

Project No: TM-2405000018P  
Report No.: TMWK2405001737KR

FCC ID: COF-WMCW26

Page: 1 / 50  
Rev.: 02

# RADIO TEST REPORT

## FCC 47 CFR PART 15 SUBPART C

|                          |                                                                                                                                                     |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Standard            | FCC Part 15.247                                                                                                                                     |
| Product name             | 802.11b/g/n + BT 5.4 Module                                                                                                                         |
| Brand Name               | USI                                                                                                                                                 |
| Model No.                | WM-CW-26                                                                                                                                            |
| 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:

sehni, Hu

Sehni Hu  
Supervisor

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at <http://www.sgs.com.tw/Terms-and-Conditions> and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at <http://www.sgs.com.tw/Terms-and-Conditions>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of client's instruction, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced, except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

## Revision History

| Rev. | Issue Date    | Revisions                       | Effect Page                                 | Revised By |
|------|---------------|---------------------------------|---------------------------------------------|------------|
| 00   | June 17, 2024 | Initial Issue                   | ALL                                         | Peggy Tsai |
| 01   | July 3, 2024  | See the following Note Rev.(01) | P.7, 9, 10, 20, 23,25, 28, 47, 48, A-2, A-3 | Peggy Tsai |
| 02   | July 10, 2024 | See the following Note Rev.(02) | P. A-3-A-5                                  | Peggy Tsai |

**Note:**

**Rev.(01)**

1. Modify instrument calibration in section 1.6.
2. Modify support and EUT accessories equipment in section 1.7.
3. Modify test set up diagram in section 1.8.
4. Modify test program in section 1.9.
5. Modify test procedure in section 4.2.2.
6. Modify test setup in section 4.2.3, 4.3.3, 4.4.3, 4.5.3.
7. Modify test result in section 4.6.4.
8. Modify test photo in appendix-A.

**Rev.(02)**

1. Modify test photo in appendix-A.

## Table of contents

|                                        |                                                        |           |
|----------------------------------------|--------------------------------------------------------|-----------|
| <b>1.</b>                              | <b>GENERAL INFORMATION .....</b>                       | <b>4</b>  |
| <b>1.1</b>                             | <b>EUT INFORMATION .....</b>                           | <b>4</b>  |
| <b>1.2</b>                             | <b>EUT CHANNEL INFORMATION .....</b>                   | <b>5</b>  |
| <b>1.3</b>                             | <b>ANTENNA INFORMATION .....</b>                       | <b>5</b>  |
| <b>1.4</b>                             | <b>MEASUREMENT UNCERTAINTY.....</b>                    | <b>6</b>  |
| <b>1.5</b>                             | <b>FACILITIES AND TEST LOCATION .....</b>              | <b>6</b>  |
| <b>1.6</b>                             | <b>INSTRUMENT CALIBRATION .....</b>                    | <b>7</b>  |
| <b>1.7</b>                             | <b>SUPPORT AND EUT ACCESSORIES EQUIPMENT .....</b>     | <b>9</b>  |
| <b>1.8</b>                             | <b>TEST SET UP DIAGRAM.....</b>                        | <b>10</b> |
| <b>1.9</b>                             | <b>TEST PROGRAM .....</b>                              | <b>10</b> |
| <b>1.10</b>                            | <b>TEST METHODOLOGY AND APPLIED STANDARDS .....</b>    | <b>10</b> |
| <b>2.</b>                              | <b>TEST SUMMERY .....</b>                              | <b>11</b> |
| <b>3.</b>                              | <b>DESCRIPTION OF TEST MODES.....</b>                  | <b>12</b> |
| <b>3.1</b>                             | <b>THE WORST MODE OF OPERATING CONDITION .....</b>     | <b>12</b> |
| <b>3.2</b>                             | <b>THE WORST MODE OF MEASUREMENT .....</b>             | <b>13</b> |
| <b>3.3</b>                             | <b>EUT DUTY CYCLE.....</b>                             | <b>14</b> |
| <b>4.</b>                              | <b>TEST RESULT .....</b>                               | <b>15</b> |
| <b>4.1</b>                             | <b>AC POWER LINE CONDUCTED EMISSION .....</b>          | <b>15</b> |
| <b>4.2</b>                             | <b>6DB BANDWIDTH AND OCCUPIED BANDWIDTH(99%) .....</b> | <b>20</b> |
| <b>4.3</b>                             | <b>OUTPUT POWER MEASUREMENT .....</b>                  | <b>23</b> |
| <b>4.4</b>                             | <b>POWER SPECTRAL DENSITY .....</b>                    | <b>25</b> |
| <b>4.5</b>                             | <b>CONDUCTED BAND EDGE AND SPURIOUS EMISSION .....</b> | <b>28</b> |
| <b>4.6</b>                             | <b>RADIATION BANDEDGE AND SPURIOUS EMISSION .....</b>  | <b>31</b> |
| <b>APPENDIX A - PHOTOGRAPHS OF EUT</b> |                                                        |           |

## 1. GENERAL INFORMATION

### 1.1 EUT INFORMATION

|                          |                                                                                                                                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Applicant</b>         | Universal Global Scientific Industrial Co., Ltd.<br>No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County,<br>542007, Taiwan |
| <b>Manufacturer</b>      | Universal Global Scientific Industrial Co., Ltd.<br>No. 141, Lane 351, Sec.1, Taiping Road, Tsaotuen, Nantou County,<br>542007, Taiwan |
| <b>Equipment</b>         | 802.11b/g/n + BT 5.4 Module                                                                                                            |
| <b>Model No.</b>         | WM-CW-26                                                                                                                               |
| <b>Model Discrepancy</b> | N/A                                                                                                                                    |
| <b>Trade Name</b>        | USI                                                                                                                                    |
| <b>Received Date</b>     | May 3, 2024                                                                                                                            |
| <b>Date of Test</b>      | May 13 ~ 24, 2024                                                                                                                      |
| <b>Power Operation</b>   | Powered from Power supply: DC 3.6V                                                                                                     |
| <b>EUT Serial #</b>      | 85016008120124030700001032                                                                                                             |
| <b>HW Version</b>        | v1.0                                                                                                                                   |
| <b>FW Version</b>        | v7.95.55                                                                                                                               |

**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 channel | 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     |
| <input type="checkbox"/> 1 MHz or less               | 1                     | Middle                                       |
| <input type="checkbox"/> 1 MHz to 10 MHz             | 2                     | 1 near top and 1 near bottom                 |
| <input checked="" type="checkbox"/> More than 10 MHz | 3                     | 1 near top, 1 near middle, and 1 near bottom |

## 1.3 ANTENNA INFORMATION

|                   |                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Antenna Type      | <input type="checkbox"/> PIFA <input type="checkbox"/> PCB <input type="checkbox"/> Dipole <input checked="" type="checkbox"/> Ceramic Chip Antenna |
| Antenna Gain      | Yageo / ANT3216LL11R2400A<br>Gain: 3.68 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              | $\pm 2.213$ dB |
| Channel Bandwidth                            | $\pm 2.7$ %    |
| RF output power (Power Meter + Power sensor) | $\pm 0.243$ dB |
| Power Spectral density                       | $\pm 2.739$ dB |
| Conducted Bandedge                           | $\pm 2.739$ dB |
| Conducted Spurious Emission                  | $\pm 2.742$ dB |
| Radiated Emission_9kHz-30MHz                 | $\pm 3.761$ dB |
| Radiated Emission_30MHz-200MHz               | $\pm 3.473$ dB |
| Radiated Emission_200MHz-1GHz                | $\pm 3.946$ dB |
| Radiated Emission_1GHz-6GHz                  | $\pm 4.797$ dB |
| Radiated Emission_6GHz-18GHz                 | $\pm 4.803$ dB |
| Radiated Emission_18GHz-26GHz                | $\pm 3.459$ dB |
| Radiated Emission_26GHz-40GHz                | $\pm 3.297$ dB |

**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.

CAB identifier: TW1309

| Test site          | Test Engineer      | Remark |
|--------------------|--------------------|--------|
| AC Conduction Room | Czerny Lin         | -      |
| Radiation          | Tony Chao · Ray Li | -      |
| RF Conducted       | Marco Chan         | -      |

**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

| Conducted_FCC/IC/NCC (All) |                             |           |               |                  |                 |
|----------------------------|-----------------------------|-----------|---------------|------------------|-----------------|
| Name of Equipment          | Manufacturer                | Model     | Serial Number | Calibration Date | Calibration Due |
| Power Sensor               | Anritsu                     | MA2411B   | 1911387       | 2023-07-25       | 2024-07-24      |
| Power Meter                | Anritsu                     | ML2496A   | 2136002       | 2023-11-16       | 2024-11-15      |
| Cable                      | Woken                       | WC12      | CC003         | 2023-06-27       | 2024-06-26      |
| EXA Signal Analyzer        | Keysight                    | N9030B    | MY62291089    | 2023-10-13       | 2024-10-12      |
| Power Supply               | ABM                         | GPC-3030D | 8070184       | 2023-10-02       | 2024-10-01      |
| Software                   | Radio Test Software Ver. 21 |           |               |                  |                 |

| 966A_Radiated      |                 |                    |                      |                  |                 |
|--------------------|-----------------|--------------------|----------------------|------------------|-----------------|
| Name of Equipment  | Manufacturer    | Model              | Serial Number        | Calibration Date | Calibration Due |
| Signal Analyzer    | KEYSIGHT        | N9010A             | MY54200716           | 2023-10-13       | 2024-10-12      |
| Thermo-Hygro Meter | WISEWIND        | 1206               | D07                  | 2023-12-08       | 2024-12-07      |
| Loop Antenna       | COM-POWER       | AL-130             | 121051               | 2023-05-23       | 2024-05-22      |
| Bi-Log Antenna     | Sunol Sciences  | JB3                | A030105              | 2023-08-08       | 2024-08-07      |
| Preamplifier       | EMEC            | EM330              | 060609               | 2024-02-21       | 2025-02-20      |
| Cable              | Huber+Suhner    | 104PEA             | 20995+21000+182330   | 2024-02-21       | 2025-02-20      |
| Horn Antenna       | ETC             | MCTD 1209          | DRH13M02003          | 2023-12-28       | 2024-12-27      |
| Preamplifier       | HP              | 8449B              | 3008A00965           | 2023-12-22       | 2024-12-21      |
| Cable              | EMCI            | EMC101G            | 221213+221011+221012 | 2023-10-17       | 2024-10-16      |
| Attenuator         | Mini-Circuits   | BW-S9W5            | BWS9W5-09-966A-01    | 2024-02-07       | 2025-02-06      |
| High Pass Filters  | Titan Microwave | T04H30001800070S01 | 22011402-4           | 2023-06-17       | 2024-06-16      |
| Horn Antenna       | SCHWARZBECK     | BBHA9170           | 1047                 | 2023-12-13       | 2024-12-12      |
| Pre-Amplifier      | EMCI            | EMC184045SE        | 980860               | 2023-12-12       | 2024-12-11      |
| DC Power Supply    | ABM             | 9603D              | D011314              | 2023-10-02       | 2024-10-01      |
| Turn Table         | CCS             | CC-T-1F            | N/A                  | N.C.R            | N.C.R           |
| Controller         | CCS             | CC-C-1F            | N/A                  | N.C.R            | N.C.R           |
| Antenna Tower      | CCS             | CC-A-1F            | N/A                  | N.C.R            | N.C.R           |
| Site Validation    | CCS             | 966A               | N/A                  | 2023-07-10       | 2024-07-09      |
| Software           | e3 V9-210616c   |                    |                      |                  |                 |

### Remark:

- Each piece of equipment is scheduled for calibration once a year.
- N.C.R. = No Calibration Required.

| AC Mains Conduction |              |           |               |                  |                 |
|---------------------|--------------|-----------|---------------|------------------|-----------------|
| Name of Equipment   | Manufacturer | Model     | Serial Number | Calibration Date | Calibration Due |
| EMI Test Receiver   | R&S          | ESCI      | 100064        | 2023-06-07       | 2024-06-06      |
| LISN                | TESEQ        | LN2-16N   | 22012         | 2024-02-29       | 2025-02-27      |
| Cable               | EMCI         | CFD300-NL | CERF          | 2023-06-27       | 2024-06-26      |
| Power Supply        | GWINISTEK    | SPS-3610  | GPE880163     | 2023-10-16       | 2024-10-15      |
| Software            | e3 V6-110812 |           |               |                  |                 |

**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

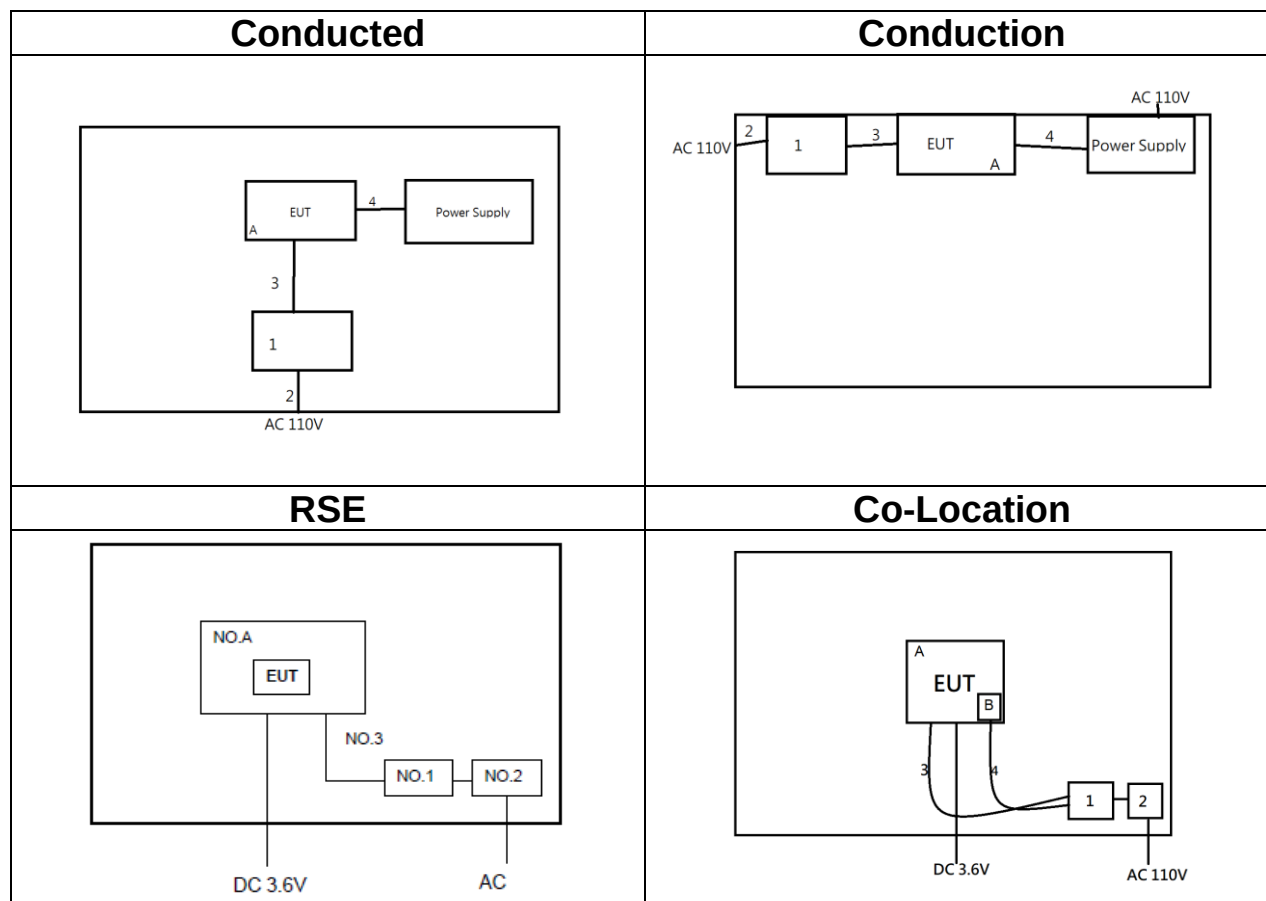
| EUT Accessories Equipment |              |       |                   |            |        |     |
|---------------------------|--------------|-------|-------------------|------------|--------|-----|
| No.                       | Equipment    | Brand | Model             | Series No. | FCC ID | IC  |
| A                         | Test Kitting | USI   | WM-BN-BM-26_A_EVB | N/A        | N/A    | N/A |

| Support Equipment (Conducted) |           |        |             |            |        |
|-------------------------------|-----------|--------|-------------|------------|--------|
| No.                           | Equipment | Brand  | Model       | Series No. | FCC ID |
| 1                             | NB(L)     | Lenovo | X260        | N/A        | N/A    |
| 2                             | Adapter   | Lenovo | ADLX45DLC3A | N/A        | N/A    |
| 3                             | Mini USB  | RS Pro | 2369084     | N/A        | N/A    |
| 4                             | DC Cable  | MISUMI | MCR3S-RE    | N/A        | N/A    |

| Support Equipment (RSE, Co-Location) |                   |           |                  |            |        |
|--------------------------------------|-------------------|-----------|------------------|------------|--------|
| No.                                  | Equipment         | Brand     | Model            | Series No. | FCC ID |
| 1                                    | NB(D)             | Lenovo    | ThinkPad X260    | N/A        | N/A    |
| 2                                    | Adapter           | Lenovo    | ADLX45DLC3A      | N/A        | N/A    |
| 3                                    | Mini USB          | RS Pro    | 2369084          | N/A        | N/A    |
| 4                                    | Micro USB         | StarTech. | UUSBHAUB3M       | N/A        | N/A    |
| B                                    | SDIO adapter card | USI       | USB TO SDIO CARD | N/A        | N/A    |

| Support Equipment (Conduction) |           |        |               |            |        |
|--------------------------------|-----------|--------|---------------|------------|--------|
| No.                            | Equipment | Brand  | Model         | Series No. | FCC ID |
| 1                              | NB(D)     | Lenovo | ThinkPad X260 | N/A        | N/A    |
| 2                              | Adapter   | Lenovo | ADLX45DLC3A   | N/A        | N/A    |
| 3                              | Mini USB  | RS Pro | 2369084       | N/A        | N/A    |
| 4                              | DC Cable  | MISUMI | MCR3S-RE      | N/A        | N/A    |

## 1.8 TEST SET UP DIAGRAM



## 1.9 TEST PROGRAM

The EUT connection corresponds to the surrounding fixture control board. This EUT uses the Linux system setup command to set the frequency, modulation, and power to allow the sample to continuously transmit (including frequency hopping mode and Co-Location).

## 1.10 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, KDB 558074.

## 2. TEST SUMMERY

| FCC Standard Section           | Report Section | Test Item                   | Result |
|--------------------------------|----------------|-----------------------------|--------|
| 15.203                         | 1.3            | Antenna Requirement         | Pass   |
| 15.207(a)                      | 4.1            | AC Conducted Emission       | Pass   |
| 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)<br>15.205,<br>15.209 | 4.6            | Radiation Band Edge         | Pass   |
| 15.247(d)<br>15.205,<br>15.209 | 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

| AC Power Line Conducted Emission |                                                                                                                                            |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition                   | AC Power line conducted emission for line and neutral                                                                                      |
| Power supply Mode                | Mode 1: EUT Power by DC power Supply                                                                                                       |
| Worst Mode                       | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

| AC Power Line Conducted Emission [co-location] |                                                                                                                                            |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition                                 | Radiated Emission [co-location]                                                                                                            |
| Power supply Mode                              | Mode 1: Wi-Fi 2.4G+ BLE 1M                                                                                                                 |
| Worst Mode                                     | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

| Radiated Emission Measurement Above 1G |                                                                                                                                                                                                                                                                                               |
|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition                         | Radiated Emission Above 1G                                                                                                                                                                                                                                                                    |
| Power supply Mode                      | Mode 1: EUT power by Power supply                                                                                                                                                                                                                                                             |
| Worst Mode                             | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4                                                                                                                                                    |
| Worst Position                         | <input type="checkbox"/> Placed in fixed position.<br><input checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane)<br><input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane)<br><input type="checkbox"/> 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 Power supply                                                                                                          |
| Worst Mode                             | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

| Radiated Emission Measurement [co-location] |                                                                                                                                            |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition                              | Radiated Emission [co-location]                                                                                                            |
| Power supply Mode                           | Mode 1: Wi-Fi 2.4G+ BLE 1M                                                                                                                 |
| Worst Mode                                  | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

#### Remark:

1. The worst mode was record in this test report.
2. AC power line conducted emission and for below 1G radiation emission were performed the EUT transmit at the highest output power channel as worse case.
3. EUT pre-scanned in three axis ,X,Y, Z and two polarity, for radiated measurement. The worst case(X-Plane) were recorded in this report

## 3.3 EUT DUTY CYCLE

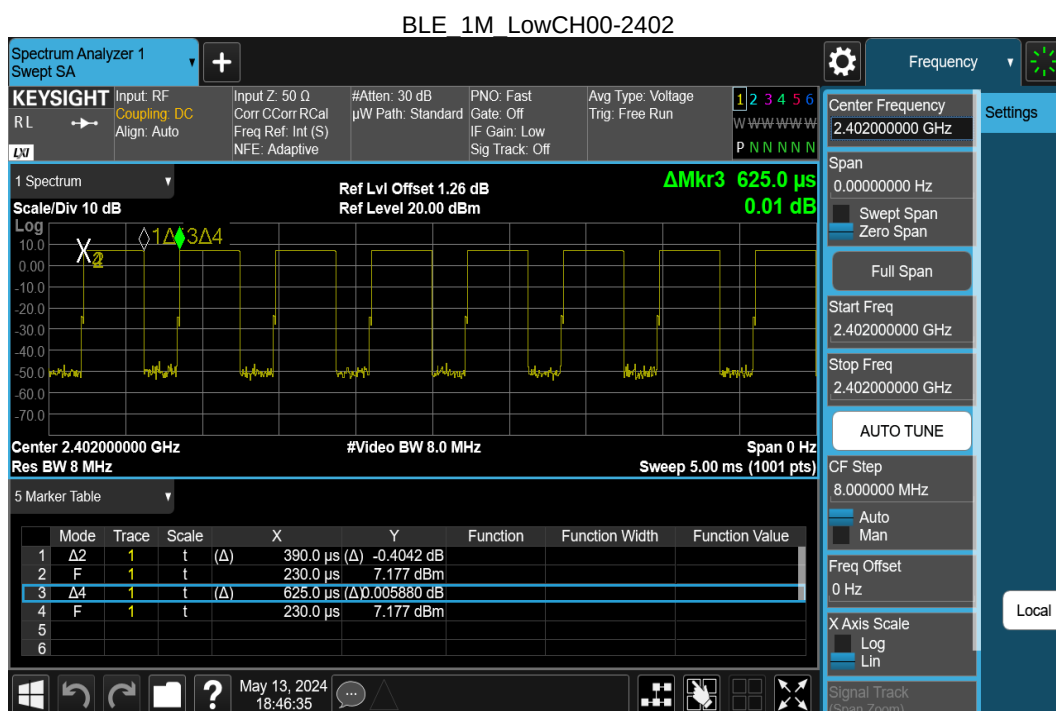
Temperature: 23.5°C

Test date: May 13, 2024

Humidity: 59% RH

Tested by: Marco Chan

|        | Duty Cycle (%)<br>= Ton / (Ton+Toff) | Duty Factor (dB)<br>=10*log ( 1/Duty<br>Cycle ) | 1/T (kHz) | VBW setting<br>(kHz) |
|--------|--------------------------------------|-------------------------------------------------|-----------|----------------------|
| BLE 1M | 62.40                                | 2.05                                            | 2.56      | 3.00                 |



## 4. TEST RESULT

### 4.1 AC POWER LINE CONDUCTED EMISSION

#### 4.1.1 Test Limit

According to §15.207(a),

| Frequency Range<br>(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        |

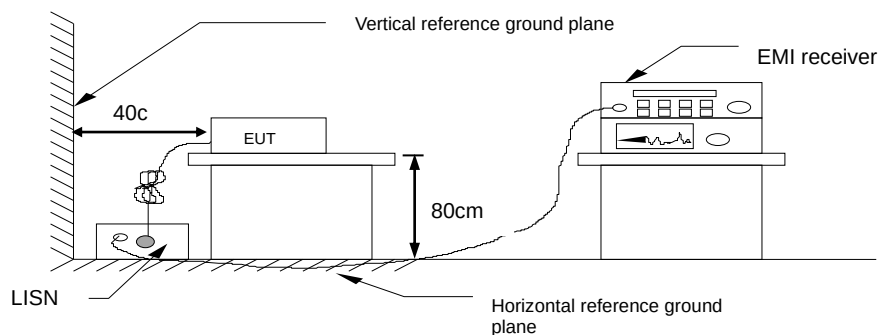
\* Decreases with the logarithm of the frequency.

#### 4.1.2 Test Procedure

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

1. The EUT was placed on a non-conducted table, which is 0.8m 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.

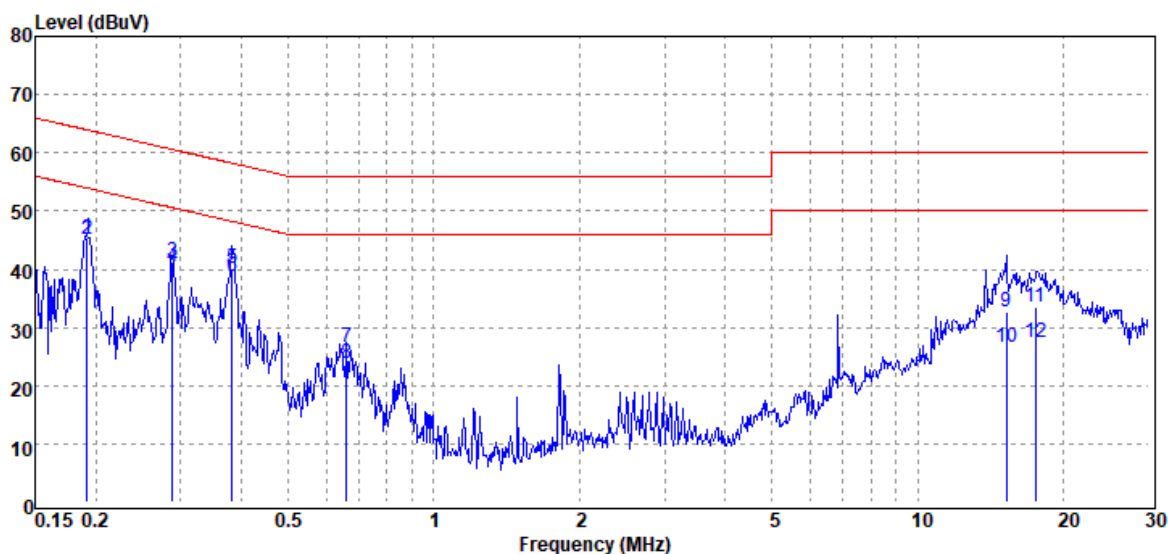
#### 4.1.3 Test Setup



## 4.1.4 Test Result

Project No : TM-2405000018P  
Operation Mode : BLE  
Test Chamber : Conduction  
Probe : LINE  
Note :

Test Date : 2024-05-24  
Temp./Humi. : 24.1°C / 55%  
Engineer : Czerny Lin  
Test Voltage : AC 120V/60Hz



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV | Limit<br>dBμV | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|----------------------|---------------|--------------|
| 0.192        | QP                           | 45.32                          | 0.15         | 45.47                | 63.94         | -18.47       |
| 0.192        | Average                      | 44.87                          | 0.15         | 45.02                | 53.94         | -8.92        |
| 0.288        | QP                           | 41.08                          | 0.15         | 41.23                | 60.57         | -19.34       |
| 0.288        | Average                      | 40.36                          | 0.15         | 40.51                | 50.57         | -10.06       |
| 0.382        | QP                           | 39.99                          | 0.15         | 40.14                | 58.23         | -18.09       |
| 0.382        | Average                      | 38.67                          | 0.15         | 38.82                | 48.23         | -9.41        |
| 0.661        | QP                           | 26.31                          | 0.16         | 26.47                | 56.00         | -29.53       |
| 0.661        | Average                      | 23.74                          | 0.16         | 23.90                | 46.00         | -22.10       |
| 15.223       | QP                           | 32.11                          | 0.45         | 32.56                | 60.00         | -27.44       |
| 15.223       | Average                      | 26.17                          | 0.45         | 26.62                | 50.00         | -23.38       |
| 17.516       | QP                           | 32.95                          | 0.48         | 33.43                | 60.00         | -26.57       |
| 17.516       | Average                      | 26.81                          | 0.48         | 27.29                | 50.00         | -22.71       |

Note: 1. Actual FS= Spectrum Read Level + Factor

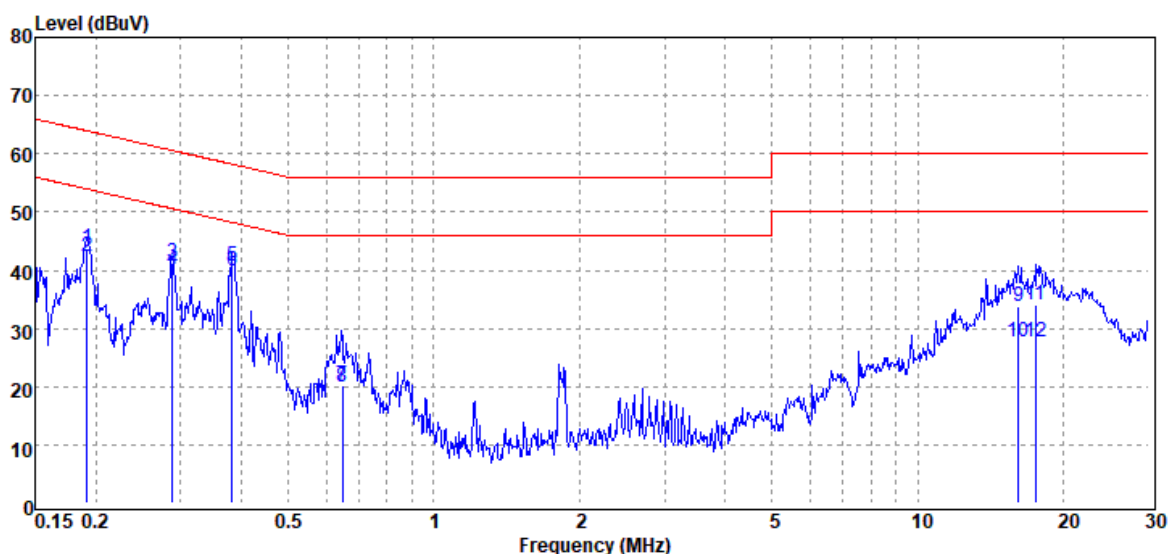
Note: 2. Margin= Actual FS - Limit

Report No.: TMWK2405001737KR

Page: 17 / 50  
Rev.: 02

Project No : TM-2405000018P  
Operation Mode : BLE  
Test Chamber : Conduction  
Probe : NEUTRAL  
Note :

Test Date : 2024-05-24  
Temp./Humi. : 24.1°C / 55%  
Engineer : Czerny Lin  
Test Voltage : AC 120V/60Hz



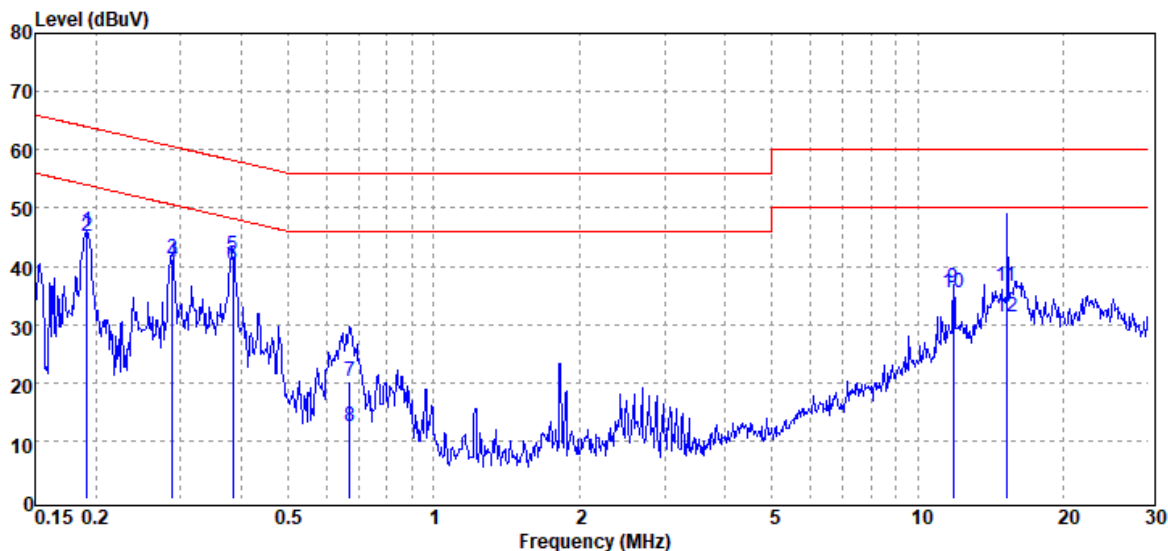
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV | Limit<br>dBμV | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|----------------------|---------------|--------------|
| 0.192        | QP                           | 43.46                          | 0.19         | 43.65                | 63.95         | -20.30       |
| 0.192        | Average                      | 42.18                          | 0.19         | 42.37                | 53.95         | -11.58       |
| 0.289        | QP                           | 40.95                          | 0.19         | 41.14                | 60.56         | -19.42       |
| 0.289        | Average                      | 39.98                          | 0.19         | 40.17                | 50.56         | -10.39       |
| 0.384        | QP                           | 40.59                          | 0.19         | 40.78                | 58.20         | -17.42       |
| 0.384        | Average                      | 39.79                          | 0.19         | 39.98                | 48.20         | -8.22        |
| 0.647        | QP                           | 20.13                          | 0.21         | 20.34                | 56.00         | -35.66       |
| 0.647        | Average                      | 19.67                          | 0.21         | 19.88                | 46.00         | -26.12       |
| 16.181       | QP                           | 33.34                          | 0.48         | 33.82                | 60.00         | -26.18       |
| 16.181       | Average                      | 27.20                          | 0.48         | 27.68                | 50.00         | -22.32       |
| 17.515       | QP                           | 33.64                          | 0.49         | 34.13                | 60.00         | -25.87       |
| 17.515       | Average                      | 27.20                          | 0.49         | 27.69                | 50.00         | -22.31       |

Note: 1. Actual FS= Spectrum Read Level + Factor

Note: 2. Margin= Actual FS - Limit

Project No : TM-2405000018P  
Operation Mode : Wi-Fi+BLE Co-Location  
Test Chamber : Conduction  
Probe : LINE  
Note :

Test Date : 2024-05-24  
Temp./Humi. : 24.1°C / 55%  
Engineer : Czerny Lin  
Test Voltage : AC 120V/60Hz



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV | Limit<br>dBμV | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|----------------------|---------------|--------------|
| 0.192        | QP                           | 45.78                          | 0.15         | 45.93                | 63.96         | -18.03       |
| 0.192        | Average                      | 45.04                          | 0.15         | 45.19                | 53.96         | -8.77        |
| 0.288        | QP                           | 41.15                          | 0.15         | 41.30                | 60.58         | -19.28       |
| 0.288        | Average                      | 40.41                          | 0.15         | 40.56                | 50.58         | -10.02       |
| 0.384        | QP                           | 41.62                          | 0.15         | 41.77                | 58.20         | -16.43       |
| 0.384        | Average                      | 40.06                          | 0.15         | 40.21                | 48.20         | -7.99        |
| 0.671        | QP                           | 20.09                          | 0.16         | 20.25                | 56.00         | -35.75       |
| 0.671        | Average                      | 12.36                          | 0.16         | 12.52                | 46.00         | -33.48       |
| 11.824       | QP                           | 35.96                          | 0.40         | 36.36                | 60.00         | -23.64       |
| 11.824       | Average                      | 34.95                          | 0.40         | 35.35                | 50.00         | -14.65       |
| 15.278       | QP                           | 36.01                          | 0.45         | 36.46                | 60.00         | -23.54       |
| 15.278       | Average                      | 30.91                          | 0.45         | 31.36                | 50.00         | -18.64       |

Note: 1. Actual FS= Spectrum Read Level + Factor

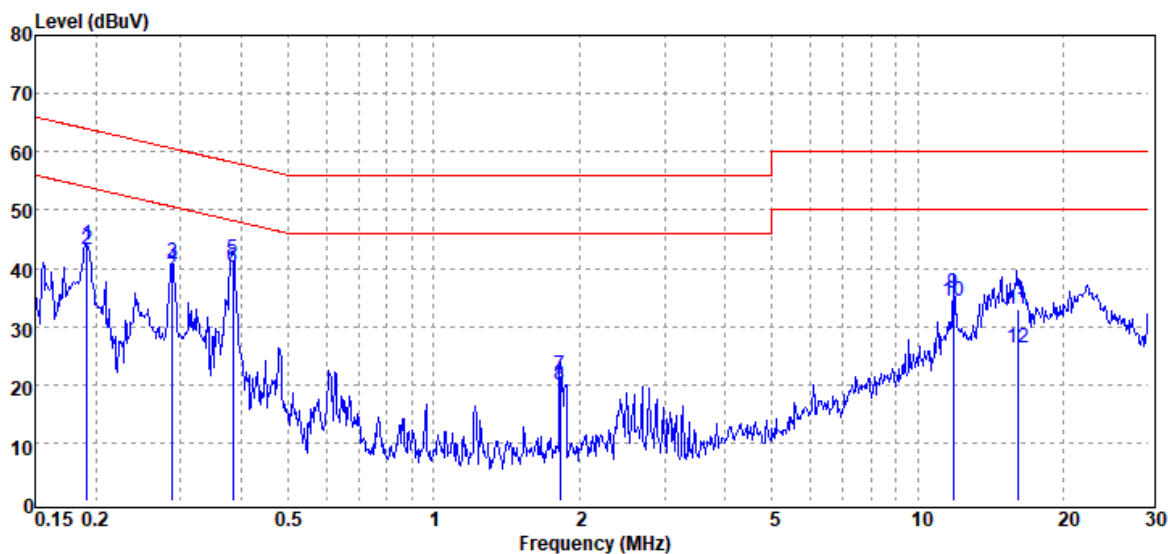
Note: 2. Margin= Actual FS - Limit

Report No.: TMWK2405001737KR

Page: 19 / 50  
Rev.: 02

Project No : TM-2405000018P  
Operation Mode : Wi-Fi+BLE Co-Location  
Test Chamber : Conduction  
Probe : NEUTRAL  
Note :

Test Date : 2024-05-24  
Temp./Humi. : 24.1°C / 55%  
Engineer : Czerny Lin  
Test Voltage : AC 120V/60Hz



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV | Limit<br>dBμV | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|----------------------|---------------|--------------|
| 0.192        | QP                           | 43.81                          | 0.19         | 44.00                | 63.95         | -19.95       |
| 0.192        | Average                      | 42.98                          | 0.19         | 43.17                | 53.95         | -10.78       |
| 0.288        | QP                           | 40.92                          | 0.19         | 41.11                | 60.57         | -19.46       |
| 0.288        | Average                      | 40.00                          | 0.19         | 40.19                | 50.57         | -10.38       |
| 0.384        | QP                           | 41.31                          | 0.19         | 41.50                | 58.19         | -16.69       |
| 0.384        | Average                      | 40.08                          | 0.19         | 40.27                | 48.19         | -7.92        |
| 1.827        | QP                           | 21.27                          | 0.25         | 21.52                | 56.00         | -34.48       |
| 1.827        | Average                      | 19.75                          | 0.25         | 20.00                | 46.00         | -26.00       |
| 11.825       | QP                           | 35.26                          | 0.42         | 35.68                | 60.00         | -24.32       |
| 11.825       | Average                      | 33.97                          | 0.42         | 34.39                | 50.00         | -15.61       |
| 16.084       | QP                           | 32.53                          | 0.47         | 33.00                | 60.00         | -27.00       |
| 16.084       | Average                      | 25.71                          | 0.47         | 26.18                | 50.00         | -23.82       |

Note: 1. Actual FS= Spectrum Read Level + Factor

Note: 2. Margin= Actual FS - Limit

## 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 KDB 558074 D01 and ANSI C63.10: 2013 clause 6.9.2.

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 6 dB 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

Refer to section 1.8.

#### 4.2.4 Test Result

Temperature: 23.5°C

Test date: May 13, 2024

Humidity: 59% RH

Tested by: Marco Chan

#### 6dB BANDWIDTH

##### BLE 1M mode

| Frequency (MHz) | 6dB BW (MHz) | Required BW (MHz) | Result |
|-----------------|--------------|-------------------|--------|
| 2402            | 0.7319       | $\geq 0.5$        | PASS   |
| 2442            | 0.7268       | $\geq 0.5$        | PASS   |
| 2480            | 0.7265       | $\geq 0.5$        | PASS   |

#### BANDWIDTH 99%

##### BLE 1M mode

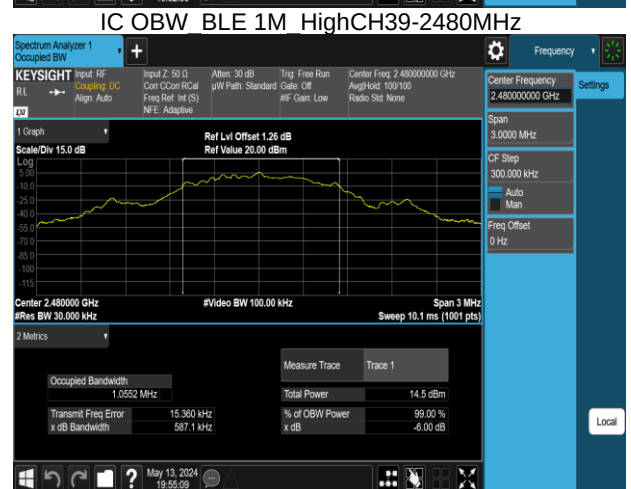
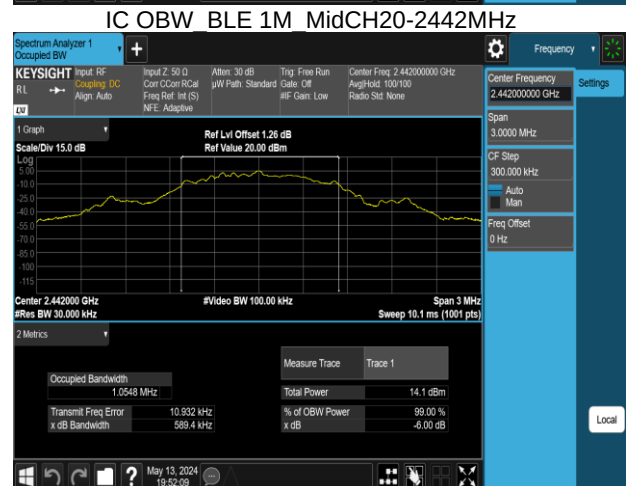
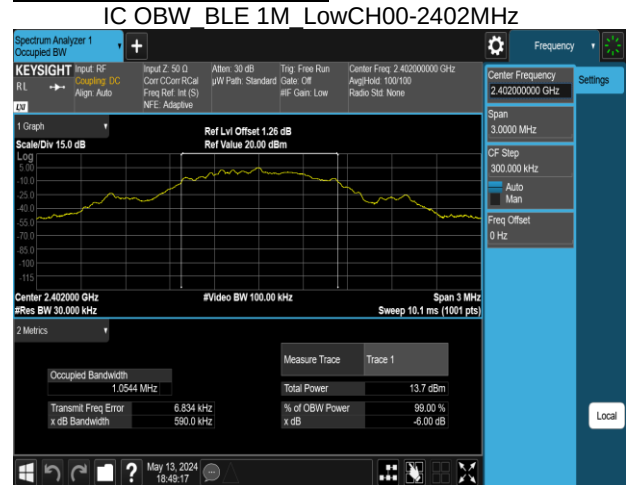
| Frequency (MHz) | 99%Bandwidth (MHz) |
|-----------------|--------------------|
| 2402            | 1.0544             |
| 2442            | 1.0548             |
| 2480            | 1.0552             |

## Test Data

### 6dB BANDWIDTH



### BANDWIDTH 99%



## 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.

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

### 4.3.2 Test Procedure

Test method Refer as KDB 558074 D01

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

Refer to section 1.8.

#### 4.3.4 Test Result

Temperature: 23.5°C

Test date: May 13, 2024

Humidity: 59% RH

Tested by: Marco Chan

##### Peak & Average output power :

BLE 1M mode:

| CH   | Frequency (MHz) | Power Setting | Peak Output Power (dBm) | Required Limit (dBm) |
|------|-----------------|---------------|-------------------------|----------------------|
| Low  | 2402            | default       | 7.28                    | 30                   |
| Mid  | 2442            | default       | 7.94                    | 30                   |
| High | 2480            | default       | 8.15                    | 30                   |
| CH   | Frequency (MHz) | Power Setting | Avg. Output Power (dBm) | Required Limit (dBm) |
| Low  | 2402            | default       | 7.21                    | 30                   |
| Mid  | 2442            | default       | 7.76                    | 30                   |
| High | 2480            | default       | 7.84                    | 30                   |

**\*Note:**

**1.Measured by power meter, cable loss 1.26 dB + Duty cycle factor has been offseted to the power meter for Avg. power and cable loss has been offseted for Peak power measurement.**

## 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 | <input checked="" type="checkbox"/> Antenna not exceed 6 dBi : 8dBm<br><input type="checkbox"/> Antenna with DG greater than 6 dBi<br>[ Limit = 8 – (DG – 6) ]<br><input type="checkbox"/> Point-to-point operation : |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 4.4.2 Test Procedure

Test method Refer as KDB 558074 D01

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 was 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

Refer to section 1.8.

#### 4.4.4 Test Result

Temperature: 23.5°C

Test date: May 13, 2024

Humidity: 59% RH

Tested by: Marco Chan

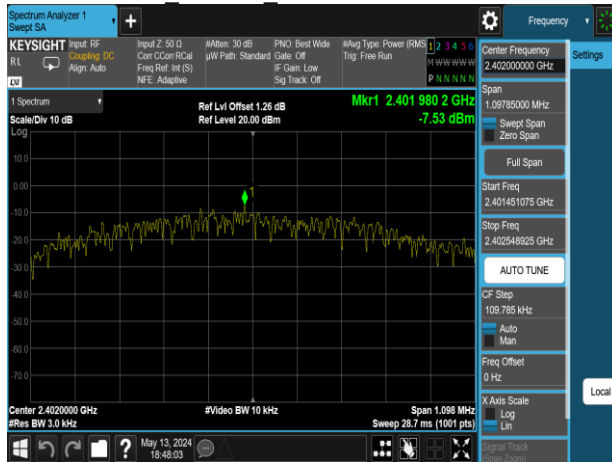
**BLE 1M mode**

| Frequency<br>(MHz) | RF Power Density<br>(dBm/3kHz) | Maximum Limit<br>(dBm/3kHz) | Result |
|--------------------|--------------------------------|-----------------------------|--------|
| 2402               | -7.53                          | 8                           | PASS   |
| 2442               | -6.99                          | 8                           | PASS   |
| 2480               | -6.65                          | 8                           | PASS   |

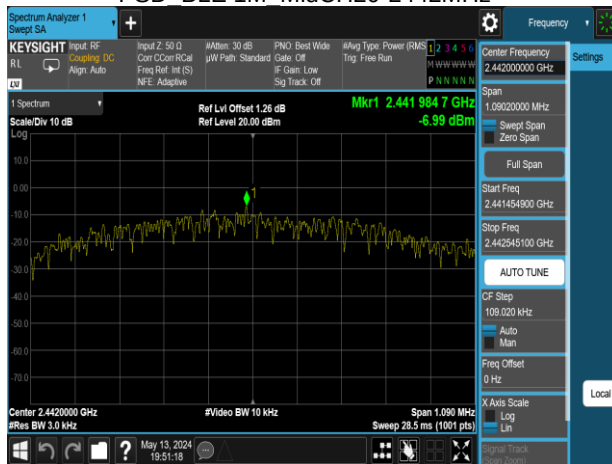
**\*Note:*****1.cable loss as 1.26dB that offsets in the spectrum***

## Test Data

PSD BLE 1M LowCH00-2402MHz



PSD BLE 1M MidCH20-2442MHz



PSD BLE 1M HighCH39-2480MHz



## 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 KDB 558074 D01

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

Refer to section 1.8.

### 4.5.4 Test Result

**Temperature:** 23.5°C

**Test date:** May 13, 2024

**Humidity:** 59% RH

**Tested by:** Marco Chan

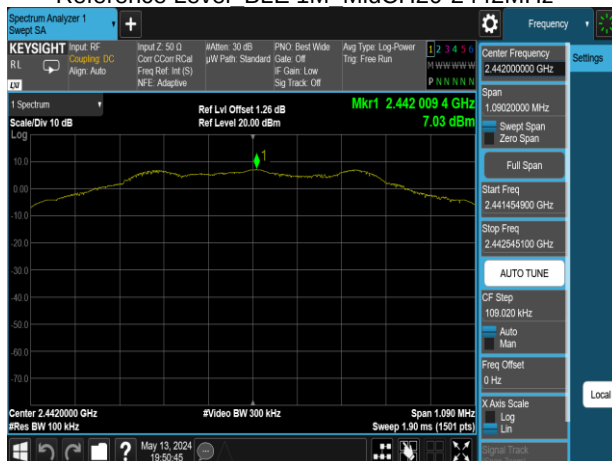
## Test Data

### Reference Level

Reference Level BLE 1M LowCH00-2402MHz



Reference Level BLE 1M MidCH20-2442MHz

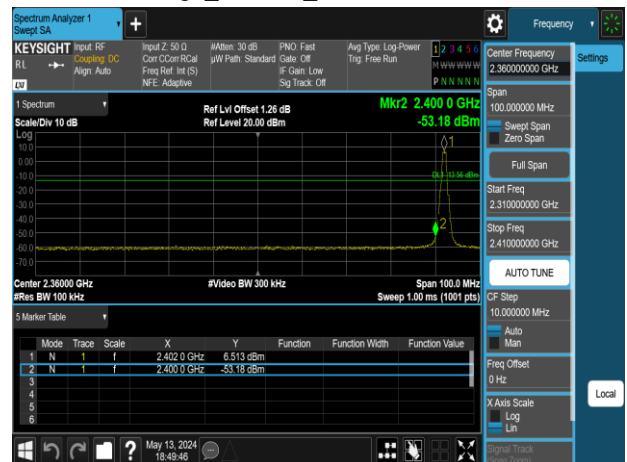


Reference Level BLE 1M HighCH39-2480MHz



### Band Edge

Band Edge\_BLE 1M\_LowCH00-2402MHz



Band Edge BLE 1M HighCH39-2480MHz



## Spurious Emission

Spurious Emission BLE 1M LowCH00-2402MHz



Spurious Emission BLE 1M MidCH20-2442MHz



Spurious Emission BLE 1M HighCH39-2480MHz



## 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<br>(microvolts/m) | Magnetic<br>H-Field<br>(microamperes/m) | Measurement<br>Distance<br>(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<br>(MHz) | Field Strength<br>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 area 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

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.
4. No emission found between lowest internal used/generated frequency to 30MHz (9KHz~30MHz).

Radiated emission below 30MHz is measured in a 9m\*6m\*6m semi-ane choic chamber, the measurements correspond to those obtained at an open-field test site. There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

5. The SA setting following :

- (1) Below 30MHz :

(1.1) 9KHz-490KHz : RBW=200Hz / VBW=1kHz / Sweep=AUTO

(1.2) 490KHz-30MHz : RBW=10kHz / VBW=30kHz / Sweep=AUTO

- (2) 30MHz to 1GHz : RBW = 100kHz, VBW  $\geq$  3\*RBW, Sweep = Auto,

Detector = Peak, Trace = Max hold.

- (3) Above 1GHz :

(3.1) For Peak measurement : RBW = 1MHz, VBW  $\geq$  3 RBW, Sweep = Auto,  
Detector = Peak, Trace = Max hold.

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

·If Duty Cycle  $\geq$  98%, VBW=10Hz.

·If Duty Cycle < 98%, VBW=1/T.

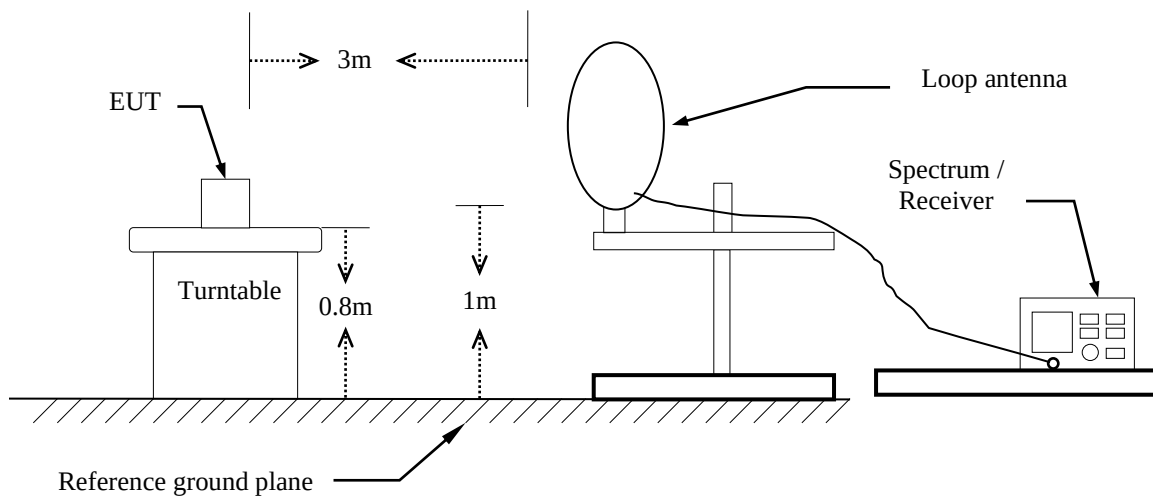
6. Data result :

Actual FS=Spectrum Reading Level + Factor

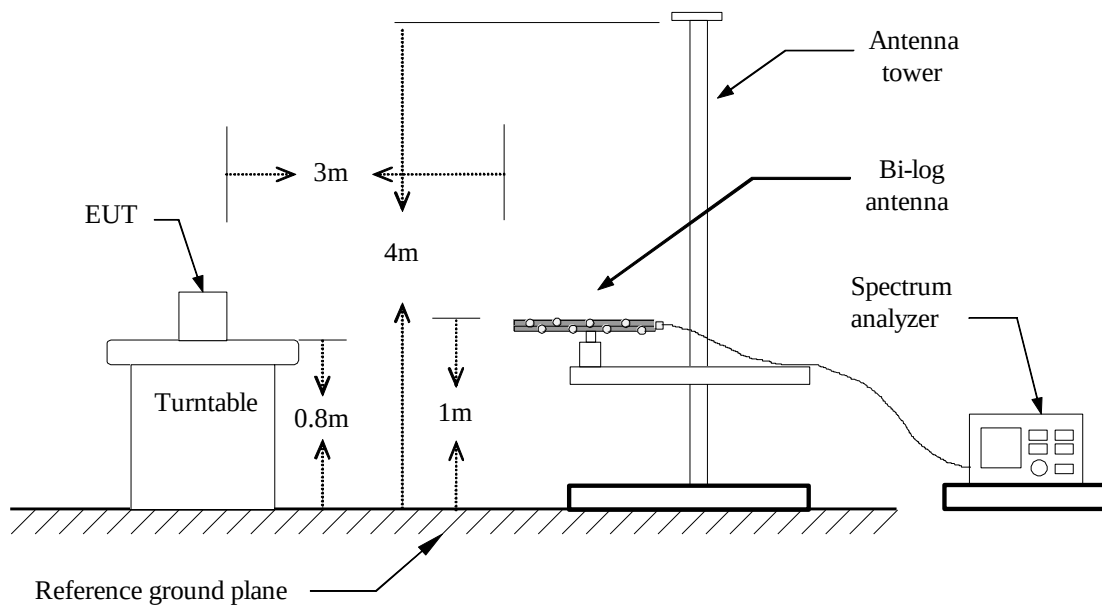
Margin=Actual FS- Limit

## 4.6.3 Test Setup

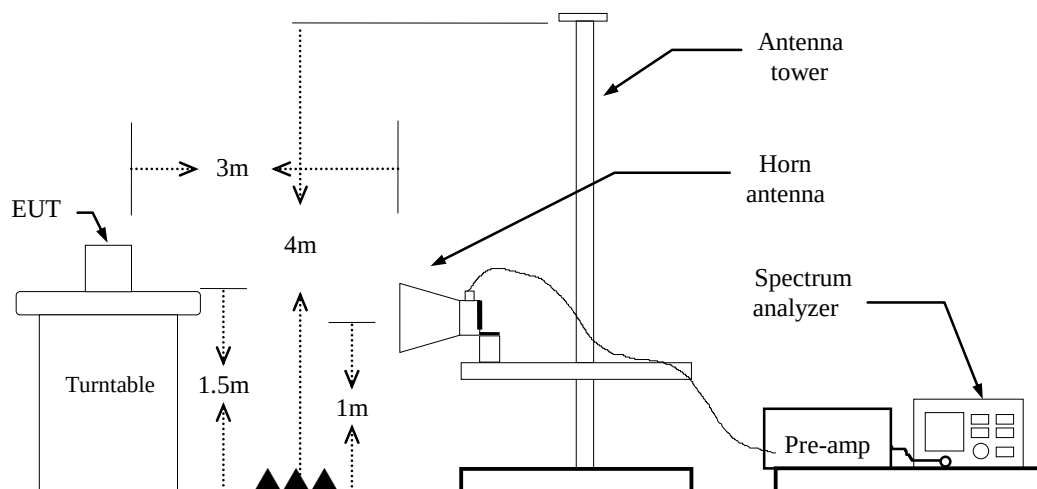
### 9kHz ~ 30MHz



### 30MHz ~ 1GHz



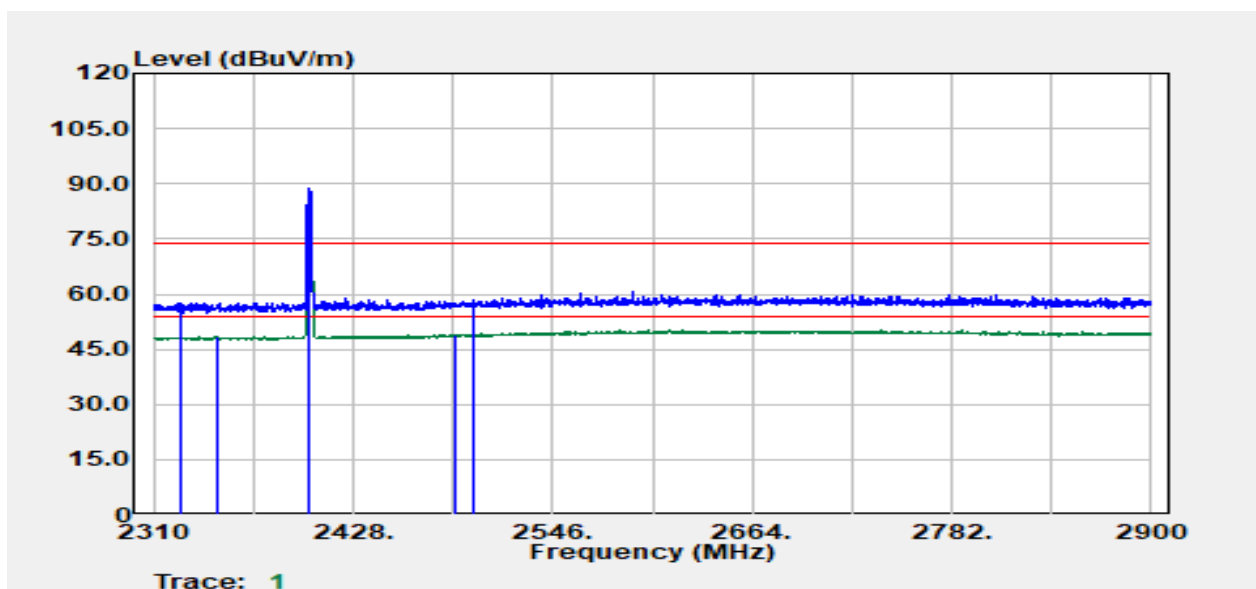
## Above 1 GHz



## 4.6.4 Test Result

### Band Edge Test Data

|                |                 |              |             |
|----------------|-----------------|--------------|-------------|
| Project No     | :TM-2405000018P | Test Date    | :2024-05-16 |
| Operation Band | :BLE 1M         | Temp./Humi.  | :24.6/57    |
| Frequency      | :2402 MHz       | Antenna Pol. | :Vertical   |
| Operation Mode | :Bandedge       | Engineer     | :Tony Chao  |
| EUT Pol        | :E2             | Test Chamber | : 966A      |
| Setting        | :               |              |             |



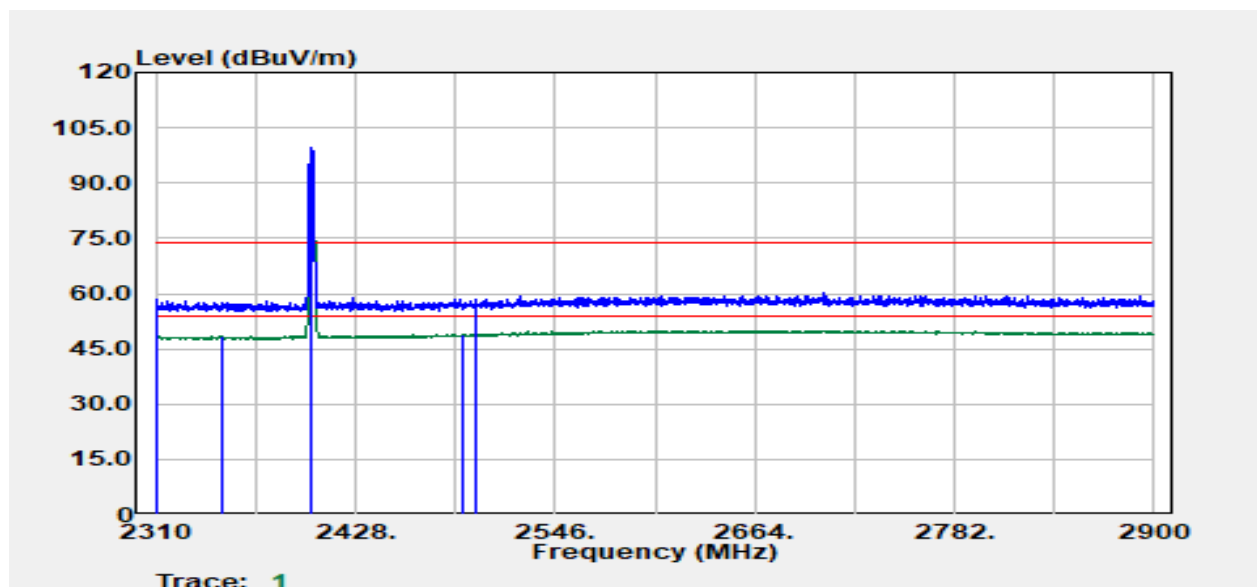
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2326.23      | Peak                         | 25.63                          | 32.05        | 57.67                  | 74.00           | -16.33       |
| 2347.45      | Average                      | 16.32                          | 32.04        | 48.37                  | 54.00           | -5.63        |
| 2402.00      | Peak                         | 56.69                          | 32.12        | 88.82                  | --              | --           |
| 2402.00      | Average                      | 56.30                          | 32.12        | 88.42                  | --              | --           |
| 2488.77      | Average                      | 16.56                          | 32.49        | 49.05                  | 54.00           | -4.95        |
| 2499.76      | Peak                         | 25.70                          | 32.51        | 58.21                  | 74.00           | -15.79       |

Report No.: TMWK2405001737KR

Page: 36 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2402 MHz  
Operation Mode :Bandedge  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :HORIZONTAL  
Engineer :Tony Chao  
Test Chamber : 966A



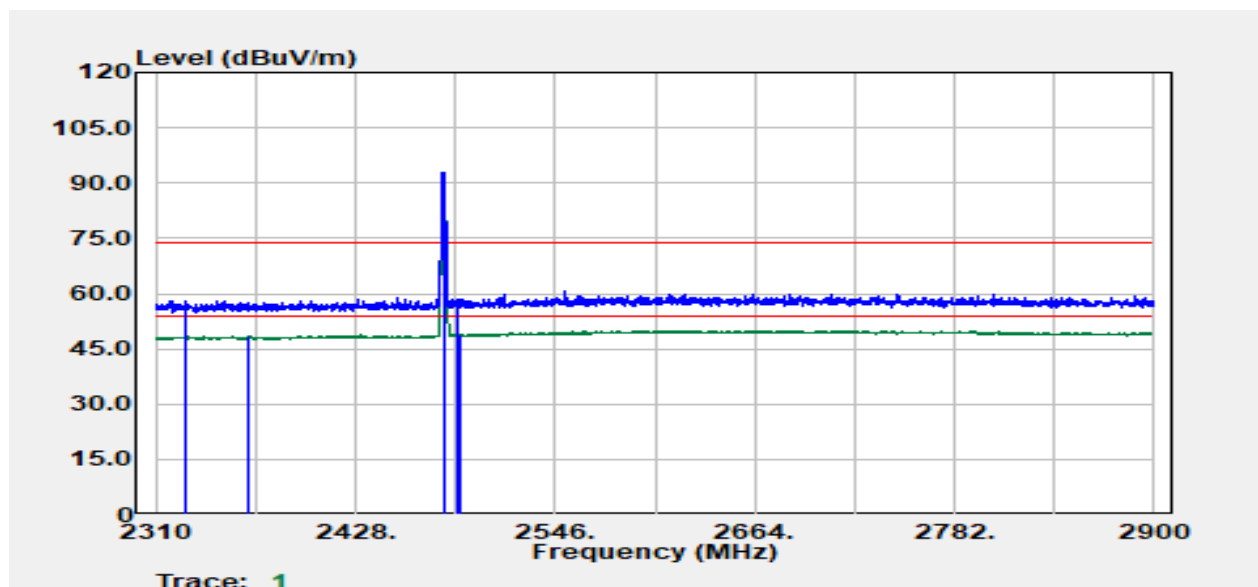
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2310.25      | Peak                         | 26.20                          | 32.03        | 58.23                  | 74.00           | -15.77       |
| 2348.95      | Average                      | 16.44                          | 32.06        | 48.50                  | 54.00           | -5.50        |
| 2402.00      | Peak                         | 67.63                          | 32.12        | 99.75                  | --              | --           |
| 2402.00      | Average                      | 67.33                          | 32.12        | 99.45                  | --              | --           |
| 2490.77      | Average                      | 16.40                          | 32.50        | 48.90                  | 54.00           | -5.10        |
| 2499.51      | Peak                         | 26.10                          | 32.51        | 58.61                  | 74.00           | -15.39       |

Report No.: TMWK2405001737KR

Page: 37 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2480 MHz  
Operation Mode :Bandedge  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :VERTICAL  
Engineer :Tony Chao  
Test Chamber : 966A



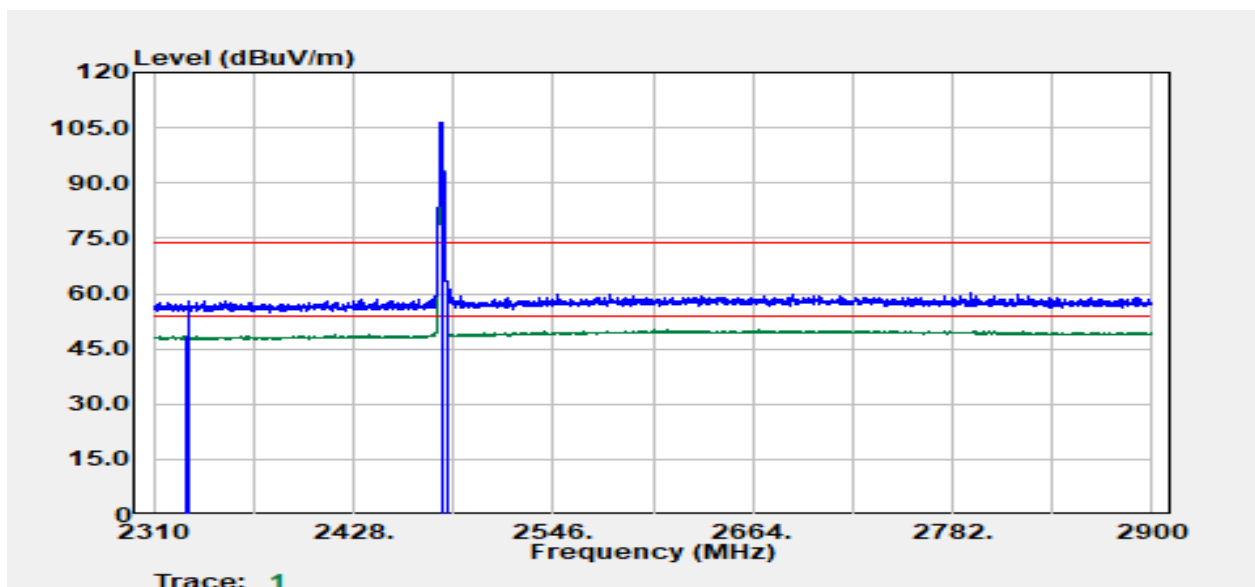
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2327.48      | Peak                         | 26.09                          | 32.05        | 58.14                  | 74.00           | -15.86       |
| 2365.18      | Average                      | 16.43                          | 32.03        | 48.46                  | 54.00           | -5.54        |
| 2480.00      | Peak                         | 60.55                          | 32.39        | 92.94                  | --              | --           |
| 2480.00      | Average                      | 60.23                          | 32.39        | 92.62                  | --              | --           |
| 2488.02      | Peak                         | 26.06                          | 32.48        | 58.54                  | 74.00           | -15.46       |
| 2490.27      | Average                      | 16.47                          | 32.50        | 48.98                  | 54.00           | -5.02        |

Report No.: TMWK2405001737KR

Page: 38 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2480 MHz  
Operation Mode :Bandedge  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :HORIZONTAL  
Engineer :Tony Chao  
Test Chamber : 966A

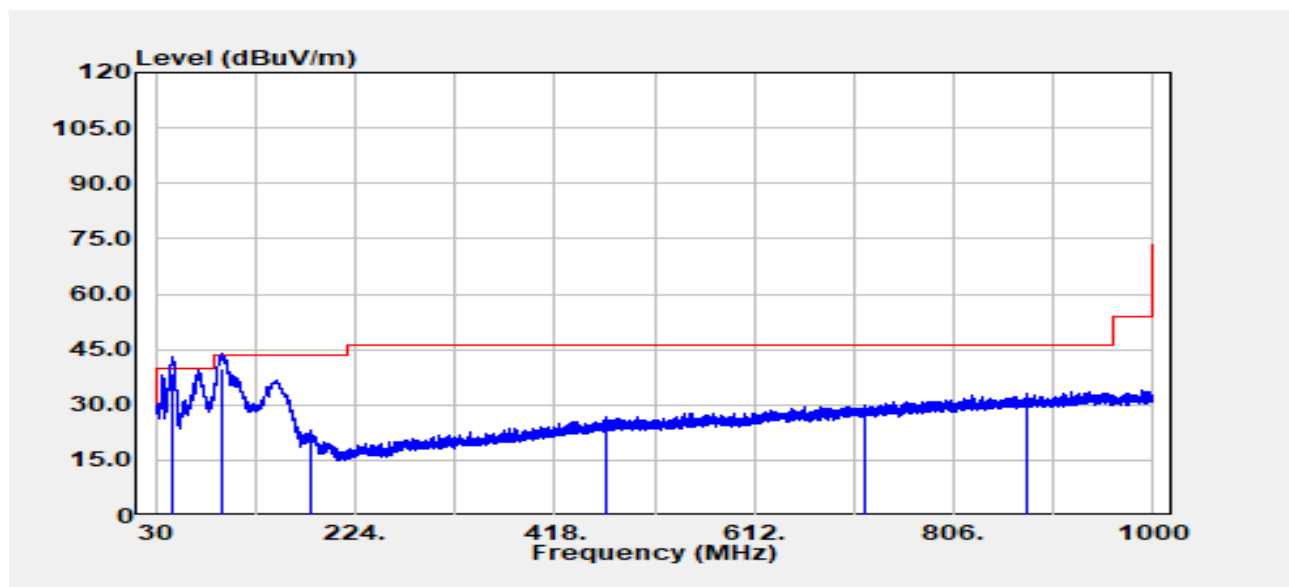


| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2328.98      | Average                      | 16.36                          | 32.05        | 48.41                  | 54.00           | -5.59        |
| 2330.22      | Peak                         | 25.98                          | 32.05        | 58.03                  | 74.00           | -15.97       |
| 2480.00      | Peak                         | 74.13                          | 32.39        | 106.52                 | --              | --           |
| 2480.00      | Average                      | 73.82                          | 32.39        | 106.21                 | --              | --           |
| 2483.53      | Average                      | 20.21                          | 32.43        | 52.64                  | 54.00           | -1.36        |
| 2483.78      | Peak                         | 29.22                          | 32.43        | 61.66                  | 74.00           | -12.34       |

Report No.: TMWK2405001737KR

Page: 39 / 50  
Rev.: 02

|                |                 |              |             |
|----------------|-----------------|--------------|-------------|
| Project No     | :TM-2405000018P | Test Date    | :2024-05-20 |
| Operation Band | :BLE 1M         | Temp./Humi.  | :24.6/57    |
| Frequency      | :2480 MHz       | Antenna Pol. | :VERTICAL   |
| Operation Mode | :TX             | Engineer     | :Ray Li     |
| EUT Pol        | :E2             | Test Chamber | : 966A      |
| Setting        | :               |              |             |



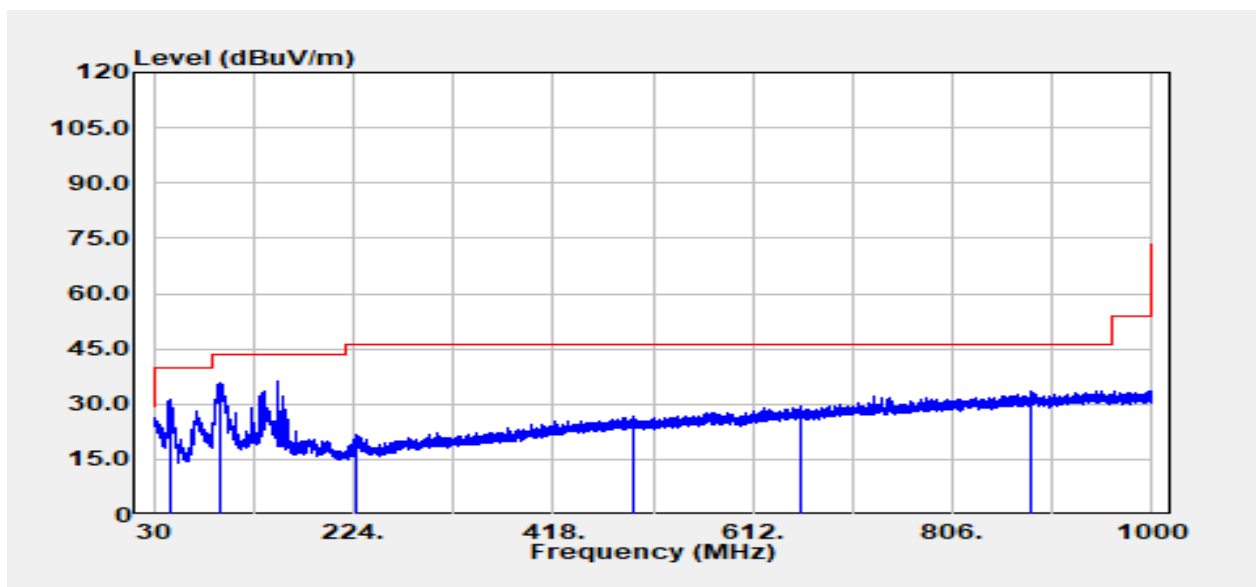
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 46.01        | QP                           | 51.74                          | -13.27       | 38.47                  | 40.00           | -1.53        |
| 93.50        | QP                           | 54.41                          | -14.43       | 39.98                  | 43.50           | -3.52        |
| 179.99       | Peak                         | 34.65                          | -11.40       | 23.25                  | 43.50           | -20.25       |
| 467.23       | Peak                         | 30.77                          | -3.90        | 26.87                  | 46.00           | -19.13       |
| 720.16       | Peak                         | 29.38                          | 0.36         | 29.74                  | 46.00           | -16.26       |
| 878.02       | Peak                         | 30.62                          | 2.56         | 33.17                  | 46.00           | -12.83       |

Report No.: TMWK2405001737KR

Page: 40 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2480 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-20  
Temp./Humi. :24.6/57  
Antenna Pol. :HORIZONTAL  
Engineer :Ray Li  
Test Chamber : 966A



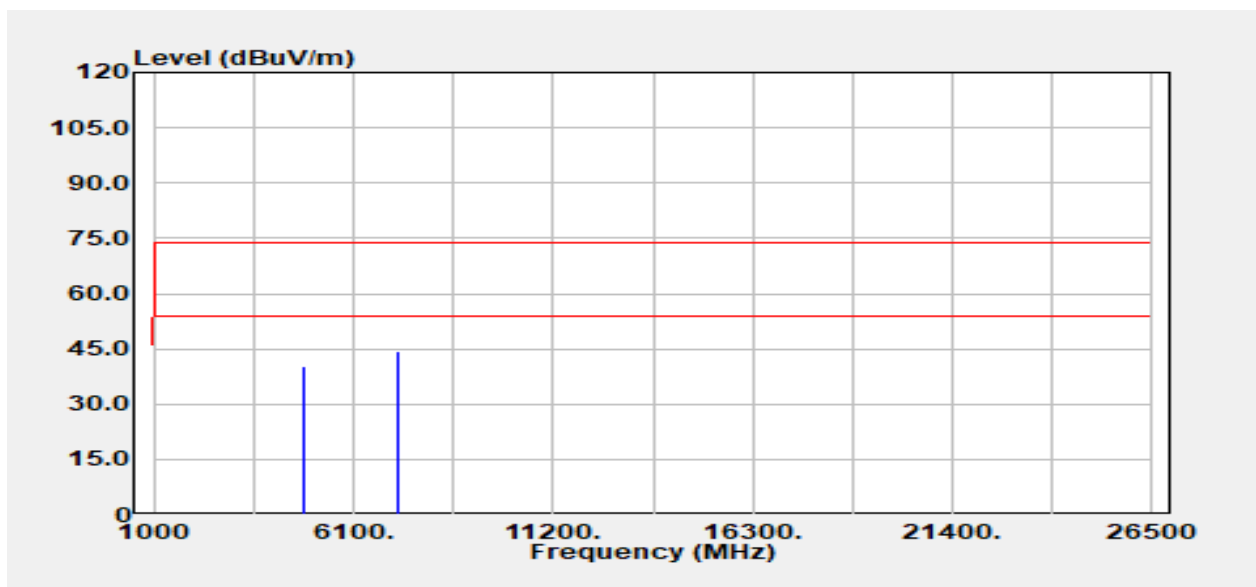
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 45.16        | Peak                         | 44.14                          | -12.94       | 31.20                  | 40.00           | -8.80        |
| 93.66        | Peak                         | 50.34                          | -14.44       | 35.89                  | 43.50           | -7.61        |
| 226.30       | Peak                         | 33.33                          | -11.51       | 21.82                  | 46.00           | -24.18       |
| 496.45       | Peak                         | 30.32                          | -3.43        | 26.89                  | 46.00           | -19.11       |
| 657.71       | Peak                         | 30.01                          | -0.60        | 29.41                  | 46.00           | -16.59       |
| 881.18       | Peak                         | 30.92                          | 2.57         | 33.49                  | 46.00           | -12.51       |

Report No.: TMWK2405001737KR

Page: 41 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2402 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Vertical  
Engineer :Ray Li  
Test Chamber : 966A



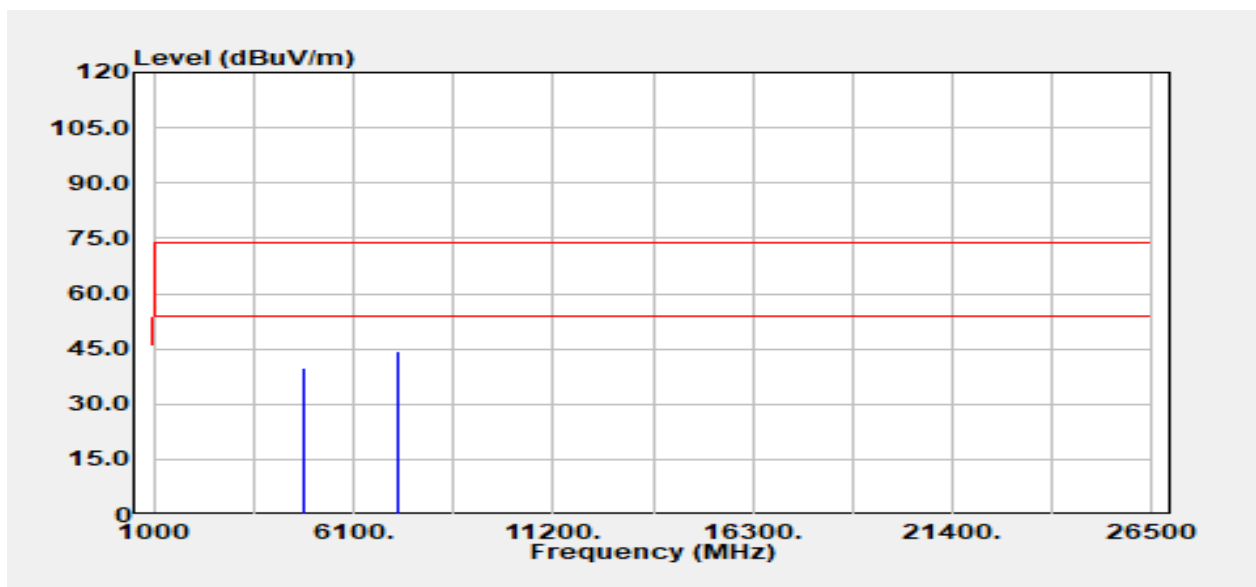
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4804.00      | Peak                         | 37.87                          | 2.23         | 40.09                  | 74.00           | -33.91       |
| 4804.00      | Average                      | 30.15                          | 2.23         | 32.38                  | 54.00           | -21.62       |
| 7206.00      | Peak                         | 35.50                          | 9.01         | 44.51                  | 74.00           | -29.49       |
| 7206.00      | Average                      | 26.92                          | 9.01         | 35.93                  | 54.00           | -18.07       |

Report No.: TMWK2405001737KR

Page: 42 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2402 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Horizontal  
Engineer :Ray Li  
Test Chamber : 966A



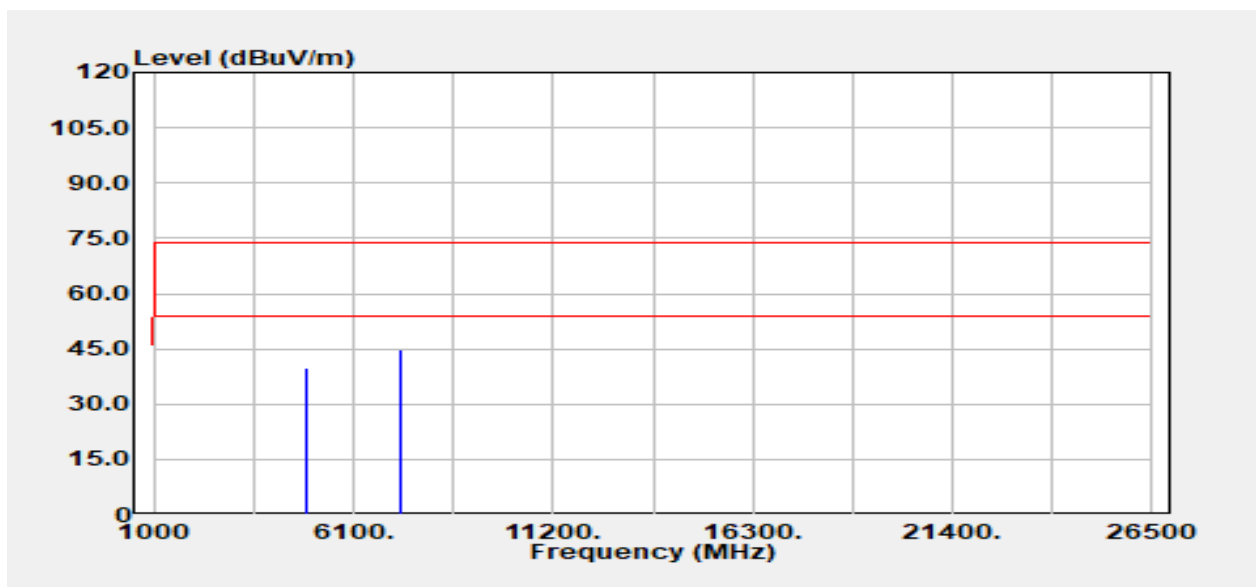
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4804.00      | Peak                         | 37.64                          | 2.23         | 39.87                  | 74.00           | -34.13       |
| 4804.00      | Average                      | 29.06                          | 2.23         | 31.28                  | 54.00           | -22.72       |
| 7206.00      | Peak                         | 35.37                          | 9.01         | 44.38                  | 74.00           | -29.62       |
| 7206.00      | Average                      | 27.10                          | 9.01         | 36.11                  | 54.00           | -17.89       |

Report No.: TMWK2405001737KR

Page: 43 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2442 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Vertical  
Engineer :Ray Li  
Test Chamber : 966A



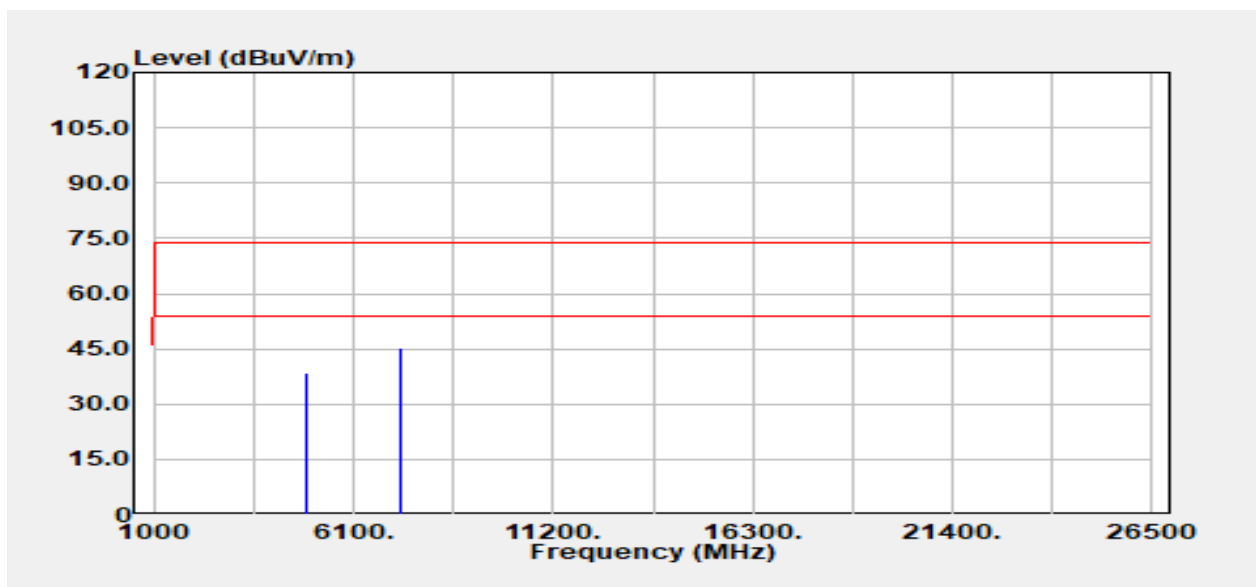
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4884.00      | Peak                         | 37.31                          | 2.58         | 39.90                  | 74.00           | -34.10       |
| 4884.00      | Average                      | 27.85                          | 2.58         | 30.43                  | 54.00           | -23.57       |
| 7326.00      | Peak                         | 36.10                          | 8.95         | 45.06                  | 74.00           | -28.94       |
| 7326.00      | Average                      | 27.07                          | 8.95         | 36.03                  | 54.00           | -17.97       |

Report No.: TMWK2405001737KR

Page: 44 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2442 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Horizontal  
Engineer :Ray Li  
Test Chamber : 966A



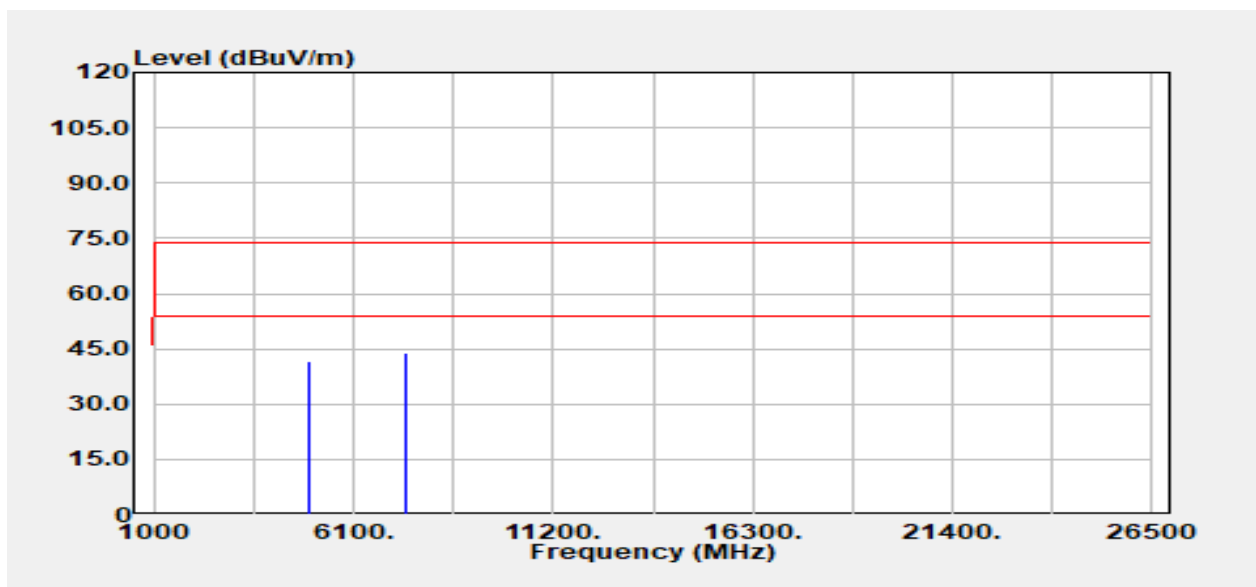
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4884.00      | Peak                         | 35.77                          | 2.58         | 38.35                  | 74.00           | -35.65       |
| 4884.00      | Average                      | 27.84                          | 2.58         | 30.43                  | 54.00           | -23.57       |
| 7326.00      | Peak                         | 36.27                          | 8.95         | 45.23                  | 74.00           | -28.77       |
| 7326.00      | Average                      | 27.17                          | 8.95         | 36.13                  | 54.00           | -17.87       |

Report No.: TMWK2405001737KR

Page: 45 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2480 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Vertical  
Engineer :Ray Li  
Test Chamber : 966A



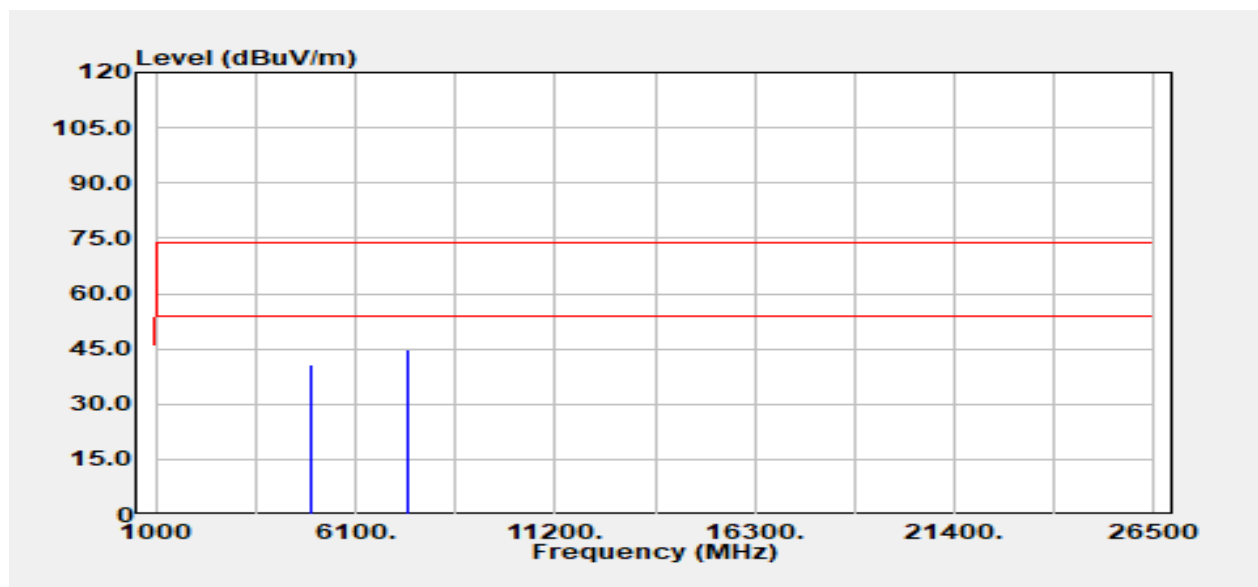
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4960.00      | Peak                         | 38.39                          | 3.21         | 41.60                  | 74.00           | -32.40       |
| 4960.00      | Average                      | 28.33                          | 3.21         | 31.54                  | 54.00           | -22.46       |
| 7440.00      | Peak                         | 34.80                          | 8.92         | 43.72                  | 74.00           | -30.28       |
| 7440.00      | Average                      | 27.17                          | 8.92         | 36.09                  | 54.00           | -17.91       |

Report No.: TMWK2405001737KR

Page: 46 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :BLE 1M  
Frequency :2480 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :

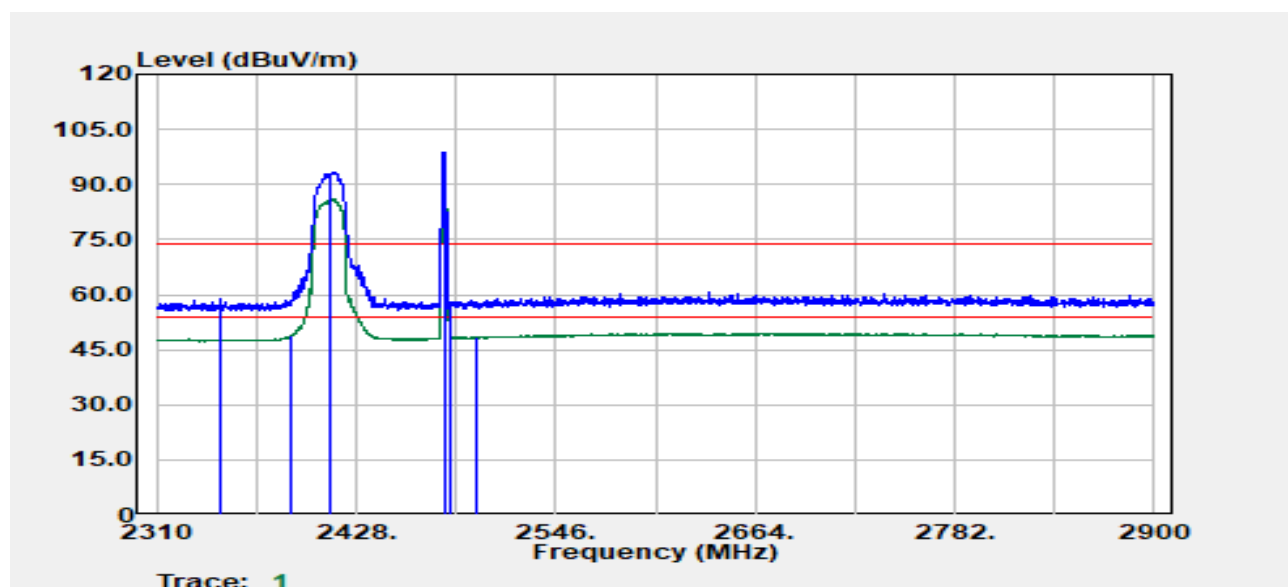
Test Date :2024-05-16  
Temp./Humi. :24.6/57  
Antenna Pol. :Horizontal  
Engineer :Ray Li  
Test Chamber : 966A



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4960.00      | Peak                         | 37.57                          | 3.21         | 40.79                  | 74.00           | -33.21       |
| 4960.00      | Average                      | 28.70                          | 3.21         | 31.91                  | 54.00           | -22.09       |
| 7440.00      | Peak                         | 36.01                          | 8.92         | 44.93                  | 74.00           | -29.07       |
| 7440.00      | Average                      | 27.37                          | 8.92         | 36.29                  | 54.00           | -17.71       |

## Co-location

|                |                   |              |             |
|----------------|-------------------|--------------|-------------|
| Project No     | :TM-2405000018P   | Test Date    | :2024-05-20 |
| Operation Band | :802.11n20_BLE 1M | Temp./Humi.  | :24.5/57    |
| Frequency      | :2412_2480 MHz    | Antenna Pol. | :VERTICAL   |
| Operation Mode | :Bandedge         | Engineer     | :Tony Chao  |
| EUT Pol        | :E2               | Test Chamber | : 966A      |
| Setting        | :15_default       |              |             |



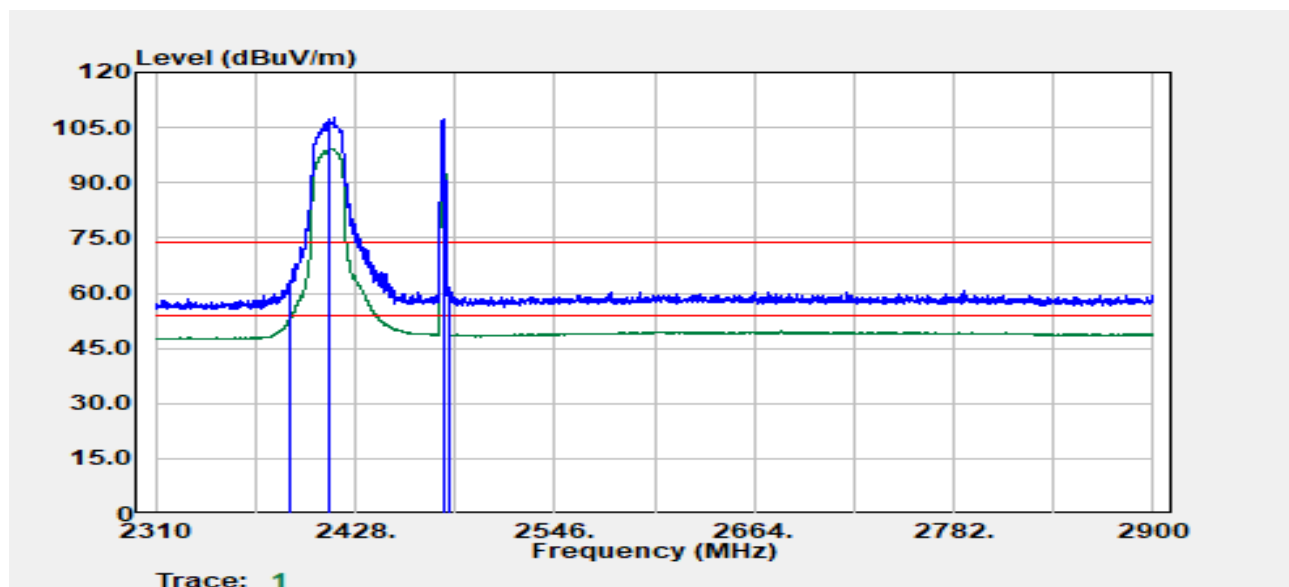
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2347.41      | Peak                         | 52.57                          | 6.21         | 58.78                  | 74.00           | -15.22       |
| 2389.77      | Average                      | 42.48                          | 6.28         | 48.75                  | 54.00           | -5.25        |
| 2412.00      | Peak                         | 90.09                          | 6.31         | 96.39                  | --              | --           |
| 2412.00      | Average                      | 82.63                          | 6.31         | 88.94                  | --              | --           |
| 2480.00      | Peak                         | 91.83                          | 6.67         | 98.50                  | --              | --           |
| 2480.00      | Average                      | 91.48                          | 6.67         | 98.14                  | --              | --           |
| 2483.50      | Peak                         | 51.69                          | 6.71         | 58.40                  | 74.00           | -15.60       |
| 2499.27      | Average                      | 41.51                          | 6.84         | 48.35                  | 54.00           | -5.65        |

Report No.: TMWK2405001737KR

Page: 48 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :802.11n20\_BLE 1M  
Frequency :2412\_2480 MHz  
Operation Mode :Bandedge  
EUT Pol :E2  
Setting :15\_default

Test Date :2024-05-20  
Temp./Humi. :24.5/57  
Antenna Pol. :HORIZONTAL  
Engineer :Tony Chao  
Test Chamber : 966A



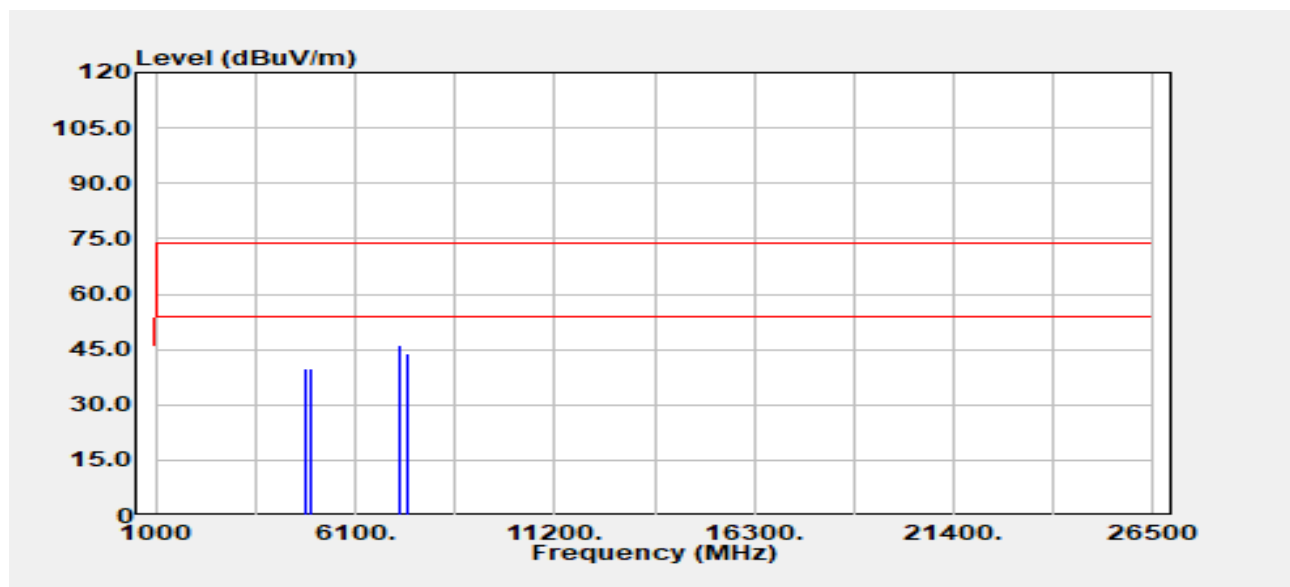
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 2390.00      | Peak                         | 57.22                          | 6.28         | 63.50                  | 74.00           | -10.50       |
| 2390.00      | Average                      | 47.19                          | 6.28         | 53.47                  | 54.00           | -0.53        |
| 2412.00      | Peak                         | 101.58                         | 6.31         | 107.88                 | --              | --           |
| 2412.00      | Average                      | 92.84                          | 6.31         | 99.15                  | --              | --           |
| 2480.00      | Peak                         | 101.22                         | 6.67         | 107.88                 | --              | --           |
| 2480.00      | Average                      | 99.39                          | 6.67         | 106.06                 | --              | --           |
| 2483.50      | Peak                         | 55.08                          | 6.71         | 61.80                  | 74.00           | -12.20       |
| 2483.50      | Average                      | 43.39                          | 6.71         | 50.11                  | 54.00           | -3.89        |

Report No.: TMWK2405001737KR

Page: 49 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :802.11n20\_BLE 1M  
Frequency :2412\_2480 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :15\_default

Test Date :2024-05-20  
Temp./Humi. :24.5/57  
Antenna Pol. :VERTICAL  
Engineer :Tony Chao  
Test Chamber : 966A



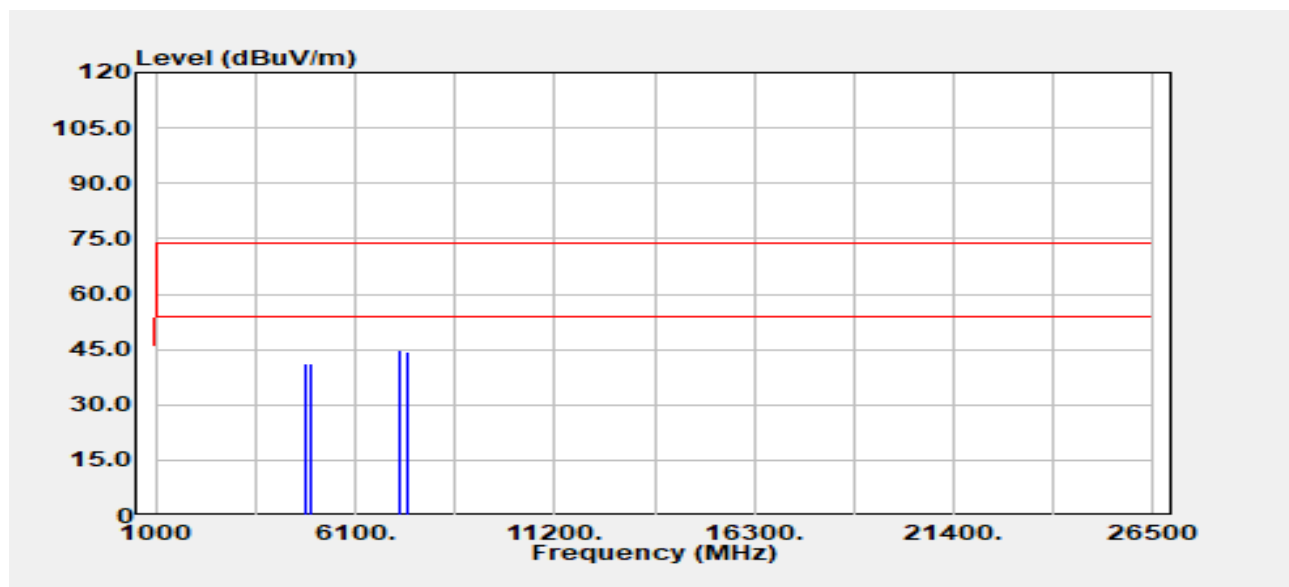
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4824.00      | Peak                         | 37.80                          | 2.25         | 40.05                  | 74.00           | -33.95       |
| 4824.00      | Average                      | 28.19                          | 2.25         | 30.44                  | 54.00           | -23.56       |
| 4960.00      | Peak                         | 36.76                          | 3.21         | 39.97                  | 74.00           | -34.03       |
| 4960.00      | Average                      | 27.59                          | 3.21         | 30.80                  | 54.00           | -23.20       |
| 7236.00      | Peak                         | 37.20                          | 9.17         | 46.36                  | 74.00           | -27.64       |
| 7236.00      | Average                      | 26.47                          | 9.17         | 35.64                  | 54.00           | -18.36       |
| 7440.00      | Peak                         | 34.85                          | 8.92         | 43.77                  | 74.00           | -30.23       |
| 7440.00      | Average                      | 28.26                          | 8.92         | 37.18                  | 54.00           | -16.82       |

Report No.: TMWK2405001737KR

Page: 50 / 50  
Rev.: 02

Project No :TM-2405000018P  
Operation Band :802.11n20\_BLE 1M  
Frequency :2412\_2480 MHz  
Operation Mode :TX  
EUT Pol :E2  
Setting :15\_default

Test Date :2024-05-20  
Temp./Humi. :24.5/57  
Antenna Pol. :HORIZONTAL  
Engineer :Tony Chao  
Test Chamber : 966A



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 4824.00      | Peak                         | 38.83                          | 2.25         | 41.08                  | 74.00           | -32.92       |
| 4824.00      | Average                      | 28.72                          | 2.25         | 30.97                  | 54.00           | -23.03       |
| 4960.00      | Peak                         | 38.04                          | 3.21         | 41.26                  | 74.00           | -32.74       |
| 4960.00      | Average                      | 28.37                          | 3.21         | 31.58                  | 54.00           | -22.42       |
| 7236.00      | Peak                         | 35.87                          | 9.17         | 45.03                  | 74.00           | -28.97       |
| 7236.00      | Average                      | 27.54                          | 9.17         | 36.71                  | 54.00           | -17.29       |
| 7440.00      | Peak                         | 35.61                          | 8.92         | 44.53                  | 74.00           | -29.47       |
| 7440.00      | Average                      | 28.63                          | 8.92         | 37.55                  | 54.00           | -16.45       |

**- End of Test Report -**