# FCC Test Report

| | |
|---|---|
| **Report No.:** | BAGZ-ESH-P21060930B-19 |
| **FCC ID:** | ZUENLS2A |
| **Product:** | We-Vibe Bond |
| **Model:** | NLS2A |
| **Received Date:** | Jun.09, 2021 |
| **Test Date:** | Jun.10 to Aug.02, 2021 |
| **Issued Date:** | Aug.06, 2021 |
| **Applicant:** | WOW Tech Canada Ltd. |
| **Address:** | 1545 Carling Avenue, Suit 401, Ottawa, Ontario, Canada, K1Z 8P9 |
| **Manufacturer:** | WOW Tech Canada Ltd. |
| **Address:** | 1545 Carling Avenue, Suit 401, Ottawa, Ontario, Canada, K1Z 8P9 |
| **Issued By:** | BUREAU VERITAS ADT (Shanghai) Corporation |
| **Lab Address:** | No. 829, Xinzhuan Road, Shanghai, P.R.China (201612) |

Test Lab
Cert 2343.01

## Table of Contents


Release Control Record ..... 4
1 Certificate of Conformity ..... 5
2 Summary of Test Results ..... 6
2.1 Test Instruments ..... 7
2.2 Measurement Uncertainty ..... 8
2.3 Modification Record ..... 8
3 General Information ..... 9
3.1 General Description of EUT ..... 9
3.2 Description of Test Modes ..... 10
3.2.1 Test Mode Applicability: ..... 11
3.2.2 Test Condition: ..... 12
3.3 Description of Support Units ..... 13
3.4 General Description of Applied Standards ..... 13
4 Test Procedure and Results ..... 14
4.1 AC Power Conducted Emission ..... 14
4.1.1 Limits ..... 14
4.1.2 Test Procedures ..... 14
4.1.3 Deviation from Test Standard ..... 14
4.1.4 Test Setup ..... 15
4.1.5 EUT Operating Conditions ..... 15
4.1.6 Test Results ..... 16
4.2 Minimum 6dB Bandwidth ..... 20
4.2.1 Limit ..... 20
4.2.2 Test Setup ..... 20
4.2.3 Test Procedures ..... 20
4.2.4 Deviation of Test Standard ..... 20
4.2.5 Test Results ..... 21
4.3 Conducted Output Power ..... 23
4.3.1 Limit ..... 23
4.3.2 Test Setup ..... 23
4.3.3 Test Procedures ..... 23
4.3.4 Deviation of Test Standard ..... 23
4.3.5 Test Results ..... 24

4.4 Power Spectral Density ..... 26
4.4.1 Limit ..... 26
4.4.2 Test Setup ..... 26
4.4.3 Test Procedures ..... 26
4.4.4 Deviation of Test Standard ..... 26
4.4.5 Test Results ..... 27
4.5 Conducted Band Edges Measurement ..... 29
4.5.1 Limit ..... 29
4.5.2 Test Setup ..... 29
4.5.3 Test Procedures ..... 29
4.5.4 Deviation of Test Standard ..... 29
4.5.5 Test Results ..... 30
4.6 Conducted Spurious Emissions ..... 32
4.6.1 Limit ..... 32
4.6.2 Test Setup ..... 32
4.6.3 Test Procedures ..... 32
4.6.4 Deviation of Test Standard ..... 32
4.6.5 Test Results ..... 33
4.7 Emissions in restricted frequency bands ..... 37
4.7.1 Test Limit ..... 37
4.7.2 Test Procedure Reference ..... 38
4.7.3 Test Procedures ..... 38
4.7.4 Test Setup ..... 39
4.7.5 Test Results ..... 40
4.8 Radiated Emission Measurement ..... 43
4.8.1 Limits ..... 43
4.8.2 Test Procedures ..... 43
4.8.3 Deviation from Test Standard ..... 44
4.8.4 Test Setup ..... 45
4.8.5 EUT Operating Conditions ..... 46
4.8.6 Test Results ..... 46
5 Pictures of Test Arrangements ..... 55

**Release Control Record**

| Issue No. | Description | Date Issued |
|---|---|---|
| BAGZ-ESH-P21060930B-19 | Original release | Aug.06, 2021 |

## 1 Certificate of Conformity

**Product:** We-Vibe Bond

**Brand:** we VIBE

**Model:** NLS2A

**Applicant:** WOW Tech Canada Ltd.

**Test Date:** Jun.10 to Aug.02, 2021

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Yuan Zhang , **Date:** Aug.06, 2021

Yuan ZHANG

Project Engineer

**Approved by :** , **Date:** Aug.06, 2021

Daniel SUN

EMC Lab Manager

## 2 Summary of Test Results

The EUT has been tested according to the following specifications:

| 47 CFR FCC Part 15, Subpart C (SECTION 15.247) | | | |
|---|---|---|---|
| FCC Clause | Test Item | Result | Remarks |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. |
| 15.247(a)(2) | Minimum 6dB Bandwidth | PASS | Meet the requirement of limit. |
| 15.247(b) | Conducted Output Power | PASS | Meet the requirement of limit. |
| 15.247(e) | Power Spectral Density | PASS | Meet the requirement of limit. |
| 15.247(d) | Conducted Band Edges Measurement | PASS | Meet the requirement of limit. |
| 15.247(d) | Conducted Spurious Emissions | PASS | Meet the requirement of limit. |
| 15.247(d) | Emissions in restricted frequency bands | PASS | Meet the requirement of limit. |
| 15.205 / 15.209 / 15.247(d) | Radiated Emissions Measurement | PASS | Meet the requirement of limit. |

Note: None.

Special Comments: The test items (AC Power Conducted Emission, Radiated Emissions Measurement) were tested with adaptor STC-A51A USBA.

## 2.1 Test Instruments

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|---|---|---|---|---|---|
| Hybrid Antenna(25MHz-1.5GHz) | Schwarzbeck | VULB9168 | E1A1012 | Jul.29, 20 | Jul.28, 22 |
| Horn Antenna(1GHz -18GHz) | Schwarzbeck | BBHA9120D | E1A1017 | Aug.25, 20 | Aug.24, 22 |
| Double Ridge Horn Antenna(18G-40G) | COM-POWER | AH-840 | E1A1040 | Jul.15, 20 | Jul.14, 22 |
| Pre-Amplifier(100kHz-1.3GHz) | Agilent | 8447D | E1A2001 | Apr.19, 21 | Apr.18, 22 |
| Pre-Amplifier(0.5GHz-18GHz) | EMCI | EMC184045SE | E1A2009 | Jul.05, 21 | Jul.04, 22 |
| Pre-Amplifier(18GHz-40GHz) | EMCI | EMC051845SE | E1A2008 | Jul.05, 21 | Jul.04, 22 |
| EMI test recerver | R&S | ESR7 | E1R1005 | Apr.19, 21 | Apr.18, 22 |
| Spectrum Analyzer | Keysight | N9030B | E1S1003 | Jul.22, 21 | Jul.21, 22 |
| Spectrum Analyzer | Keysight | N9020A | E1S1004 | Mar.02, 21 | Mar.01, 22 |
| EMI test recerver | R&S | ESCS30 | E1R1001 | May.11, 21 | May.10, 22 |
| LISN | R&S | ENV216 | E1L1011 | May.11, 21 | May.10, 22 |
| Humidity&Temp Tester | Baolima | WS508 | E1H1011 | Apr.02, 21 | Apr.01, 22 |
| RF Control Unit | Toscend | JS0806-2 | E1C5003 | N/A | N/A |
| Test Software | ADT | ADT_COND_V7.3.1 | N/A | N/A | N/A |
| Test Software | Toscend | JS32-RE | N/A | N/A | N/A |
| Test Software | Toscend | JS1120 | N/A | N/A | N/A |
| Test Software | Toscend | JS1120-3 | N/A | N/A | N/A |

## 2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Measurement | Frequency | Expanded Uncertainty (k=2) (±) |
|---|---|---|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 1.83 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 5.36 dB |
| Radiated Emissions above 1 GHz | 1GHz ~ 6GHz | 3.47 dB |
| | 6GHz ~ 18GHz | 3.75 dB |
| | 18GHz ~ 40GHz | 3.30 dB |

## 2.3 Modification Record

There were no modifications required for compliance.

## 3 General Information

### 3.1 General Description of EUT

| | |
|---|---|
| Product | We-Vibe Bond |
| Brand |  |
| Test Model | NLS2A |
| Power Rating | DC5V, 0.5A |
| Modulation Type | GFSK |
| Modulation Technology | Bluetooth Low Energy 4.2 |
| Operating Frequency | 2402MHz ~ 2480MHz |
| Number of Channel | 40 |
| Antenna Type | Wire Antenna |
| Antenna Gain | 2dBi |

Note:

1. For more details, please refer to the User's manual of the EUT.

### 3.2 Description of Test Modes

40 channels are provided for Bluetooth LE.

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

### 3.2.1 Test Mode Applicability:

| EUT Configure Mode | Applicable to | | | | Description |
|---|---|---|---|---|---|
| | RE ≥ 1G | RE < 1G | PLC | APCM | |
| - | √ | √ | -- | √ | - |

Where **RE≥1G:** Radiated Emission above 1GHz **RE< 1G:** Radiated Emission below 1GHz

**PLC:** Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

**Radiated Emission Test (Above 1 GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

☒ For different antenna gain, select high gain antenna for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|---|
| - | BLE | 0 to 39 | 0, 19, 39 | GFSK |

**Radiated Emission Test (Below 1 GHz):**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|---|
| - | BLE | 0 to 39 | 0 | GFSK |

**Power Line Conducted Emission Test:**

☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☐ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|---|
| - | BLE | 0 to 39 | 0 | GFSK |

**Antenna Port Conducted Measurement**

☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|---|---|---|---|---|
| - | BLE | 0 to 39 | 0, 19, 39 | GFSK |

### 3.2.2 Test Condition:

| Applicable to | Normal Environmental Conditions | Normal Input Power |
|---|---|---|
| **RE ≥ 1G** | 23deg. C, 58%RH | 120Vac, 60Hz |
| **RE < 1G** | 23deg. C, 58%RH | 120Vac, 60Hz |
| **PLC** | 23deg. C, 58%RH | 120Vac, 60Hz |
| **APCM** | 25deg. C, 60%RH | Powered by USB |

### 3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

### 3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

**FCC Part 15, Subpart C (15.247)**

**KDB 558074 D01 DTS Meas Guidance v05r02**

**ANSI C63.10:2013**

All relaxed test items have been performed and recorded as per the above standard.

## 4 Test Procedure and Results

### 4.1 AC Power Conducted Emission

#### 4.1.1 Limits

| Frequency (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

#### 4.1.2 Test Procedures

a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

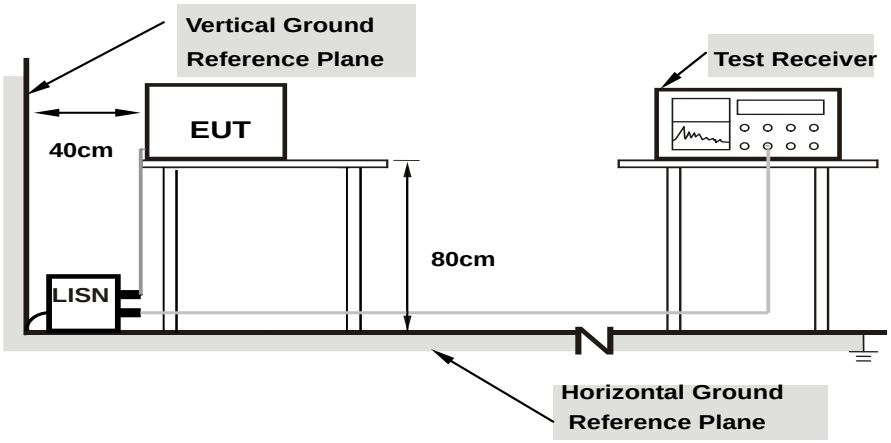
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

**NOTE:** The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

#### 4.1.3 Deviation from Test Standard

No deviation.

### 4.1.4 Test Setup




**Note: 1.Support units were connected to second LISN.**

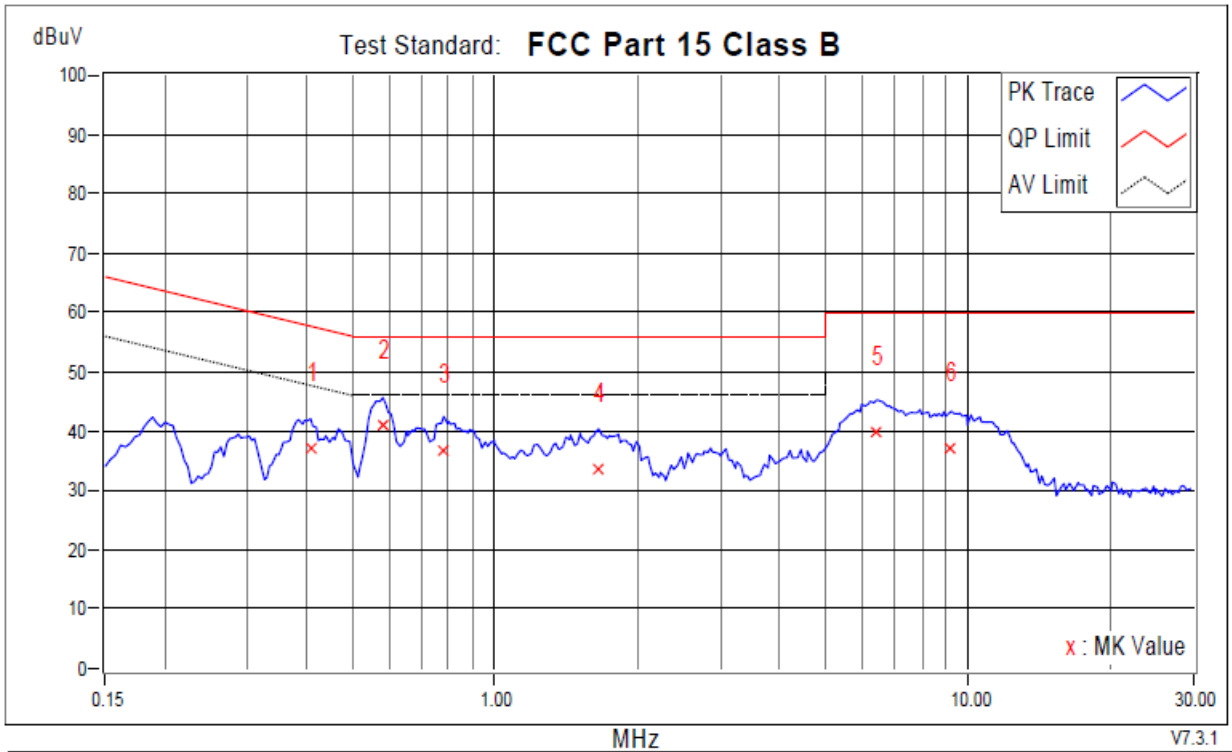
For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 4.1.5 EUT Operating Conditions

Same as 4.1.6.

**4.1.6** Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|---|---|---|---|
| Power supply | AC 120V, 60Hz | | |

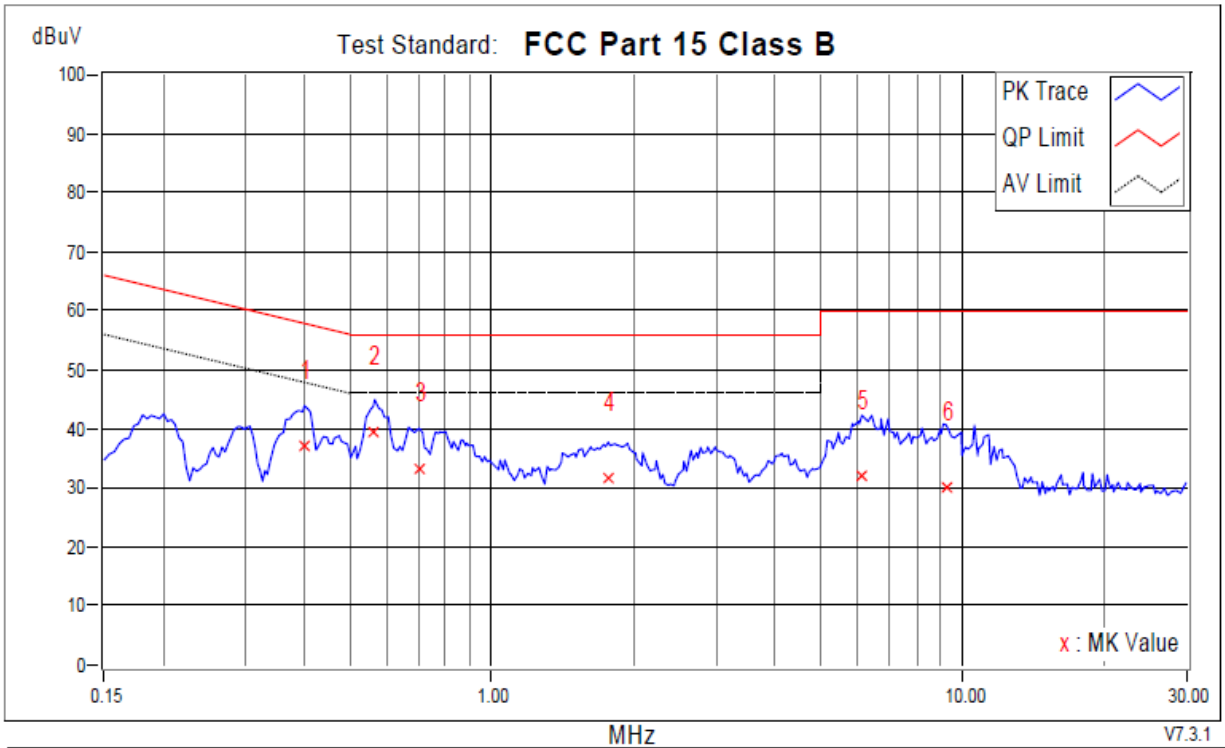



| | Frequency | Corr. Factor | Reading dBuV | | Emission dBuV | | Limit dBuV | | Margins dB | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | MHz | dB | QP | AV | QP | AV | QP | AV | QP | AV | |
| 1 | 0.40806 | 9.75 | 27.55 | 16.84 | 37.30 | 26.59 | 57.69 | 47.69 | -20.39 | -21.10 | |
| +2 | 0.58010 | 9.70 | 31.32 | 23.19 | 41.02 | 32.89 | 56.00 | 46.00 | -14.98 | -13.11 | |
| 3 | 0.77951 | 9.61 | 27.17 | 18.56 | 36.78 | 28.17 | 56.00 | 46.00 | -19.22 | -17.83 | |
| 4 | 1.65688 | 9.73 | 23.93 | 14.29 | 33.66 | 24.02 | 56.00 | 46.00 | -22.34 | -21.98 | |
| 5 | 6.41535 | 10.16 | 29.54 | 19.51 | 39.70 | 29.67 | 60.00 | 50.00 | -20.30 | -20.33 | |
| 6 | 9.16408 | 10.36 | 26.93 | 16.28 | 37.29 | 26.64 | 60.00 | 50.00 | -22.71 | -23.36 | |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---|---|---|---|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
| Power supply | AC 120V, 60Hz | | |

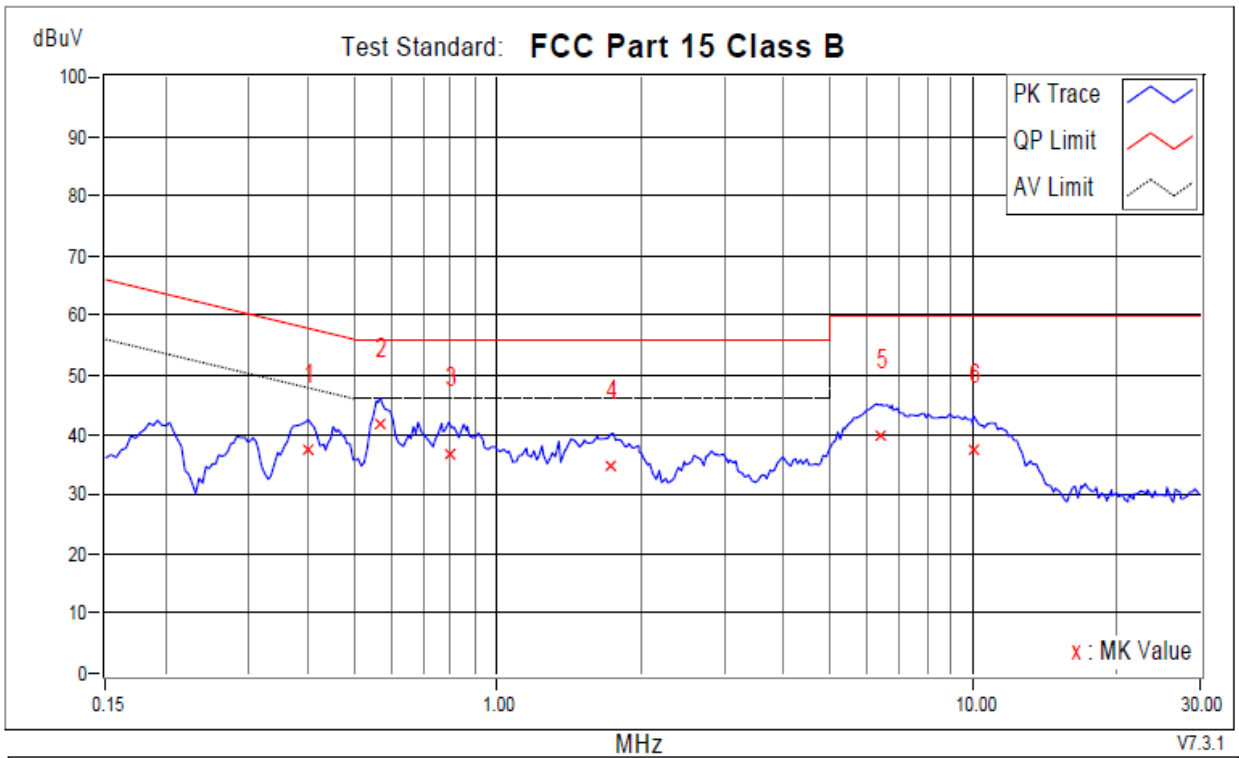



| No. | Frequency MHz | Corr. Factor dB | Reading dBuV QP | Reading dBuV AV | Emission dBuV QP | Emission dBuV AV | Limit dBuV QP | Limit dBuV AV | Margins dB QP | Margins dB AV | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.40024 | 9.89 | 27.08 | 16.98 | 36.97 | 26.87 | 57.85 | 47.85 | -20.87 | -20.97 | |
| +2 | 0.56055 | 9.86 | 29.43 | 22.47 | 39.29 | 32.33 | 56.00 | 46.00 | -16.71 | -13.67 | |
| 3 | 0.70131 | 9.83 | 23.44 | 11.46 | 33.27 | 21.29 | 56.00 | 46.00 | -22.73 | -24.71 | |
| 4 | 1.77027 | 9.95 | 21.51 | 13.05 | 31.46 | 23.00 | 56.00 | 46.00 | -24.54 | -23.00 | |
| 5 | 6.12601 | 10.00 | 22.05 | 15.91 | 32.05 | 25.91 | 60.00 | 50.00 | -27.95 | -24.09 | |
| 6 | 9.25401 | 10.37 | 19.89 | 11.49 | 30.26 | 21.86 | 60.00 | 50.00 | -29.74 | -28.14 | |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---|---|---|---|
| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
| Power supply | AC 240V, 50Hz | | |

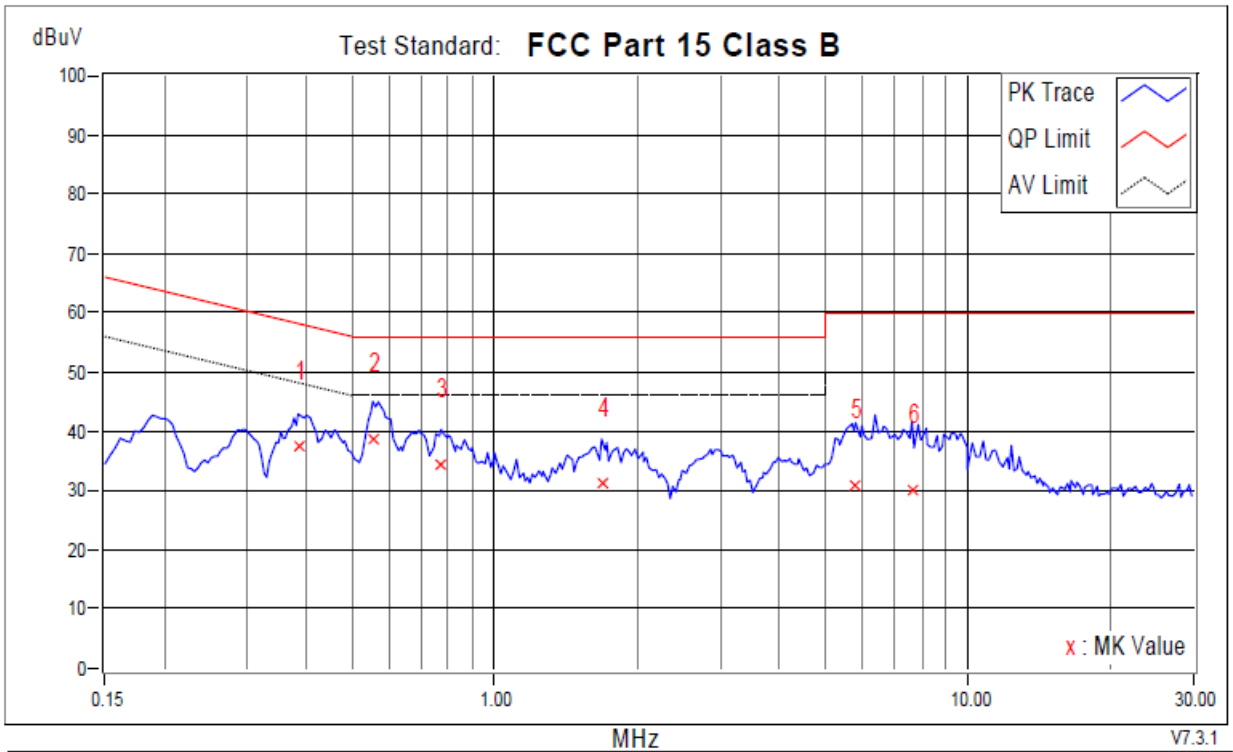



| | Frequency | Corr. Factor | Reading dBuV | | Emission dBuV | | Limit dBuV | | Margins dB | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | MHz | dB | QP | AV | QP | AV | QP | AV | QP | AV | |
| 1 | 0.40024 | 9.75 | 27.75 | 19.05 | 37.50 | 28.80 | 57.85 | 47.85 | -20.35 | -19.05 | |
| +2 | 0.56837 | 9.71 | 32.07 | 24.16 | 41.78 | 33.87 | 56.00 | 46.00 | -14.22 | -12.13 | |
| 3 | 0.79124 | 9.61 | 27.27 | 17.22 | 36.88 | 26.83 | 56.00 | 46.00 | -19.12 | -19.17 | |
| 4 | 1.72335 | 9.74 | 25.18 | 16.46 | 34.92 | 26.20 | 56.00 | 46.00 | -21.08 | -19.80 | |
| 5 | 6.43099 | 10.16 | 29.57 | 19.84 | 39.73 | 30.00 | 60.00 | 50.00 | -20.27 | -20.00 | |
| 6 | 10.02737 | 10.43 | 27.11 | 17.34 | 37.54 | 27.77 | 60.00 | 50.00 | -22.46 | -22.23 | |

**REMARKS:**

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---|---|---|---|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
| Power supply | AC 240V, 50Hz | | |




| | Frequency | Corr. Factor | Reading dBuV | | Emission dBuV | | Limit dBuV | | Margins dB | | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | MHz | dB | QP | AV | QP | AV | QP | AV | QP | AV | |
| 1 | 0.38460 | 9.90 | 27.51 | 17.82 | 37.41 | 27.72 | 58.18 | 48.18 | -20.77 | -20.46 | |
| +2 | 0.55273 | 9.86 | 28.92 | 21.69 | 38.78 | 31.55 | 56.00 | 46.00 | -17.22 | -14.45 | |
| 3 | 0.77169 | 9.89 | 24.66 | 15.54 | 34.55 | 25.43 | 56.00 | 46.00 | -21.45 | -20.57 | |
| 4 | 1.68425 | 9.94 | 21.45 | 12.80 | 31.39 | 22.74 | 56.00 | 46.00 | -24.61 | -23.26 | |
| 5 | 5.80539 | 9.92 | 20.89 | 14.76 | 30.81 | 24.68 | 60.00 | 50.00 | -29.19 | -25.32 | |
| 6 | 7.63527 | 10.22 | 20.01 | 13.16 | 30.23 | 23.38 | 60.00 | 50.00 | -29.77 | -26.62 | |

**REMARKS:**

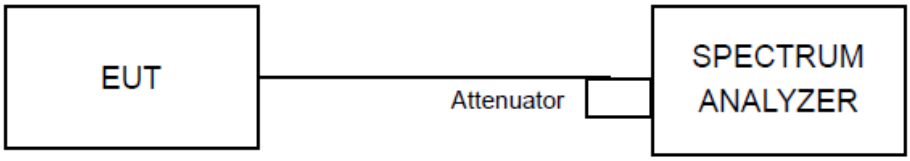
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level - Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value.

## 4.2 Minimum 6dB Bandwidth

### 4.2.1 Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz

### 4.2.2 Test Setup




### 4.2.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 8.2).

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described above (i.e., RBW = 100 kHz, VBW ≥ 3 · RBW, peak detector with maximum hold) is implemented by the instrumentation function.

### 4.2.4 Deviation of Test Standard

No deviation.

### 4.2.5 Test Results

| Test Mode | Antenna | Channel [MHz] | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit [MHz] | Verdict |
|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | 0.684 | 2401.646 | 2402.330 | >=0.5 | PASS |
| | | 2440 | 0.684 | 2439.640 | 2440.324 | >=0.5 | PASS |
| | | 2480 | 0.756 | 2479.604 | 2480.360 | >=0.5 | PASS |

BLE_1M_Ant1_2402


BLE_1M_Ant1_2440

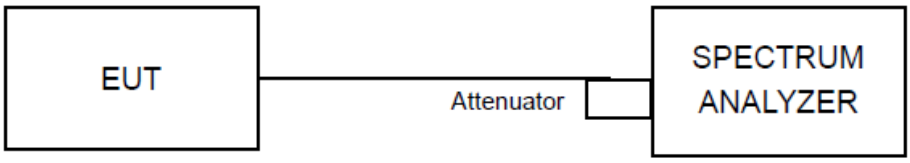

BLE_1M_Ant1_2480

## 4.3 Conducted Output Power

### 4.3.1 Limit

For systems using digital modulation in the 2400 – 2483.5 MHz bands: 1 Watt (30 dBm)

### 4.3.2 Test Setup




### 4.3.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” for compliance to FCC 47CFR 15.247 requirements (clause 9.2.2.4).

a) Set RBW ⩾ DTS bandwidth

b) Set VBW ⩾ 3 RBW.

c) Set Span ⩾ 3 RBW.

d) Sweep time = auto couple.

e) Detector = peak

f) Trace mode = max hold.

g) Allow trace to fully stabilize

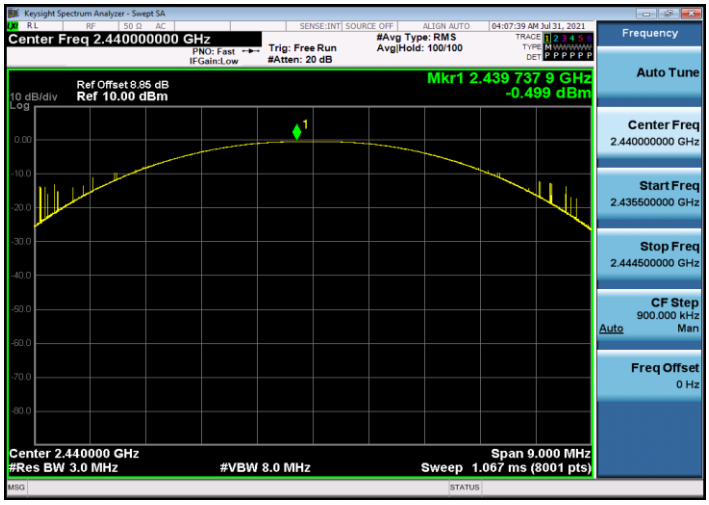
h) Use peak marker function to determine the peak amplitude level.

### 4.3.4 Deviation of Test Standard

No deviation.

### 4.3.5 Test Results

| Test Mode | Antenna | Channel [MHz] | Power [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | -1.46 | <=30 | PASS |
| | | 2440 | -0.50 | <=30 | PASS |
| | | 2480 | -1.19 | <=30 | PASS |

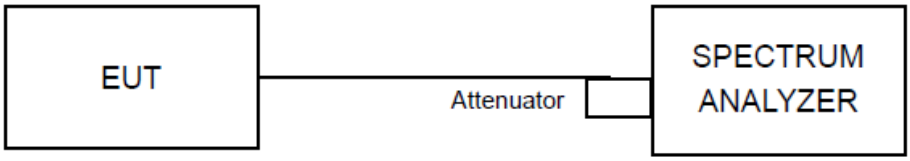
| BLE_1M_Ant1_2402 |
| --- |
|  |
| BLE_1M_Ant1_2440 |
|  |
| BLE_1M_Ant1_2480 |
|  |

## 4.4 Power Spectral Density

### 4.4.1 Limit

The Maximum of Power Spectral Density Measurement is 8 dBm.

### 4.4.2 Test Setup




### 4.4.3 Test Procedures

The power output per FCC § 15.247(e) was tested according to DTS test procedure of "KDB558074 D01 DTS Meas Guidance" (clause 10.5) for compliance to FCC 47CFR 15.247 requirements.

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ 3 ×RBW.

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

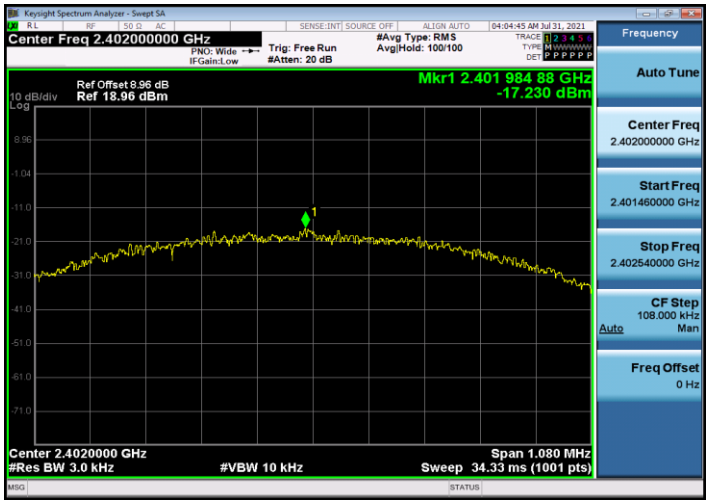
### 4.4.4 Deviation of Test Standard

No deviation.

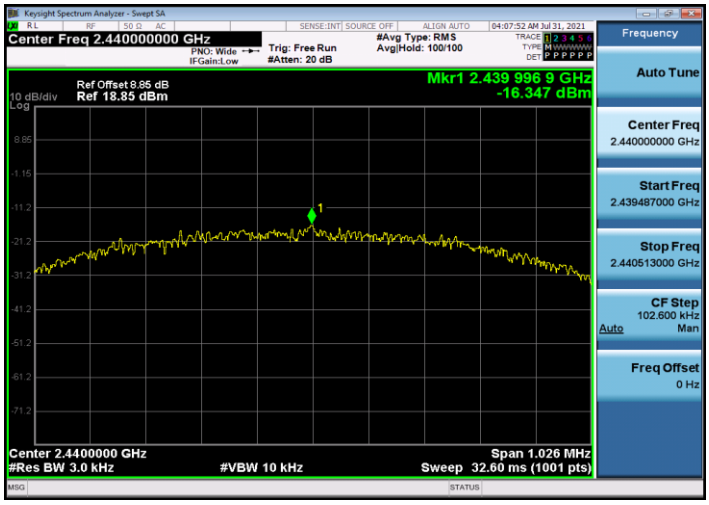
### 4.4.5 Test Results

| Test Mode | Antenna | Channel [MHz] | PSD[dBm/3kHz] | Limit[dBm/3kHz] | Verdict |
|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | -17.23 | <=8 | PASS |
| | | 2440 | -16.35 | <=8 | PASS |
| | | 2480 | -17.25 | <=8 | PASS |

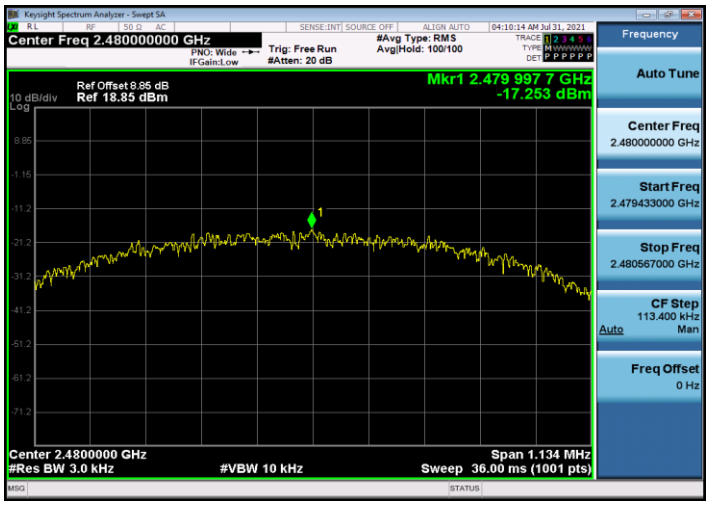
BLE_1M_Ant1_2402




BLE_1M_Ant1_2440




BLE_1M_Ant1_2480

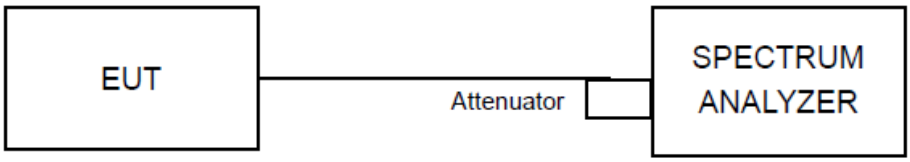


## 4.5 Conducted Band Edges Measurement

### 4.5.1 Limit

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

### 4.5.2 Test Setup




### 4.5.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

**MEASUREMENT PROCEDURE REF**

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

**MEASUREMENT PROCEDURE OOBE**

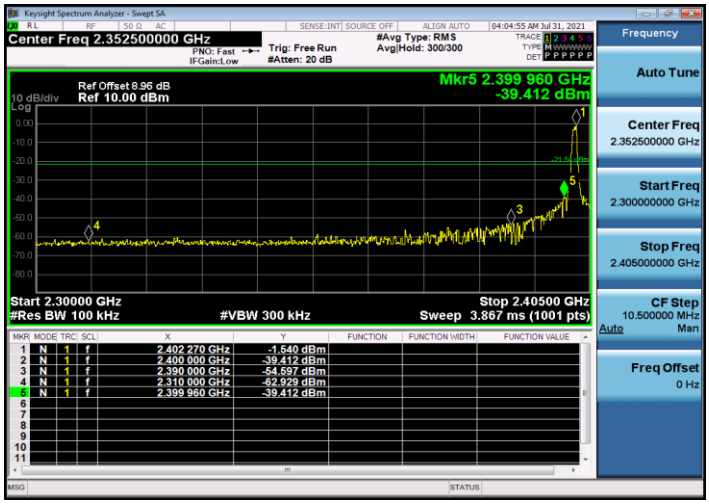
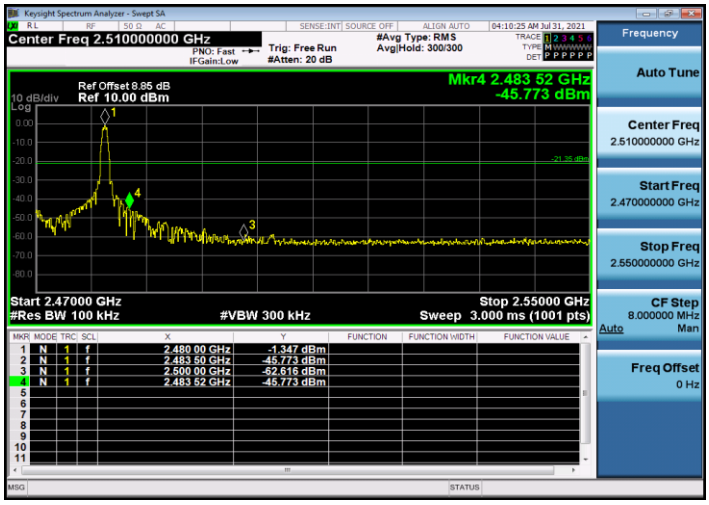
1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

### 4.5.4 Deviation of Test Standard

No deviation.

### 4.5.5 Test Results

| Test Mode | Antenna | ChName | Channel [MHz] | RefLevel [dBm] | Max. Spurious Level [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | Low | 2402 | -1.54 | -39.41 | <=-21.54 | PASS |
| | | High | 2480 | -1.35 | -45.77 | <=-21.35 | PASS |

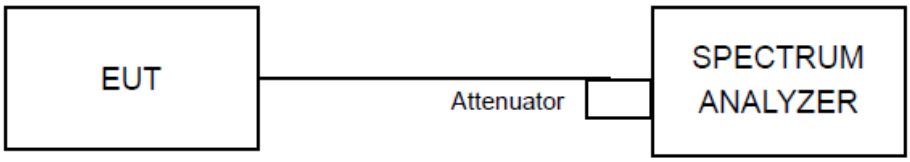
| BLE_1M_Ant1_Low_2402 |
| --- |
|  |
| BLE_1M_Ant1_High_2480 |
|  |

## 4.6 Conducted Spurious Emissions

### 4.6.1 Limit

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

### 4.6.2 Test Setup




### 4.6.3 Test Procedures

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance” (clause 11.0) for compliance to FCC 47CFR 15.247 requirements.

**MEASUREMENT PROCEDURE REF**

1. Set the RBW = 100 kHz.

2. Set the VBW ≥ 300 kHz.

3. Detector = peak.

4. Sweep time = auto couple.

5. Trace mode = max hold.

6. Allow trace to fully stabilize.

7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

**MEASUREMENT PROCEDURE OOBE**

1. Set RBW = 100 kHz.

2. Set VBW ≥ 300 kHz.

3. Detector = peak.

4. Sweep = auto couple.

5. Trace Mode = max hold.

6. Allow trace to fully stabilize.

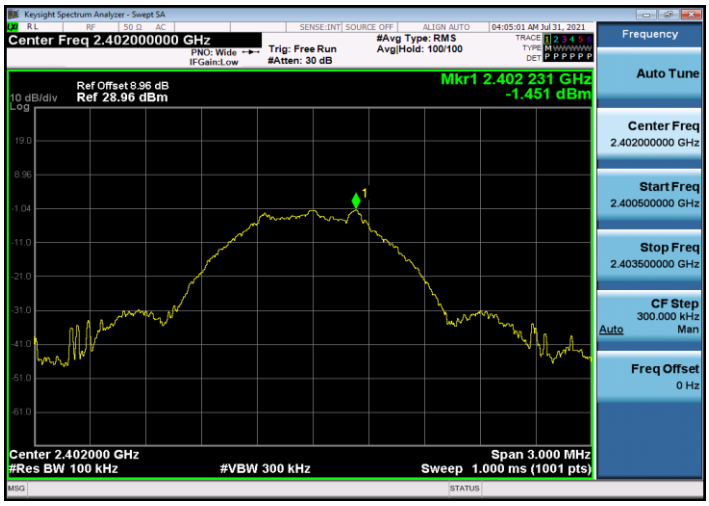
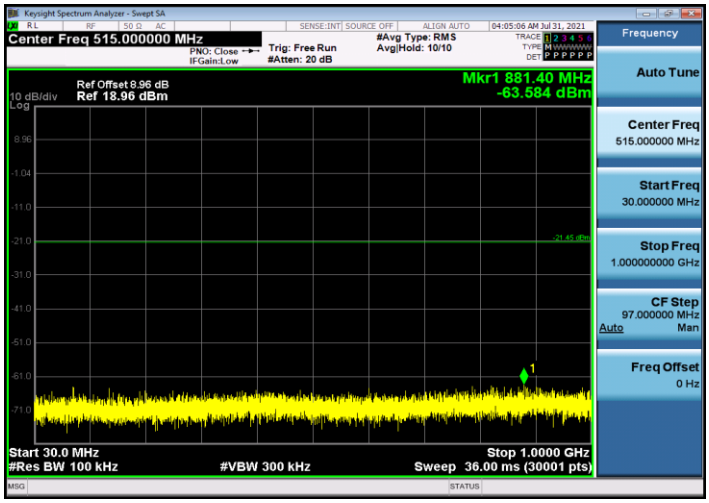
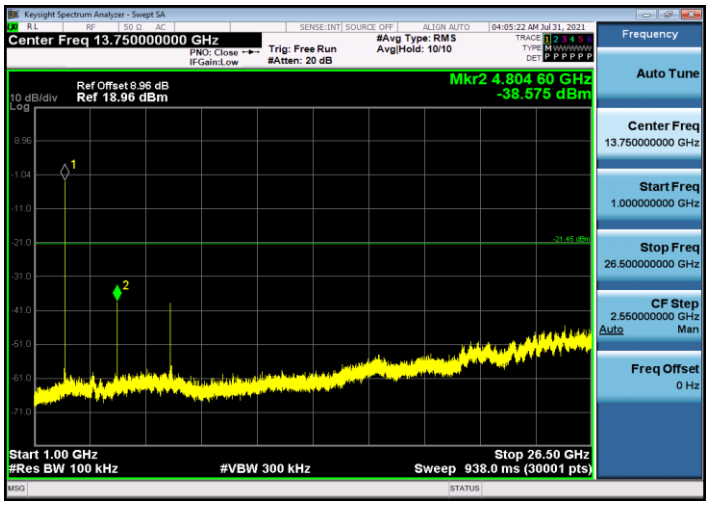
7. Use the peak marker function to determine the maximum amplitude level.

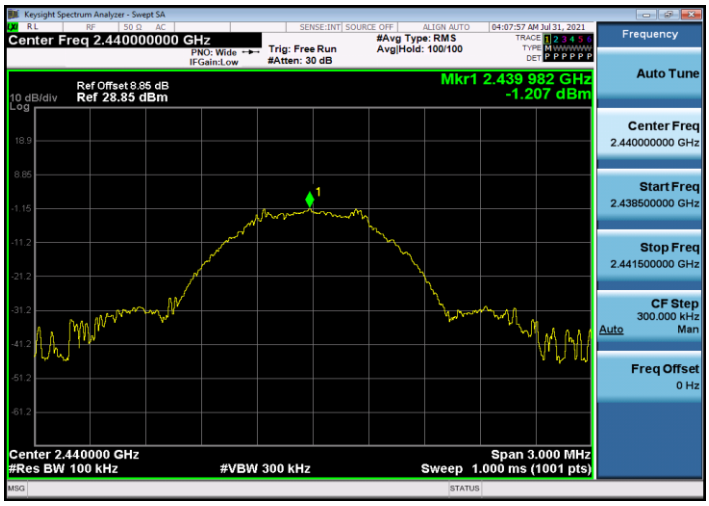
### 4.6.4 Deviation of Test Standard

No deviation.

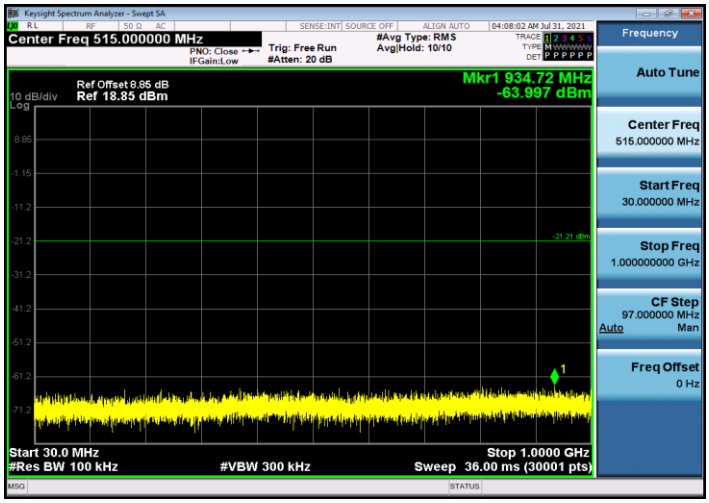
### 4.6.5 Test Results

| Test Mode | Antenna | Channel [MHz] | FreqRange [MHz] | RefLevel [dBm] | Result [dBm] | Limit [dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | Reference | -1.45 | -1.45 | --- | PASS |
| | | | 30~1000 | -1.45 | -63.58 | <=-21.45 | PASS |
| | | | 1000~26500 | -1.45 | -38.58 | <=-21.45 | PASS |
| | | 2440 | Reference | -1.21 | -1.21 | --- | PASS |
| | | | 30~1000 | -1.21 | -64 | <=-21.21 | PASS |
| | | | 1000~26500 | -1.21 | -39.15 | <=-21.21 | PASS |
| | | 2480 | Reference | -1.23 | -1.23 | --- | PASS |
| | | | 30~1000 | -1.23 | -62.86 | <=-21.23 | PASS |
| | | | 1000~26500 | -1.23 | -43.04 | <=-21.23 | PASS |

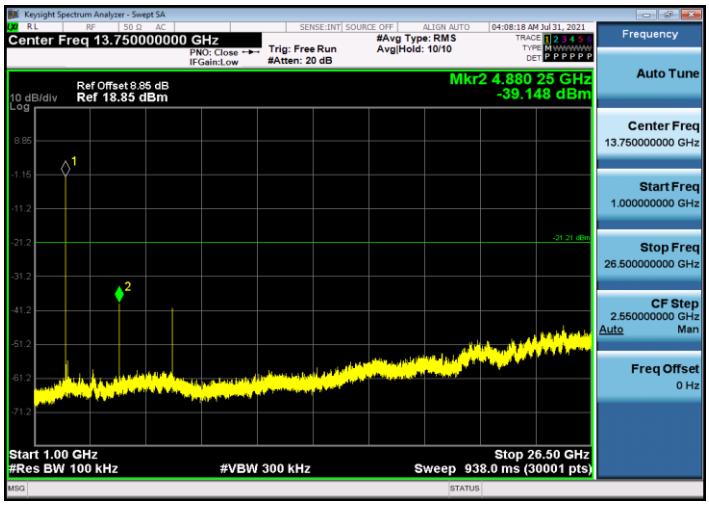
| BLE_1M_Ant1_2402_0~Reference |
| --- |
|  |
| BLE_1M_Ant1_2402_30~1000 |
|  |
| BLE_1M_Ant1_2402_1000~26500 |
|  |

| BLE_1M_Ant1_2440_0~Reference |
| --- |
|  |



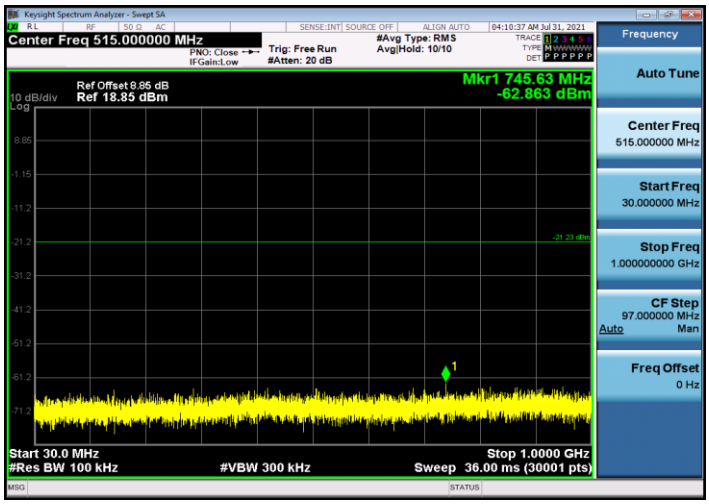
| BLE_1M_Ant1_2440_30~1000 |
| --- |
|  |



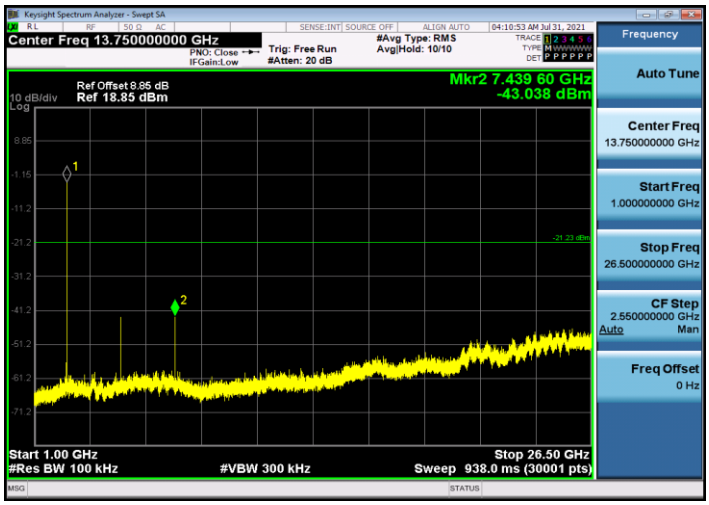
| BLE_1M_Ant1_2440_1000~26500 |
| --- |
|  |

| BLE_1M_Ant1_2480_0~Reference |
| --- |
|  |



| BLE_1M_Ant1_2480_30~1000 |
| --- |
|  |



| BLE_1M_Ant1_2480_1000~26500 |
| --- |
|  |

### 4.7 Emissions in restricted frequency bands

#### 4.7.1 Test Limit

**For 15.205 requirement:**

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part1 5, must also comply with the radiated emission limits specified in Section 15.209(a).

| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (GHz) |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| 1 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (2) |
| 13.36 - 13.41 | -- | -- | -- |

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

| FCC Part 15 Subpart C Paragraph 15.209 | | |
|---|---|---|
| Frequency [MHz] | Field Strength [uV/m] | Measured Distance [Meters] |
| 0.009 - 0.490 | 2400/F (kHz) | 300 |
| 0.490 - 1.705 | 24000/F (kHz) | 30 |
| 1.705 - 30 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

#### 4.7.2 Test Procedure Reference

ANSI C63.10 Section 6.3 (General Requirements)

ANSI C63.10 Section 6.6 (Standard test method above 1GHz)

#### 4.7.3 Test Procedures

**Peak Field Strength Measurements**

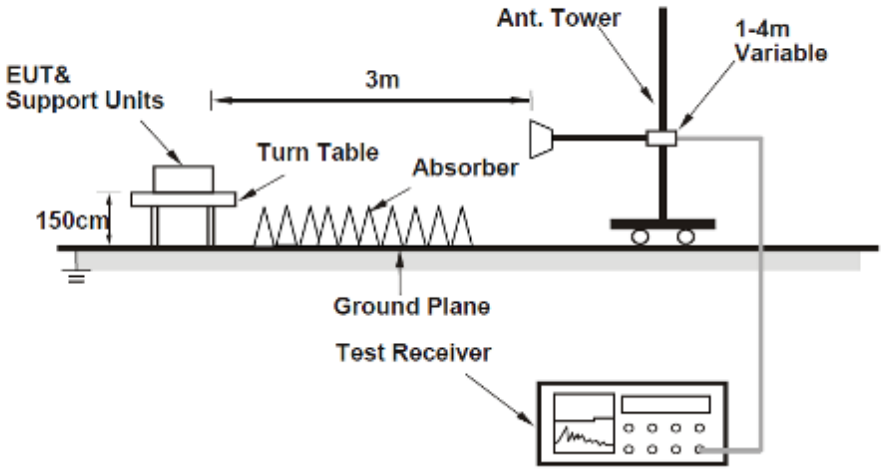
1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

## Average Measurements above 1GHz (Method VB)

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW; If the EUT is configured to transmit with duty cycle ≥ 98%, set VBW = 10 Hz.
   If the EUT duty cycle is < 98%, set VBW ≥ 1/T. T is the minimum transmission duration.
3. Detector = Peak
5. Sweep time = auto
6. Trace mode = max hold
7. Trace was allowed to stabilize

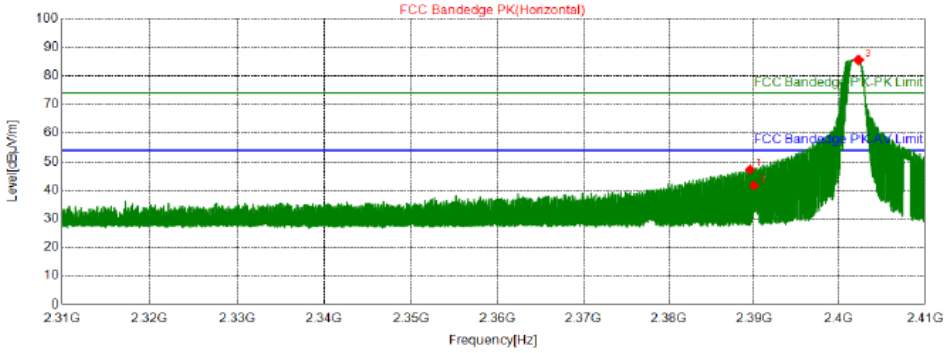
### 4.7.4 Test Setup

**For Radiated emission above 1GHz**



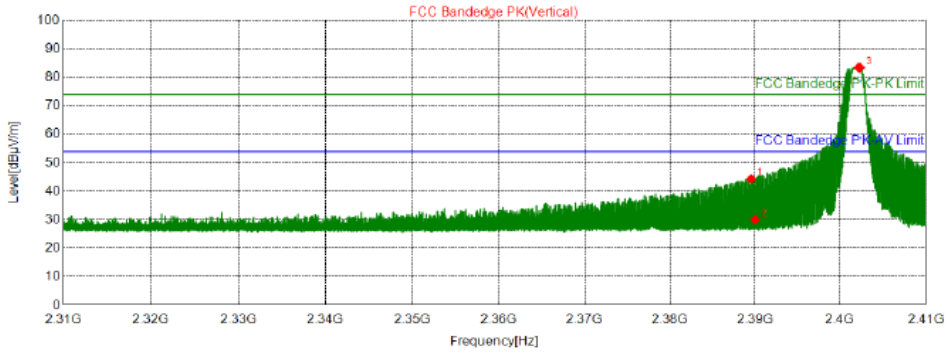
### 4.7.5 Test Results

BLE_1M_2402_Ant1/ Horizontal



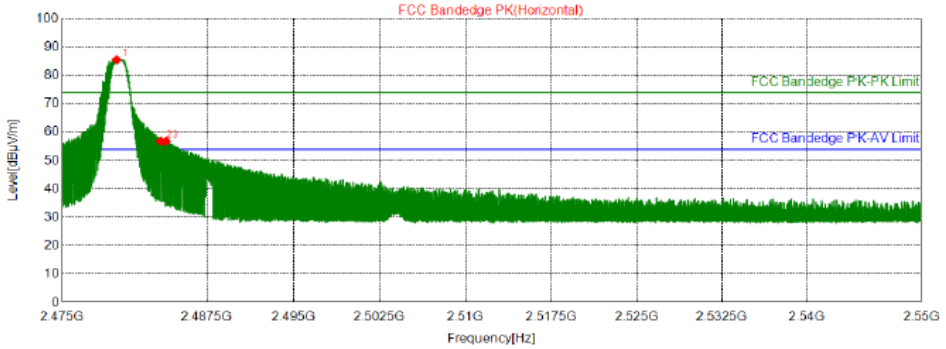

| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2389.5250 | 63.15 | 47.34 | 74.00 | 26.66 | 380 | 280 | Horizontal | PK |
| 2 | 2390.0000 | 57.52 | 41.71 | 74.00 | 32.29 | 380 | 164 | Horizontal | PK |
| 3 | 2402.2250 | 101.33 | 85.56 | 74.00 | -11.56 | 380 | 180 | Horizontal | PK |

BLE_1M_2402_Ant1/ Vertical



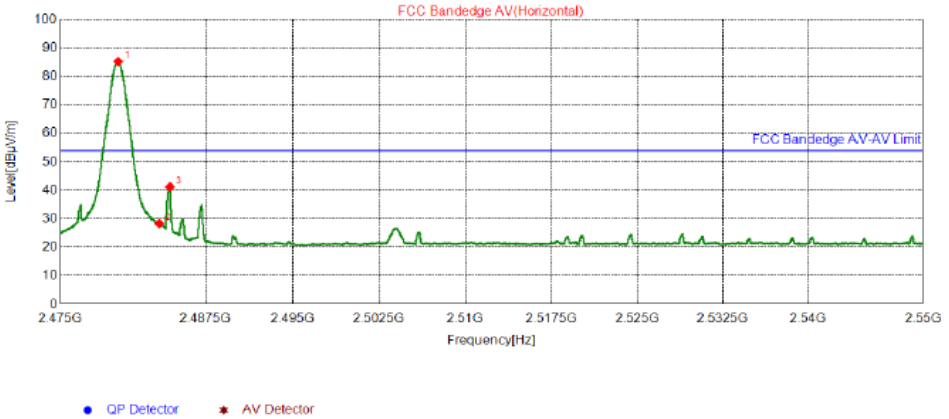

| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2389.5350 | 60.09 | 44.28 | 74.00 | 29.72 | 380 | 197 | Vertical | PK |
| 2 | 2390.0000 | 45.84 | 30.03 | 74.00 | 43.97 | 380 | 248 | Vertical | PK |
| 3 | 2402.2000 | 99.18 | 83.41 | 74.00 | -9.41 | 380 | 197 | Vertical | PK |

## BLE_1M_2480_Ant1/ Horizontal-PK



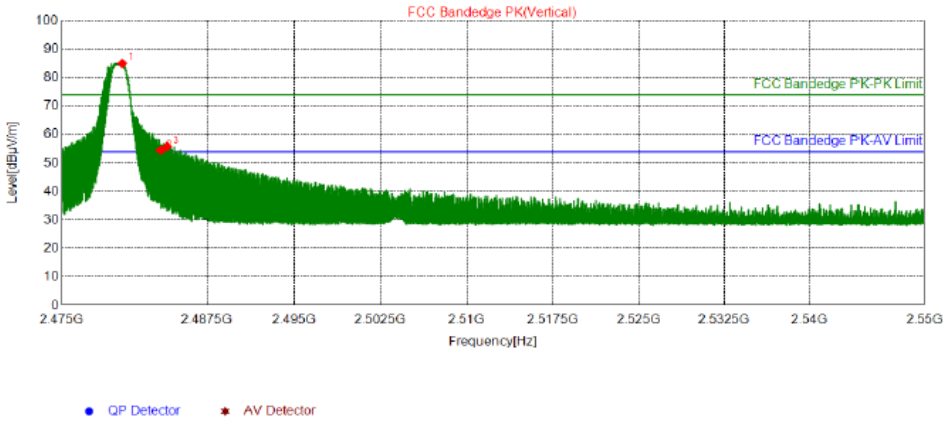

| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2479.6913 | 101.00 | 85.49 | 74.00 | -11.49 | 380 | 338 | Horizontal | PK |
| 2 | 2483.5013 | 72.27 | 56.77 | 74.00 | 17.23 | 380 | 105 | Horizontal | PK |
| 3 | 2483.9663 | 72.20 | 56.71 | 74.00 | 17.29 | 380 | 88 | Horizontal | PK |

## BLE_1M_2480_Ant1/ Horizontal-AV



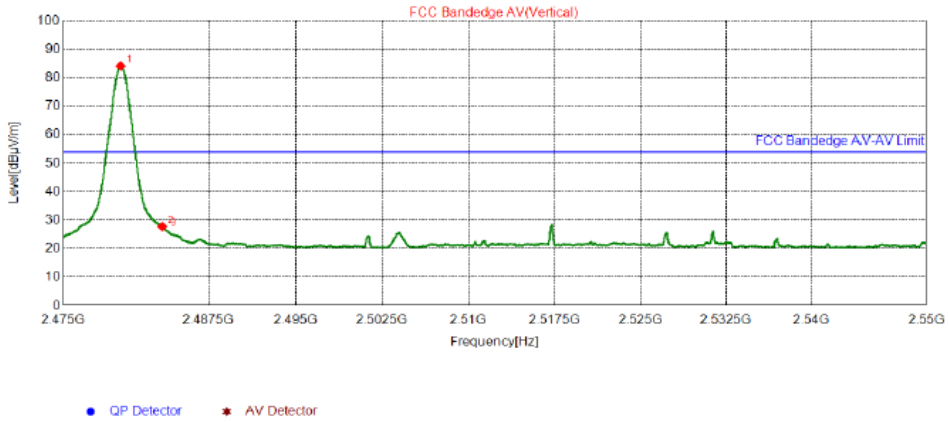

| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2479.9688 | 100.74 | 85.23 | 54.00 | -31.23 | 380 | 332 | Horizontal | PK |
| 2 | 2483.5031 | 43.84 | 28.34 | 54.00 | 25.66 | 380 | 332 | Horizontal | PK |
| 3 | 2484.4313 | 56.69 | 41.20 | 54.00 | 12.80 | 380 | 32 | Horizontal | PK |

## BLE_1M_2480_Ant1/ Vertical-PK




| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2480.1938 | 100.49 | 84.98 | 74.00 | -10.98 | 380 | 188 | Vertical | PK |
| 2 | 2483.5013 | 69.96 | 54.46 | 74.00 | 19.54 | 380 | 155 | Vertical | PK |
| 3 | 2484.0600 | 71.30 | 55.81 | 74.00 | 18.19 | 380 | 188 | Vertical | PK |

## BLE_1M_2480_Ant1/ Vertical-AV




| NO. | Freq. [MHz] | Reading [dBµV/m] | Level [dBµV/m] | Limit [dBµV/m] | Margin [dB] | Height [cm] | Angle [°] | Polarity | Detector |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2479.9219 | 99.61 | 84.10 | 54.00 | -30.10 | 380 | 184 | Vertical | PK |
| 2 | 2483.5031 | 43.28 | 27.78 | 54.00 | 26.22 | 380 | 188 | Vertical | PK |
| 3 | 2483.6719 | 42.58 | 27.09 | 54.00 | 26.91 | 380 | 186 | Vertical | PK |

## 4.8 Radiated Emission Measurement

### 4.8.1 Limits

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

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

**NOTE**:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

### 4.8.2 Test Procedures

**For Radiated emission below 30MHz**

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degree to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. Both X and Y axes of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned from 0 degree to 360 degree to find the maximum reading.

e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

**Note:**

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

**For Radiated emission above 30MHz**

a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

**Note:**

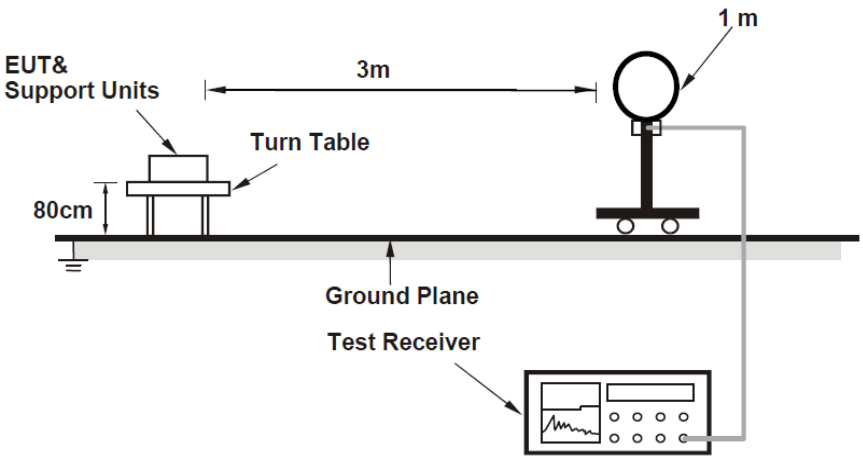
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for RMS Average (Duty cycle < 98 %) for Peak detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 4.8.3 Deviation from Test Standard

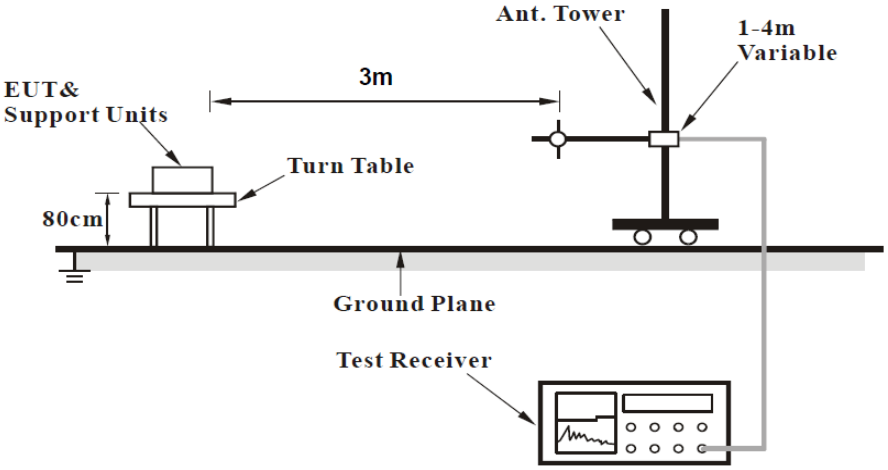
No deviation.

### 4.8.4 Test Setup

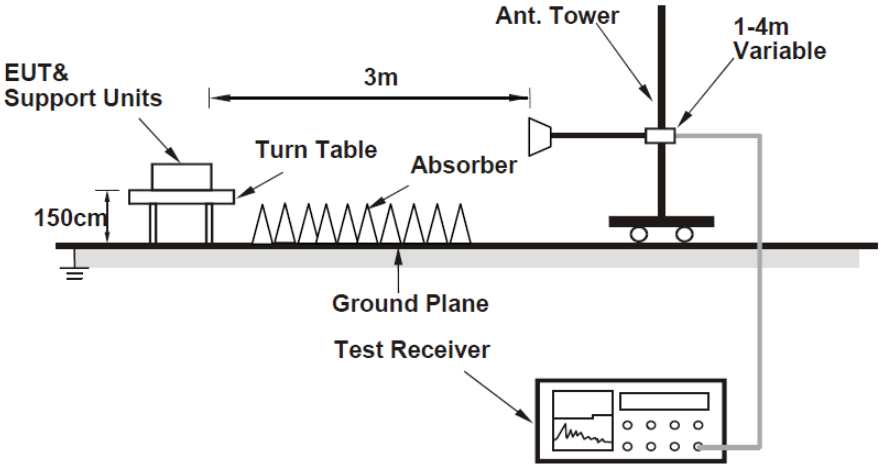
**For Radiated emission below 30MHz**




**For Radiated emission 30MHz to 1GHz**



For Radiated emission above 1GHz




For the actual test configuration, please refer to the attached file (Test Setup Photo).

### 4.8.5 EUT Operating Conditions

a. Placed the EUT on a testing table.

b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

### 4.8.6 Test Results

**Radiated Emissions Range 9kHz~30MHz**

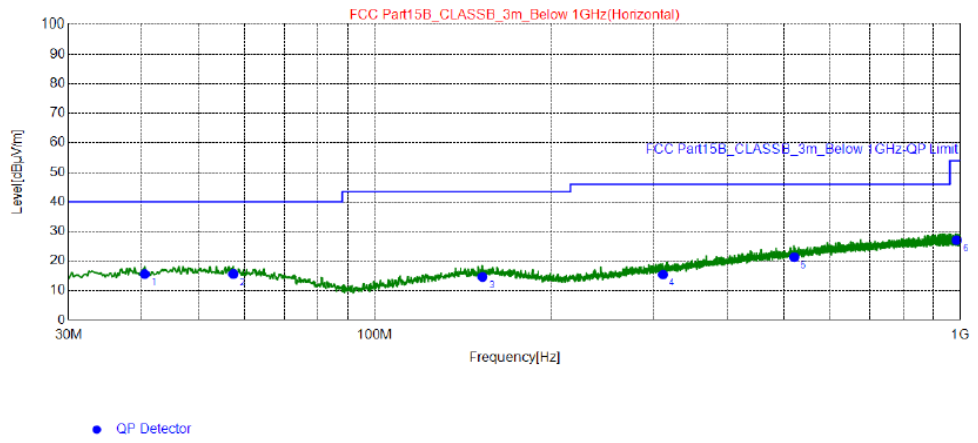
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

## Radiated Emissions Range 30MHz~1GHz

## Below is the worst test data

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Horizontal |
| **Test mode** | Working mode | | |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 40.47 | 25.9 | -10.40 | 15.50 | 40.00 | 24.50 | 100 | 336 | Horizontal |
| 2 | 57.35 | 25.64 | -10.12 | 15.52 | 40.00 | 24.48 | 100 | 184 | Horizontal |
| 3 | 152.8 | 24.54 | -9.96 | 14.58 | 43.50 | 28.92 | 200 | 266 | Horizontal |
| 4 | 310.7 | 23.69 | -8.35 | 15.34 | 46.00 | 30.66 | 200 | 83 | Horizontal |
| 5 | 520.8 | 25.45 | -4.19 | 21.26 | 46.00 | 24.74 | 200 | 351 | Horizontal |
| 6 | 986.0 | 24.79 | 2.22 | 27.01 | 54.00 | 26.99 | 200 | 187 | Horizontal |

**REMARKS:**

1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)

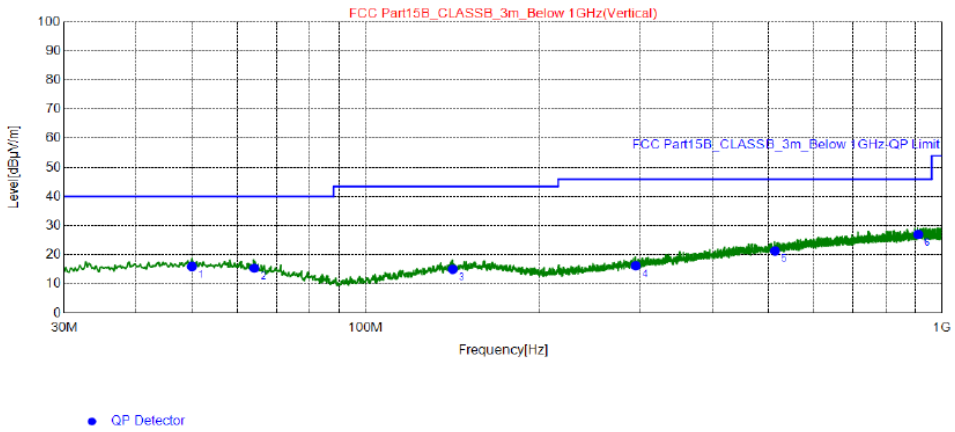
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Vertical |
| **Test mode** | Working mode | | |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 49.98 | 25.71 | -9.70 | 16.01 | 40.00 | 23.99 | 200 | 207 | Vertical |
| 2 | 64.14 | 26.45 | -11.01 | 15.44 | 40.00 | 24.56 | 200 | 102 | Vertical |
| 3 | 141.7 | 25.35 | -10.28 | 15.07 | 43.50 | 28.43 | 100 | 64 | Vertical |
| 4 | 294.4 | 25.04 | -8.78 | 16.26 | 46.00 | 29.74 | 200 | 43 | Vertical |
| 5 | 513.4 | 25.69 | -4.31 | 21.38 | 46.00 | 24.62 | 100 | 172 | Vertical |
| 6 | 909.7 | 25.95 | 1.08 | 27.03 | 46.00 | 18.97 | 100 | 135 | Vertical |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

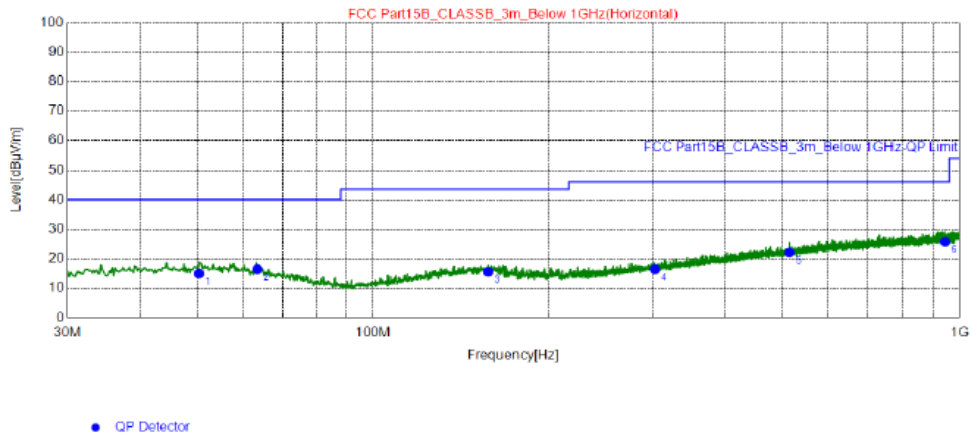
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Horizontal |
| **Test mode** | Charging mode | **Voltage** | 120V, 60Hz |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 50.37 | 24.68 | -9.72 | 14.96 | 40.00 | 25.04 | 100 | 134 | Horizontal |
| 2 | 63.36 | 27.38 | -10.87 | 16.51 | 40.00 | 23.49 | 200 | 354 | Horizontal |
| 3 | 157.2 | 25.47 | -9.84 | 15.63 | 43.50 | 27.87 | 100 | 242 | Horizontal |
| 4 | 303.1 | 25.03 | -8.54 | 16.49 | 46.00 | 29.51 | 200 | 354 | Horizontal |
| 5 | 514.6 | 26.38 | -4.29 | 22.09 | 46.00 | 23.91 | 200 | 306 | Horizontal |
| 6 | 944.1 | 23.97 | 1.82 | 25.79 | 46.00 | 20.21 | 200 | 44 | Horizontal |

**REMARKS:**

1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)

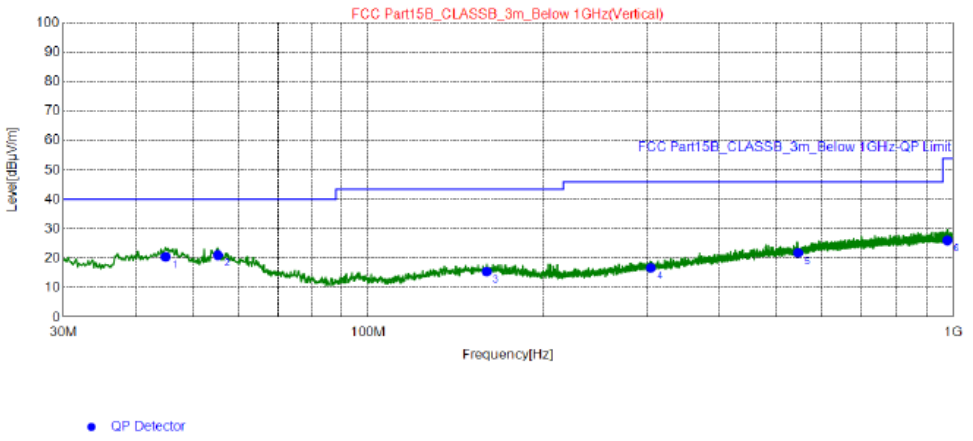
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Vertical |
| **Test mode** | Charging mode | **Voltage** | 120V, 60Hz |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 44.93 | 30.68 | -10.07 | 20.61 | 40.00 | 19.39 | 100 | 54 | Vertical |
| 2 | 55.22 | 31.11 | -10.00 | 21.11 | 40.00 | 18.89 | 200 | 20 | Vertical |
| 3 | 159.5 | 25.36 | -9.77 | 15.59 | 43.50 | 27.91 | 200 | 95 | Vertical |
| 4 | 304.8 | 25.26 | -8.50 | 16.76 | 46.00 | 29.24 | 200 | 280 | Vertical |
| 5 | 545.0 | 25.64 | -3.77 | 21.87 | 46.00 | 24.13 | 100 | 194 | Vertical |
| 6 | 977.1 | 23.95 | 2.15 | 26.10 | 54.00 | 27.90 | 100 | 3 | Vertical |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

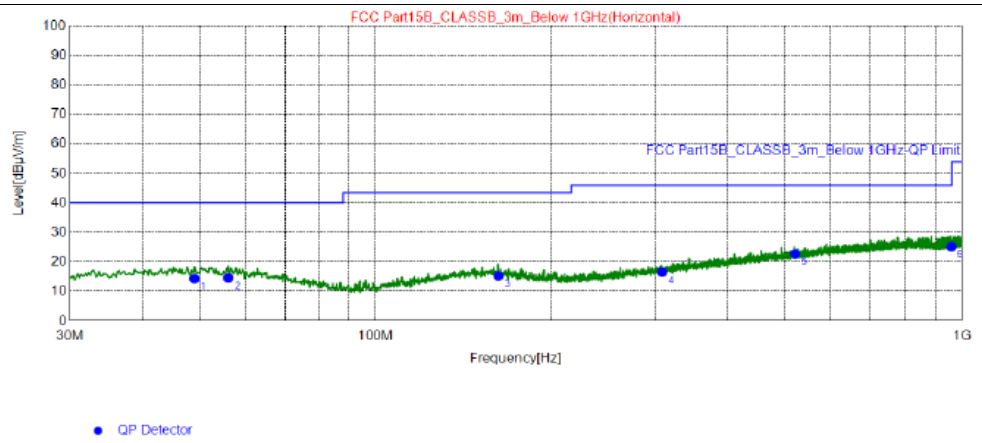
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Horizontal |
| **Test mode** | Charging mode | **Voltage** | 240V, 50Hz |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 49.01 | 24.07 | -9.77 | 14.30 | 40.00 | 25.70 | 100 | 194 | Horizontal |
| 2 | 55.99 | 24.65 | -10.05 | 14.60 | 40.00 | 25.40 | 200 | 185 | Horizontal |
| 3 | 162.1 | 25.18 | -9.88 | 15.30 | 43.50 | 28.20 | 100 | 120 | Horizontal |
| 4 | 308.7 | 24.96 | -8.40 | 16.56 | 46.00 | 29.44 | 200 | 204 | Horizontal |
| 5 | 521.2 | 26.93 | -4.18 | 22.75 | 46.00 | 23.25 | 100 | 228 | Horizontal |
| 6 | 958.0 | 23.23 | 2.01 | 25.24 | 46.00 | 20.76 | 100 | 336 | Horizontal |

**REMARKS:**

1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)

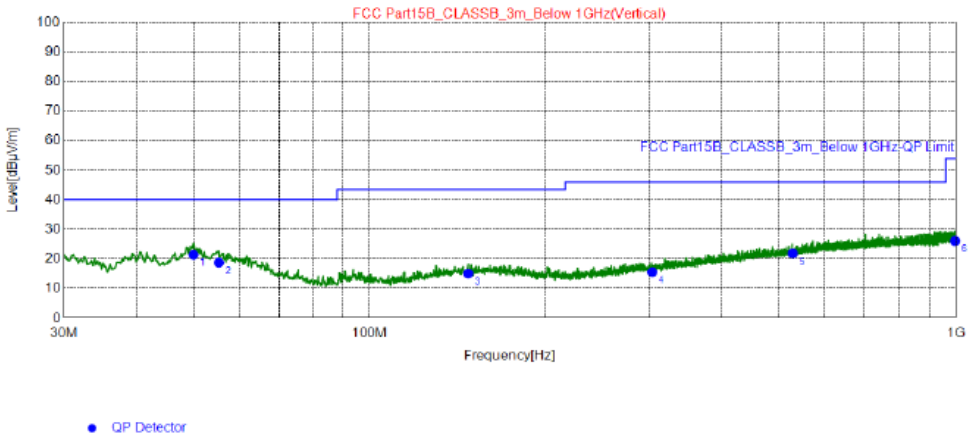
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_2402 | **Detector Function** | Quasi-Peak (QP) |
| **Frequency Range** | 30MHz ~ 1GHz | **Antenna Polarity** | Vertical |
| **Test mode** | Charging mode | **Voltage** | 240V, 50Hz |

Test Plot:




**Final Data List**

| NO. | Freq. [MHz] | QP Reading [dBμV/m] | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 49.98 | 31.1 | -9.70 | 21.40 | 40.00 | 18.60 | 100 | 165 | Vertical |
| 2 | 55.22 | 28.76 | -10.00 | 18.76 | 40.00 | 21.24 | 100 | 61 | Vertical |
| 3 | 147.3 | 25.21 | -10.12 | 15.09 | 43.50 | 28.41 | 100 | 209 | Vertical |
| 4 | 304.1 | 24.11 | -8.52 | 15.59 | 46.00 | 30.41 | 100 | 154 | Vertical |
| 5 | 528.7 | 25.92 | -4.05 | 21.87 | 46.00 | 24.13 | 200 | 202 | Vertical |
| 6 | 995.5 | 23.78 | 2.30 | 26.08 | 54.00 | 27.92 | 100 | 102 | Vertical |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

## Radiated Emission Range 1GHz~10th Harmonic

## Below is the worst test data

| | | | |
|---|---|---|---|
| **Channel** | BLE_1M_2402 | **Detector Function** | Peak (PK) |
| **Frequency Range** | 1GHz ~ 25GHz | | Average (AV) |

| Spurious Emission Level | | | | | | | |
|---|---|---|---|---|---|---|---|
| **No.** | **Frequency (MHz)** | **Emission Level (dBuV/m)** | **Limit (dBuV/m)** | **Margin (dB)** | **Correction Factor (dB/m)** | **Antenna Polarity** | **Detector** |
| 1 | 7205.0000 | 61.53 | 74.00 | 12.47 | -0.58 | H | PK |
| 2 | 7206.7000 | 49.97 | 54.00 | 4.03 | -0.58 | H | AV |
| 3 | 7206.7000 | 59.61 | 74.00 | 14.39 | -0.58 | V | PK |
| 4 | 7206.7000 | 50.73 | 54.00 | 3.27 | -0.58 | V | AV |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_1M_2440 | **Detector Function** | Peak (PK) |
| **Frequency Range** | 1GHz ~ 25GHz | | Average (AV) |

| Spurious Emission Level | | | | | | | |
|---|---|---|---|---|---|---|---|
| **No.** | **Frequency (MHz)** | **Emission Level (dBuV/m)** | **Limit (dBuV/m)** | **Margin (dB)** | **Correction Factor (dB/m)** | **Antenna Polarity** | **Detector** |
| 1 | 7320.6000 | 52.69 | 74.00 | 21.31 | -0.88 | H | PK |
| 2 | 7320.6000 | 46.28 | 54.00 | 7.72 | -0.88 | H | AV |
| 3 | 7318.9000 | 55.30 | 74.00 | 18.70 | -0.87 | V | PK |
| 4 | 7320.6000 | 51.55 | 54.00 | 2.45 | -0.88 | V | AV |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

| | | | |
|---|---|---|---|
| **Channel** | BLE_1M_2480 | **Detector Function** | Peak (PK) |
| **Frequency Range** | 1GHz ~ 25GHz | | Average (AV) |

| Spurious Emission Level | | | | | | | |
|---|---|---|---|---|---|---|---|
| **No.** | **Frequency (MHz)** | **Emission Level (dBuV/m)** | **Limit (dBuV/m)** | **Margin (dB)** | **Correction Factor (dB/m)** | **Antenna Polarity** | **Detector** |
| 1 | 7441.3000 | 51.44 | 74.00 | 22.56 | -1.19 | H | PK |
| 2 | 7441.3000 | 47.11 | 54.00 | 6.89 | -1.19 | H | AV |
| 3 | 7439.6000 | 51.76 | 74.00 | 22.24 | -1.19 | V | PK |
| 4 | 7441.3000 | 48.58 | 54.00 | 5.42 | -1.19 | V | AV |

**REMARKS:**

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)

2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)

3. The other emission levels were very low against the limit.

4. Margin value = Limit value – Emission Level

## 5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

**--- END ---**