



# FCC RADIO TEST REPORT

**FCC ID** : SH6MDBT50Q  
**Equipment** : MDBT50Q  
**Brand Name** : Raytac  
**Model Name** : MDBT50Q  
**Applicant** : Raytac  
5F., No.3, Jiankang Rd., Zhonghe Dist.,  
New Taipei City, Taiwan  
**Manufacturer** : Unigen Corporation  
39730 Eureka Dr, Newark, CA 94560  
**Standard** : FCC Part 15 Subpart C §15.247

The product was received on May 15, 2020 and testing was started from May 28, 2020 and completed on May 28, 2020. We, SPORTON INTERNATIONAL INC., EMC & Wireless Communications Laboratory, 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 report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

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

*Louis Wu*

Approved by: Louis Wu

**SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory**

No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)



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### History of this test report

| Report No.  | Version | Description                    | Issued Date   |
|-------------|---------|--------------------------------|---------------|
| FR991726-02 | 01      | Initial issue of report        | Jul. 06, 2020 |
| FR991726-02 | 02      | Revising applicant information | Jul. 08, 2020 |
|             |         |                                |               |
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|             |         |                                |               |
|             |         |                                |               |



### Summary of Test Result

| Report Clause | Ref Std. Clause    | Test Items                                 | Result (PASS/FAIL) | Remark                            |
|---------------|--------------------|--|--------------------|-----------------------------------|
| -             | 15.247(a)(2)       | 6dB Bandwidth                              | Not Required       | -                                 |
| -             | 2.1049             | 99% Occupied Bandwidth                     | Reporting only     | -                                 |
| -             | 15.247(b)(3)       | Output Power                               | Not Required       | -                                 |
| -             | 15.247(e)          | Power Spectral Density                     | Not Required       | -                                 |
| -             | 15.247(d)          | Conducted Band Edges and Spurious Emission | Not Required       | -                                 |
| 3.1           | 15.247(d)          | Radiated Band Edges and Spurious Emission  | Pass               | Under limit 3.73 dB at 59.430 MHz |
| -             | 15.207             | AC Conducted Emission                      | Not Required       | -                                 |
| 3.2           | 15.203 & 15.247(b) | Antenna Requirement                        | Pass               | -                                 |

**Note:**

1. Not required means after assessing, test items are not necessary to carry out.
2. This is a variant report by removing connectors on the device which would not effect RF design and function. All the test cases were performed on original report which can be referred to Sporton Report Number FR991726-01. Based on the original report, the radiated emission and RF electromagnetic field test cases were verified.

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

**Reviewed by: Wii Chang**

**Report Producer: Vivian Hsu**



# 1 General Description

## 1.1 Product Feature of Equipment Under Test

Bluetooth - LE

| Product Specification subjective to this standard |   |
|---|---|
| Sample 1  | Host with Antenna 1   |
| Sample 2  | Host with Antenna 2   |
| Installed into Host                               | Brand Name: Proxy<br>Model Name: Mobile Reader Nano Connect |

Remark: All test items were performed with Sample 1.

| Antenna Information |              |             |                 |          |
|---------------------|--------------|-------------|-----------------|----------|
| Antenna 1           | Model number | 146153-0150 | Peak gain (dBi) | 2.8      |
|                     |              |             | Type            | Dipole   |
| Antenna 2           | Model number | 206994-0100 | Peak gain (dBi) | 3.6      |
|                     |              |             | Type            | Monopole |

## 1.2 Modification of EUT

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



### 1.3 Testing Location

|                           |   |
|---------------------------|---|
| <b>Test Site</b>          | SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory   |
| <b>Test Site Location</b> | No.52, Huaya 1st 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>   |
|                           | 03CH07-HY   |

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

FCC designation No.: TW1190

### 1.4 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 v05r02
- ♦ FCC KDB 414788 D01 Radiated Test Site v01r01
- ♦ 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. The TAF code is not including all the FCC KDB listed without accreditation.
3. 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. (MHz) | Channel | Freq. (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    | -           | -       |             |

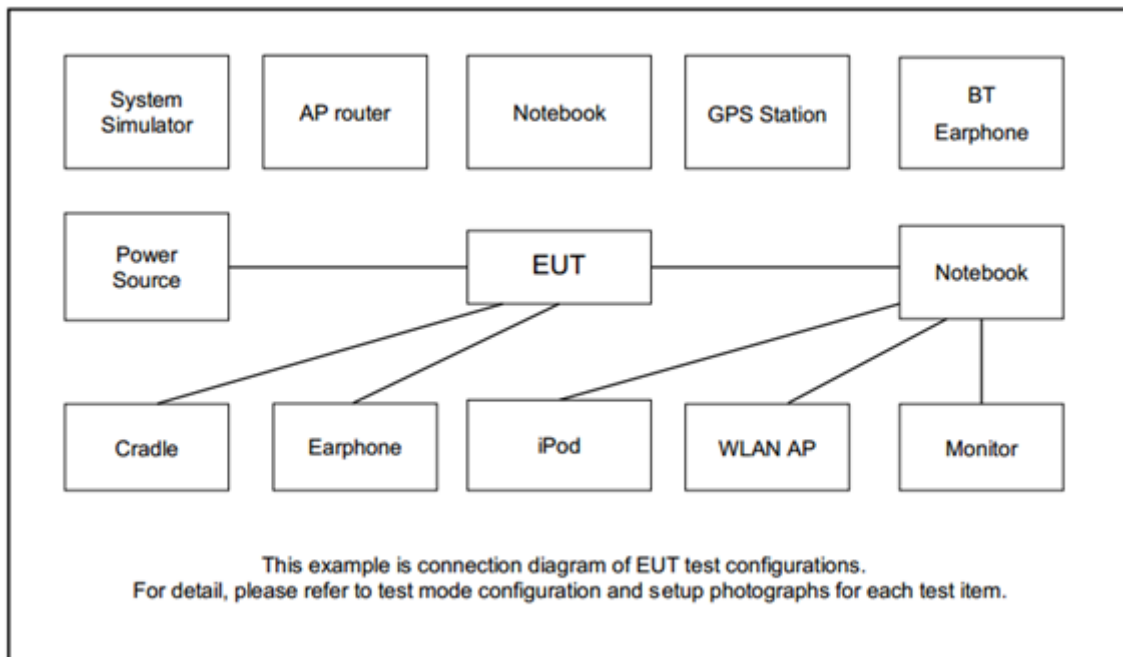
## 2.2 Test Mode

- 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).

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                    |
| Radiated Test Cases         | Mode 1: Bluetooth Tx CH39_2480 MHz_2Mbps |

## 2.3 Connection Diagram of Test System







## 2.4 Support Unit used in test configuration and system

| Item | Equipment       | Trade Name | Model Name     | FCC ID  | Data Cable | Power Cord   |
|------|-----------------|------------|----------------|---|------------|--|
| 1.   | DC Power Supply | Aglient    | E3610A         | FCC DoC                                       | N/A        | N/A  |
| 2.   | Notebook        | DELL       | Latitude E3340 | FCC DoC/<br>Contains<br>FCC ID:<br>PD97260NGU | 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 “nRF\_DTM v0.9.1” 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 Radiated Band Edges and Spurious Emission Measurement

##### 3.1.1 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 (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                             |

##### 3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

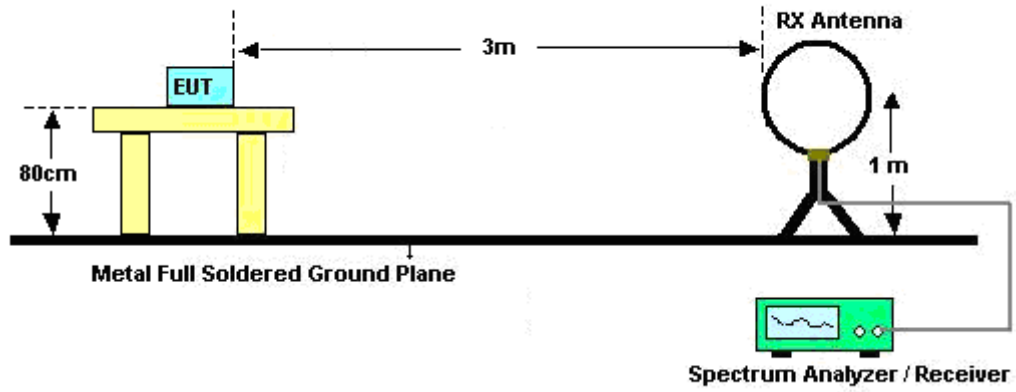


### 3.1.3 Test Procedures

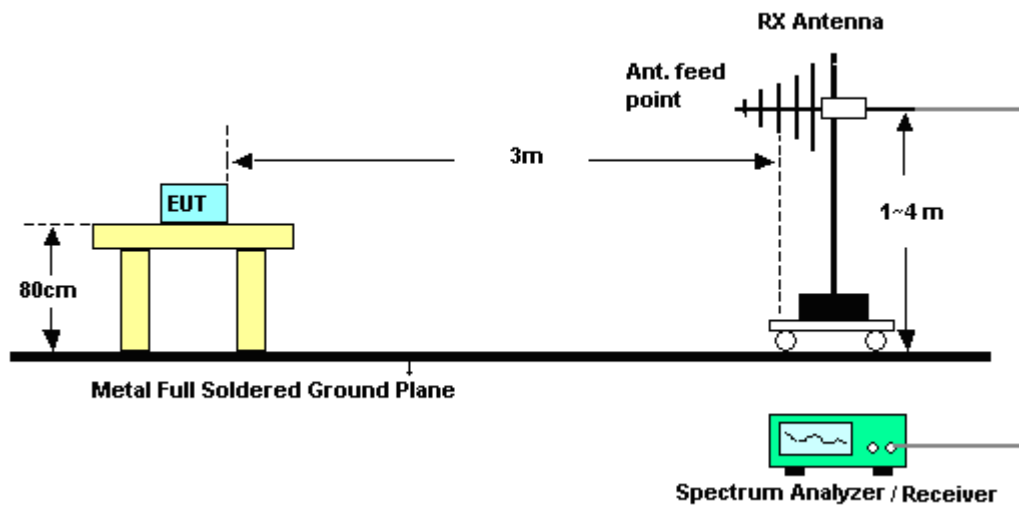
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the 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  $f < 1$  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.

### 3.1.4 Test Setup

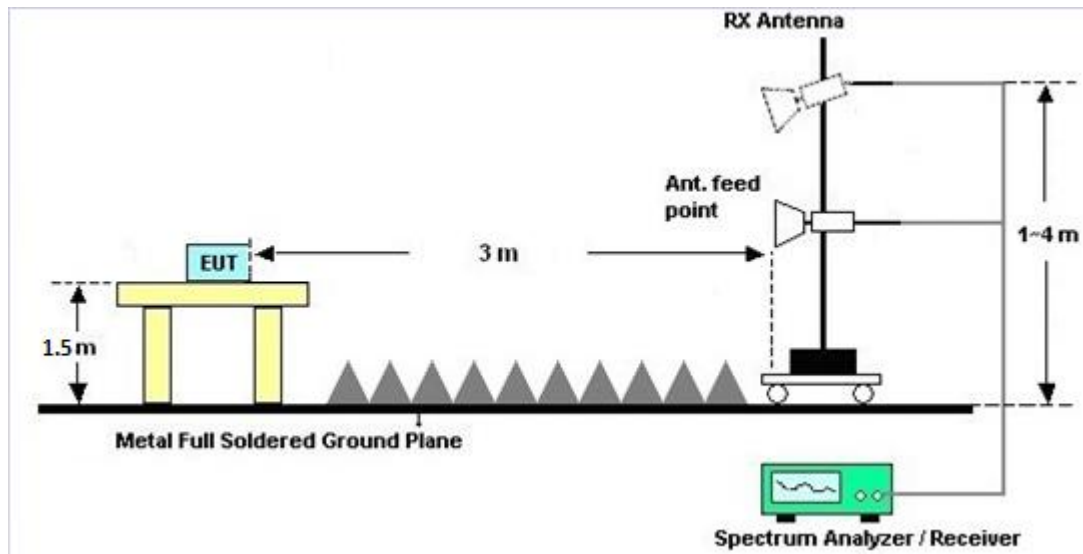
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



### 3.1.5 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 alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

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

Please refer to Appendix A and B.

### 3.1.7 Duty Cycle

Please refer to Appendix C.

### 3.1.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix A and B.



## **3.2 Antenna Requirements**

### **3.2.1 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.

### **3.2.2 Antenna Anti-Replacement Construction**

An embedded-in antenna design is used.

### **3.2.3 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                |
|--------------------------------------|-----------------|-----------------------------|--------------|------------------------|------------------|--------------|---------------|-----------------------|
| Bilog Antenna                        | TESEQ           | CBL 6111D & 00800N1D01 N-06 | 35419 & 03   | 30MHz~1GHz             | Apr. 29, 2020    | May 28, 2020 | Apr. 28, 2021 | Radiation (03CH07-HY) |
| Double Ridge Horn Antenna            | ESCO            | 3117                        | 00075962     | 1GHz ~ 18GHz           | Dec. 06, 2019    | May 28, 2020 | Dec. 05, 2020 | Radiation (03CH07-HY) |
| Loop Antenna                         | Rohde & Schwarz | HFH2-Z2                     | 100315       | 9 kHz~30 MHz           | Dec. 26, 2019    | May 28, 2020 | Dec. 25, 2020 | Radiation (03CH07-HY) |
| Preamplifier                         | COM-POWER       | PA-103A                     | 161241       | 10MHz~1GHz             | May 19, 2020     | May 28, 2020 | May 18, 2021  | Radiation (03CH07-HY) |
| Preamplifier                         | Agilent         | 8449B                       | 3008A02362   | 1GHz~26.5GHz           | Nov. 01, 2019    | May 28, 2020 | Oct. 31, 2020 | Radiation (03CH07-HY) |
| Filter                               | Wainwright      | WLKS1200-8SS                | SN3          | 1.2GHz Low Pass Filter | Aug. 22, 2019    | May 28, 2020 | Aug. 21, 2020 | Radiation (03CH07-HY) |
| 3m Semi Anechoic Chamber (NSA)       | TDK             | SAC-3M                      | 03CH07-HY    | 30MHz~1GHz             | Jan. 01, 2020    | May 28, 2020 | Dec. 31, 2021 | Radiation (03CH07-HY) |
| 3m Semi Anechoic Chamber (Site VSWR) | TDK             | SAC-3M                      | 03CH07-HY    | 1GHz~18GHz             | Dec. 24, 2019    | May 28, 2020 | Dec. 23, 2020 | Radiation (03CH07-HY) |
| Controller                           | ChainTek        | Chaintek 3000               | N/A          | Control Turn table     | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |
| Controller                           | Max-Full        | MF7802                      | MF780208368  | Control Ant Mast       | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |
| Antenna Mast                         | Max-Full        | MFA520BS                    | N/A          | 1m~4m                  | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |
| Turn Table                           | ChainTek        | Chaintek 3000               | N/A          | 0~360 Degree           | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |
| Attenuator                           | HONOVA          | 5910 SMA-50-005-19-NE       | ATT-36       | N/A                    | Nov. 01, 2019    | May 28, 2020 | Oct. 31, 2020 | Radiation (03CH07-HY) |
| USB Data Logger                      | TECPEL          | TR-32                       | HE17XB2495   | N/A                    | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |
| Spectrum Analyzer                    | Keysight        | N9010A                      | MY54200485   | 10Hz~44GHz             | Feb. 10, 2020    | May 28, 2020 | Feb. 09, 2021 | Radiation (03CH07-HY) |
| SHF-EHF Horn Antenna                 | SCHWARZBECK     | BBHA 9170                   | BBHA9170251  | 18GHz~40GHz            | Nov. 26, 2019    | May 28, 2020 | Nov. 25, 2020 | Radiation (03CH07-HY) |
| Preamplifier                         | EMEC            | EM18G40G                    | 060715       | 18GHz~40GHz            | Dec. 13, 2019    | May 28, 2020 | Dec. 12, 2020 | Radiation (03CH07-HY) |
| Software                             | Audix           | E3 6.2009-8-24              | 80504004656H | N/A                    | N/A              | May 28, 2020 | N/A           | Radiation (03CH07-HY) |



## 5 Uncertainty of Evaluation

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

|   |     |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 2.6 |
|---|-----|

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

|   |     |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.6 |
|---|-----|

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

|   |     |
|---|-----|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.2 |
|---|-----|





## Appendix A. Radiated Spurious Emission

|                 |            |                     |           |
|-----------------|------------|---------------------|-----------|
| Test Engineer : | Jesse Wang | Temperature :       | 20 ~ 21°C |
|                 |            | Relative Humidity : | 59 ~ 62%  |

### 2.4GHz 2400~2483.5MHz

#### BLE (Band Edge @ 3m)

| BLE                     | Note  | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak | Pol.        |
|-------------------------|---|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|------|-------------|
|                         |   | ( MHz )   | ( dBμV/m ) | ( dB ) | Limit Line | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | Avg. | (P/A) (H/V) |
| BLE<br>CH 39<br>2480MHz | *   | 2480      | 96.41      | -      | -          | 81.51    | 32.07    | 18.12  | 35.29  | 102    | 43      | P    | H           |
|                         | *   | 2480      | 94.94      | -      | -          | 80.04    | 32.07    | 18.12  | 35.29  | 102    | 43      | A    | H           |
|                         |   | 2486.12   | 54.12      | -19.88 | 74         | 39.22    | 32.07    | 18.12  | 35.29  | 102    | 43      | P    | H           |
|                         |   | 2484.12   | 47.25      | -6.75  | 54         | 32.35    | 32.07    | 18.12  | 35.29  | 102    | 43      | A    | H           |
|                         |   |           |            |        |            |          |          |        |        |        |         |      | H           |
|                         |   |           |            |        |            |          |          |        |        |        |         |      | H           |
|                         | *   | 2480      | 97.07      | -      | -          | 82.17    | 32.07    | 18.12  | 35.29  | 300    | 117     | P    | V           |
|                         | *   | 2480      | 95.31      | -      | -          | 80.41    | 32.07    | 18.12  | 35.29  | 300    | 117     | A    | V           |
|                         |   | 2483.56   | 55.27      | -18.73 | 74         | 40.37    | 32.07    | 18.12  | 35.29  | 300    | 117     | P    | V           |
|                         |   | 2484.28   | 47.03      | -6.97  | 54         | 32.13    | 32.07    | 18.12  | 35.29  | 300    | 117     | A    | 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.    |   |
|---------------------|--|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|---|
|                     |  | ( MHz )   | ( dBμV/m ) | ( dB ) | ( dBμV/m ) | ( dBμV ) | ( dB/m ) | ( dB ) | ( dB ) | ( cm ) | ( deg ) | ( P/A ) | ( H/V ) |   |
| 2.4GHz<br>BLE<br>LF |  | 59.43     | 25.42      | -14.58 | 40         | 42.16    | 11.94    | 1.31   | 29.99  | -      | -       | P       | H       |   |
|                     |  | 95.88     | 30.07      | -13.43 | 43.5       | 42.76    | 15.54    | 1.74   | 29.97  | -      | -       | P       | H       |   |
|                     |  | 203.07    | 35.42      | -8.08  | 43.5       | 47.81    | 15.04    | 2.5    | 29.93  | -      | -       | P       | H       |   |
|                     |  | 305.6     | 36.79      | -9.21  | 46         | 44.26    | 19.31    | 3.12   | 29.9   | -      | -       | P       | H       |   |
|                     |  | 332.9     | 31.85      | -14.15 | 46         | 38.73    | 19.76    | 3.25   | 29.89  | -      | -       | P       | H       |   |
|                     |  | 794.9     | 41.6       | -4.4   | 46         | 38.25    | 27.77    | 5.04   | 29.46  | 100    | 0       | P       | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           |            |        |            |          |          |        |        |        |         |         | H       |   |
|                     |  |           | 30         | 32.89  | -7.11      | 40       | 37.64    | 24.32  | 0.94   | 30.01  | -       | -       | P       | V |
|                     |  |           | 59.43      | 36.27  | -3.73      | 40       | 53.01    | 11.94  | 1.31   | 29.99  | 100     | 0       | P       | V |
|                     |  |           | 71.85      | 35.96  | -4.04      | 40       | 51.98    | 12.51  | 1.45   | 29.98  | -       | -       | P       | V |
|                     |  |           | 332.9      | 29.48  | -16.52     | 46       | 36.36    | 19.76  | 3.25   | 29.89  | -       | -       | P       | V |
|                     |  |           | 531        | 32.38  | -13.62     | 46       | 34.28    | 23.93  | 4.03   | 29.86  | -       | -       | P       | V |
|                     |  |           | 811.7      | 38.22  | -7.78      | 46       | 34.98    | 27.55  | 5.09   | 29.4   | -       | -       | 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>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:

| BLE                     | Note | Frequency | Level      | Over   | Limit      | Read     | Antenna  | Path   | Preamp | Ant    | Table   | Peak    | Pol.    |
|-------------------------|------|-----------|------------|--------|------------|----------|----------|--------|--------|--------|---------|---------|---------|
|                         |      | ( 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. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =  
Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)
3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

**For Peak Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path 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)
2. Over Limit(dB)  
= Level(dBμV/m) – Limit Line(dBμV/m)  
= 55.45(dBμV/m) – 74(dBμV/m)  
= -18.55(dB)

**For Average Limit @ 2390MHz:**

1. Level(dBμV/m)  
= Antenna Factor(dB/m) + Path 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)
2. 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”.**

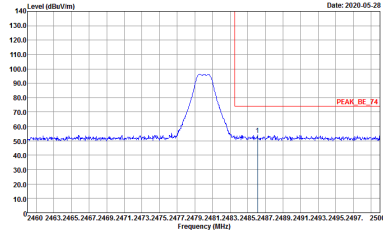
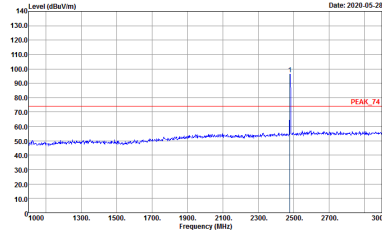
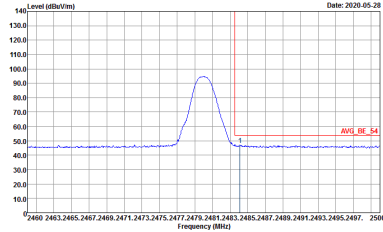
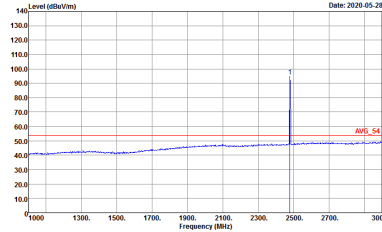


## Appendix B. Radiated Spurious Emission Plots

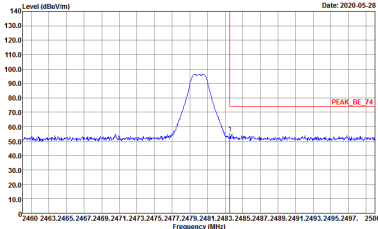
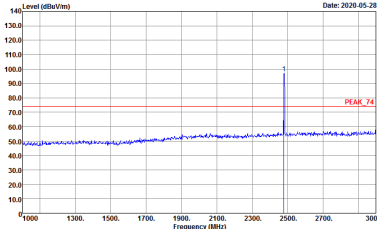
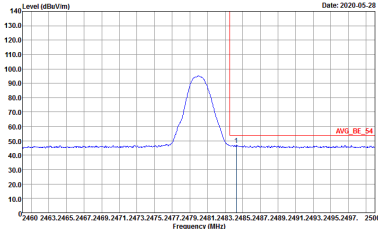
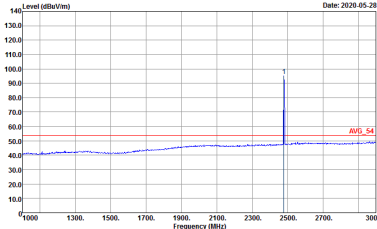
|                 |            |                     |           |
|-----------------|------------|---------------------|-----------|
| Test Engineer : | Jesse Wang | Temperature :       | 20 ~ 21°C |
|                 |            | Relative Humidity : | 59 ~ 62%  |



2.4GHz 2400~2483.5MHz  
BLE (Band Edge @ 3m)

| BLE              | 2.4GHz 2400~2483.5MHz Band Edge @ 3m   |  |
|------------------|--|--|
| BLE CH39 2480MHz |  |  |
| Horizontal       |  | Fundamental  |
| Peak             |  <p>Date: 2020-05-28</p> <p>Site : 03CH07-HY<br/>Condition : PEAK_BE_74 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 1</p>  |  <p>Date: 2020-05-28</p> <p>Site : 03CH07-HY<br/>Condition : PEAK_74 3m HE_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 1</p>  |
| Avg.             |  <p>Date: 2020-05-28</p> <p>Site : 03CH07-HY<br/>Condition : AVG_BE_S4 3m HF_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 1</p> |  <p>Date: 2020-05-28</p> <p>Site : 03CH07-HY<br/>Condition : AVG_S4 3m HE_ANT_00075962 HORIZONTAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 1</p> |



| BLE              | 2.4GHz 2400~2483.5MHz Band Edge @ 3m  |  |
|------------------|---|--|
| BLE CH39 2480MHz |   |  |
| Vertical         |   | Fundamental  |
| Peak             |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a peak at 2480 MHz. The peak level is approximately 100 dBuV/m. The plot includes a red horizontal line labeled 'PEAK_BE_74' at the peak level.</p> <p>Site : 03CH07-HY<br/>           Condition : PEAK_BE_74 3m HF_ANT_00075962 VERTICAL<br/>           Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>           Project : Peak<br/>           Mode : 991726-02<br/>           : 1</p> |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing a sharp peak at 2480 MHz. The peak level is approximately 100 dBuV/m. The plot includes a red horizontal line labeled 'PEAK_74' at the peak level.</p> <p>Site : 03CH07-HY<br/>           Condition : PEAK_74 3m HF_ANT_00075962 VERTICAL<br/>           Detector : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto<br/>           Project : Peak<br/>           Mode : 991726-02<br/>           : 1</p> |
| Avg.             |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing the average level across the band. A red horizontal line labeled 'AVG_BE_54' is shown at approximately 54 dBuV/m.</p> <p>Site : 03CH07-HY<br/>           Condition : AVG_BE_54 3m HF_ANT_00075962 VERTICAL<br/>           Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto<br/>           Project : Peak<br/>           Mode : 991726-02<br/>           : 1</p>                                |  <p>Level (dBuV/m) vs Frequency (MHz) plot showing the average level across the band. A red horizontal line labeled 'AVG_54' is shown at approximately 54 dBuV/m.</p> <p>Site : 03CH07-HY<br/>           Condition : AVG_54 3m HF_ANT_00075962 VERTICAL<br/>           Detector : RBW:1000.000KHz VBW:10.000KHz SWT:Auto<br/>           Project : Peak<br/>           Mode : 991726-02<br/>           : 1</p>                                      |



Emission below 1GHz  
2.4GHz BLE (LF)

| BLE          | 2.4GHz 2400~2483.5MHz  |  |
|--------------|--|--|
|              | BLE LF   |  |
|              | Horizontal   | Vertical   |
| QP /<br>Peak | <p>Site : 03CH07-4HY<br/>Condition : QP 3m LF-ANT-35419(G) HORIZONTAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 2</p> | <p>Site : 03CH07-4HY<br/>Condition : QP 3m LF-ANT-35419(G) VERTICAL<br/>Detector : Peak<br/>Project : 991726-02<br/>Mode : 2</p> |

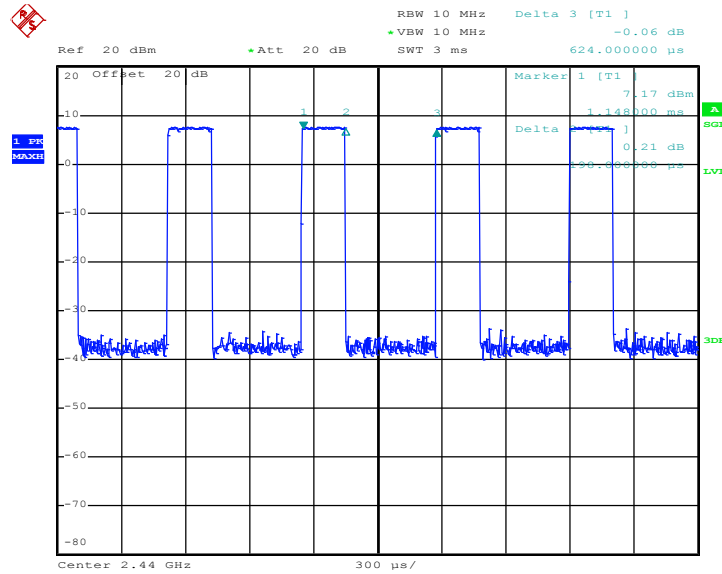




### Appendix C. Duty Cycle Plots

| Band                    | Duty Cycle(%) | T(us) | 1/T(kHz) | VBW Setting | Duty Factor(dB) |
|-------------------------|---------------|-------|----------|-------------|-----------------|
| Bluetooth -LE for 2Mbps | 31.73         | 198   | 5.05     | 10kHz       | 4.99            |

#### Bluetooth - LE for 2Mbps



Date: 17.APR.2020 14:13:34