# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

| | |
|---|---|
| **Test Standard** | **FCC Part 15.247** |
| **Product name** | **Image sensor with LoRa module** |
| **Brand Name** | **Sercomm** |
| **Model No.** | **SL-IMG01** |
| **Test Result** | **Pass** |
| **Statements of Conformity** | **Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.** |

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:

Shawn Wu
Supervisor

# Revision History

| Rev. | Issue Date | Revisions | Effect Page | Revised By |
|---|---|---|---|---|
| 00 | June 8, 2023 | Initial Issue | ALL | Doris Chu |
| 01 | June 16, 2023 | See the following Note Rev. (01) | P.4 | Doris Chu |

Rev. (01)
1. Modify power supply in section 1.1.

# Table of contents

# 1. GENERAL INFORMATION

## 1.1 EUT INFORMATION

| | |
|---|---|
| **Applicant** | Sercomm Corporation<br>8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan |
| **Manufacturer** | Sercomm Corporation<br>8F, No. 3-1, YuanQu St., NanKang, Taipei 115, Taiwan |
| **Equipment** | Image sensor with LoRa module |
| **Model Name** | SL-IMG01 |
| **Model Discrepancy** | N/A |
| **Brand Name** | Sercomm |
| **Received Date** | May 9, 2023 |
| **Date of Test** | May 15 ~ June 5, 2023 |
| **Power Supply** | Power from Battery. (DC 6V) |

**Remark:**
1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.

## 1.2 EUT CHANNEL INFORMATION

| | |
|---|---|
| Frequency Range | 2402MHz-2480MHz |
| Modulation Type | GFSK for BLE 1 Mbps |
| Number of channels | 40 Channels |

**Remark:**
Refer as ANSI C63.10: 2013 clause 5.6.1 Table 4 for test channels

| Number of frequencies to be tested | | |
|---|---|---|
| **Frequency range in which device operates** | **Number of frequencies** | **Location in frequency range of operation** |
| ☐ 1 MHz or less | 1 | Middle |
| ☐ 1 MHz to 10 MHz | 2 | 1 near top and 1 near bottom |
| ☒ More than 10 MHz | 3 | 1 near top, 1 near middle, and 1 near bottom |

## 1.3 ANTENNA INFORMATION

| | |
|---|---|
| **Antenna Specification** | ☐ PIFA ☒ Chip ☐ Dipole ☐ Coils |
| **Antenna Gain** | Gain: -0.7 dBi |
| **Antenna connector** | N/A |

**Notes:**
1.The antenna(s) of the EUT are permanently attached and there are no provisions for connection to an external antenna. So the EUT complies with the requirements of §15.203.

# 1.4 MEASUREMENT UNCERTAINTY

| PARAMETER | UNCERTAINTY |
|---|---|
| AC Powerline Conducted Emission | ± 2.1183 |
| Channel Bandwidth | ± 2.1863 |
| RF output power (Power Meter + Power sensor) | ± 1.2688 |
| Power Spectral density | ± 2.1855 |
| Conducted Bandedge | ± 2.1866 |
| Conducted Spurious Emission | ± 2.1859 |
| Radiated Emission_9kHz-30MHz | ± 3.842 |
| Radiated Emission_30MHz-200MHz | ± 4.517 |
| Radiated Emission_200MHz-1GHz | ± 4.844 |
| Radiated Emission_1GHz-6GHz | ± 5.411 |
| Radiated Emission_6GHz-18GHz | ± 5.266 |
| Radiated Emission_18GHz-26GHz | ± 4.270 |
| Radiated Emission_26GHz-40GHz | ± 4.203 |

**Remark**:

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

2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

## 1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

☒ No.11, Wugong 6th Rd., Wugu Dist., New Taipei City, Taiwan.

☒ No. 12, Ln. 116, Wugong 3rd Rd., Wugu Dist., New Taipei City, Taiwan 24803

CAB identifier: TW1309

| Test site | Test Engineer | Remark |
|---|---|---|
| AC Conduction Room | - | Not applicable, because EUT not connect to AC Main Source direct. |
| Radiation | Czerny Lin | - |
| RF Conducted | Jack Chen | - |

**Remark:** The lab has been recognized as the FCC accredited lab. under the KDB 974614 D01 and is listed in the FCC pubic Access Link (PAL) database, FCC Registration No. :444940, the FCC Designation No.:TW1309

# 1.6 INSTRUMENT CALIBRATION

| RF Conducted Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Power Sensor | Anritsu | MA2411B | 1911386 | 2022-08-08 | 2023-08-07 |
| Power Sensor | Anritsu | MA2411B | 1911387 | 2022-08-08 | 2023-08-07 |
| EXA Signal Analyzer | Keysight | N9010B | MY55460167 | 2022-09-07 | 2023-09-06 |
| EXA Signal Analyzer | Keysight | N9010A | MY54200716 | 2022-10-13 | 2023-10-12 |
| Power Meter | Anritsu | ML2496A | 2136002 | 2022-11-24 | 2023-11-23 |
| **Software** | Radio Test Software Ver. 21 | | | | |

| 3M 966 Chamber Test Site | | | | | |
|---|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Date** | **Calibration Due** |
| Antenna | SHWARZBECK | VULB 9168 | 1277 | 2023-01-13 | 2024-01-12 |
| Pre-Amplifier | EMCI | EMC118A45SE | 980820 | 2022-12-23 | 2023-12-22 |
| Pre-Amplifier | EMCI | EMC330N | 980853 | 2022-12-23 | 2023-12-22 |
| Coaxial Cable | EMC | EMC101G-KM-KM-9000 | 220407+211228+230205 | 2023-03-21 | 2024-03-20 |
| Signal Generator | Agilent | N9010A | MY52220817 | 2023-03-09 | 2024-03-08 |
| Coaxial Cable | EMC | EMCCFD400 | 211212+211222+211020 | 2023-03-21 | 2024-03-20 |
| High Pass Filter | TITAN | T04H30001800070S01 | 211215-7-1 | 2023-02-02 | 2024-02-01 |
| Thermo-Hygro Meter | EDSDS | EDS-A49 | 966D1 | 2023-05-11 | 2024-05-10 |
| Pre-Amplifier | EMCI | EMC184045SE | 980872 | 2023-01-03 | 2024-01-02 |
| Horn Antenna | RF SPIN | DRH18-E | 210301A18ES | 2023-02-03 | 2024-02-02 |
| Horn Antenna | SHWARZBECK | BBHA 9170 | 1134 | 2022-12-30 | 2023-12-29 |
| Loop Antenna | SCHWARZBECK | FMZB 1513-60 | 1513-60-028 | 2022-12-27 | 2023-12-26 |
| **Software** | e3 6.11-20180419c | | | | |

| AC Conducted Emissions Test Site | | | | | |
|---|---|---|---|---|---|
| **Equipment** | **Manufacturer** | **Model** | **S/N** | **Cal Date** | **Cal Due** |
| N/A | | | | | |

**Remark:**
1. Each piece of equipment is scheduled for calibration once a year.
2. N.C.R. = No Calibration Required.

## 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

| EUT Accessories Equipment | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** | **IC** |
| | N/A | | | | | |
| | | | | | | |

| Support Equipment | | | | | | |
|---|---|---|---|---|---|---|
| **No.** | **Equipment** | **Brand** | **Model** | **Series No.** | **FCC ID** | **IC** |
| 1 | NB(E) | Lenovo | T460 | N/A | N/A | N/A |

## 1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC Part 2, FCC Part 15.247 and KDB 558074.

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# 2. TEST SUMMARY

| FCC Standard Section | Report Section | Test Item | Result |
|---|---|---|---|
| 15.203 | 1.3 | Antenna Requirement | Pass |
| 15.207(a) | 4.1 | AC Conducted Emission | N/A |
| 15.247(a)(2) | 4.2 | 6 dB Bandwidth | Pass |
| - | 4.2 | Occupied Bandwidth (99%) | Pass |
| 15.247(b)(3) | 4.3 | Output Power Measurement | Pass |
| 15.247(e) | 4.4 | Power Spectral Density | Pass |
| 15.247(d) | 4.5 | Conducted Band Edge | Pass |
| 15.247(d) | 4.5 | Conducted Spurious Emission | Pass |
| 15.247(d) | 4.6 | Radiation Band Edge | Pass |
| 15.247(d) | 4.6 | Radiation Spurious Emission | Pass |

# 3. DESCRIPTION OF TEST MODES

## 3.1 THE WORST MODE OF OPERATING CONDITION

| | |
|---|---|
| Operation mode | BLE Mode (1Mbps) |
| Test Channel Frequencies | 1.Lowest Channel : 2402MHz<br>2.Middle Channel : 2442MHz<br>3.Highest Channel : 2480MHz |

**Remark:**

1. EUT pre-scanned data rate of output power for each mode, the worst data rate were recorded in this report.

## 3.2 THE WORST MODE OF MEASUREMENT

| Radiated Emission Measurement Above 1G | |
|---|---|
| **Test Condition** | **Radiated Emission Above 1G** |
| **Power supply Mode** | **Mode 1: EUT power by Battery** |
| **Worst Mode** | ☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4 |
| **Worst Position** | ☐ Placed in fixed position.<br>☐ Placed in fixed position at X-Plane (E2-Plane)<br>☒ Placed in fixed position at Y-Plane (E1-Plane)<br>☐ Placed in fixed position at Z-Plane (H-Plane) |

| Radiated Emission Measurement Below 1G | |
|---|---|
| **Test Condition** | **Radiated Emission Below 1G** |
| **Power supply Mode** | **Mode 1: EUT power by Battery** |
| **Worst Mode** | ☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4 |

*Remark:*
*1. The worst mode was record in this test report.*
*2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(Y-Plane) were recorded in this report*

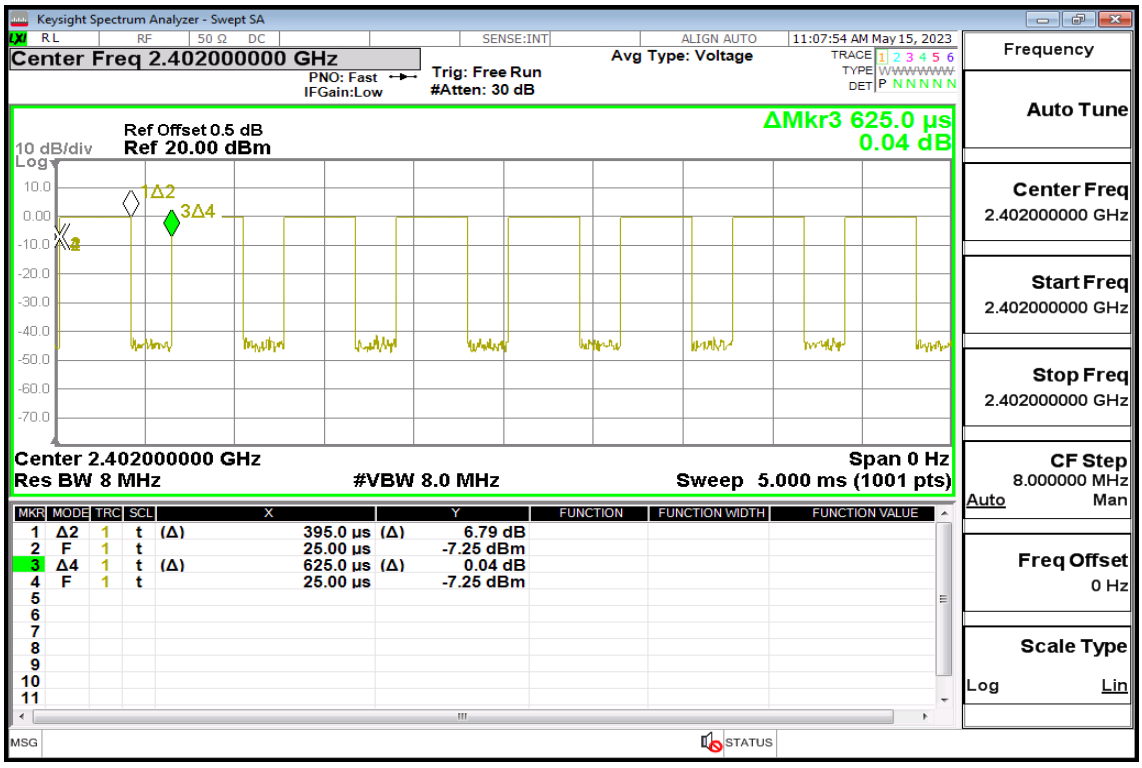
# 3.3 EUT DUTY CYCLE

**Temperature:** 25.0 ~ 25.3℃ **Test date:** May 15 ~ 16, 2023

**Humidity:** 56 ~ 57% RH **Tested by:** Jack Chen

| Duty Cycle | | | | |
|---|---|---|---|---|
| Configuration | Duty Cycle (%) = Ton / (Ton+Toff) | Duty Factor (dB) =10*log ( 1/Duty Cycle ) | 1/T (kHz) | VBW setting (kHz) |
| BLE 1M | 63.20 | 1.99 | 2.53 | 3.00 |

BLE-1Mbps



# 4. TEST RESULT

## 4.1 AC POWER LINE CONDUCTED EMISSION

### 4.1.1 Test Limit

According to §15.207(a),

| Frequency Range (MHz) | Limits(dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

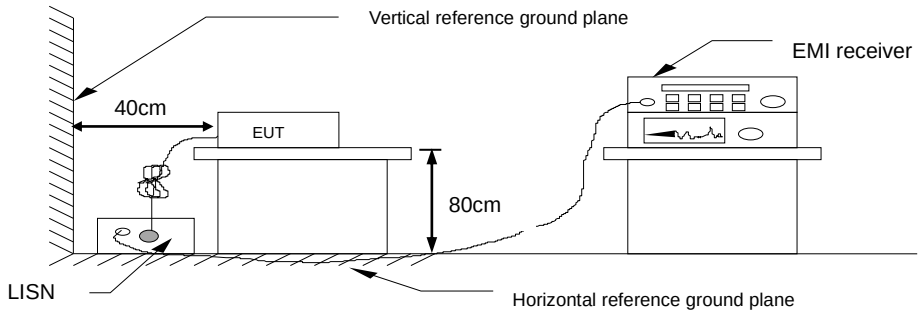
* Decreases with the logarithm of the frequency.

### 4.1.2 Test Procedure

Test method Refer as ANSI C63.10: 2013 clause 6.2,

1. The EUT was placed above horizontal ground plane and 0.4m above vertical ground plane
2. EUT connected to the line impedance stabilization network (LISN)
3. Receiver set RBW of 9kHz and Detector Peak, and note as quasi-peak and average.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Recorded Line for Neutral and Line.

### 4.1.3 Test Setup




### 4.1.4 Test Result

**Not applicable, because EUT not connect to AC Main Source direct.**

# 4.2 6dB BANDWIDTH AND OCCUPIED BANDWIDTH (99%)

## 4.2.1 Test Limit

According to §15.247(a)(2)

**6 dB Bandwidth** ：

| | |
|---|---|
| Limit | Shall be at least 500kHz |

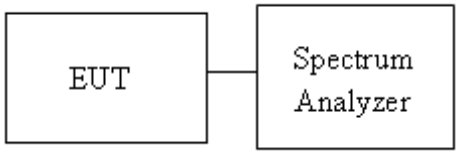
**Occupied Bandwidth(99%)** ： For reporting purposes only.

## 4.2.2 Test Procedure

Test method Refer as ANSI C63.10: 2013,

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT.
3. SA set RBW =100KHz, VBW = 300KHz and Detector = Peak, to measurement 6dB Bandwidth.
4. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, to measurement 99% Bandwidth.
5. Measure and record the result of 6 dB Bandwidth and 99% Bandwidth. in the test report.

## 4.2.3 Test Setup



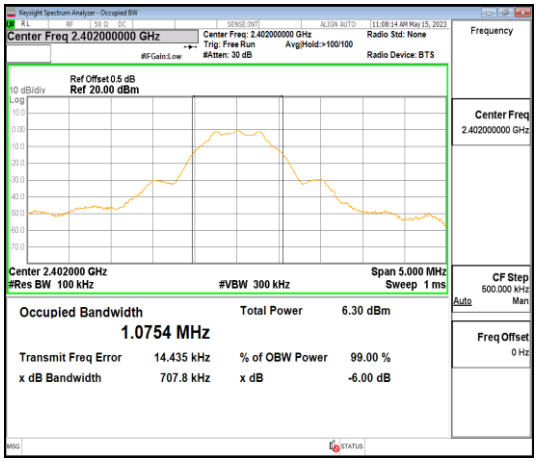
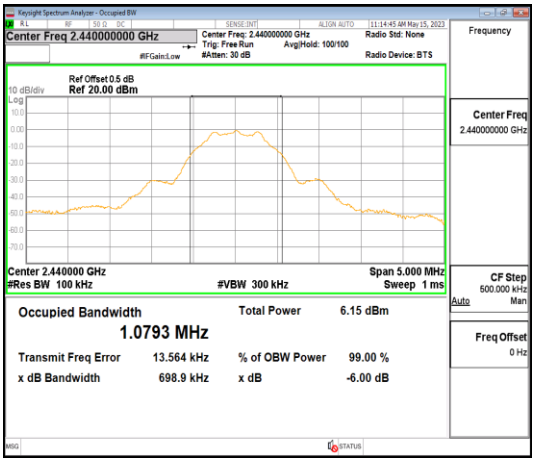
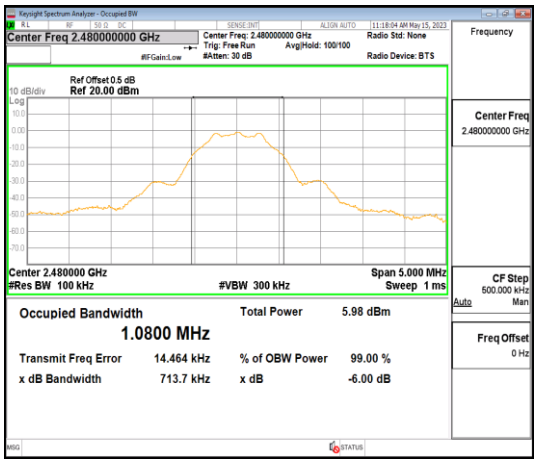
### 4.2.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.0 ~ 25.3℃ | **Test date:** | May 15 ~ 16, 2023 |
| **Humidity:** | 56 ~ 57% RH | **Tested by:** | Jack Chen |

| Test mode: BLE-1Mbps mode / 2402-2480 MHz | | | | |
|---|---|---|---|---|
| **Channel** | **Frequency (MHz)** | **OBW (99%) (MHz)** | **6dB BW (kHz)** | **6dB limit (kHz)** |
| Low | 2402 | 1.0406 | 0.7078 | ≥500 |
| Mid | 2442 | 1.0441 | 0.6989 | |
| High | 2480 | 1.0451 | 0.7137 | |

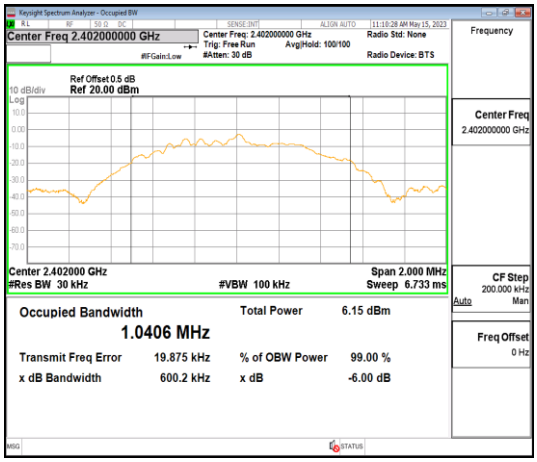
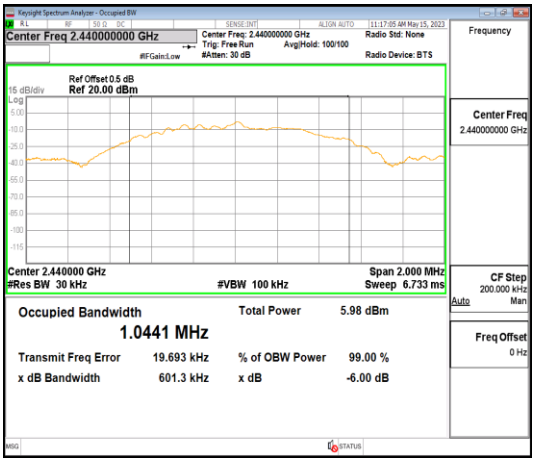
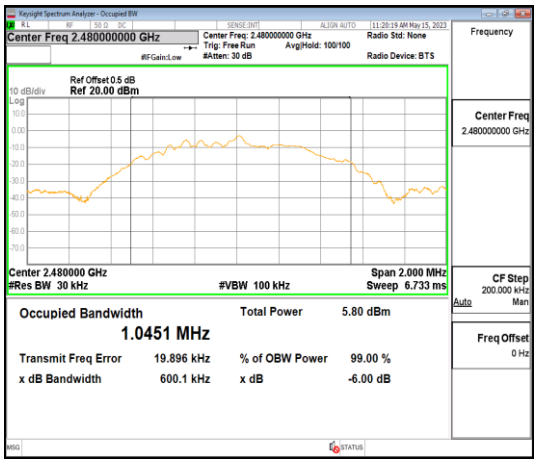
# Test Data

## 6dB BANDWIDTH

| BLE-1Mbps mode | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

# Test Data

## BANDWIDTH (99%)

| BLE-1Mbps mode | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

# 4.3 OUTPUT POWER MEASUREMENT

## 4.3.1 Test Limit

According to §15.247(b)(3)

**Peak output power**：

**FCC**

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement,

| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：30dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 30 – (DG – 6) ]<br>☐ Point-to-point operation |

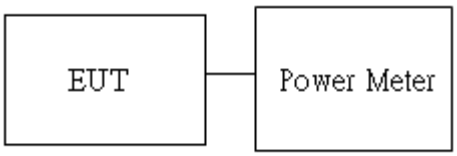
**Average output power**：For reporting purposes only.

## 4.3.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the power meter by RF cable.
2. Setting maximum power transmit of EUT.
3. The path loss was compensated to the results for each measurement.
4. Measure and record the result of Peak output power and Average output power. in the test report.

## 4.3.3 Test Setup



## 4.3.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.0 ~ 25.3℃ | **Test date:** | May 15 ~ 16, 2023 |
| **Humidity:** | 56 ~ 57% RH | **Tested by:** | Jack Chen |

**Peak output power：**

**BLE 1M mode:**

| CH | Frequency (MHz) | Power set | Peak Power Output (dBm) | Required Limit (dBm) |
|---|---|---|---|---|
| Low | 2402 | default | **-0.95** | 30 |
| Mid | 2440 | default | -1.10 | 30 |
| High | 2480 | default | -1.33 | 30 |

**Average output power：**

**BLE 1M mode:**

| CH | Frequency (MHz) | Power set | Average Power Output (dBm) | Required Limit (dBm) |
|---|---|---|---|---|
| Low | 2402 | default | -1.05 | 30 |
| Mid | 2440 | default | -1.15 | 30 |
| High | 2480 | default | -1.48 | 30 |

# 4.4 POWER SPECTRAL DENSITY

## 4.4.1 Test Limit

According to §15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

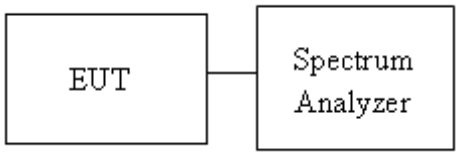
| | |
|---|---|
| Limit | ☒ Antenna not exceed 6 dBi：8dBm<br>☐ Antenna with DG greater than 6 dBi<br>[ Limit = 8 – (DG – 6) ]<br>☐ Point-to-point operation： |

## 4.4.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT RF output connected to the spectrum analyzer by RF cable.
2. Setting maximum power transmit of EUT
3. SA set RBW = 3kHz, VBW = 10kHz, Span = 1.5 times DTS Bandwidth (6 dB BW), Detector = Peak, Sweep Time = Auto and Trace = Max hold.
4. The path loss and Duty Factor were compensated to the results for each measurement by SA.
5. Mark the maximum level.
6. Measure and record the result of power spectral density. in the test report.

## 4.4.3 Test Setup



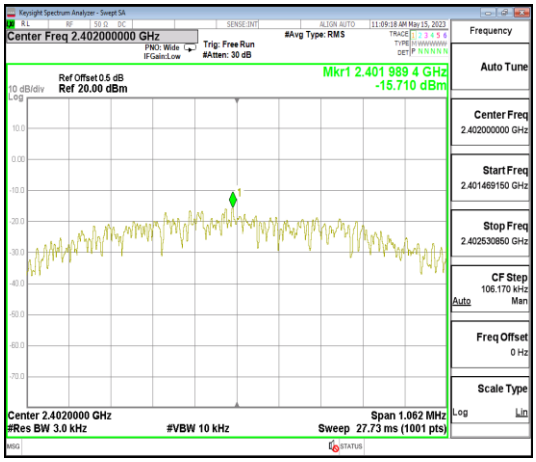
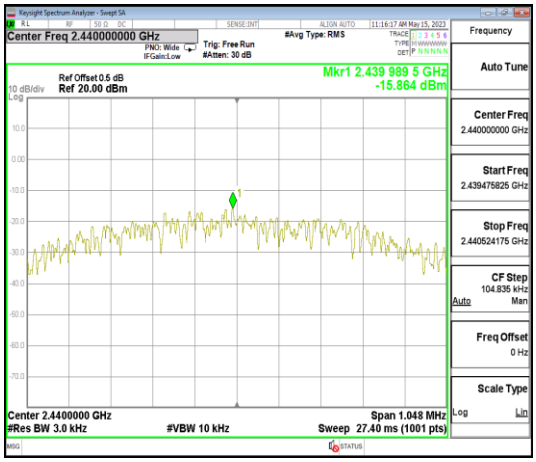
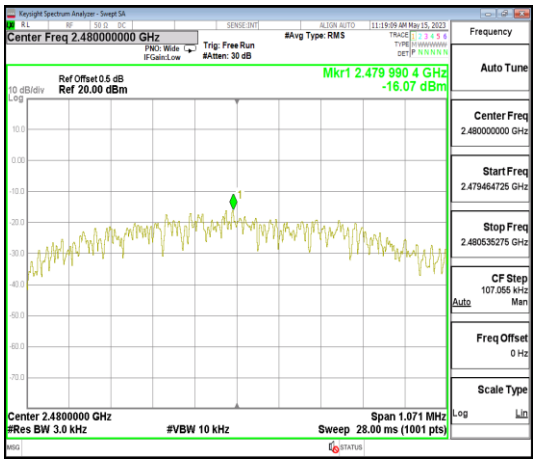
## 4.4.4 Test Result

| | | | |
|---|---|---|---|
| **Temperature:** | 25.0 ~ 25.3℃ | **Test date:** | May 15 ~ 16, 2023 |
| **Humidity:** | 56 ~ 57% RH | **Tested by:** | Jack Chen |

**BLE 1M mode**

| Frequency (MHz) | RF Power Density (dBm/3kHz) | Maximum Limit (dBm/3kHz) | Result |
|---|---|---|---|
| 2402 | -15.710 | 8 | PASS |
| 2442 | -15.864 | 8 | PASS |
| 2480 | -16.070 | 8 | PASS |

# Test Data

| BLE-1Mbps mode | |
|---|---|
| **Low CH** | **Mid CH** |
|  |  |
| **High CH** | |
|  | |

# 4.5 CONDUCTED BAND EDGE AND SPURIOUS EMISSION

## 4.5.1 Test Limit

According to §15.247(d)

**FCC:** In any 100 kHz bandwidth outside the authorized frequency band,

Non-restricted bands shall be attenuated at least 20 dB/30 dB relative to the maximum PSD level in 100 kHz by RF conducted or a radiated measurement which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

## 4.5.2 Test Procedure

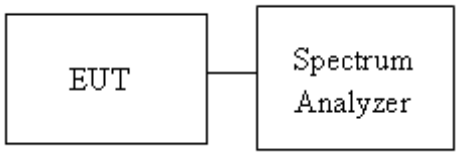
Test method Refer as ANSI C63.10:2013.

1. EUT RF output port connected to the SA by RF cable, and the path loss was compensated to result.

2. SA setting, RBW=100kHz, VBW=300kHz, Detector=Peak, Trace mode = max hold, SWT = Auto.

3. In any 100 kHz bandwidth outside the authorized frequency band, shall be attenuated at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when conducted power procedure is used. If the transmitter complies with the conducted power limits 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.

## 4.5.3 Test Setup



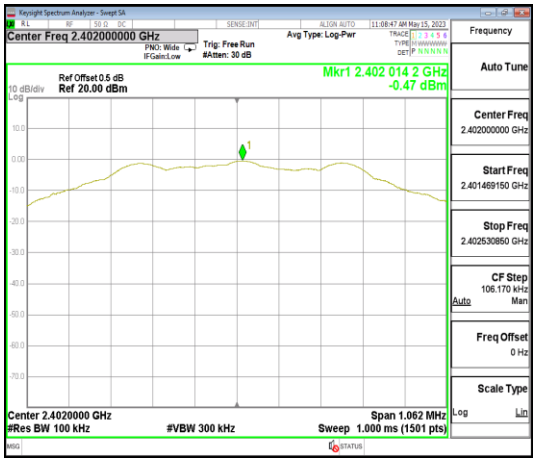
### 4.5.4 Test Result

**Test Data**

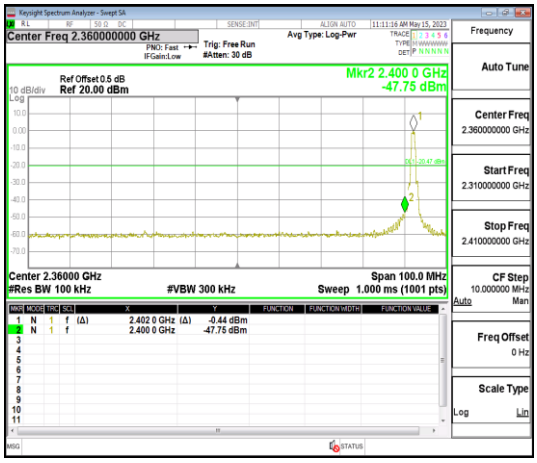
| | | | |
|---|---|---|---|
| **Temperature:** | 25.0 ~ 25.3℃ | **Test date:** | May 15 ~ 16, 2023 |
| **Humidity:** | 56 ~ 57% RH | **Tested by:** | Jack Chen |

**BLE-1Mbps mode Low CH**

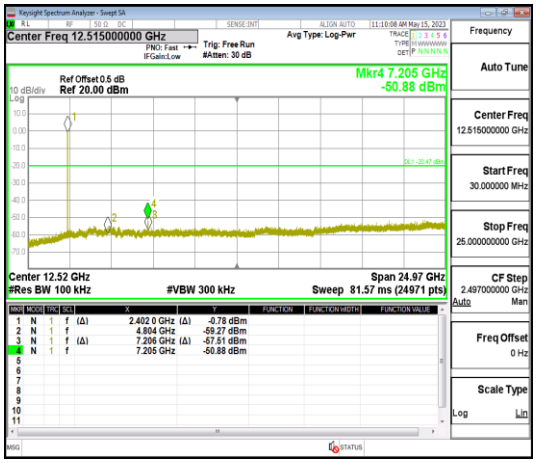
**Reference Level**

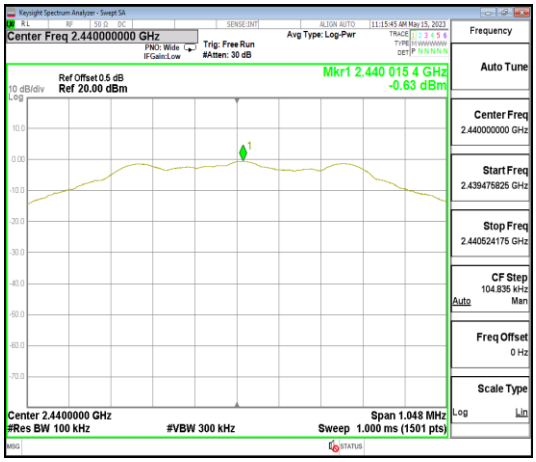
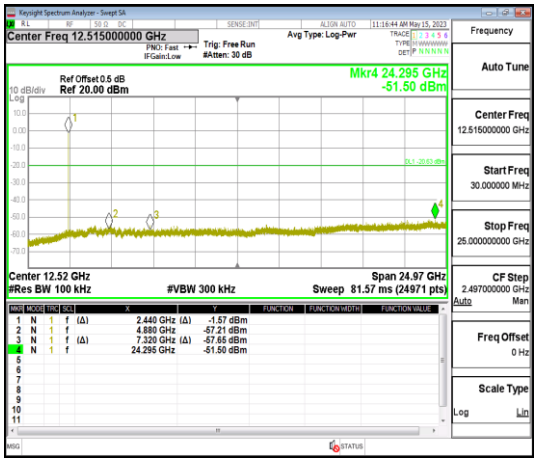


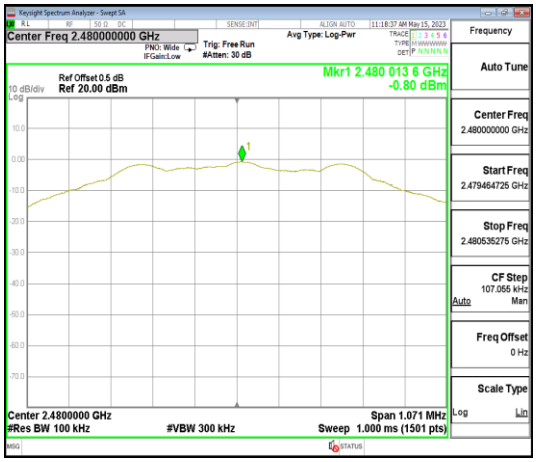
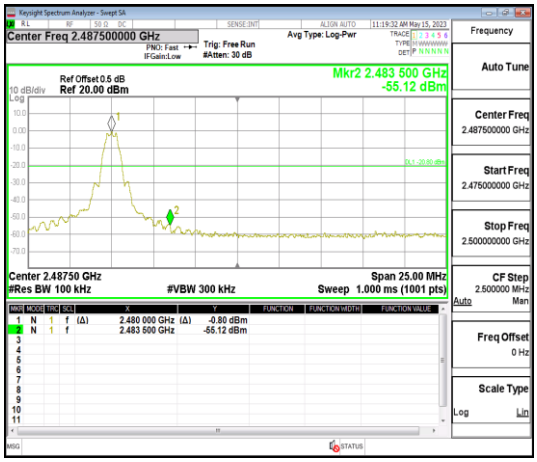
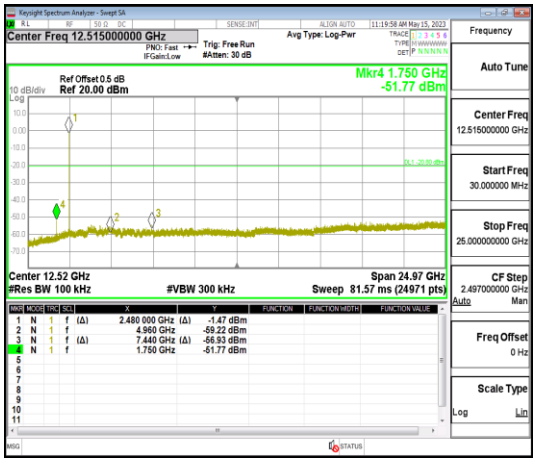

**Band Edge**




**Spurious Emission 30MHz-25GHz**



| BLE-1Mbps mode Mid CH | |
|---|---|
| **Reference Level** | **Spurious Emission 30MHz-25GHz** |
|  |  |

| BLE-1Mbps mode High CH | |
|---|---|
| **Reference Level** | **Band Edge** |
|  |  |
| **Spurious Emission 30MHz-25GHz** | |
|  | |

# 4.6 RADIATION BANDEDGE AND SPURIOUS EMISSION

## 4.6.1 Test Limit

FCC according to §15.247(d), §15.209 and §15.205,

In any 100 kHz bandwidth outside the authorized frequency band, all harmonic and spurious must be least 20 dB below the highest emission level with the authorized frequency band. Radiation emission which fall in the restricted bands must also follow the FCC section 15.209 as below limit in table.

**Below 30 MHz**

| Frequency | Field Strength (microvolts/m) | Magnetic H-Field (microamperes/m) | Measurement Distance (metres) |
|---|---|---|---|
| 9-490 kHz | 2,400/F (F in kHz) | 2,400/F (F in kHz) | 300 |
| 490-1,705 kHz | 24,000/F (F in kHz) | 24,000/F (F in kHz) | 30 |
| 1.705-30 MHz | 30 | N/A | 30 |

**Above 30 MHz**

| Frequency (MHz) | Field Strength microvolts/m at 3 metres (watts, e.i.r.p.) | |
|---|---|---|
| | Transmitters | Receivers |
| 30-88 | 100 (3 nW) | 100 (3 nW) |
| 88-216 | 150 (6.8 nW) | 150 (6.8 nW) |
| 216-960 | 200 (12 nW) | 200 (12 nW) |
| Above 960 | 500 (75 nW) | 500 (75 nW) |

Remark:
Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

## 4.6.2 Test Procedure

Test method Refer as ANSI C63.10:2013.

1. The EUT is placed on a turntable, Above 1 GHz is 1.5m and below 1 GHz is 0.8m above ground plane. The EUT Configured un accordance with ANSI C63.10: 2013, and the EUT set in a continuous mode.

2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. And EUT is set 3m away from the receiving antenna, which is scanned from 1m to 4m above the ground plane to find out the highest emissions. Measurement are made polarized in both the vertical and the horizontal positions with antenna.

3. Span shall wide enough to full capture the emission measured. The SA from 9KHz to 26.5GHz set to the low, Mid and High channels with the EUT transmit.

Remark:
1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

3. The SA setting following：

(1) Below 1G：RBW = 100kHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2) Above 1G：

(2.1) For Peak measurement：RBW = 1MHz, VBW ≥ 3 RBW, Sweep = Auto, Detector = Peak, Trace = Max hold.

(2.2) For Average measurement：RBW = 1MHz, VBW

- If Duty Cycle ≥ 98%, VBW=10Hz.
- If Duty Cycle < 98%, VBW=1/T.

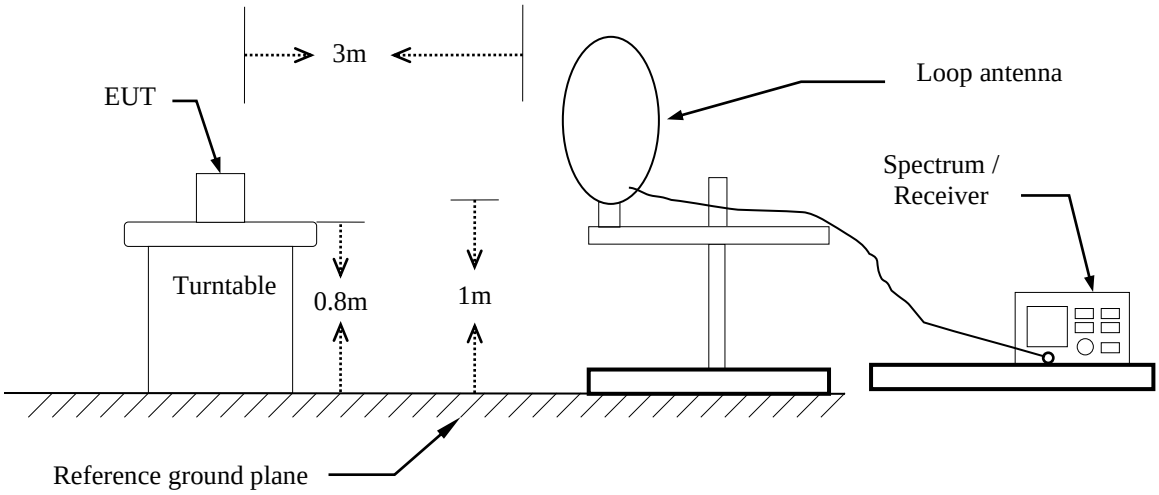
4. Data result

Actual FS=Spectrum Reading Level+Factor

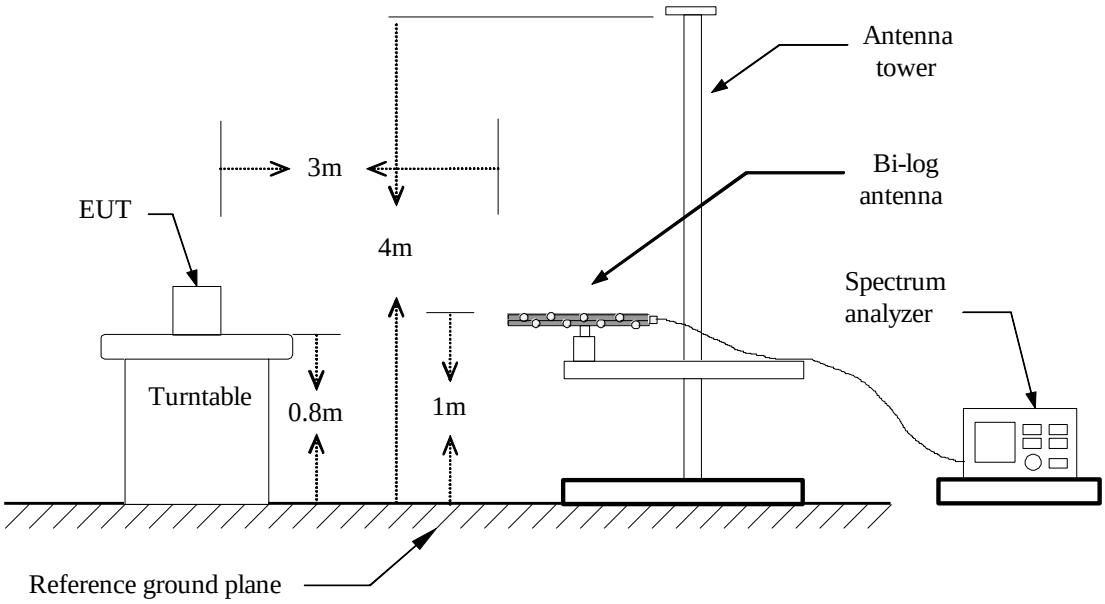
Margin=Actual FS- Limit

### 4.6.3 Test Setup

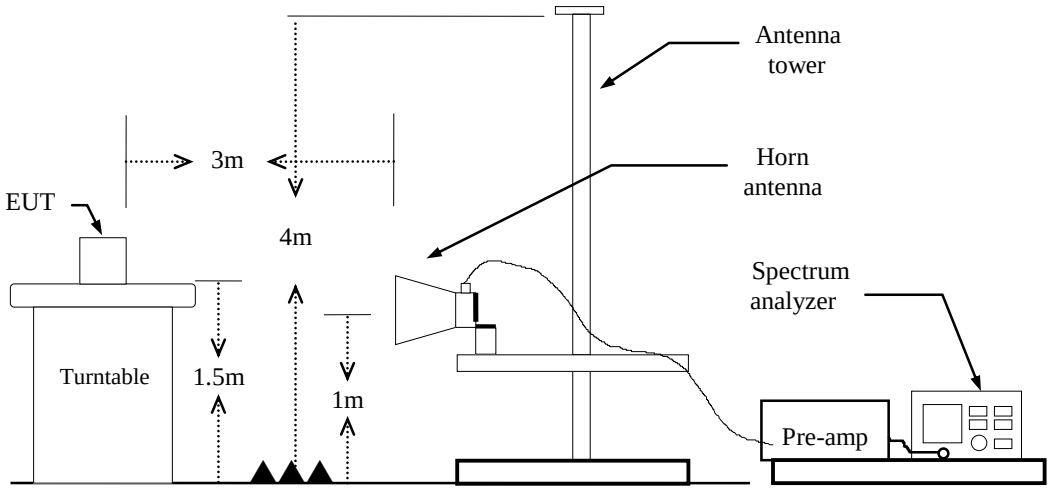
**9kHz ~ 30MHz**




**30MHz ~ 1GHz**



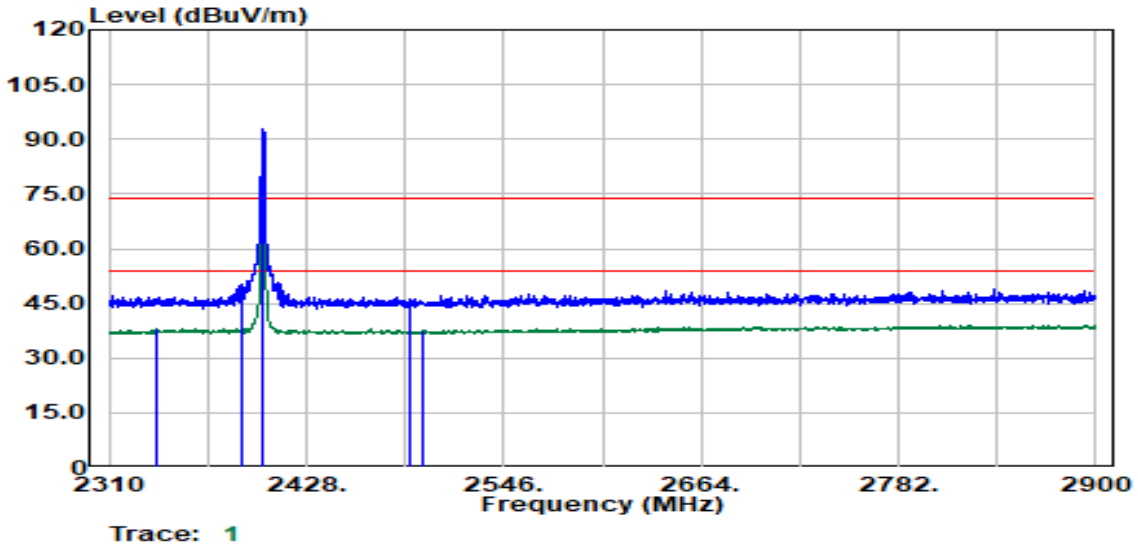
**Above 1 GHz**



## 4.6.4 Test Result

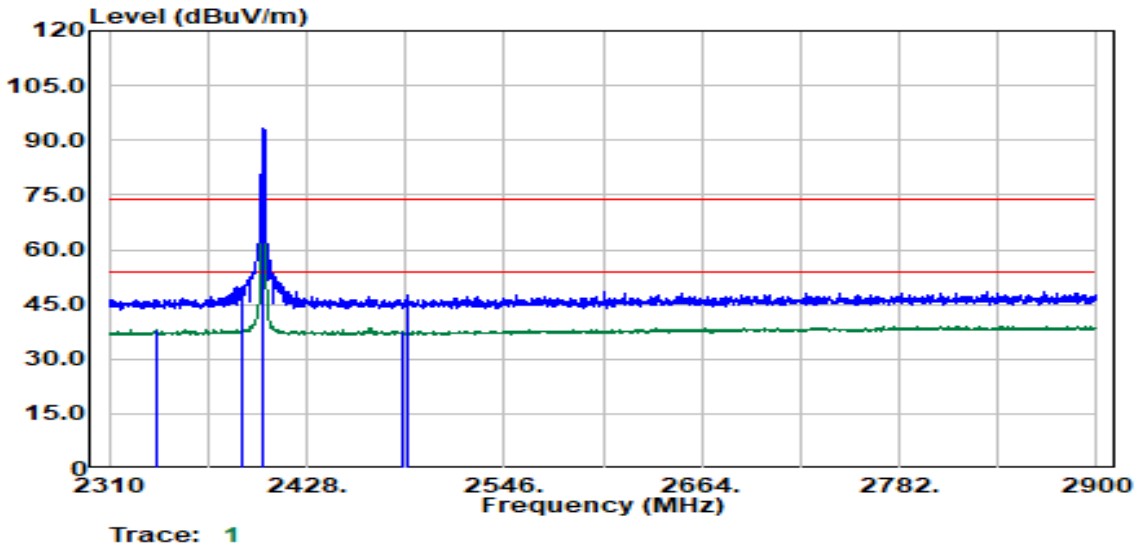
**Band Edge Test Data**

| Test Mode: | BLE-1Mbps Low CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | May 22, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |



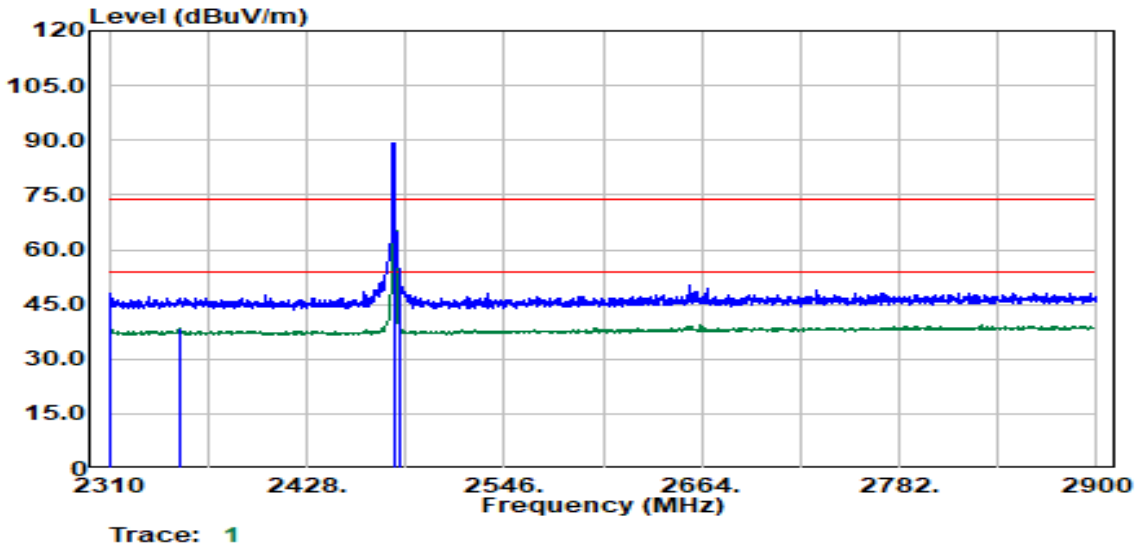

| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2338.26 | Average | 33.31 | 4.75 | 38.06 | 54.00 | -15.94 |
| 2390.03 | Peak | 45.35 | 4.80 | 50.16 | 74.00 | -23.84 |
| 2402.00 | Peak | 88.27 | 4.51 | 92.78 | -- | -- |
| 2402.00 | Average | 87.64 | 4.51 | 92.15 | -- | -- |
| 2489.33 | Peak | 41.63 | 4.55 | 46.18 | 74.00 | -27.82 |
| 2498.33 | Average | 32.94 | 4.63 | 37.57 | 54.00 | -16.43 |

| Test Mode: | BLE-1Mbps Low CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | May 22, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |



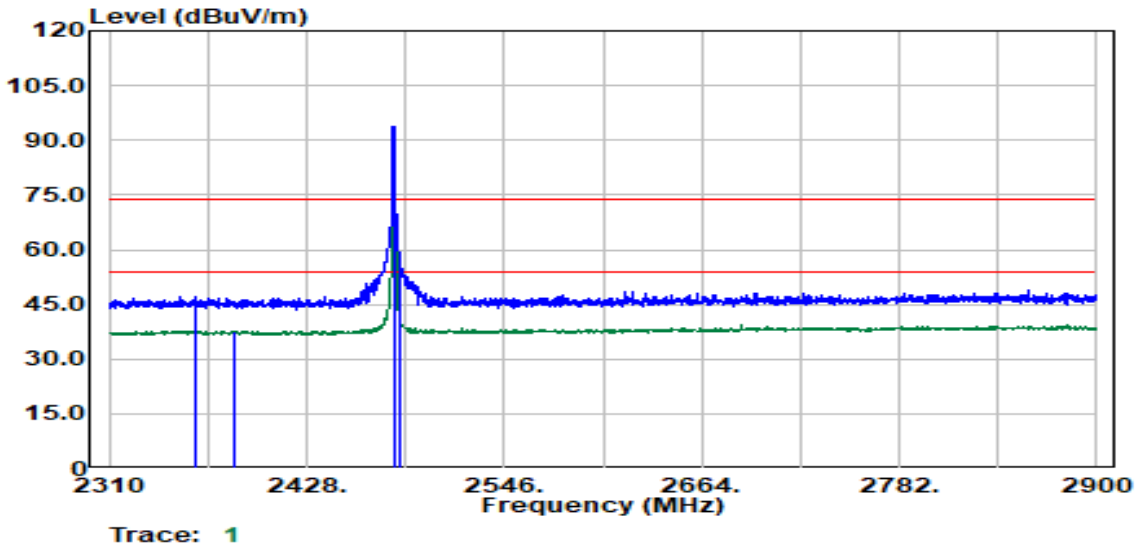

| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2338.01 | Average | 33.45 | 4.75 | 38.20 | 54.00 | -15.80 |
| 2389.78 | Peak | 44.84 | 4.80 | 49.64 | 74.00 | -24.36 |
| 2402.00 | Peak | 89.00 | 4.51 | 93.51 | -- | -- |
| 2402.00 | Average | 88.36 | 4.51 | 92.87 | -- | -- |
| 2484.82 | Average | 33.00 | 4.60 | 37.60 | 54.00 | -16.40 |
| 2487.58 | Peak | 43.03 | 4.57 | 47.60 | 74.00 | -26.40 |

| Test Mode: | BLE-1Mbps High CH | Temp/Hum | 23.2(℃) / 63%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | May 24, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |




| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2311.00 | Peak | 43.48 | 4.74 | 48.22 | 74.00 | -25.78 |
| 2352.02 | Average | 33.58 | 4.86 | 38.44 | 54.00 | -15.56 |
| 2480.00 | Peak | 84.62 | 4.65 | 89.27 | -- | -- |
| 2480.00 | Average | 83.96 | 4.65 | 88.60 | -- | -- |
| 2483.57 | Peak | 47.44 | 4.61 | 52.05 | 74.00 | -21.95 |
| 2484.32 | Average | 33.74 | 4.60 | 38.35 | 54.00 | -15.65 |

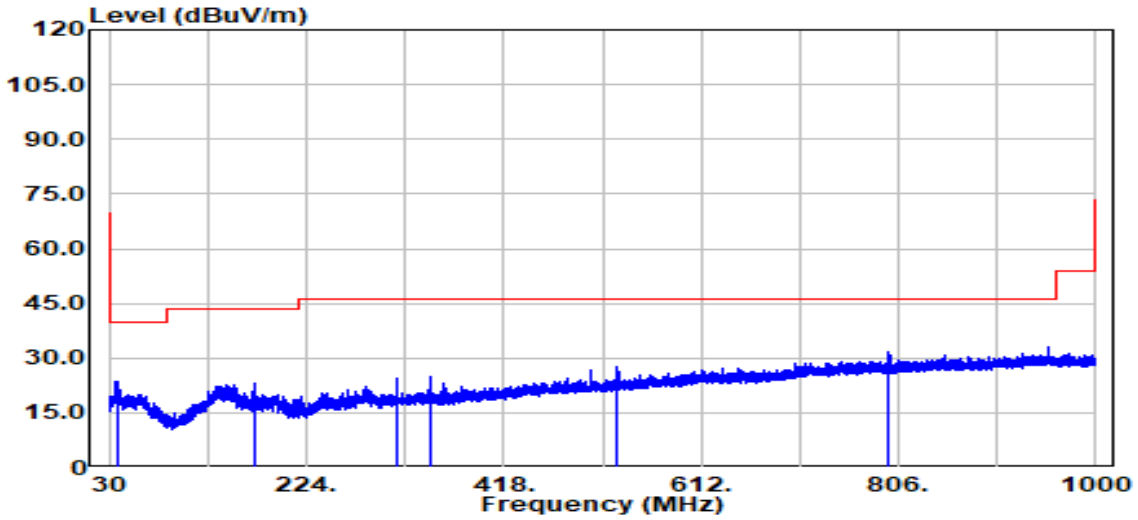
| Test Mode: | BLE-1Mbps High CH | Temp/Hum | 23.2(℃) / 63%RH |
|---|---|---|---|
| Test Item | Band Edge | Test Date | May 24, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |




| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 2361.77 | Peak | 42.27 | 4.77 | 47.04 | 74.00 | -26.96 |
| 2385.28 | Average | 33.01 | 4.80 | 37.81 | 54.00 | -16.19 |
| 2480.00 | Peak | 89.27 | 4.65 | 93.91 | -- | -- |
| 2480.00 | Average | 88.65 | 4.65 | 93.30 | -- | -- |
| 2483.57 | Peak | 53.47 | 4.61 | 58.08 | 74.00 | -15.92 |
| 2483.57 | Average | 36.90 | 4.61 | 41.51 | 54.00 | -12.49 |

**Below 1G Test Data**

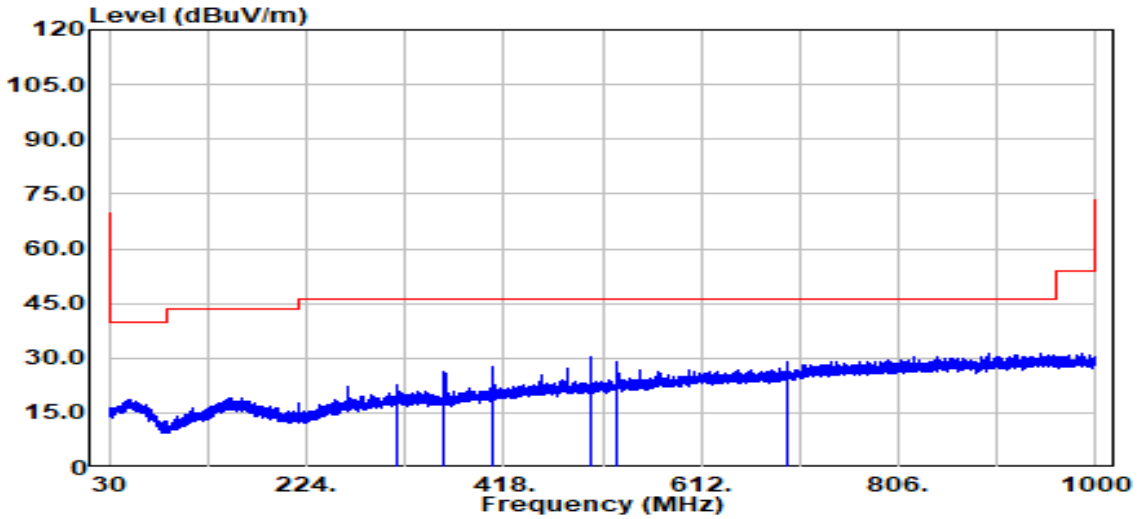
| Test Mode: | BLE-1Mbps Mode | Temp/Hum | 24.4(℃) / 59%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | June 5, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak | | |




| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 38.15 | Peak | 37.27 | -13.56 | 23.70 | 40.00 | -16.30 |
| 172.11 | Peak | 36.60 | -13.61 | 22.99 | 43.50 | -20.51 |
| 311.98 | Peak | 36.47 | -11.92 | 24.56 | 46.00 | -21.44 |
| 345.64 | Peak | 36.25 | -11.18 | 25.07 | 46.00 | -20.93 |
| 528.00 | Peak | 34.41 | -7.01 | 27.40 | 46.00 | -18.60 |
| 796.98 | Peak | 33.52 | -2.04 | 31.48 | 46.00 | -14.52 |

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

| Test Mode: | BLE-1Mbps Mode | Temp/Hum | 24.4(℃) / 59%RH |
|---|---|---|---|
| Test Item | 30MHz-1GHz | Test Date | June 5, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak | | |

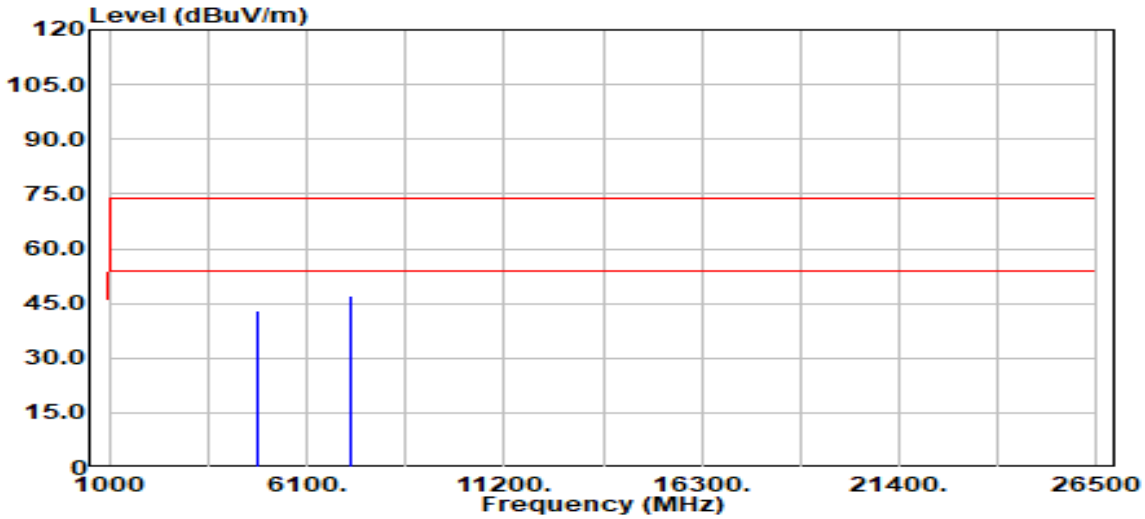



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 311.98 | Peak | 34.67 | -11.92 | 22.76 | 46.00 | -23.24 |
| 359.99 | Peak | 37.22 | -11.10 | 26.12 | 46.00 | -19.88 |
| 408.01 | Peak | 37.33 | -9.59 | 27.75 | 46.00 | -18.25 |
| 504.04 | Peak | 37.46 | -7.33 | 30.13 | 46.00 | -15.87 |
| 528.00 | Peak | 36.07 | -7.01 | 29.06 | 46.00 | -16.94 |
| 696.00 | Peak | 32.88 | -3.73 | 29.16 | 46.00 | -16.84 |

Note: No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

**Above 1G Test Data**

| Test Mode: | BLE-1Mbps Low CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |

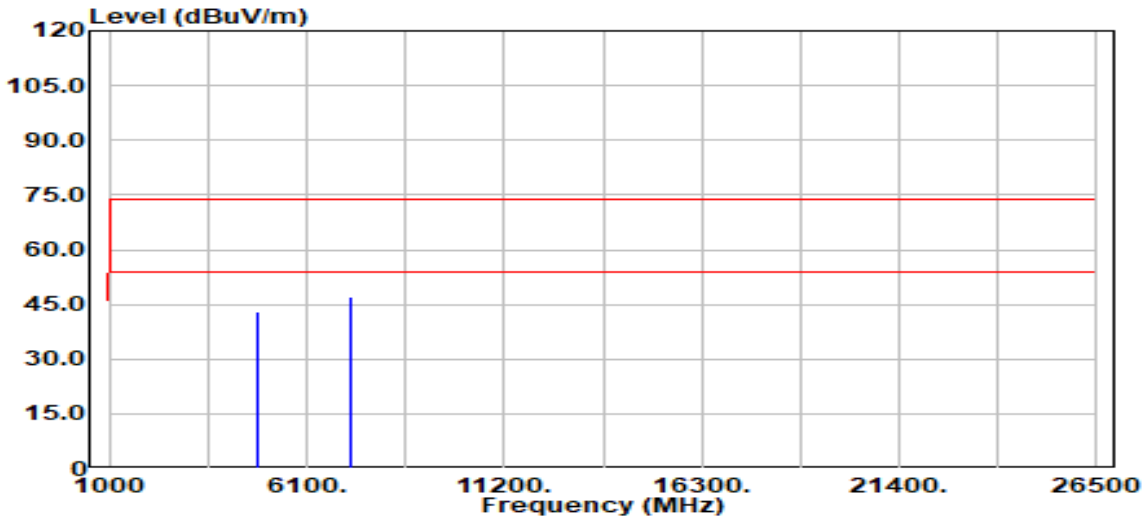



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4804.00 | Peak | 42.64 | 0.38 | 43.02 | 74.00 | -30.98 |
| 4804.00 | Average | 33.13 | 0.38 | 33.52 | 54.00 | -20.48 |
| 7206.00 | Peak | 41.96 | 5.33 | 47.28 | 74.00 | -26.72 |
| 7206.00 | Average | 33.01 | 5.33 | 38.34 | 54.00 | -15.66 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

| Test Mode: | BLE-1Mbps Low CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |

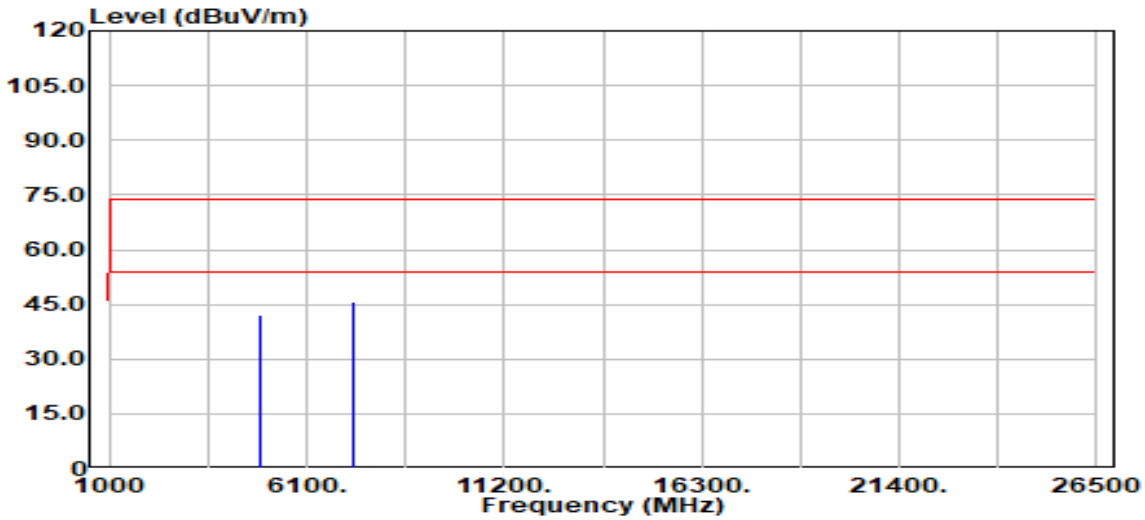



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4804.00 | Peak | 42.64 | 0.38 | 43.02 | 74.00 | -30.98 |
| 4804.00 | Average | 33.02 | 0.38 | 33.40 | 54.00 | -20.60 |
| 7206.00 | Peak | 41.72 | 5.33 | 47.04 | 74.00 | -26.96 |
| 7206.00 | Average | 33.50 | 5.33 | 38.83 | 54.00 | -15.17 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

| Test Mode: | BLE-1Mbps Mid CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |

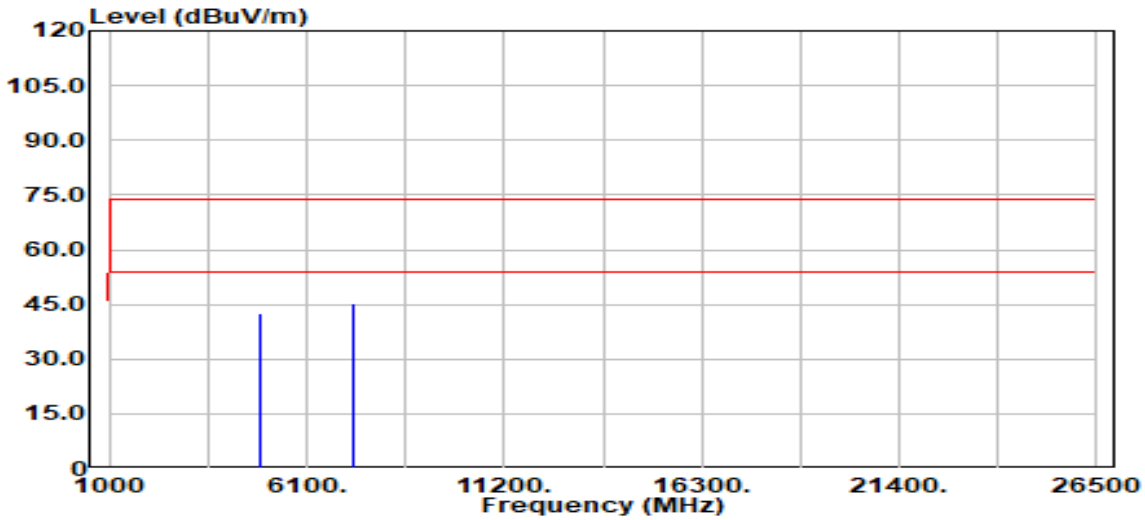



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4880.00 | Peak | 41.58 | 0.48 | 42.06 | 74.00 | -31.94 |
| 4880.00 | Average | 32.19 | 0.48 | 32.68 | 54.00 | -21.33 |
| 7320.00 | Peak | 40.26 | 5.48 | 45.74 | 74.00 | -28.26 |
| 7320.00 | Average | 33.00 | 5.48 | 38.48 | 54.00 | -15.52 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

| Test Mode: | BLE-1Mbps Mid CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |

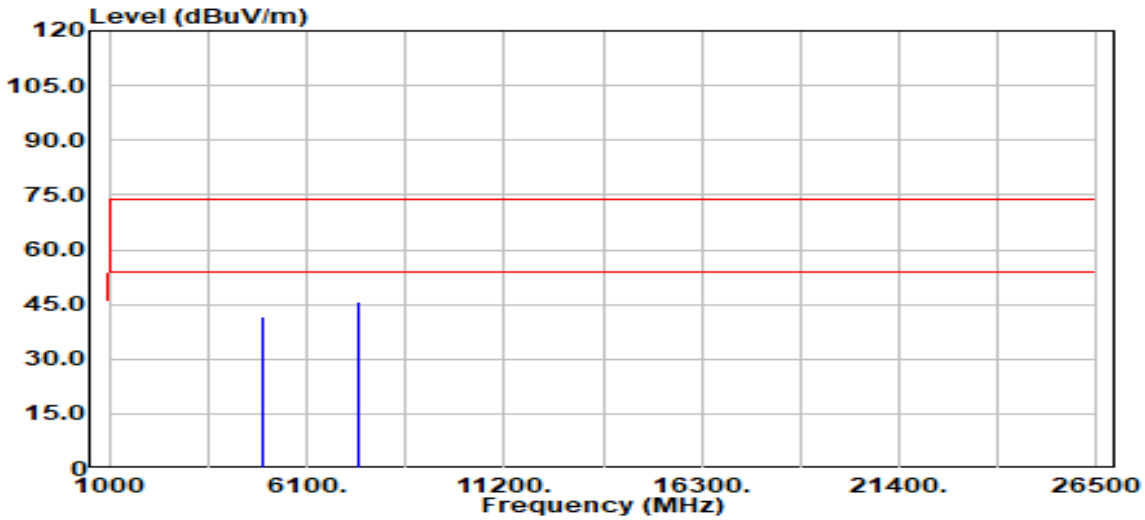



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4880.00 | Peak | 42.26 | 0.48 | 42.75 | 74.00 | -31.25 |
| 4880.00 | Average | 32.09 | 0.48 | 32.57 | 54.00 | -21.43 |
| 7320.00 | Peak | 40.01 | 5.48 | 45.50 | 74.00 | -28.50 |
| 7320.00 | Average | 32.28 | 5.48 | 37.76 | 54.00 | -16.24 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

| Test Mode: | BLE-1Mbps High CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Vertical | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |

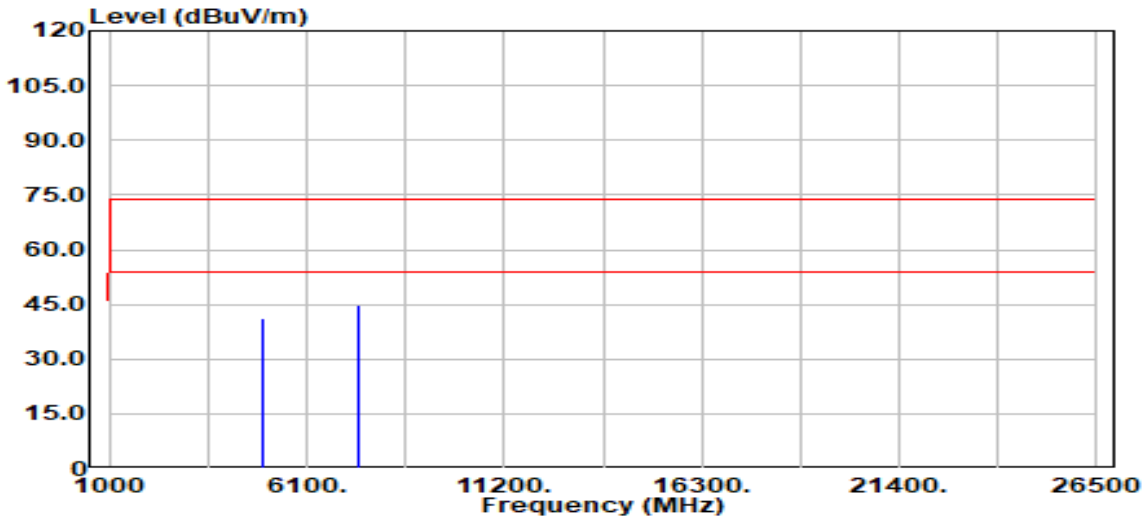



| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4960.00 | Peak | 40.81 | 0.65 | 41.46 | 74.00 | -32.54 |
| 4960.00 | Average | 32.39 | 0.65 | 33.03 | 54.00 | -20.97 |
| 7440.00 | Peak | 40.15 | 5.56 | 45.72 | 74.00 | -28.28 |
| 7440.00 | Average | 33.21 | 5.56 | 38.77 | 54.00 | -15.23 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

| Test Mode: | BLE-1Mbps High CH | Temp/Hum | 25.5(℃) / 54%RH |
|---|---|---|---|
| Test Item | Harmonic | Test Date | May 22, 2023 |
| Polarize | Horizontal | Test Engineer | Czerny Lin |
| Detector | Peak / Average | | |




| Freq. (MHz) | Detector Mode (PK/QP/AV) | Spectrum Reading Level (dBµV) | Factor (dB) | Actual FS (dBµV/m) | Limit @3m (dBµV/m) | Margin (dB) |
|---|---|---|---|---|---|---|
| 4960.00 | Peak | 40.64 | 0.65 | 41.29 | 74.00 | -32.71 |
| 4960.00 | Average | 32.66 | 0.65 | 33.31 | 54.00 | -20.69 |
| 7440.00 | Peak | 39.30 | 5.56 | 44.86 | 74.00 | -29.14 |
| 7440.00 | Average | 32.37 | 5.56 | 37.93 | 54.00 | -16.07 |
| N/A | | | | | | |
| | | | | | | |

**Remark:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

**--End of Test Report--**