

# FCC Test Report

Product Name : Handheld Terminal

Brand Name : KEYENCE

Model No. : DX-W600

FCC ID : RF41539G

Applicant : Keyence Corporation

Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka  
533-8555 Japan

Date of Receipt : May 23, 2022

Issued Date : Jul. 21, 2022

Report No. : 2250673R-RFUSBLEV01-A

Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.


This report must not be used to claim product endorsement by TAF or any agency of the government.


Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

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Product Name : Handheld Terminal  
Applicant : Keyence Corporation  
Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka 533-8555  
Japan  
Manufacturer : KEYENCE CORPORATION  
Address : 1-3-14 Higashinakajima, Higashiyodagawa-ku Osaka 533-8555  
Japan  
Brand Name : KEYENCE  
Model No. : DX-W600  
FCC ID : RF41539G  
EUT Voltage : DC 5V (host equipment)  
DC 3.8V (li-ion battery)  
Testing Voltage : AC 120V/60Hz  
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247  
ANSI C63.10: 2013  
Laboratory Name : DEKRA Testing and Certification Co., Ltd.  
Hsin Chu Laboratory  
Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu  
County 310, Taiwan, R.O.C.  
Test Result : Complied

Documented By :   
\_\_\_\_\_  
(Amelia Wu / Project Specialist)

Approved By :   
\_\_\_\_\_  
(Rueyyan Lin / Supervisor)

The test results relate only to the samples tested.

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## Revision History

| Version | Description             | Issued Date   |
|---------|-------------------------|---------------|
| V1.0    | Initial issue of report | Jul. 21, 2022 |
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## 1. General Information

### 1.1 EUT Description

|                    |                         |
|--------------------|-------------------------|
| Product Name       | Handheld Terminal       |
| Brand Name         | KEYENCE                 |
| Model No.          | DX-W600                 |
| Frequency Range    | 1 Mbps: 2402 ~ 2480 MHz |
| Channel Number     | 1 Mbps: 40 Channels     |
| Type of Modulation | GFSK                    |

| Accessories Information |                |            |           |                           |
|-------------------------|----------------|------------|-----------|---------------------------|
| No.                     | Equipment Name | Brand Name | Model No. | Rating                    |
| 1                       | Li-ion Battery | KEYENCE    | DX-BQ6    | 3.8Vdc (23.02Wh), 6060mAh |

| Antenna Information |                            |                  |      |            |
|---------------------|----------------------------|------------------|------|------------|
| Ant.                | Brand Name                 | Model No.        | Type | Gain (dBi) |
| 1                   | ARISTOTLE ENTERPRISES INC. | RFA-25-F77-40-42 | PIFA | -8.37      |

#### GFSK (1 Mbps)

| Working Frequency of Each Channel |           |         |           |         |           |         |           |
|-----------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                           | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 00                                | 2402 MHz  | 10      | 2422 MHz  | 20      | 2442 MHz  | 30      | 2462 MHz  |
| 01                                | 2404 MHz  | 11      | 2424 MHz  | 21      | 2444 MHz  | 31      | 2464 MHz  |
| 02                                | 2406 MHz  | 12      | 2426 MHz  | 22      | 2446 MHz  | 32      | 2466 MHz  |
| 03                                | 2408 MHz  | 13      | 2428 MHz  | 23      | 2448 MHz  | 33      | 2468 MHz  |
| 04                                | 2410 MHz  | 14      | 2430 MHz  | 24      | 2450 MHz  | 34      | 2470 MHz  |
| 05                                | 2412 MHz  | 15      | 2432 MHz  | 25      | 2452 MHz  | 35      | 2472 MHz  |
| 06                                | 2414 MHz  | 16      | 2434 MHz  | 26      | 2454 MHz  | 36      | 2474 MHz  |
| 07                                | 2416MHz   | 17      | 2436 MHz  | 27      | 2456 MHz  | 37      | 2476 MHz  |
| 08                                | 2418 MHz  | 18      | 2438 MHz  | 28      | 2458 MHz  | 38      | 2478 MHz  |
| 09                                | 2420 MHz  | 19      | 2440 MHz  | 29      | 2460 MHz  | 39      | 2480 MHz  |

#### Note:

1. Regards to the frequency band operation; the lowest · middle and highest frequency of channel were selected to perform the test, and then shown on this report.
2. The above EUT information is declared by the manufacturer.

## 1.2 Test Mode

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

|           |                  |
|-----------|------------------|
| Test Mode | Mode 1: Transmit |
|-----------|------------------|

| Test Items                         | Test Mode | Modulation    | Channel  | Result |
|------------------------------------|-----------|---------------|----------|--------|
| AC Power Line Conducted Emission   | Mode 1    | GFSK (1 Mbps) | 39       | Pass   |
| Maximum Conducted Output Power     | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |
| Radiated Emission Below 1 GHz      | Mode 1    | GFSK (1 Mbps) | 39       | Pass   |
| Radiated Emission Above 1 GHz      | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |
| Antenna Port Conducted Emission    | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |
| Radiated Emission Band Edge        | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |
| Occupied Bandwidth & DTS Bandwidth | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |
| Maximum Power Spectral Density     | Mode 1    | GFSK (1 Mbps) | 00/19/39 | Pass   |

Note:

1. Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. For below 1 GHz radiated emission and AC Power Line Conducted Emission have performed all modes of operation were investigated and the worst-case emissions are reported.
3. The EUT was performed at X axis, Y axis and Z axis position for radiated emission and band edge tests. The worst case was found at Z axis, so the measurement will follow this same test configuration.

## 1.3 Comments and Remarks

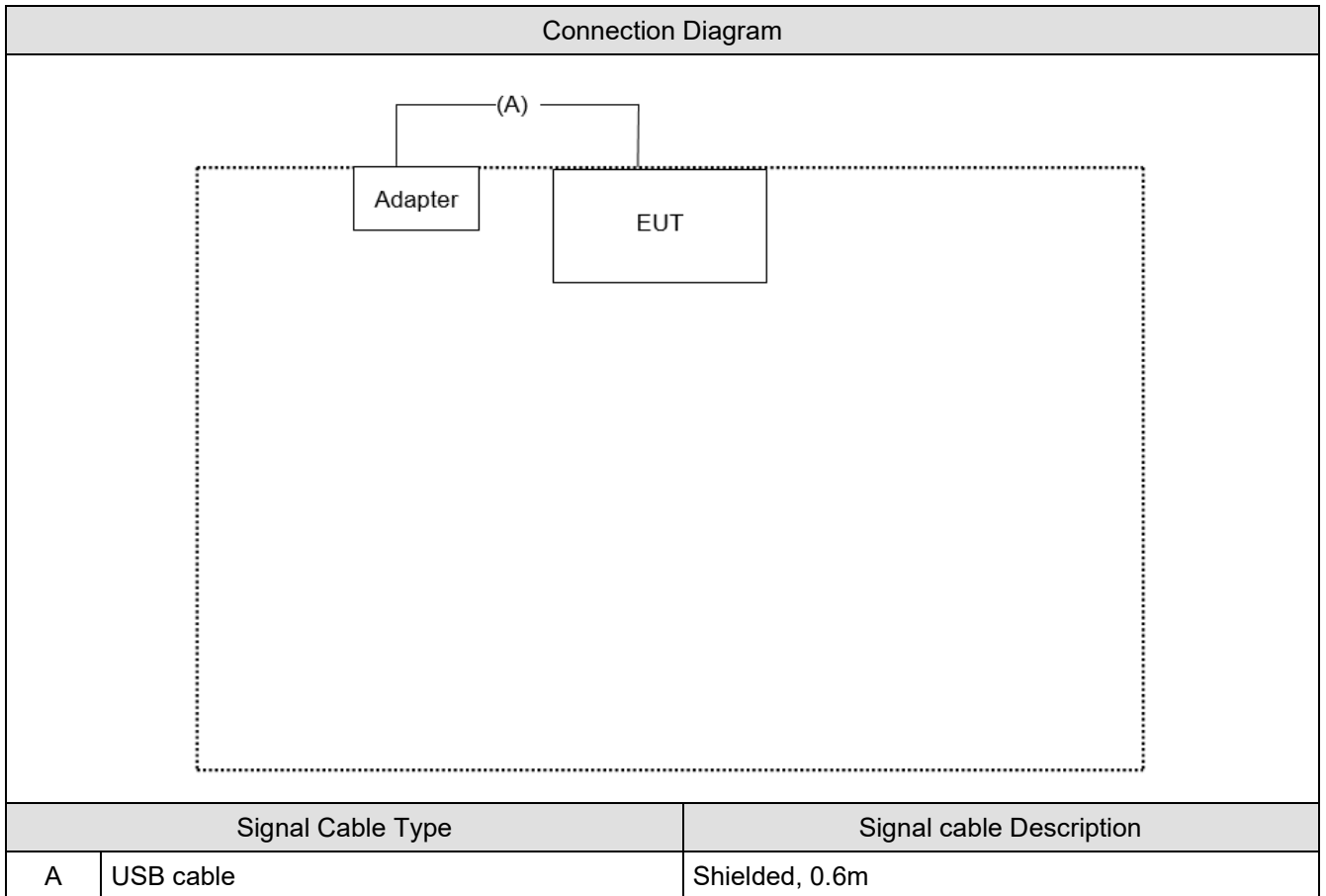
The product specification and testing instructions for the EUT declared in the report are provided by the manufacturer who will take all responsibilities for the accuracy.

### 1.4 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system.

|   | Product | Manufacturer | Model No.  | Serial No. |
|---|---------|--------------|------------|------------|
| 1 | Adapter | ASUS         | PA-1070-07 | N/A        |

### 1.5 Configuration of tested System



### 1.6 EUT Operation of during Test

|   |   |
|---|---|
| 1 | Set the EUT as shown.   |
| 2 | Execute the control software MP tool (Version 0.0001.1020.2018) |
| 3 | Configure test mode, test channel and data rate.                |
| 4 | Let the EUT start transmit continuously.                        |
| 5 | Verify that device is working properly                          |



## 1.7 Test Facility

Ambient conditions in the laboratory:

| Items            | Test Item                           | Actually | Tested by   | Test Date  | Test Site |
|------------------|-------------------------------------|----------|-------------|------------|-----------|
| Temperature (°C) | AC power Line Conducted Emission    | 23.9     | Ling Chen   | 2022/06/07 | HC-SR02   |
| Humidity (%RH)   |                                     | 60       |             |            |           |
| Temperature (°C) | Maximum Peak Conducted Output Power | 24.1     | Scott Chang | 2022/06/09 | HC-SR12   |
| Humidity (%RH)   |                                     | 53       |             |            |           |
| Temperature (°C) | Radiated Emission                   | 23.6     | Ling Chen   | 2022/06/08 | HC-CB04   |
| Humidity (%RH)   |                                     | 60       |             |            |           |
| Temperature (°C) | Antenna Port Conducted Emission     | 24.1     | Scott Chang | 2022/06/09 | HC-SR12   |
| Humidity (%RH)   |                                     | 53       |             |            |           |
| Temperature (°C) | Radiated Emission Band Edge         | 24.1     | Gary Liao   | 2022/06/07 | HC-CB04   |
| Humidity (%RH)   |                                     | 60       |             |            |           |
| Temperature (°C) | Occupied Bandwidth & DTS Bandwidth  | 24.1     | Scott Chang | 2022/06/09 | HC-SR12   |
| Humidity (%RH)   |                                     | 53       |             |            |           |
| Temperature (°C) | Maximum Power Spectral Density      | 24.1     | Scott Chang | 2022/06/09 | HC-SR12   |
| Humidity (%RH)   |                                     | 53       |             |            |           |

Note: Test site information refers to Laboratory Information.

### Laboratory Information

**USA** : FCC Registration Number: TW3024  
**Canada** : CAB identifier : TW3024

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

|                 |  |
|-----------------|--|
| Test Laboratory | DEKRA Testing and Certification Co., Ltd.  |
| Address         | 1. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.<br>2. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. |
| Phone number    | 1. +886-3-582-8001<br>2. +886-3-582-8001   |
| Fax number      | 1. +886-3-582-8958<br>2. +886-3-582-8958   |
| Email address   | <a href="mailto:info.tw@dekra.com">info.tw@dekra.com</a>   |
| Website         | <a href="http://www.dekra.com.tw">http://www.dekra.com.tw</a>  |

Note: Test site number for address 1 includes HC-SR02. Test site number for address 2 includes HC-CB02, HC-CB03, HC-CB04, HC-SR10 and HC-SR12.

## 1.8 List of Test Equipment

### HC-SR02

| Instrument               | Manufacturer | Model No.   | Serial No. | Cal. Date  | Next Cal. Date |
|--------------------------|--------------|-------------|------------|------------|----------------|
| Artificial Mains Network | R&S          | ENV4200     | 848411/010 | 2021/12/27 | 2022/12/26     |
| EMI Test Receiver        | R&S          | ESR3        | 102608     | 2022/05/30 | 2023/05/29     |
| LISN                     | R&S          | ENV216      | 100092     | 2022/04/29 | 2023/04/28     |
| Coaxial Cable(9 m)       | Harbour      | RG-400      | HC-SR02    | 2021/08/15 | 2022/08/14     |
| DEKRA Testing System     | DEKRA        | Version 2.0 | HC-SR02    | N/A        | N/A            |

### HC-SR12

| Instrument                             | Manufacturer | Model No. | Serial No. | Cal. Date  | Next Cal. Date |
|--|--------------|-----------|------------|------------|----------------|
| High Speed Peak Power Meter Dual Input | Anritsu      | ML2496A   | 1602004    | 2021/11/12 | 2022/11/11     |
| Pulse Power Sensor                     | Anritsu      | MA2411B   | 1531043    | 2021/11/12 | 2022/11/11     |
| EXA Signal Analyzer                    | Keysight     | N9010A    | MY51440132 | 2022/01/07 | 2023/01/06     |
| Pulse Power Sensor                     | Anritsu      | MA2411B   | 1531044    | 2021/11/12 | 2022/11/11     |
| Power Meter                            | Keysight     | 8990B     | MY51000248 | 2022/05/06 | 2023/05/05     |
| Power Sensor                           | Keysight     | N1923A    | MY57240005 | 2022/05/06 | 2023/05/05     |
| Spectrum Analyzer                      | Agilent      | N9010A    | US47140172 | 2022/05/08 | 2023/05/07     |
| Signal & Spectrum Analyzer             | R&S          | FSV40     | 101049     | 2022/04/25 | 2023/04/24     |

### HC-CB04

| Instrument                   | Manufacturer   | Model No.    | Serial No. | Cal. Date  | Next Cal. Date |
|------------------------------|----------------|--------------|------------|------------|----------------|
| Signal Analyzer              | R&S            | FSVA40       | 101455     | 2021/10/22 | 2022/10/21     |
| Signal and Spectrum Analyzer | R&S            | FSVA40       | 101435     | 2022/05/30 | 2023/05/29     |
| EXA Signal Analyzer          | Keysight       | N9010A       | MY51440132 | 2022/01/07 | 2023/01/06     |
| Trilog Broadband Antenna     | Schwarzbeck    | VULB 9168    | 1272       | 2022/05/19 | 2023/05/18     |
| Horn Antenna                 | Schwarzbeck    | BBHA 9120D   | 01640      | 2021/09/03 | 2022/09/02     |
| Horn Antenna                 | Schwarzbeck    | BBHA 9170    | 203        | 2022/02/23 | 2023/02/22     |
| Pre-Amplifier                | EMCI           | EMC01820I    | 980365     | 2022/04/15 | 2023/04/14     |
| Pre-Amplifier                | EMEC           | EM01G18GA    | 060835     | 2021/07/12 | 2022/07/11     |
| Pre-Amplifier                | DEKRA          | AP-400C      | 201801231  | 2021/12/24 | 2022/12/23     |
| Coaxial Cable(10m)           | Suhner         | SF102_SF104  | HC-CB04    | 2021/08/09 | 2022/08/08     |
| Coaxial Cable(3m)            | Suhnerr,Rosnol | SF102_Rosnol | HC-CB04_1  | 2021/08/17 | 2022/08/18     |
| EMI Test Receiver            | R&S            | ESR7         | 102260     | 2021/12/22 | 2022/12/21     |
| Magnetic Loop Antenna        | Teseq          | HLA 6121     | 44287      | 2021/09/06 | 2022/09/05     |
| Radiated Software            | AUDIX          | e3 V9        | HC-CB04    | N/A        | N/A            |

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

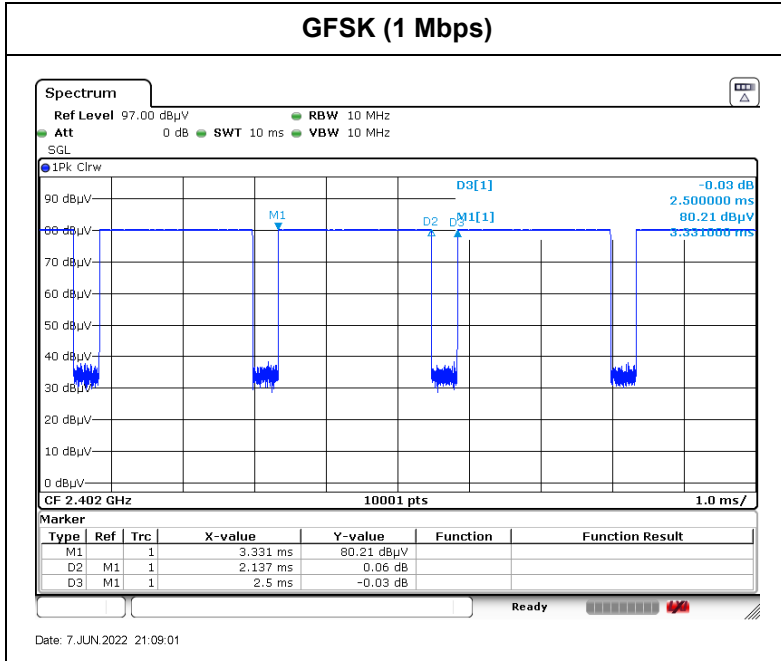
## 1.9 Measurement Uncertainty

Uncertainties have been calculated according to the DEKRA internal document with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ( $k=2$ )).

| Test item                          | Uncertainty  |
|------------------------------------|--|
| AC Power Line Conducted Emission   | $\pm 2.10$ dB  |
| Maximum Conducted Output Power     | $\pm 1.16$ dB  |
| Radiated Emission                  | $\pm 3.25$ dB below 1 GHz<br>$\pm 3.32$ dB above 1 GHz |
| Antenna Port Conducted Emission    | $\pm 1.60$ dB  |
| Radiated Emission Band Edge        | $\pm 3.32$ dB  |
| Occupied Bandwidth & DTS Bandwidth | $\pm 282.55$ Hz  |
| Maximum Power Spectral Density     | $\pm 1.60$ dB  |

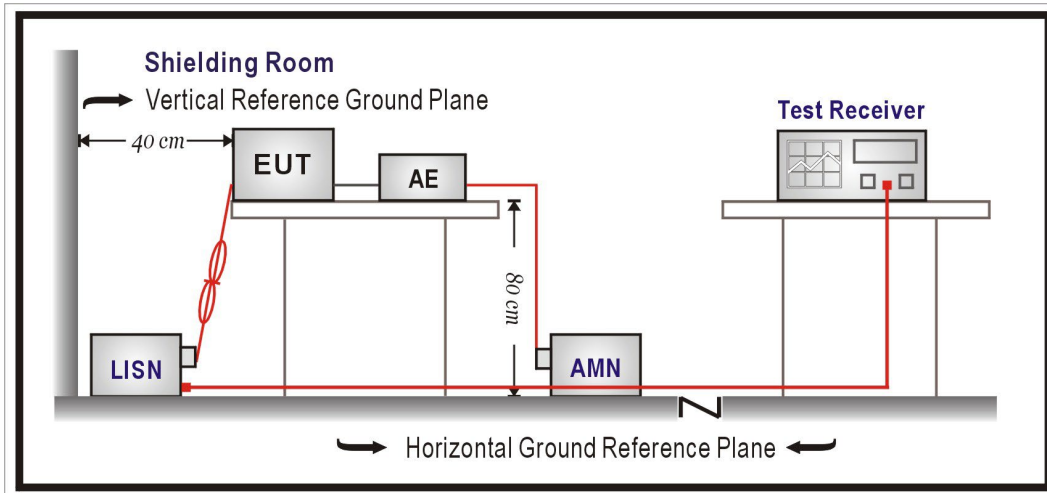
### 1.10 Duty Cycle

| Mode          | On Time (ms) | On+Off Time (ms) | Duty Cycle (%) | Duty Factor (dB) | 1/T Minimum VBW (kHz) |
|---------------|--------------|------------------|----------------|------------------|-----------------------|
| GFSK (1 Mbps) | 2.137        | 2.500            | 85.48          | 0.68             | 0.468                 |



## 2. AC Power Line Conducted Emission

### 2.1 Test Setup



### 2.2 Test Limit

| Frequency (MHz) | QP (dBuV) | AV (dBuV) |
|-----------------|-----------|-----------|
| 0.15 - 0.50     | 66 - 56   | 56 - 46   |
| 0.50 - 5.0      | 56        | 46        |
| 5.0 - 30        | 60        | 50        |

Remarks: In the above table, the tighter limit applies at the band edges.

### 2.3 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50 uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50 ohm/50 uH coupling impedance with 50 ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

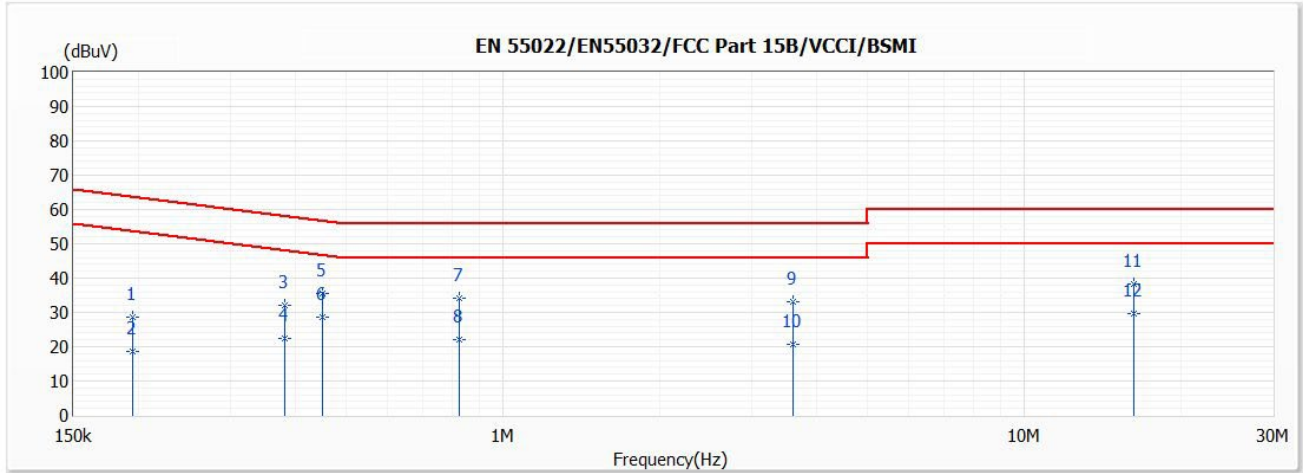
AC Power Line Conducted Emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a receiver bandwidth of 9 kHz.

### 2.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.207.

## 2.5 Test Result of AC Power Line Conducted Emission

|                |                          |       |      |
|----------------|--------------------------|-------|------|
| Test Mode      | Mode 1: Transmit         | Phase | Line |
| Test Condition | GFSK (1 Mbps) / 2480 MHz |       |      |

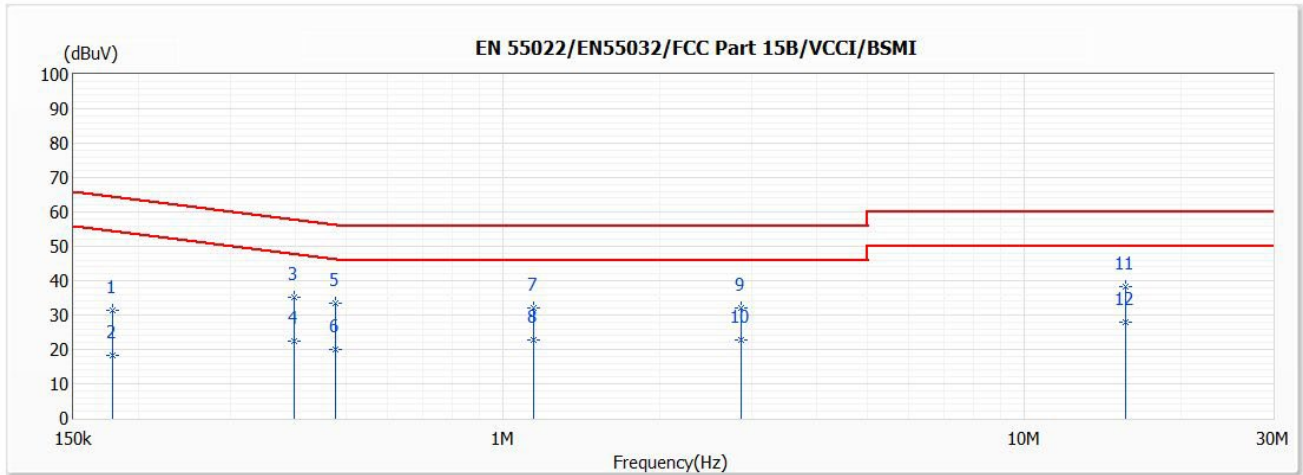


| No | Frequency (MHz) | Emission Level (dBuV) | Limit (dBuV) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB) | Detector Type |
|----|-----------------|-----------------------|--------------|-------------|----------------------|---------------------|---------------|
| 1  | 0.195           | 28.68                 | 63.84        | -35.16      | 19.06                | 9.62                | QP            |
| 2  | 0.195           | 18.67                 | 53.84        | -35.17      | 9.05                 | 9.62                | AV            |
| 3  | 0.382           | 31.96                 | 58.24        | -26.28      | 22.32                | 9.64                | QP            |
| 4  | 0.382           | 22.34                 | 48.24        | -25.90      | 12.70                | 9.64                | AV            |
| 5  | 0.450           | 35.47                 | 56.88        | -21.41      | 25.82                | 9.65                | QP            |
| *6 | 0.450           | 28.48                 | 46.88        | -18.40      | 18.83                | 9.65                | AV            |
| 7  | 0.824           | 34.14                 | 56.00        | -21.86      | 24.45                | 9.69                | QP            |
| 8  | 0.824           | 22.05                 | 46.00        | -23.95      | 12.36                | 9.69                | AV            |
| 9  | 3.600           | 32.96                 | 56.00        | -23.04      | 23.12                | 9.84                | QP            |
| 10 | 3.600           | 20.83                 | 46.00        | -25.17      | 10.99                | 9.84                | AV            |
| 11 | 16.212          | 38.40                 | 60.00        | -21.60      | 28.15                | 10.25               | QP            |
| 12 | 16.212          | 29.72                 | 50.00        | -20.28      | 19.47                | 10.25               | AV            |

Remark:

1. "\*" means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor (Correct Factor = LISN Insertion Loss + Cable Loss).
3. Margin = Emission Level - Limit.

|                |                          |       |         |
|----------------|--------------------------|-------|---------|
| Test Mode      | Mode 1: Transmit         | Phase | Neutral |
| Test Condition | GFSK (1 Mbps) / 2480 MHz |       |         |



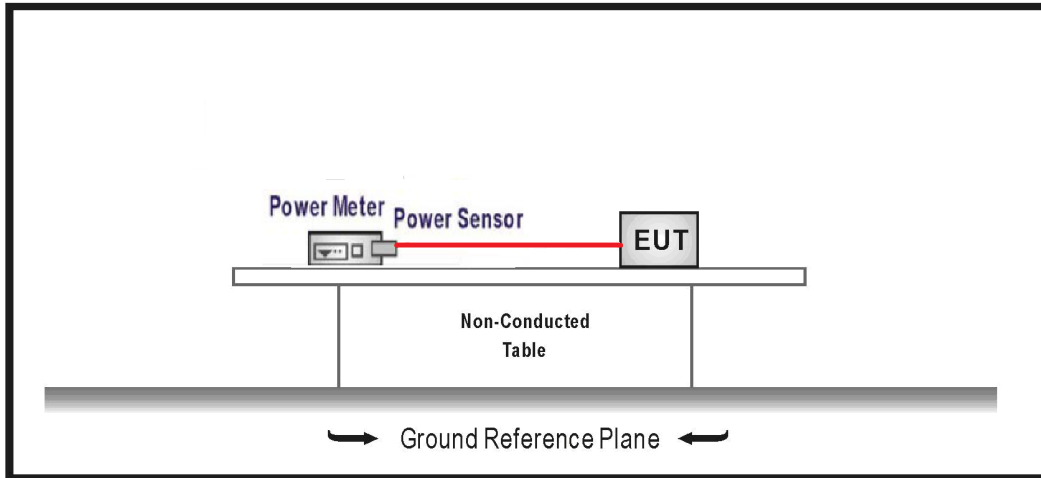
| No  | Frequency (MHz) | Emission Level (dBuV) | Limit (dBuV) | Margin (dB) | Reading Level (dBuV) | Correct Factor (dB) | Detector Type |
|-----|-----------------|-----------------------|--------------|-------------|----------------------|---------------------|---------------|
| 1   | 0.178           | 31.32                 | 64.58        | -33.26      | 21.71                | 9.61                | QP            |
| 2   | 0.178           | 18.22                 | 54.58        | -36.36      | 8.61                 | 9.61                | AV            |
| 3   | 0.398           | 35.12                 | 57.90        | -22.78      | 25.48                | 9.64                | QP            |
| 4   | 0.398           | 22.46                 | 47.90        | -25.44      | 12.82                | 9.64                | AV            |
| 5   | 0.478           | 33.45                 | 56.38        | -22.93      | 23.80                | 9.65                | QP            |
| 6   | 0.478           | 19.89                 | 46.38        | -26.49      | 10.24                | 9.65                | AV            |
| 7   | 1.144           | 32.16                 | 56.00        | -23.84      | 22.45                | 9.71                | QP            |
| 8   | 1.144           | 22.68                 | 46.00        | -23.32      | 12.97                | 9.71                | AV            |
| 9   | 2.855           | 32.14                 | 56.00        | -23.86      | 22.34                | 9.80                | QP            |
| 10  | 2.855           | 22.79                 | 46.00        | -23.21      | 12.99                | 9.80                | AV            |
| *11 | 15.629          | 38.25                 | 60.00        | -21.75      | 27.91                | 10.34               | QP            |
| 12  | 15.629          | 28.00                 | 50.00        | -22.00      | 17.66                | 10.34               | AV            |

Remark:

1. "\*" means this data is the worst emission level.
2. Emission Level = Reading Level + Correct Factor (Correct Factor = LISN Insertion Loss + Cable Loss).
3. Margin = Emission Level - Limit.

### 3. Maximum Conducted Output Power

#### 3.1 Test Setup



#### 3.2 Test Limit

The Maximum Conducted Output Power shall be less 1 Watt.

#### 3.3 Test procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 v05r02 for compliance to FCC 47CFR 15.247 requirements.

#### 3.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.



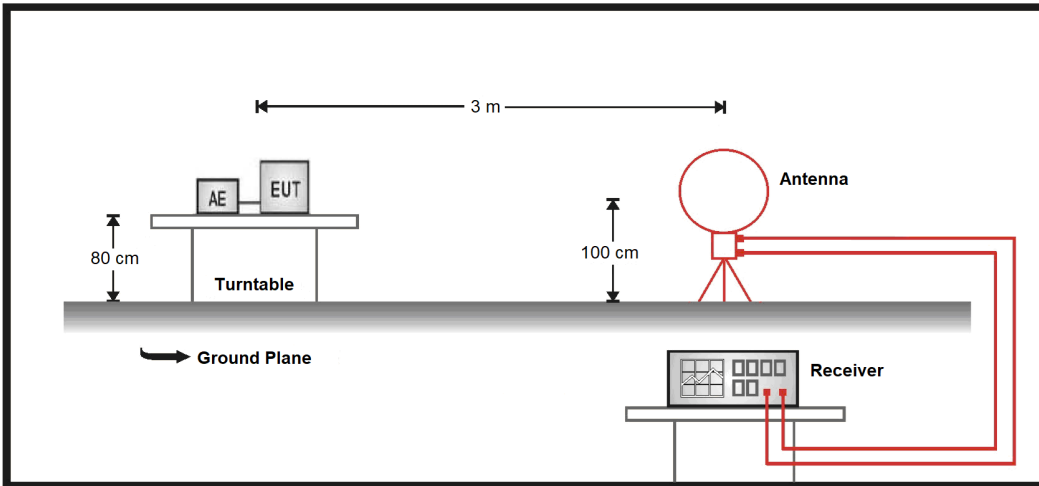
### 3.5 Test Result of Maximum Conducted Output Power

| Modulation    | Channel | Frequency (MHz) | Measure Level (dBm) | Limit (dBm)  | Result |
|---------------|---------|-----------------|---------------------|--------------|--------|
| GFSK (1 Mbps) | 00      | 2402            | 3.810               | $\leq 30.00$ | Pass   |
|               | 19      | 2440            | 3.110               | $\leq 30.00$ | Pass   |
|               | 39      | 2480            | 3.020               | $\leq 30.00$ | Pass   |

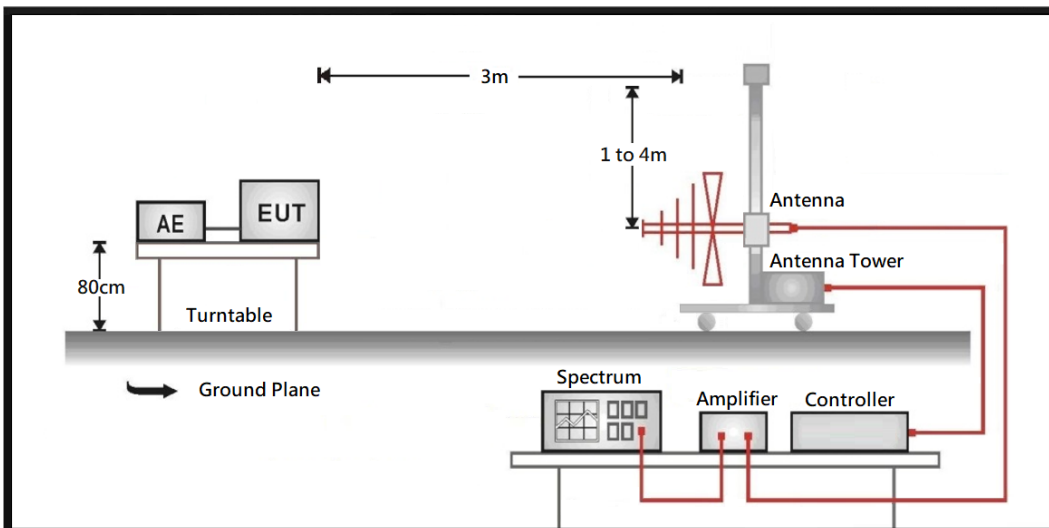
## 4. Radiated Emission

### 4.1 Test Setup

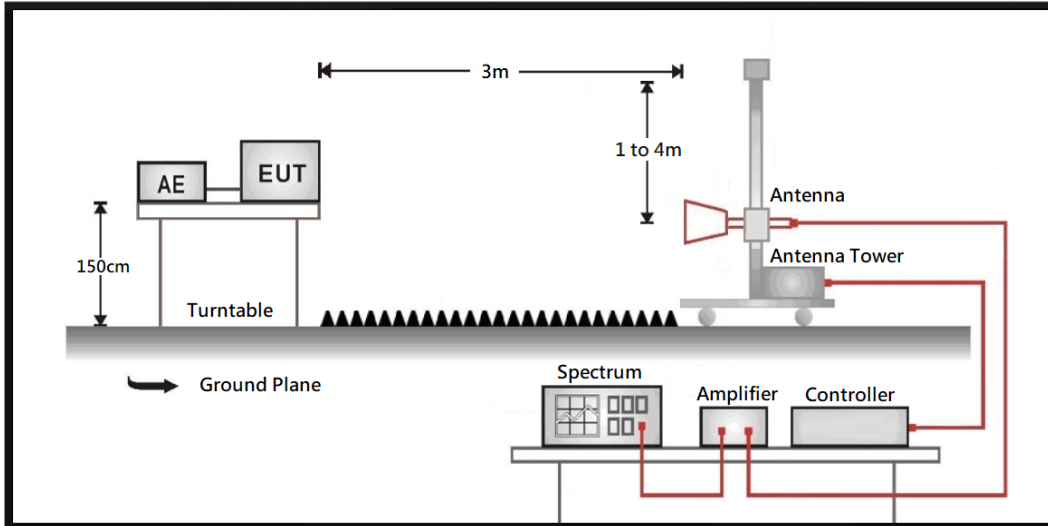
9 kHz ~ 30 MHz



30 MHz ~ 1 GHz



Above 1 GHz



### 4.2 Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

| Frequency (MHz) | Field strength (uV/m) | Field strength (dBuV/m) | Measurement distance (m) |
|-----------------|-----------------------|-------------------------|--------------------------|
| 0.009 – 0.490   | 2400/F(kHz)           | 20 log (2400/F(kHz))    | 300                      |
| 0.490 – 1.705   | 24000/F(kHz)          | 20 log (24000/F(kHz))   | 30                       |
| 1.705 - 30      | 30                    | 29.5                    | 30                       |
| 30 - 88         | 100                   | 40                      | 3                        |
| 88 - 216        | 150                   | 43.5                    | 3                        |
| 216 - 960       | 200                   | 46                      | 3                        |
| Above 960       | 500                   | 54                      | 3                        |

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

### 4.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB 558074 D01V05r02 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

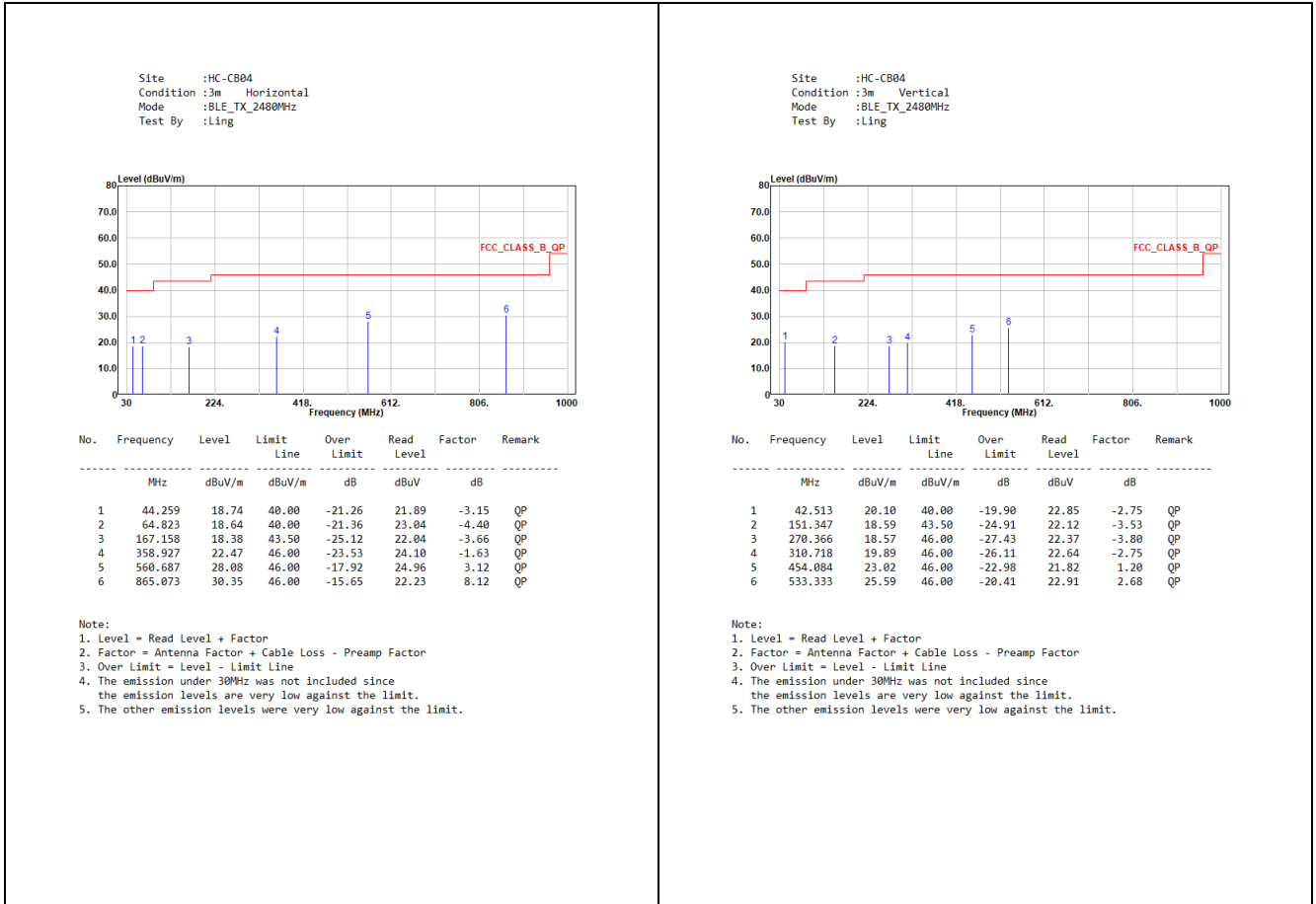
On any frequency or frequencies from 9 kHz (include The the lowest oscillator frequency generated within the device up to the 10th harmonic) to 1000 MHz, the limit shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limit shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

The bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1MHz.

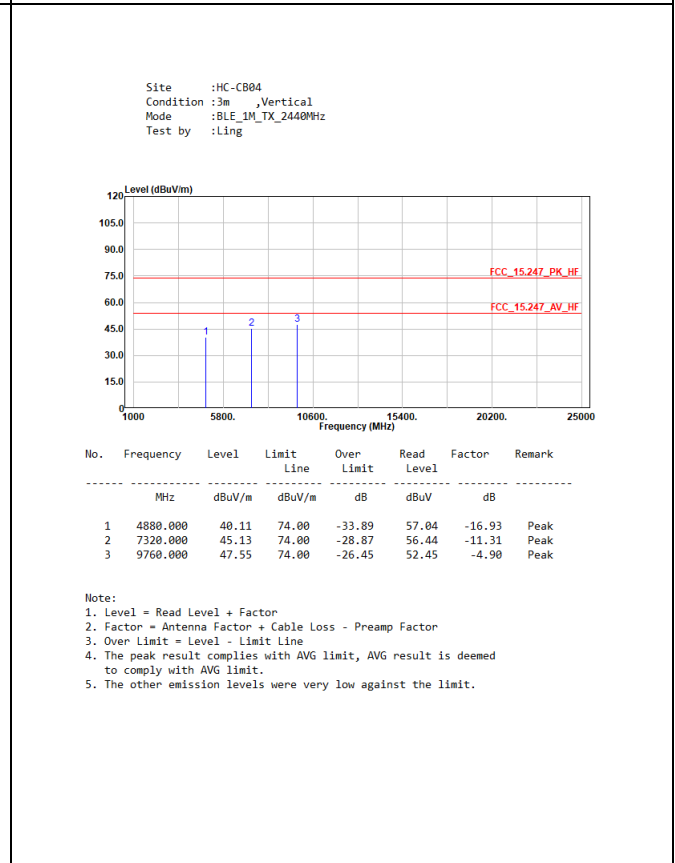
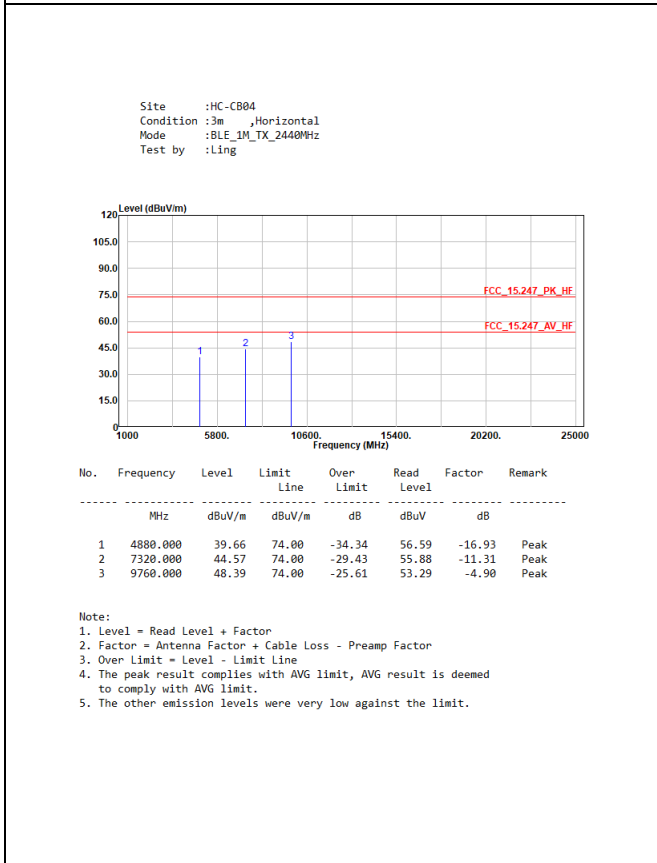
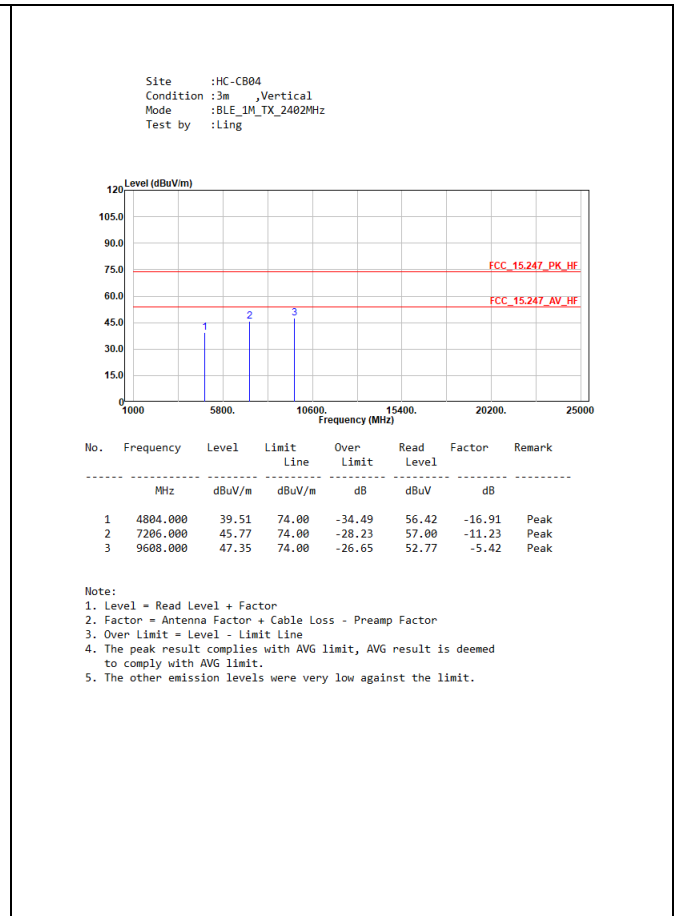
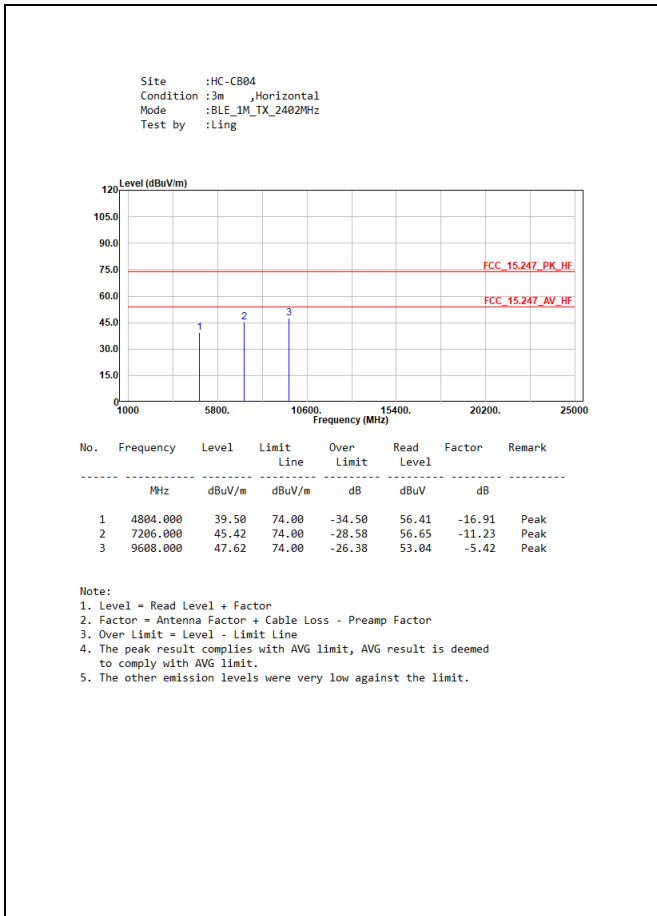
### 4.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

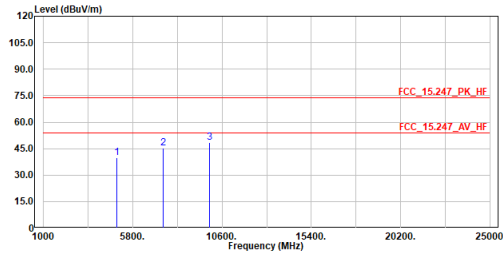
### 4.5 Test Result of Radiated Emissions (30 MHz ~ 1 GHz)



### 4.6 Test Result of Radiated Emissions (1 GHz ~ 10<sup>th</sup> Harmonic)



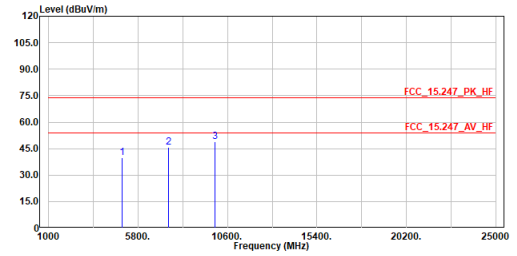
Site :HC-CB04  
 Condition :3m ,Horizontal  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Ling



| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>Line<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark |
|-----|------------------|-----------------|-------------------------|---------------------|-----------------------|--------------|--------|
| 1   | 4960.000         | 39.81           | 74.00                   | -34.19              | 56.60                 | -16.79       | Peak   |
| 2   | 7440.000         | 45.33           | 74.00                   | -28.67              | 56.15                 | -10.82       | Peak   |
| 3   | 9920.000         | 48.60           | 74.00                   | -25.40              | 52.97                 | -4.37        | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

Site :HC-CB04  
 Condition :3m ,Vertical  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Ling

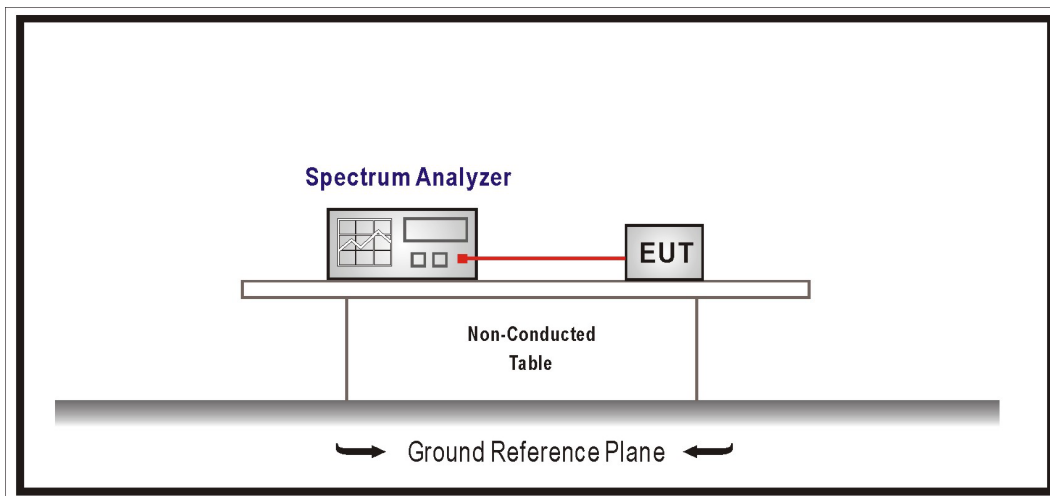


| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>Line<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark |
|-----|------------------|-----------------|-------------------------|---------------------|-----------------------|--------------|--------|
| 1   | 4960.000         | 39.96           | 74.00                   | -34.04              | 56.75                 | -16.79       | Peak   |
| 2   | 7440.000         | 45.66           | 74.00                   | -28.34              | 56.48                 | -10.82       | Peak   |
| 3   | 9920.000         | 48.73           | 74.00                   | -25.27              | 53.10                 | -4.37        | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

## 5. Antenna Port Conducted Emission

### 5.1 Test Setup



### 5.2 Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limit. If the transmitter complies with the conducted power limit based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limit specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §15.205(c)).

### 5.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

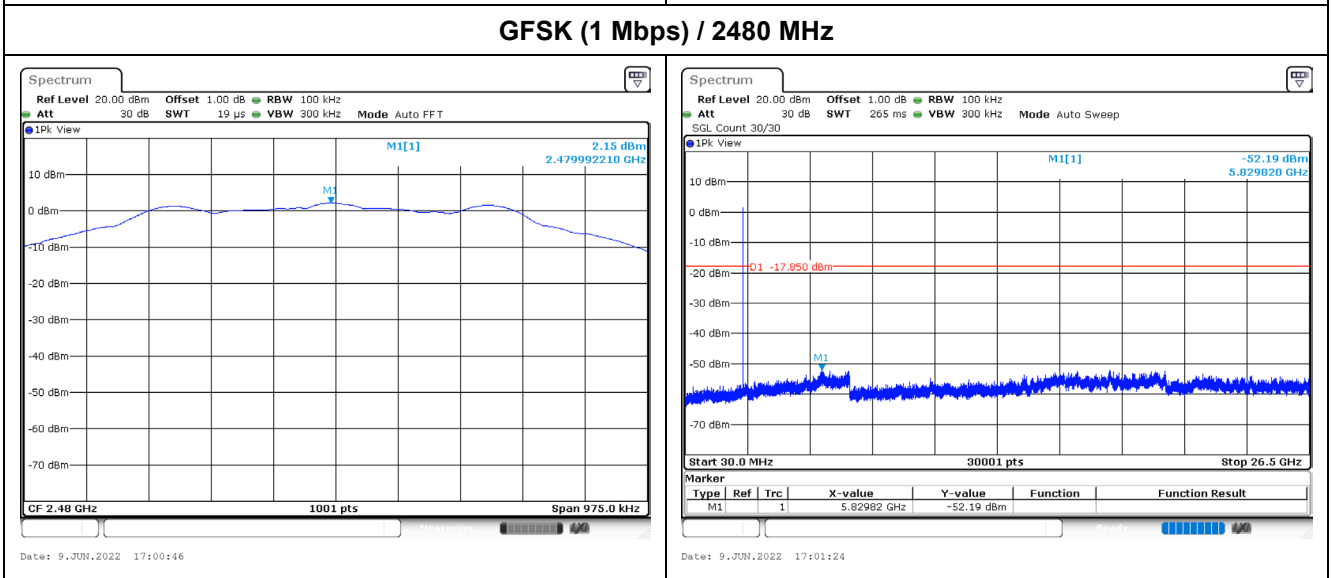
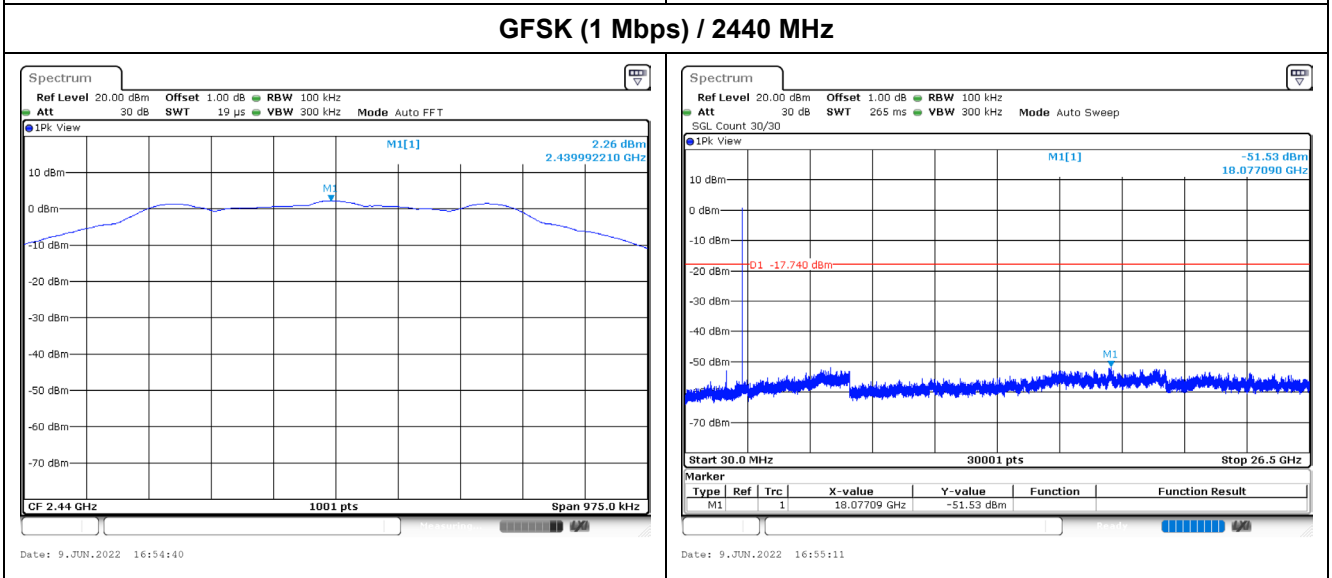
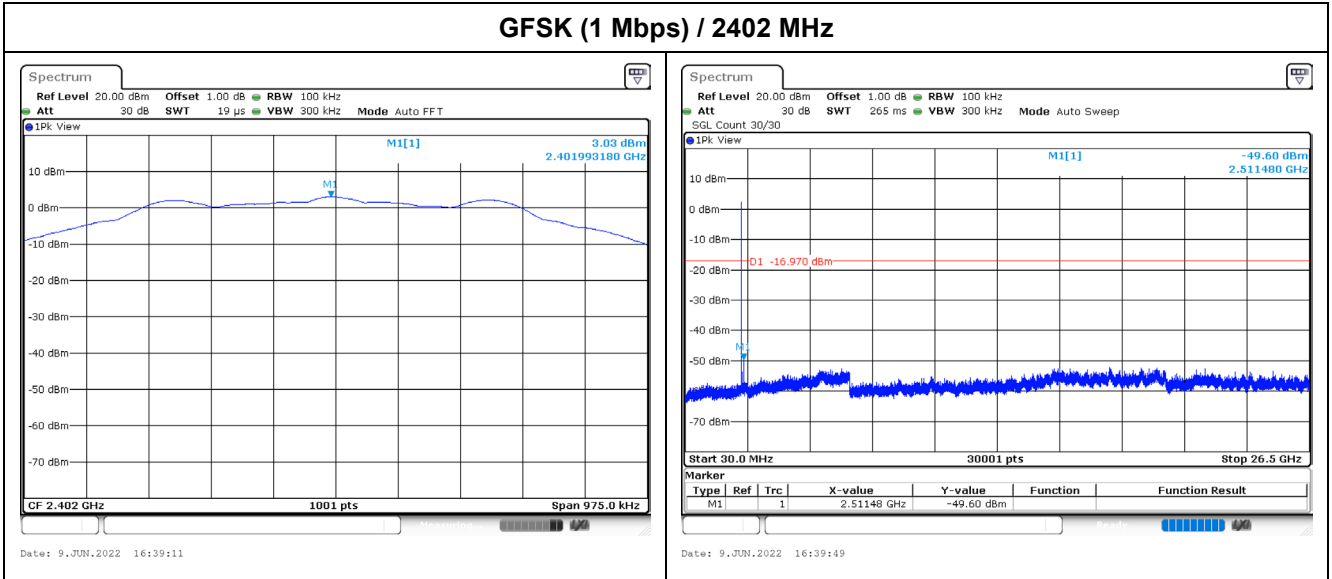
Set RBW = 100 kHz, Set VBW > RBW, scan up through 10th harmonic.

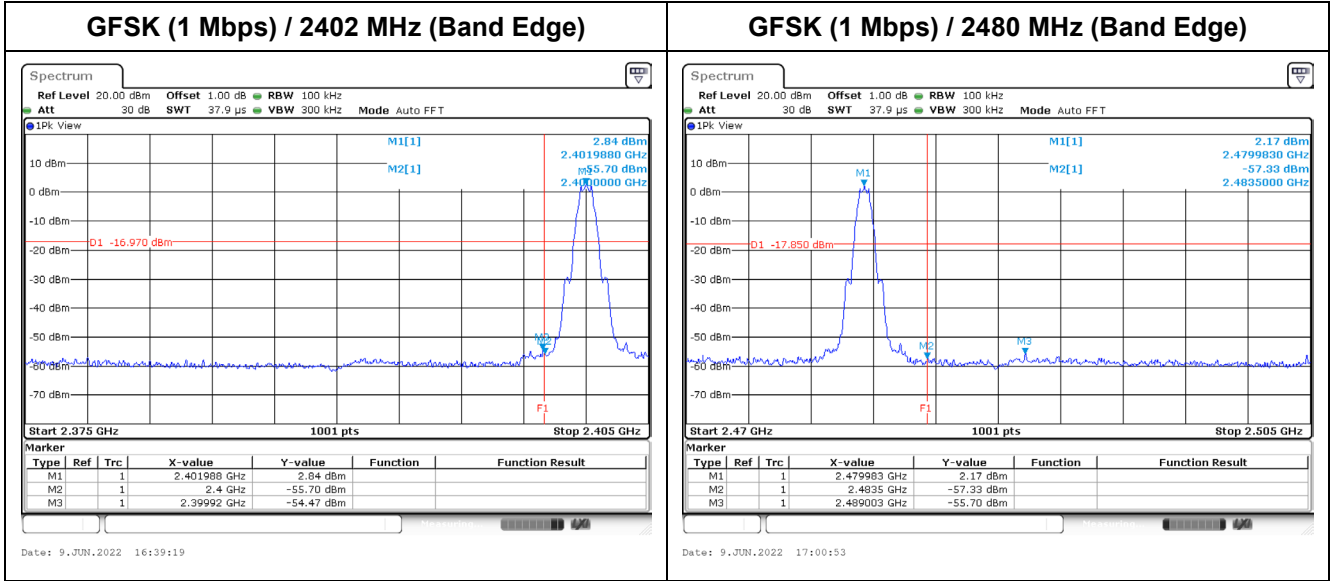
### 5.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.



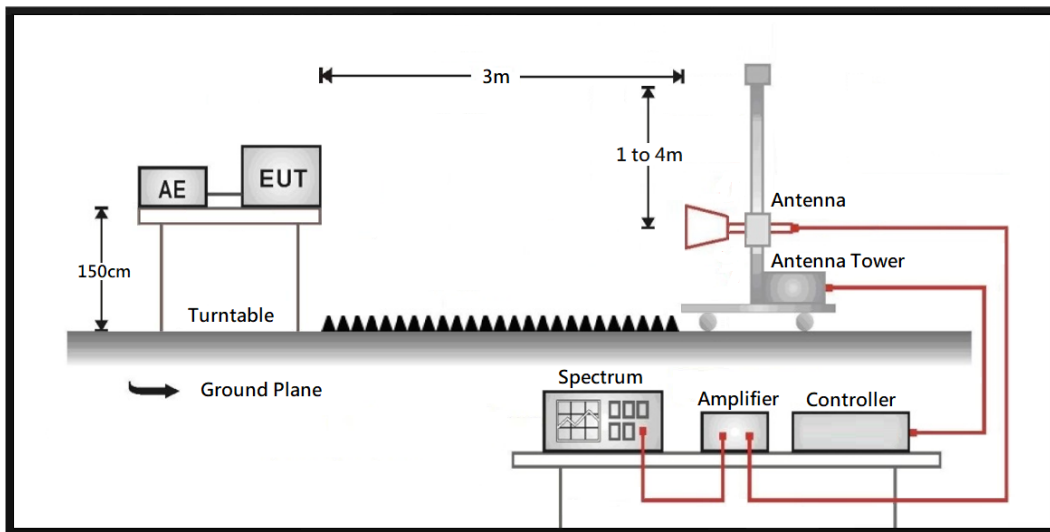
### 5.5 Test Result of Antenna Port Conducted Emission





## 6. Radiated Emission Band Edge

### 6.1 Test Setup



### 6.2 Test Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general radiated emission limit in paragraph 15.209, whichever is the lesser attenuation.

| Frequency (MHz) | Field strength (uV/m) | Field strength (dBuV/m) | Measurement distance (m) |
|-----------------|-----------------------|-------------------------|--------------------------|
| 30 - 88         | 100                   | 40                      | 3                        |
| 88 - 216        | 150                   | 43.5                    | 3                        |
| 216 - 960       | 200                   | 46                      | 3                        |
| Above 960       | 500                   | 54                      | 3                        |

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

### 6.3 Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC KDB 558074 D01 v05r02 for compliance to FCC 47CFR 15.247 requirements.

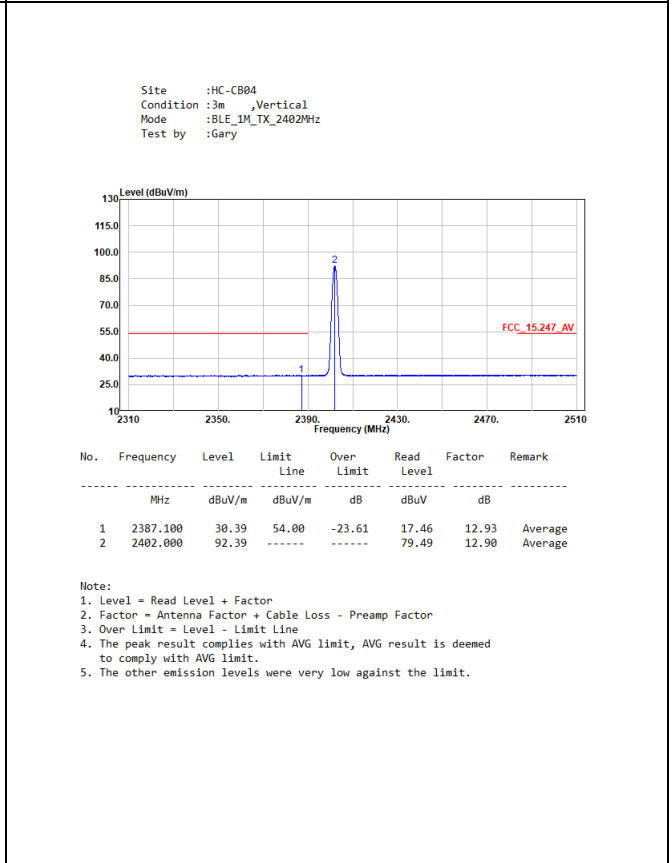
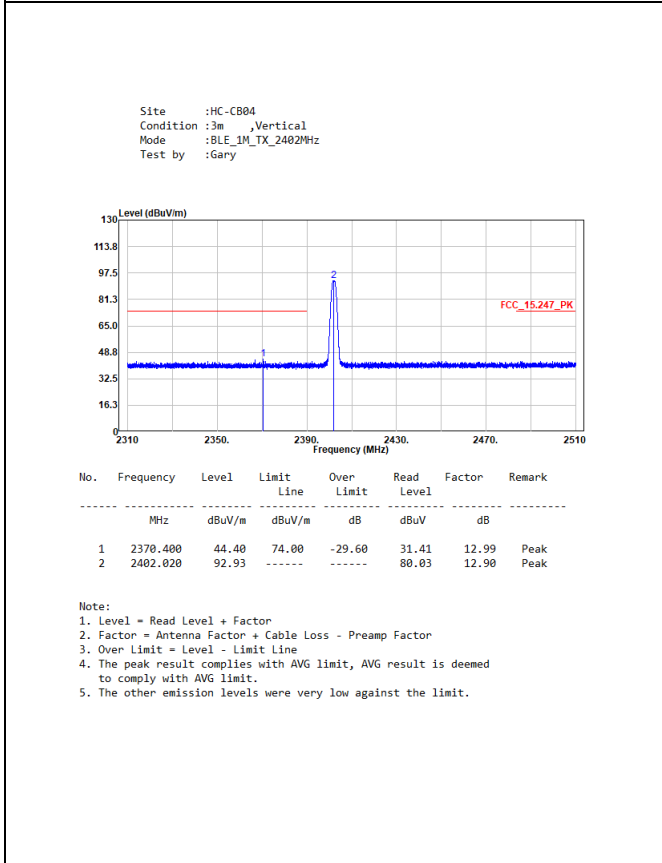
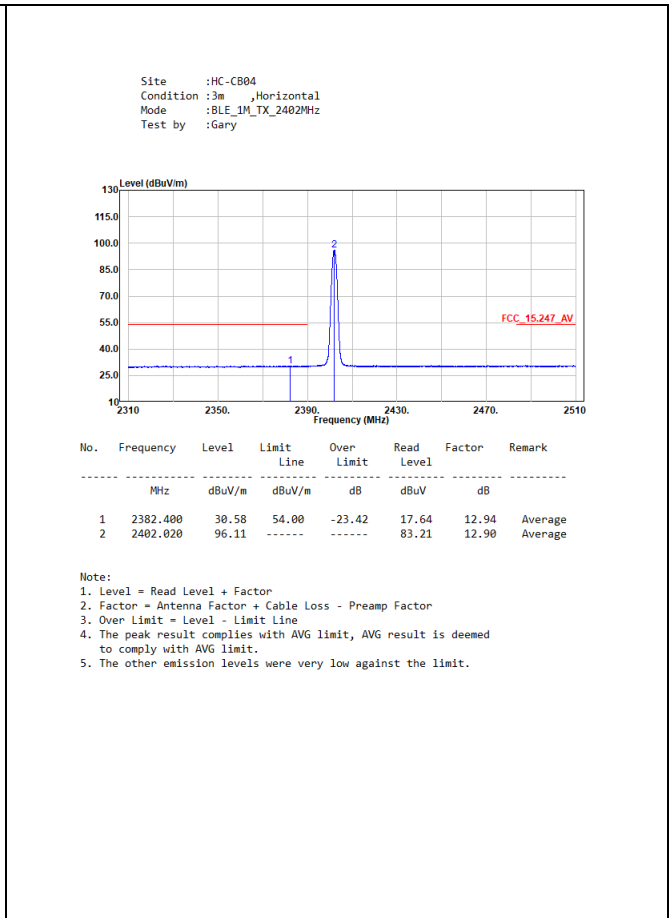
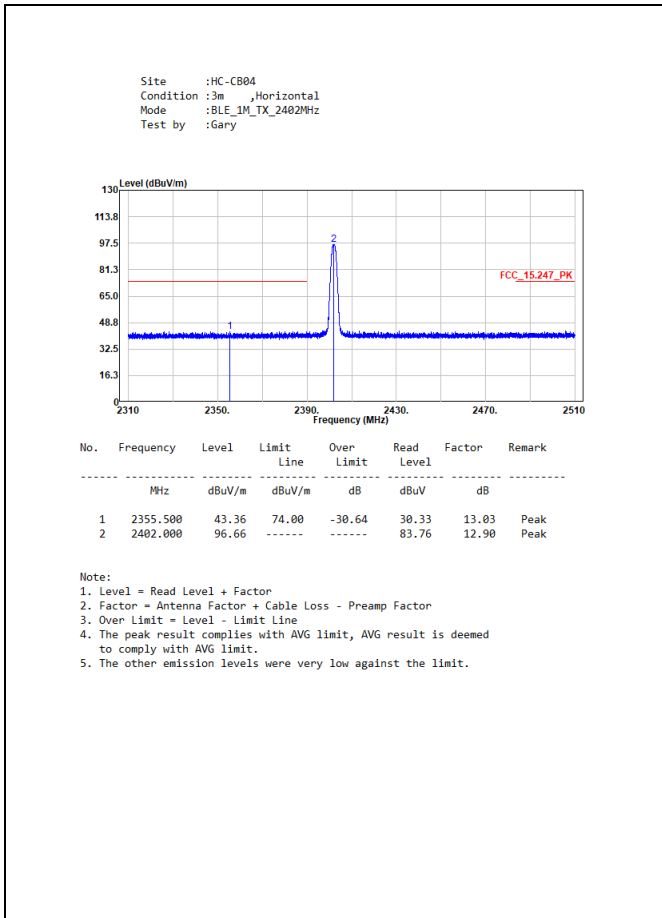
The EUT and its simulators are placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

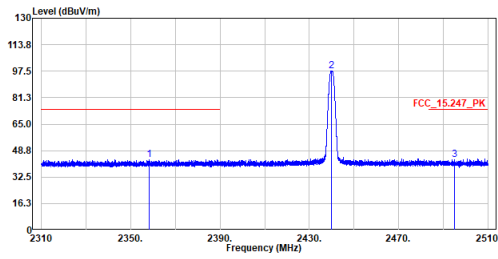
### 6.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.

### 6.5 Test Result of Radiated Emission Band Edge



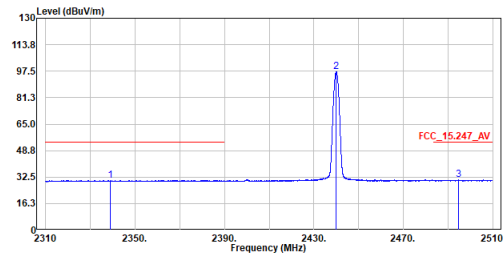
Site :HC-CB04  
 Condition :3m ,Horizontal  
 Mode :BLE\_1M\_TX\_2440MHz  
 Test by :Gary



| No. | Frequency | Level  | Limit  | Over   | Read  | Factor | Remark |
|-----|-----------|--------|--------|--------|-------|--------|--------|
|     | MHz       | dBuV/m | dBuV/m | dB     | dBuV  | dB     |        |
| 1   | 2358.140  | 43.37  | 74.00  | -30.63 | 30.34 | 13.03  | Peak   |
| 2   | 2440.000  | 97.78  | -----  | -----  | 84.78 | 13.00  | Peak   |
| 3   | 2495.000  | 43.14  | 74.00  | -30.86 | 30.09 | 13.05  | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

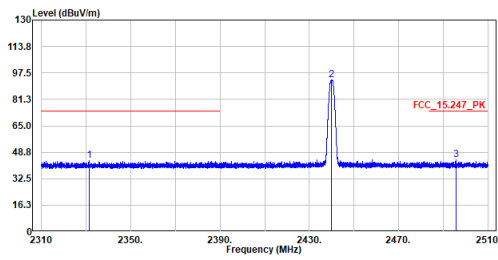
Site :HC-CB04  
 Condition :3m ,Horizontal  
 Mode :BLE\_1M\_TX\_2440MHz  
 Test by :Gary



| No. | Frequency | Level  | Limit  | Over   | Read  | Factor | Remark  |
|-----|-----------|--------|--------|--------|-------|--------|---------|
|     | MHz       | dBuV/m | dBuV/m | dB     | dBuV  | dB     |         |
| 1   | 2338.980  | 30.41  | 54.00  | -23.59 | 17.39 | 13.02  | Average |
| 2   | 2440.000  | 97.23  | -----  | -----  | 84.23 | 13.00  | Average |
| 3   | 2494.760  | 30.77  | 54.00  | -23.23 | 17.72 | 13.05  | Average |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

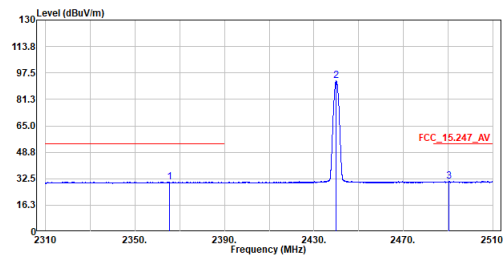
Site :HC-CB04  
 Condition :3m ,Vertical  
 Mode :BLE\_1M\_TX\_2440MHz  
 Test by :Gary



| No. | Frequency | Level  | Limit  | Over   | Read  | Factor | Remark |
|-----|-----------|--------|--------|--------|-------|--------|--------|
|     | MHz       | dBuV/m | dBuV/m | dB     | dBuV  | dB     |        |
| 1   | 2331.420  | 43.81  | 74.00  | -30.19 | 30.82 | 12.99  | Peak   |
| 2   | 2439.980  | 93.02  | -----  | -----  | 80.02 | 13.00  | Peak   |
| 3   | 2495.800  | 44.24  | 74.00  | -29.76 | 31.18 | 13.06  | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

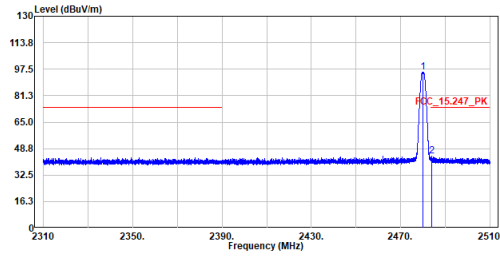
Site :HC-CB04  
 Condition :3m ,Vertical  
 Mode :BLE\_1M\_TX\_2440MHz  
 Test by :Gary



| No. | Frequency | Level  | Limit  | Over   | Read  | Factor | Remark  |
|-----|-----------|--------|--------|--------|-------|--------|---------|
|     | MHz       | dBuV/m | dBuV/m | dB     | dBuV  | dB     |         |
| 1   | 2365.380  | 30.51  | 54.00  | -23.49 | 17.51 | 13.00  | Average |
| 2   | 2440.020  | 92.49  | -----  | -----  | 79.49 | 13.00  | Average |
| 3   | 2490.540  | 30.70  | 54.00  | -23.30 | 17.64 | 13.06  | Average |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

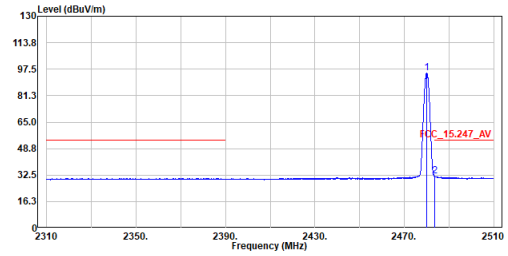
Site :HC-CB04  
 Condition :3m ,Horizontal  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Gary



| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark |
|-----|------------------|-----------------|-----------------|---------------------|-----------------------|--------------|--------|
| 1   | 2480.020         | 95.80           | -----           | -----               | 82.75                 | 13.05        | Peak   |
| 2   | 2483.940         | 44.05           | 74.00           | -29.95              | 31.01                 | 13.04        | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

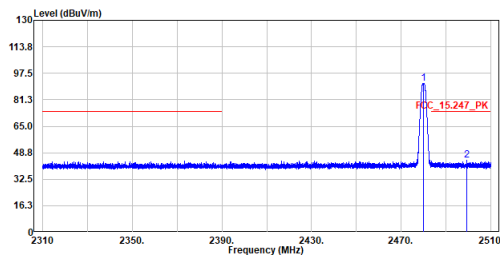
Site :HC-CB04  
 Condition :3m ,Horizontal  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Gary



| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark  |
|-----|------------------|-----------------|-----------------|---------------------|-----------------------|--------------|---------|
| 1   | 2480.020         | 95.23           | -----           | -----               | 82.18                 | 13.05        | Average |
| 2   | 2483.640         | 31.81           | 54.00           | -22.19              | 18.77                 | 13.04        | Average |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

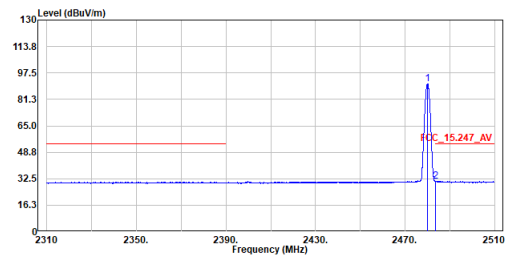
Site :HC-CB04  
 Condition :3m ,Vertical  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Gary



| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark |
|-----|------------------|-----------------|-----------------|---------------------|-----------------------|--------------|--------|
| 1   | 2479.940         | 91.44           | -----           | -----               | 78.39                 | 13.05        | Peak   |
| 2   | 2499.220         | 44.03           | 74.00           | -29.97              | 30.97                 | 13.06        | Peak   |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

Site :HC-CB04  
 Condition :3m ,Vertical  
 Mode :BLE\_1M\_TX\_2480MHz  
 Test by :Gary

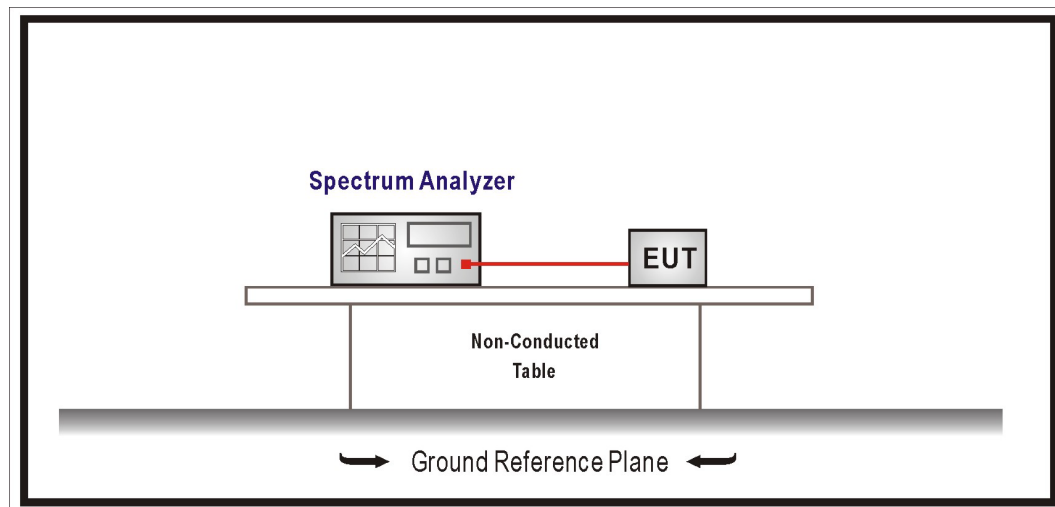


| No. | Frequency<br>MHz | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Read<br>Level<br>dBuV | Factor<br>dB | Remark  |
|-----|------------------|-----------------|-----------------|---------------------|-----------------------|--------------|---------|
| 1   | 2480.020         | 90.92           | -----           | -----               | 77.87                 | 13.05        | Average |
| 2   | 2483.520         | 31.07           | 54.00           | -22.93              | 18.03                 | 13.04        | Average |

Note:  
 1. Level = Read Level + Factor  
 2. Factor = Antenna Factor + Cable Loss - Preamp Factor  
 3. Over Limit = Level - Limit Line  
 4. The peak result complies with AVG limit, AVG result is deemed to comply with AVG limit.  
 5. The other emission levels were very low against the limit.

## 7. Occupied Bandwidth & DTS Bandwidth

### 7.1 Test Setup



### 7.2 Test Limit

The 6 dB bandwidth:  $\geq 500$  kHz.

Occupied Bandwidth: NA

### 7.3 Test Procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

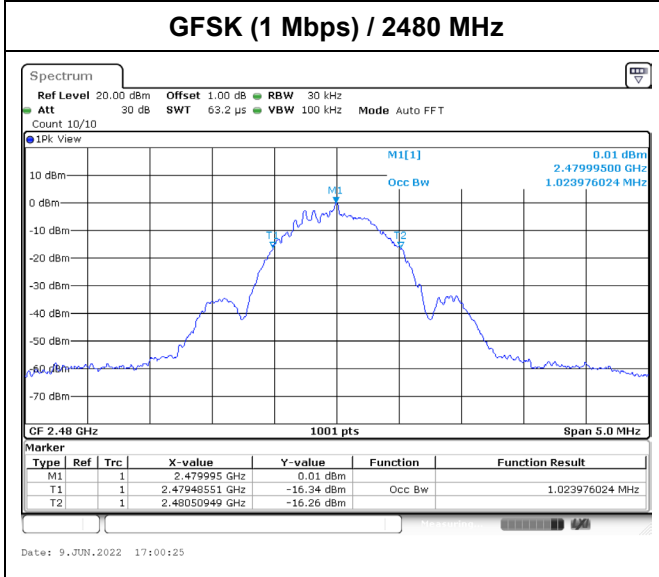
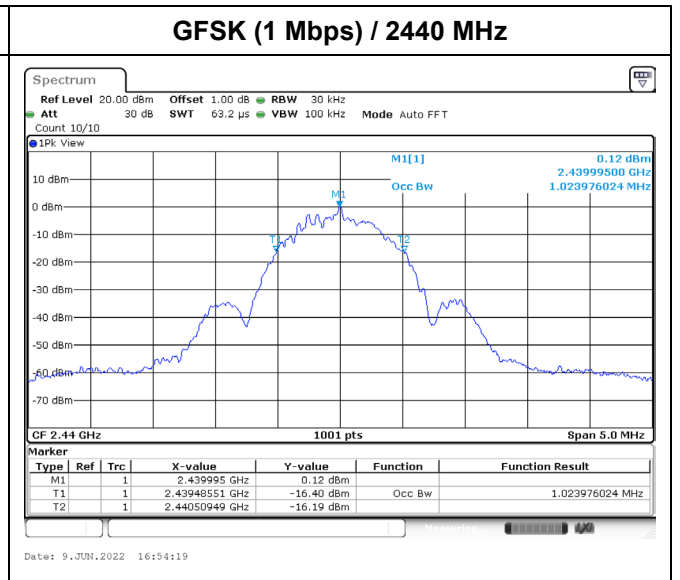
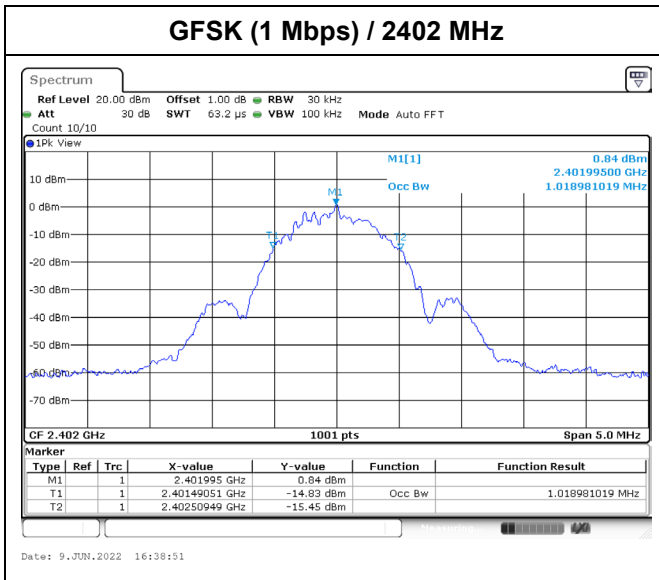
### 7.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247.



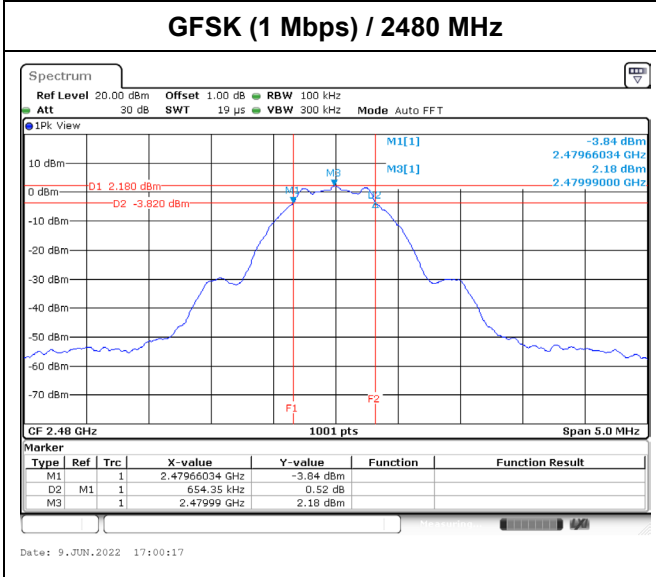
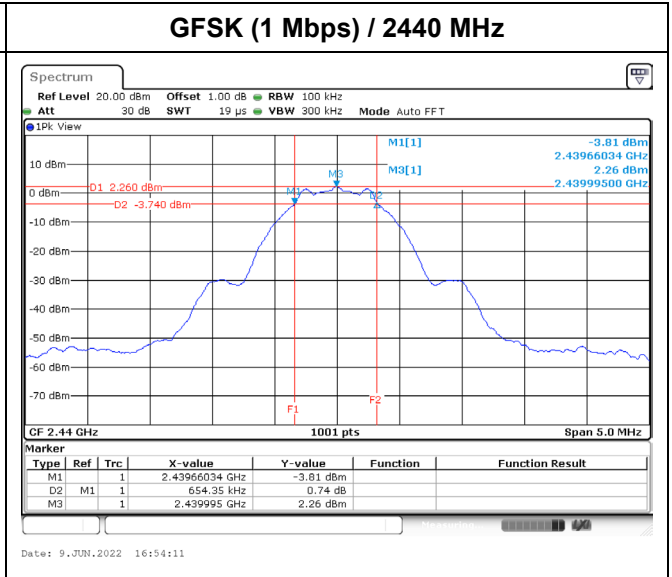
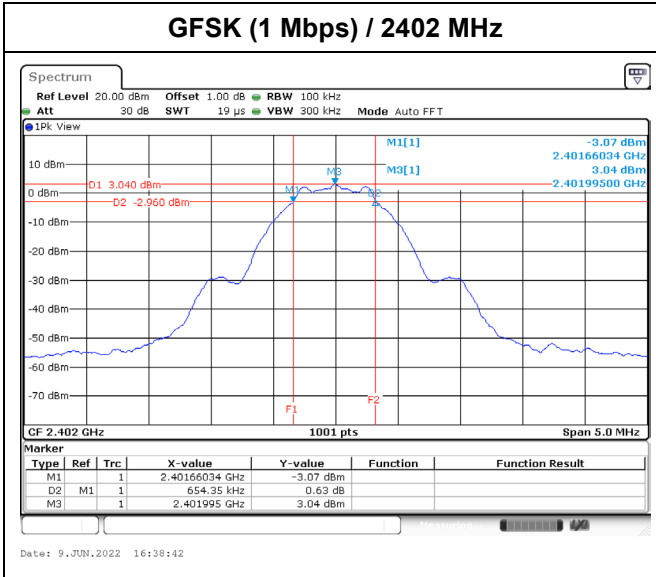
### 7.5 Test Result of Occupied Bandwidth

| Modulation    | Channel | Frequency (MHz) | Measure Level (MHz) | Limit (MHz) |
|---------------|---------|-----------------|---------------------|-------------|
| GFSK (1 Mbps) | 00      | 2402            | 1.018               | -           |
|               | 19      | 2440            | 1.023               | -           |
|               | 39      | 2480            | 1.023               | -           |



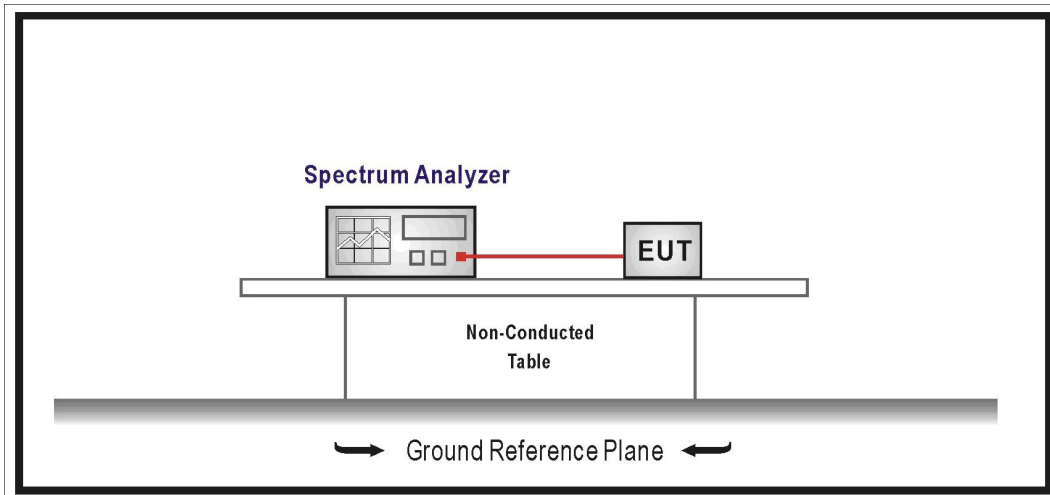
### 7.6 Test Result of DTS Bandwidth

| Modulation    | Channel | Frequency (MHz) | Measure Level (MHz) | Limit (MHz) | Result |
|---------------|---------|-----------------|---------------------|-------------|--------|
| GFSK (1 Mbps) | 00      | 2402            | 0.654               | ≥ 0.500     | Pass   |
|               | 19      | 2440            | 0.654               | ≥ 0.500     | Pass   |
|               | 39      | 2480            | 0.654               | ≥ 0.500     | Pass   |



## 8. Maximum Power Spectral Density

### 8.1 Test Setup



### 8.2 Test Limit

The peak power spectral density conducted from the intentional radiated to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 8.3 Test Procedures

The EUT was setup according to ANSI C63.10: 2013; tested according to DTS test procedure of KDB 558074 D01 V05r02 for compliance to FCC 47CFR 15.247 requirements.

### 8.4 Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247

### 8.5 Test Result of Maximum Power Spectral Density

| Modulation    | Channel | Frequency (MHz) | Measure Value (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|---------------|---------|-----------------|--------------------------|------------------|--------|
| GFSK (1 Mbps) | 00      | 2402            | -12.020                  | ≤8.000           | Pass   |
|               | 19      | 2440            | -14.040                  | ≤8.000           | Pass   |
|               | 39      | 2480            | -14.370                  | ≤8.000           | Pass   |

