | 32.22    | 4.58   | 35.86  | 103    | 308     | P       | H       |
|                         |      | 2390      | 43.54      | -10.46 | 54         | 42.6     | 32.22    | 4.58   | 35.86  | 103    | 308     | A       | H       |

$$1. \text{ Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)}$$

$$2. \text{ Level(dB}\mu\text{V/m) =}$$

$$\text{Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB}\mu\text{V) - Preamp Factor(dB)}$$

$$3. \text{ Over Limit(dB) = Level(dB}\mu\text{V/m) - Limit Line(dB}\mu\text{V/m)}$$

#### For Peak Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB}\mu\text{V) - Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 54.51(\text{dB}\mu\text{V}) - 35.86(\text{dB})$$

$$= 55.45(\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m) - Limit Line(dB}\mu\text{V/m)}$$

$$= 55.45(\text{dB}\mu\text{V/m}) - 74(\text{dB}\mu\text{V/m})$$

$$= -18.55(\text{dB})$$

#### For Average Limit @ 2390MHz:

$$1. \text{ Level(dB}\mu\text{V/m)}$$

$$= \text{Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB}\mu\text{V) - Preamp Factor(dB)}$$

$$= 32.22(\text{dB/m}) + 4.58(\text{dB}) + 42.6(\text{dB}\mu\text{V}) - 35.86(\text{dB})$$

$$= 43.54(\text{dB}\mu\text{V/m})$$

$$2. \text{ Over Limit(dB)}$$

$$= \text{Level(dB}\mu\text{V/m) - Limit Line(dB}\mu\text{V/m)}$$

$$= 43.54(\text{dB}\mu\text{V/m}) - 54(\text{dB}\mu\text{V/m})$$

$$= -10.46(\text{dB})$$

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



## Appendix C. Radiated Spurious Emission Plots

|                 |                                   |                     |         |
|-----------------|-----------------------------------|---------------------|---------|
| Test Engineer : | Watt Tseng, Karl Hou, and Nick Yu | Temperature :       | 22~23°C |
|                 |                                   | Relative Humidity : | 59~61%  |

### Note symbol

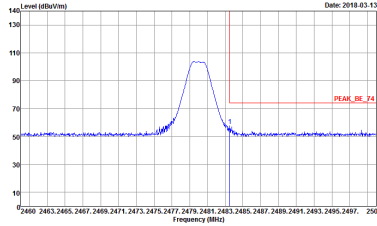
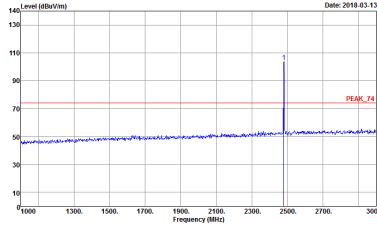
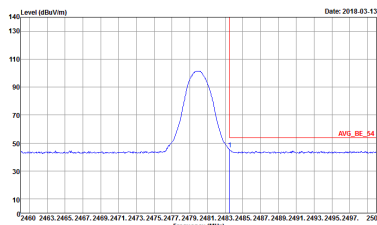
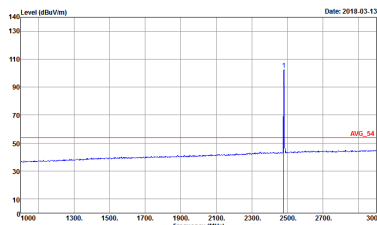
|    |                       |
|----|-----------------------|
| -L | Low channel location  |
| -R | High channel location |



2.4GHz 2400~2483.5MHz

BLE (Band Edge @ 3m)

| BLE  | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                            |                                                                                                                              |
|------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| ANT  | BLE CH39 2480MHz                                                                                                                |                                                                                                                              |
| 1    | Horizontal                                                                                                                      | Fundamental                                                                                                                  |
| Peak | <p>Site : 03CH12-HY<br/>Condition : PEAK_BE_74 3m HORN_9120D_1328 HORIZONTAL<br/>: RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto</p> | <p>Site : 03CH12-HY<br/>Condition : PEAK_74 3m HORN_9120D_1328 HORIZONTAL<br/>: RBW:1000.0000Hz VBW:3000.0000Hz SWT:Auto</p> |
| Avg. | <p>Site : 03CH12-HY<br/>Condition : AVG_BE_54 3m HORN_9120D_1328 HORIZONTAL<br/>: RBW:1000.0000Hz VBW:10.0000Hz SWT:Auto</p>    | <p>Site : 03CH12-HY<br/>Condition : AVG_54 3m HORN_9120D_1328 HORIZONTAL<br/>: RBW:1000.0000Hz VBW:10.0000Hz SWT:Auto</p>    |

| BLE         | 2.4GHz 2400~2483.5MHz Band Edge @ 3m                                                                                                                                                                          |                                                                                                                                                                                                             |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT         | BLE CH39 2480MHz                                                                                                                                                                                              |                                                                                                                                                                                                             |
| 1           | Vertical                                                                                                                                                                                                      | Fundamental                                                                                                                                                                                                 |
| <b>Peak</b> |  <p>Site : 03CH12-HY<br/>Condition : PEAK_BE_74 3m HORN_9120D_1328 VERTICAL<br/>RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |  <p>Site : 03CH12-HY<br/>Condition : PEAK_74 3m HORN_9120D_1328 VERTICAL<br/>RBW:1000.000KHz VBW:3000.000KHz SWT:Auto</p> |
|             |  <p>Site : 03CH12-HY<br/>Condition : AVG_BE_54 3m HORN_9120D_1328 VERTICAL<br/>RBW:1000.000KHz VBW:10.000KHz SWT:Auto</p>  |  <p>Site : 03CH12-HY<br/>Condition : AVG_54 3m HORN_9120D_1328 VERTICAL<br/>RBW:1000.000KHz VBW:10.000KHz SWT:Auto</p>  |



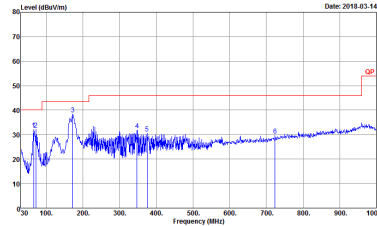
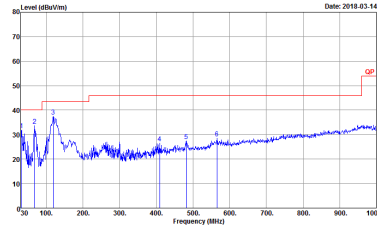
2.4GHz 2400~2483.5MHz

BLE (Harmonic @ 3m)

| BLE  | 2.4GHz 2400~2483.5MHz Harmonic @ 3m                                                                          |                                                                                                            |
|------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| ANT  | BLE CH39 2480MHz                                                                                             |                                                                                                            |
| 1    | Horizontal                                                                                                   | Vertical                                                                                                   |
| Peak | <div><p>Site : 03CH12-HY<br/>Condition : PEAK_74 3m HORN_91200_1328 HORIZONTAL<br/>Detector : Peak</p></div> | <div><p>Site : 03CH12-HY<br/>Condition : PEAK_74 3m HORN_91200_1328 VERTICAL<br/>Detector : Peak</p></div> |



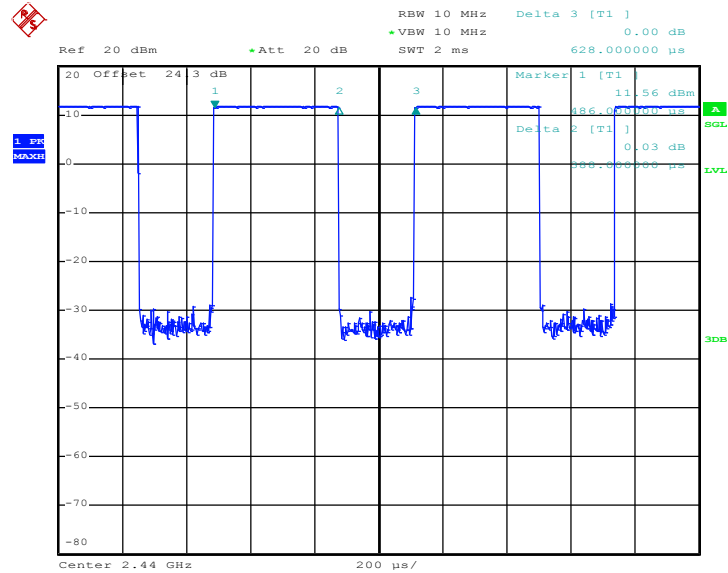
Emission below 1GHz  
2.4GHz BLE (LF)

| BLE          | 2.4GHz 2400~2483.5MHz                                                                                                                                                            |                                                                                                                                                                                 |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ANT          | BLE LF                                                                                                                                                                           |                                                                                                                                                                                 |
| 1            | Horizontal                                                                                                                                                                       | Vertical                                                                                                                                                                        |
| QP /<br>Peak |  <p>Site : 03CH12-HY<br/>Condition : QP 3m BIL06_6111D_35414 HORIZONTAL<br/>Detector : Peak</p> |  <p>Site : 03CH12-HY<br/>Condition : QP 3m BIL06_6111D_35414 VERTICAL<br/>Detector : Peak</p> |
|              |                                                                                                                                                                                  |                                                                                                                                                                                 |

## Appendix D. Duty Cycle Plots

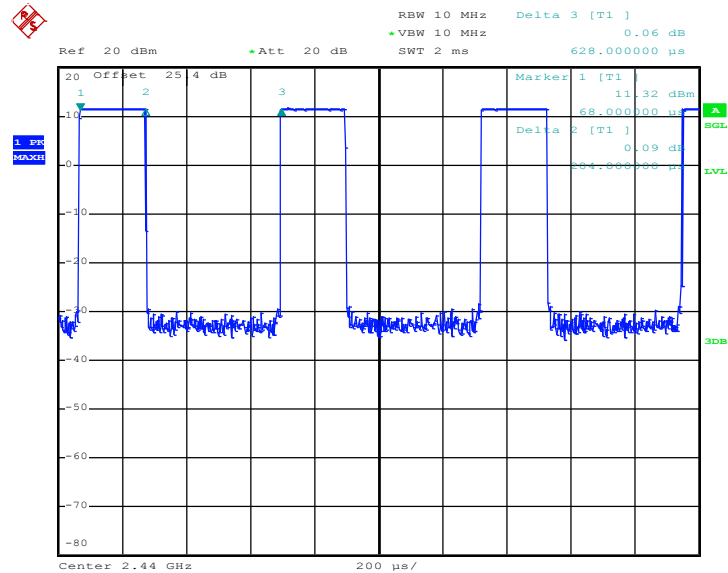
| Band                | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting | Duty Factor(dB) |
|---------------------|---------------|-------|----------|-------------|-----------------|
| Bluetooth –LE 1Mbps | 61.78         | 388   | 2.58     | 3kHz        | 2.09            |
| Bluetooth –LE 2Mbps | 34.48         | 204   | 4.90     | 10kHz       | 4.62            |

## Bluetooth – LE 1Mbps



Date: 27.FEB.2018 00:26:04

## Bluetooth – LE 2Mbps



Date: 8.FEB.2018 01:06:37