



# RF TEST REPORT

**Report No.:** 20231217G17421X-W2

**Product Name:** UAM057

**Main Model No.:** UAM057

**FCC ID:** 2A68EJX-UAM057

**Applicant:** Shenzhen Uascent Technology Co.,Ltd

**Address:** 7th Floor, Building A2, Chuangzhiyuncheng, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen

**Dates of Testing:** 12/14/2023 - 01/04/2024

**Issued by:** CCIC Southern Testing Co., Ltd.

**Lab Location:** Electronic Testing Building, No. 43 Shahe Road, Xili Street, Nanshan District, Shenzhen, Guangdong, China.

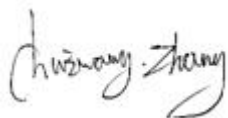
**Tel:** 86 755 26627338      **Fax:** 86 755 26627238

This test report consists of 35 pages in total. It may be duplicated completely for legal use with the approval of the applicant. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product endorsement by CCIC-SET. The test results in the report only apply to the tested sample. The test report shall be invalid without all the signatures of testing engineers, reviewer and approver. Any objections must be raised to CCIC-SET within 15 days since the date when the report is received. It will not be taken into consideration beyond this limit.



## Test Report

**Product**.....: UAM057  
**Brand Name**.....: Uascent  
**Trade Name** .....: Uascent  
**Applicant**.....: Shenzhen Uascent Technology Co.,Ltd  
**Applicant Address**.....: 7th Floor, Building A2, Chuangzhiyuncheng, Liuxian Avenue, Xili Community, Xili Street, Nanshan District, Shenzhen  
**Manufacturer**.....: ShengXianZhiKongCo.,Ltd  
**Manufacturer Address**.....: Room 804, one of No.9 Yucheng Road, Chang'an Town, Dongguan City, Guangdong Province  
**Test Standards**.....: 47 CFR Part 15 Subpart C 15.247  
ANSI C63.10-2013  
**Test Result**.....: Pass

**Tested by** .....:  2024.01.04

Chuiwang Zhang, Test Engineer

**Reviewed by**.....:  2024.01.04

Chris You, Senior Engineer

**Approved by**.....:  2024.01.04

Yang Fan, Manager

## TABLE OF CONTENTS

|                                                        |           |
|--------------------------------------------------------|-----------|
| <b>TABLE OF CONTENTS .....</b>                         | <b>3</b>  |
| <b>1. GENERAL INFORMATION .....</b>                    | <b>5</b>  |
| 1.1. EUT Description .....                             | 5         |
| 1.2. Test Standards and Results .....                  | 6         |
| 1.3. Table for Supporting Units .....                  | 7         |
| 1.4. EUT Operation Test Setup .....                    | 7         |
| 1.5. Test environment and mode .....                   | 7         |
| 1.6. Laboratory Facilities .....                       | 8         |
| <b>2. TEST REQUIREMENTS .....</b>                      | <b>9</b>  |
| 2.1. Antenna requirement .....                         | 9         |
| 2.2. Maximum Conducted Output Power .....              | 10        |
| 2.3. 6dB and 99% Bandwidth .....                       | 12        |
| 2.4. Power spectral density (PSD) .....                | 14        |
| 2.5. Conducted Band Edges and Spurious Emissions ..... | 16        |
| 2.6. Radiated Band Edge and Spurious Emission .....    | 18        |
| 2.7. AC Power Line Conducted Emission .....            | 26        |
| <b>3. LIST OF MEASURING EQUIPMENT .....</b>            | <b>28</b> |
| <b>4. UNCERTAINTY OF EVALUATION .....</b>              | <b>29</b> |
| <b>APPENDIX A .....</b>                                | <b>30</b> |



| Change History |            |                   |
|----------------|------------|-------------------|
| Issue          | Date       | Reason for change |
| 1.0            | 2024.01.04 | First edition     |
|                |            |                   |

## 1. General Information

### 1.1. EUT Description

|                                 |                   |
|---------------------------------|-------------------|
| Product Name                    | UAM057            |
| EUT supports Radios application | Bluetooth LE V5.2 |
| Frequency Range                 | 2402MHz~2480MHz   |
| Channel Number                  | 40                |
| Bit Rate of Transmitter         | 1Mbps             |
| Modulation Type                 | GFSK              |
| Antenna Type                    | PCB Antenna       |
| Antenna Gain                    | -1.3dBi           |
| Power supply                    | DC 3.3V           |

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.

Note 2: The EUT was programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.

Note 3: The information of antenna gain and cable loss is provided by the manufacturer and our lab is not responsible for the accuracy of the antenna gain and cable loss information.

## 1.2. Test Standards and Results

The purpose of the report is to conduct testing according to the following FCC certification standards:

| No. | Identity                                         | Document Title                                                                                                                                                                            |
|-----|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 47 CFR Part 15<br>Subpart C                      | Radio Frequency Devices                                                                                                                                                                   |
| 2   | ANSI C63.10-2013                                 | American National Standard for Testing Unlicensed Wireless Devices                                                                                                                        |
| 3   | KDB 558074 D01<br>15.247 Meas<br>Guidance v05r02 | Cuidance for Compliance Measurement on Digital Transmission Systems, Frequency Hopping Spread Spectrum Systems, and Hybrid System Devices Operating under Section 15.247 of the FCC Rules |

Test detailed items/section required by FCC rules and results are as below:

| No. | Section in CFR 47             | Description                                | Result                |
|-----|-------------------------------|--------------------------------------------|-----------------------|
| 1   | 15.203<br>15.247(c)           | Antenna Requirement                        | PASS                  |
| 2   | 15.247(b)(3)                  | Peak Conducted Output Power                | PASS                  |
| 3   | 15.247(a)(2)                  | 6dB and 99% Bandwidth                      | PASS                  |
| 4   | 15.247(d)                     | Conducted Band Edges and Spurious Emission | PASS                  |
| 5   | 15.247(e)                     | Power spectral density (PSD)               | PASS                  |
| 6   | 15.207                        | AC Power Line Conducted Emission           | N/A <sup>Note 3</sup> |
| 7   | 15.209<br>15.205<br>15.247(d) | Radiated Band Edges and Spurious Emission  | PASS                  |

Note 1: The tests of Conducted Emission and Radiated Emission were performed according to the method of measurements prescribed in ANSI C63.10-2013.

Note 2: These RF tests were performed according to the method of measurements prescribed in KDB 558074 D01 15.247 Meas Guidance v05r02.

Note 3: Not applicable, the EUT is powered from a 3V DC supply.

40 channels are provided for Bluetooth LE.

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

Note: Channel 0, 19 & 39 selected for GFSK.

| Test Items                                                                                                                                  | Modulation Type | Data Rate | Channel |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------|---------|
| Peak Conducted Output Power<br>Power Spectral Density<br>6dB and 99% Bandwidth<br>Conducted Spurious Emission<br>Radiated Spurious Emission | GFSK            | 1Mbps     | 0/19/39 |
| Band Edge                                                                                                                                   | GFSK            | 1Mbps     | 0/39    |

### 1.3. Table for Supporting Units

| No. | Equipment | Brand Name | Model Name | Manufacturer | Serial No. | Note    |
|-----|-----------|------------|------------|--------------|------------|---------|
| 1   | Laptop    | HP         | TPN-Q221   | HP           | 5CD14347QB | FCC DOC |

### 1.4. EUT Operation Test Setup

For RF test items, an engineering test program was provided and enable to make EUT transmitting.

### 1.5. Test environment and mode

During the measurement, the environmental conditions were within the listed ranges:

| Operating Environment          |                                                         |
|--------------------------------|---------------------------------------------------------|
| Temperature                    | 15°C - 35°C                                             |
| Humidity                       | 30% -60%                                                |
| Atmospheric Pressure           | 86kPa-106kPa                                            |
| Test mode:                     |                                                         |
| Continuously transmitting mode | Keep the EUT in continuous transmitting with modulation |

## **1.6. Laboratory Facilities**

### **FCC-Registration No.: 406086**

CCIC Southern Testing Co., Ltd EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. Designation Number: CN1283, valid time is until Jun. 30th, 2025.

### **ISED Registration: 11185A**

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A on Aug. 04, 2016, valid time is until Jun. 30th, 2025.

### **CAB number: CN0064**

### **A2LA Code: 5721.01**

CCIC-SET is a third party testing organization accredited by A2LA according to ISO/IEC 17025. The accreditation certificate number is 5721.01.



## 2. Test Requirements

### 2.1. Antenna requirement

#### 2.1.1. Applicable Standard

According to FCC 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

And according to FCC 47 CFR Section 15.247(c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

#### 2.1.2. Antenna Information

**Antenna Category:** PCB Antenna

A internal Antenna was soldered to the antenna port of EUT via an adaptor cable, can't be removed.

**Antenna General Information:**

| No. | EUT    | Operating frequency range | Ant. Type | Ant. Gain |
|-----|--------|---------------------------|-----------|-----------|
| 1   | UAM057 | 2402-2480MHz              | PCB       | -1.3 dBi  |

#### 2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

## 2.2. Maximum Conducted Output Power

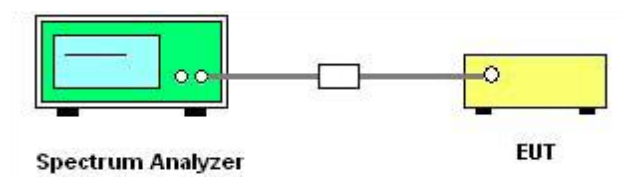
### 2.2.1. Limit of Maximum Conducted Output Power

For DTSSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W.

### 2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.2.3. Test Setup



### 2.2.4. Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 Section 11.9.1.1.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:  
RBW  $\geq$  DTS bandwidth / VBW  $\geq$  3\*RBW / Sweep time: Auto couple / Detector mode: Peak /  
Trace mode: Max hold / Allow trace to fully stabilize / Use peak marker function to determine the peak amplitude level.
5. Record the measurement results in the test report.



### **2.2.5. Test Result of Maximum Conducted Output Power**

Please refer to Appendix A for detail.

## 2.3. 6dB and 99% Bandwidth

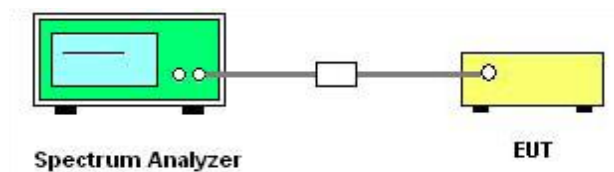
### 2.3.1. Limit of 6dB and 99% Bandwidth

The minimum 6 dB Occupied bandwidth shall be at least 500 kHz.

### 2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.3.3. Test Setup



### 2.3.4. Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 Section 11.8.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the spectrum analyzer “Channel Bandwidth” function to easurement the 6dB EBW and 99% OBW.
5. For 6dB EBW Use the following spectrum analyzer settings:  
RBW: 100kHz / VBW: 300kHz / Detector: Peak / Trace mode: Max hold / Sweep time: Auto couple / Allow trace to fully stabilize.
6. For 99% OBW Use the following spectrum analyzer settings:  
Set RBW = approximately 1% EBW or 1.5 times to 5.0 times the OBW,  $VBW \geq 3 \times RBW$ .
7. Record the measurement results in the test report.



### **2.3.5. Test Results of 6dB and 99% Bandwidth**

Please refer to Appendix A for detail.

## 2.4. Power spectral density (PSD)

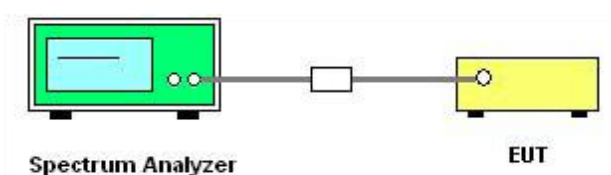
### 2.4.1. Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

### 2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.4.3. Test Setup



### 2.4.4. Test Procedures

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 Section 11.10.2.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:

Set instrument center frequency to DTS channel center frequency / Set the span to 1.5 times the DTS bandwidth / RBW: 3kHz / VBW: 10kHz / Detector: Peak / Sweep time: Auto couple / Trace mode: Max hold / Allow trace to fully stabilize / Use the peak marker function to determine the maximum power level.

5. Record the measurement results in the test report.



#### **2.4.5. Test Results of Power spectral density**

Please refer to Appendix A for detail.

## 2.5. Conducted Band Edges and Spurious Emissions

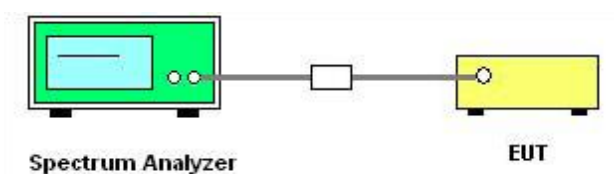
### 2.5.1. Limit of Conducted Band Edges and Spurious Emissions

In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that.

### 2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.5.3. Test Setup



### 2.5.4. Test Procedure

1. The testing follows the Measurement Procedure of ANSI C63.10-2013 Section 11.11 and 11.13.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set to the maximum power setting and enable the EUT transmit continuously.
4. Use the following spectrum analyzer settings:

Reference level measurement: Set spectrum analyzer center frequency to DTS channel center frequency / Set the span to  $\geq 1.5$  times the DTS bandwidth / RBW: 100kHz / VBW: 300kHz / Detector: Peak / Sweep time: Auto couple / Trace mode: Max hold / Allow trace to fully stabilize / Use the peak marker function to determine the maximum PSD level and attenuate it by 20dB.

Emission level measurement: Set the center frequency and span to encompass frequency range to be measured / RBW: 100kHz / VBW: 300kHz / Detector: Peak / Sweep time: Auto couple / Trace mode: Max hold / Allow trace to fully stabilize / Use the peak marker function to determine the maximum amplitude level.

5. Record the measurement results in the test report.





### **2.5.5. Test Results of Conducted Band Edges and Spurious Emissions**

Please refer to Appendix A for detail.

## 2.6. Radiated Band Edge and Spurious Emission

### 2.6.1. Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level. If the transmitter uses an RMS average conducted power limit, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions 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).

§15.209(a) Radiated emission limits:

| Frequency (MHz) | Field Strength ( $\mu\text{V/m}$ ) | Measurement Distance (m) |
|-----------------|------------------------------------|--------------------------|
| 0.009 - 0.490   | 2400/F(kHz)                        | 300                      |
| 0.490 - 1.705   | 24000/F(kHz)                       | 30                       |
| 1.705 - 30.0    | 30                                 | 30                       |
| 30 - 88         | 100                                | 3                        |
| 88 - 216        | 150                                | 3                        |
| 216 - 960       | 200                                | 3                        |
| Above 960       | 500                                | 3                        |

Restricted bands of operation refer to §15.205 (a):

| MHz                      | MHz                 | MHz           | GHz              |
|--------------------------|---------------------|---------------|------------------|
| 0.090-0.110              | 16.42-16.423        | 399.9-410     | 4.5-5.15         |
| <sup>1</sup> 0.495-0.505 | 16.69475-16.69525   | 608-614       | 5.35-5.46        |
| 2.1735-2.1905            | 16.80425-16.80475   | 960-1240      | 7.25-7.75        |
| 4.125-4.128              | 25.5-25.67          | 1300-1427     | 8.025-8.5        |
| 4.17725-4.17775          | 37.5-38.25          | 1435-1626.5   | 9.0-9.2          |
| 4.20725-4.20775          | 73-74.6             | 1645.5-1646.5 | 9.3-9.5          |
| 6.215-6.218              | 74.8-75.2           | 1660-1710     | 10.6-12.7        |
| 6.26775-6.26825          | 108-121.94          | 1718.8-1722.2 | 13.25-13.4       |
| 6.31175-6.31225          | 123-138             | 2200-2300     | 14.47-14.5       |
| 8.291-8.294              | 149.9-150.05        | 2310-2390     | 15.35-16.2       |
| 8.362-8.366              | 156.52475-156.52525 | 2483.5-2500   | 17.7-21.4        |
| 8.37625-8.38675          | 156.7-156.9         | 2690-2900     | 22.01-23.12      |
| 8.41425-8.41475          | 162.0125-167.17     | 3260-3267     | 23.6-24.0        |
| 12.29-12.293             | 167.72-173.2        | 3332-3339     | 31.2-31.8        |
| 12.51975-12.52025        | 240-285             | 3345.8-3358   | 36.43-36.5       |
| 12.57675-12.57725        | 322-335.4           | 3600-4400     | ( <sup>2</sup> ) |
| 13.36-13.41              | /                   | /             | /                |

Note: <sup>1</sup>Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

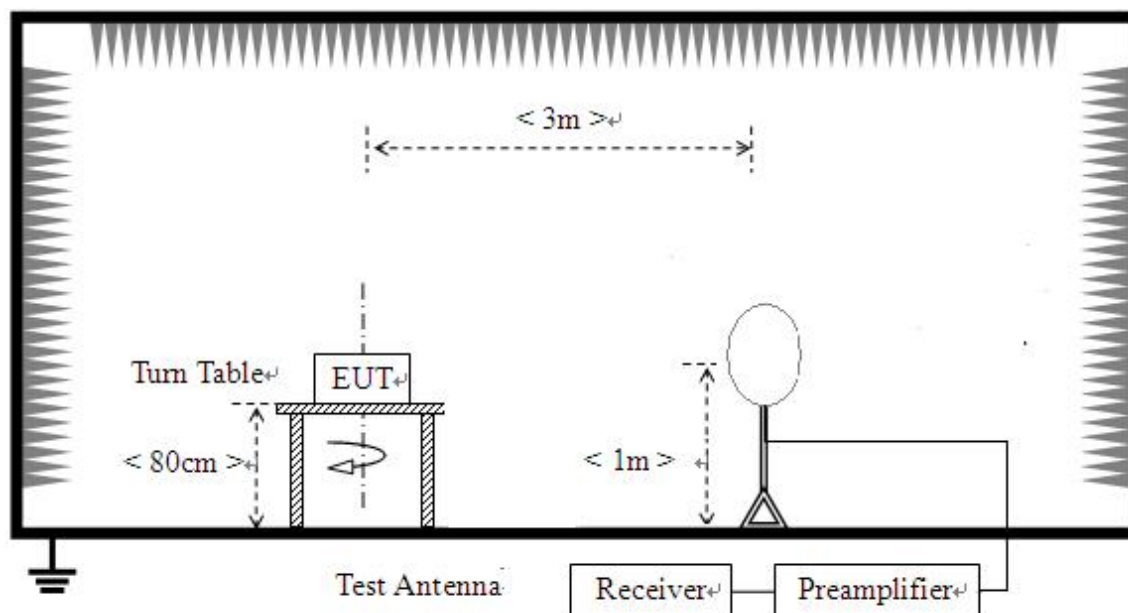
<sup>2</sup>Above 38.6.

## 2.6.2. Measuring Instruments

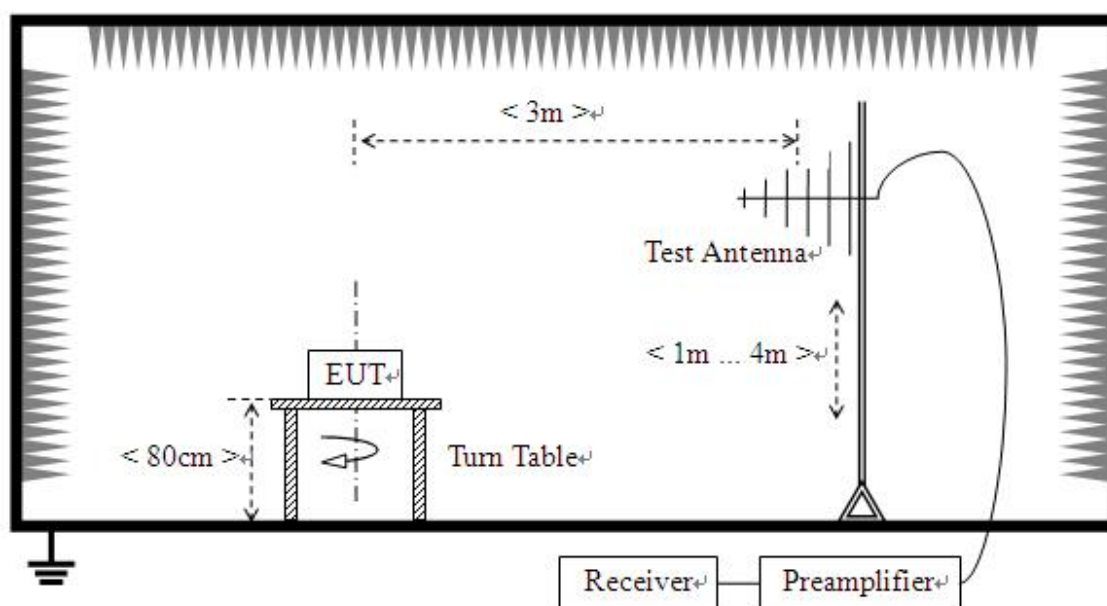
The measuring equipment is listed in the section 3 of this test report.

## 2.6.3. Test Setup

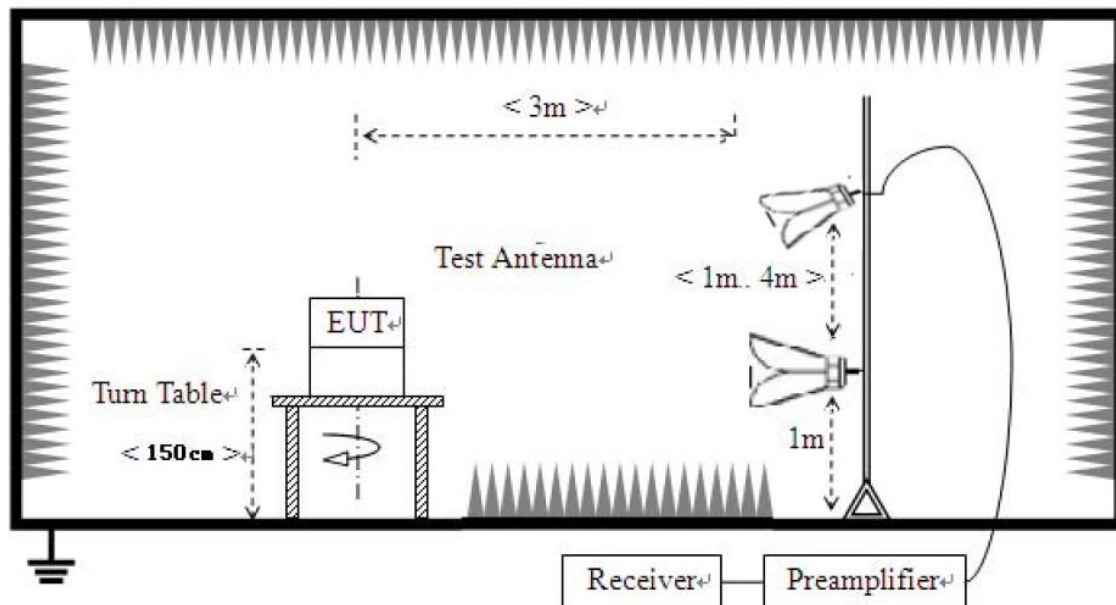
For radiated emissions from 9 kHz to 30 MHz



For radiated emissions from 30MHz to 1GHz



### For radiated emissions above 1GHz



#### 2.6.4. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8m for below 1GHz and 1.5m for above 1GHz above the ground at a 3 meters semi-anechoic chamber.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. Height of receiving antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then

reported in a data sheet.

7. For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle > 98%) for Average detection (AV) at frequency above 1GHz.
4. All radiated emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

#### **2.6.5. Test Results of Radiated Band Edge and Spurious Emission**

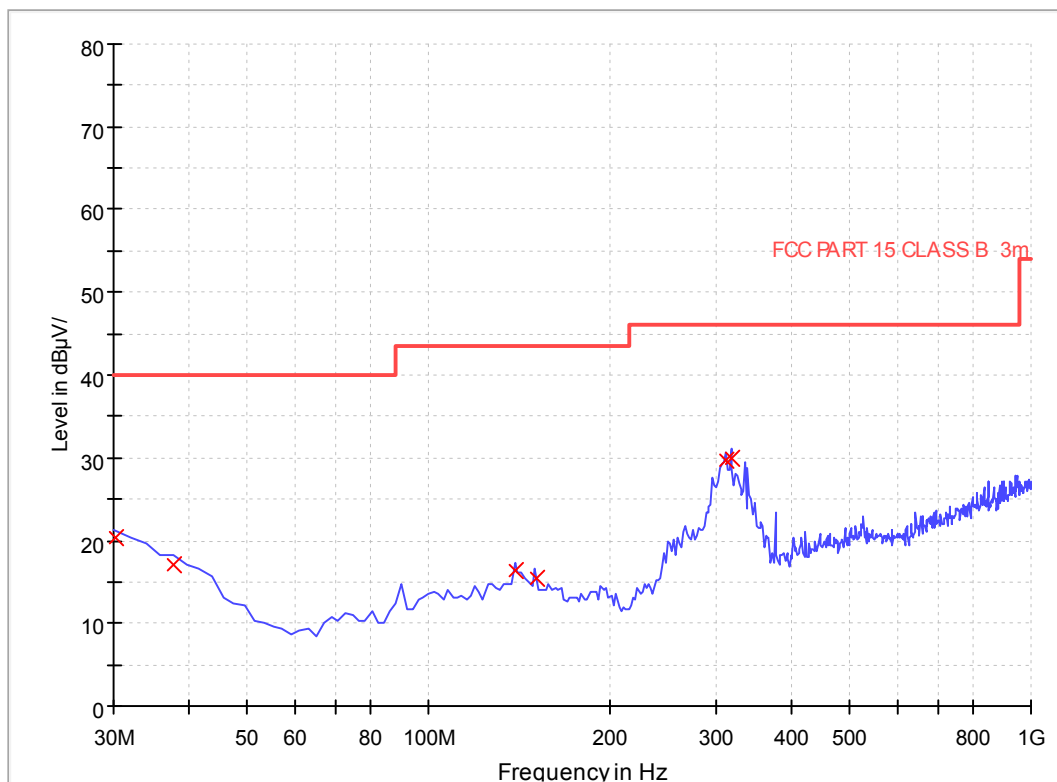
For 9 kHz to 30MHz, The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1GHz, All of the EUT Configure mode were tested and found 2480MHz channel is the worst mode, the worst case is recorded in this report.

### For 30MHz to 1000MHz

|            |                     |              |                            |
|------------|---------------------|--------------|----------------------------|
| Test site: | 3M anechoic chamber | Environment: | Temp: 23℃; Humi:48%;101kPa |
| Operator:  | Deng ShanFei        | Test Date:   | 2024.01.04                 |
| Test Mode: | BLE - TX            | Test Result: | Pass                       |

EMI Sweep-3M(30-1G)



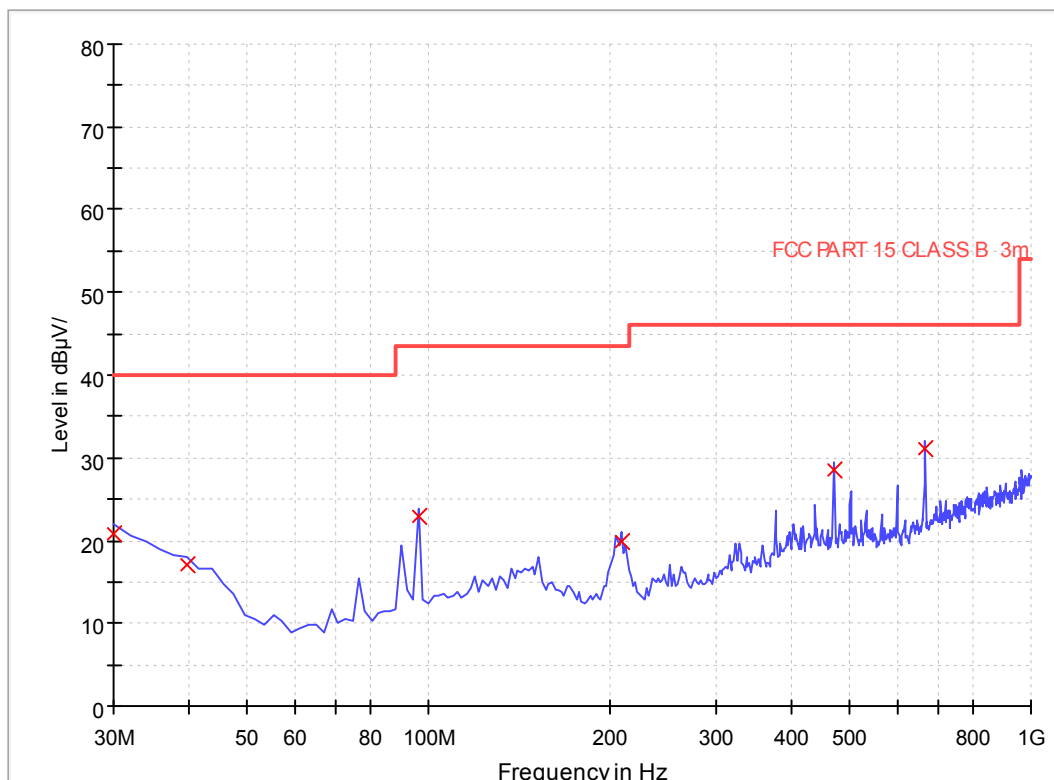
| Frequency (MHz) | QuasiPeak (dB V/m) | Bandwidth (kHz) | Height (cm) | Polarity | Corr. (dB/m) | Margin - QPK | Limit - QPK |
|-----------------|--------------------|-----------------|-------------|----------|--------------|--------------|-------------|
| 30.120000       | 20.27              | 120.000         | 100.0       | H        | 21.0         | 19.73        | 40.0        |
| 37.800000       | 17.17              | 120.000         | 100.0       | H        | 17.6         | 22.83        | 40.0        |
| 138.840000      | 16.40              | 120.000         | 100.0       | H        | 13.8         | 27.10        | 43.5        |
| 150.600000      | 15.52              | 120.000         | 100.0       | H        | 13.8         | 27.98        | 43.5        |
| 311.880000      | 29.74              | 120.000         | 100.0       | H        | 16.7         | 16.26        | 46.0        |
| 317.720000      | 30.02              | 120.000         | 100.0       | H        | 16.8         | 15.98        | 46.0        |

#### Remark:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB).
3. Margin value = Limit value - Emission Level.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. Only the antenna height (from 1m to 4m) at maximum reading are recorded.

|            |                     |              |                             |
|------------|---------------------|--------------|-----------------------------|
| Test site: | 3M anechoic chamber | Environment: | Temp: 23°C; Humi:48%;101kPa |
| Operator:  | Deng ShanFei        | Test Date:   | 2024.01.04                  |
| Test Mode: | BLE - TX            | Test Result: | Pass                        |

EMI Sweep-3M(30-1G)



| Frequency (MHz) | QuasiPeak (dB)μV/m | Bandwidth (kHz) | Height (cm) | Polarity | Corr. (dB/m) | Margin - QPK | Limit - QPK |
|-----------------|--------------------|-----------------|-------------|----------|--------------|--------------|-------------|
| 30.040000       | 20.93              | 120.000         | 100.0       | V        | 21.0         | 19.07        | 40.0        |
| 39.680000       | 16.98              | 120.000         | 100.0       | V        | 16.9         | 23.02        | 40.0        |
| 96.120000       | 22.84              | 120.000         | 100.0       | V        | 11.9         | 20.66        | 43.5        |
| 208.880000      | 19.96              | 120.000         | 100.0       | V        | 11.3         | 23.54        | 43.5        |
| 471.280000      | 28.46              | 120.000         | 100.0       | V        | 19.7         | 17.54        | 46.0        |
| 667.600000      | 31.16              | 120.000         | 100.0       | V        | 21.7         | 14.84        | 46.0        |

#### Remark:

- Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m).
- Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB).
- Margin value = Limit value - Emission Level.
- The emission levels of other frequencies are very lower than the limit and not show in test report.
- Only the antenna height (from 1m to 4m) at maximum reading are recorded.

### For 1GHz to 25GHz

| GFSK_2402MHz    |                        |                |             |                    |                      |                    |                          |            |          |
|-----------------|------------------------|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|------------|----------|
| Frequency (MHz) | Emssion Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) | Polarity   | Detector |
| 2390.00         | 51.94                  | 74.00          | -22.06      | 1.60               | 120                  | 55.03              | -3.09                    | Horizontal | Peak     |
| 2390.00         | 43.63                  | 54.00          | -10.37      | 1.60               | 120                  | 46.72              | -3.09                    | Horizontal | Average  |
| 4804.00         | 46.66                  | 74.00          | -27.34      | 1.60               | 120                  | 45.40              | 1.26                     | Horizontal | Peak     |
| 4804.00         | 37.10                  | 54.00          | -16.90      | 1.60               | 120                  | 35.84              | 1.26                     | Horizontal | Average  |
| 7206.00         | 50.08                  | 74.00          | -23.92      | 1.60               | 120                  | 43.91              | 6.17                     | Horizontal | Peak     |
| 7206.00         | 40.74                  | 54.00          | -13.26      | 1.60               | 120                  | 34.57              | 6.17                     | Horizontal | Average  |
| 2390.00         | 52.60                  | 74.00          | -21.40      | 1.50               | 310                  | 55.69              | -3.09                    | Vertical   | Peak     |
| 2390.00         | 42.53                  | 54.00          | -11.47      | 1.50               | 310                  | 45.62              | -3.09                    | Vertical   | Average  |
| 4804.00         | 46.77                  | 74.00          | -27.23      | 1.50               | 310                  | 45.51              | 1.26                     | Vertical   | Peak     |
| 4804.00         | 37.14                  | 54.00          | -16.86      | 1.50               | 310                  | 35.88              | 1.26                     | Vertical   | Average  |
| 7206.00         | 50.76                  | 74.00          | -23.24      | 1.50               | 310                  | 44.59              | 6.17                     | Vertical   | Peak     |
| 7206.00         | 40.77                  | 54.00          | -13.23      | 1.50               | 310                  | 34.60              | 6.17                     | Vertical   | Average  |

| GFSK_2440MHz    |                        |                |             |                    |                      |                    |                          |            |          |
|-----------------|------------------------|----------------|-------------|--------------------|----------------------|--------------------|--------------------------|------------|----------|
| Frequency (MHz) | Emssion Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV/m) | Correction Factor (dB/m) | Polarity   | Detector |
| 4880.00         | 46.95                  | 74.00          | -27.05      | 1.60               | 120                  | 46.02              | 0.93                     | Horizontal | Peak     |
| 4880.00         | 37.00                  | 54.00          | -17.00      | 1.60               | 120                  | 36.07              | 0.93                     | Horizontal | Average  |
| 7320.00         | 49.68                  | 74.00          | -24.32      | 1.60               | 120                  | 44.09              | 5.59                     | Horizontal | Peak     |
| 7320.00         | 40.75                  | 54.00          | -13.25      | 1.60               | 120                  | 35.16              | 5.59                     | Horizontal | Average  |
| 4880.00         | 36.59                  | 74.00          | -37.41      | 1.50               | 310                  | 35.66              | 0.93                     | Vertical   | Peak     |
| 4880.00         | 36.78                  | 54.00          | -17.22      | 1.50               | 310                  | 35.85              | 0.93                     | Vertical   | Average  |
| 7320.00         | 50.67                  | 74.00          | -23.33      | 1.50               | 310                  | 45.08              | 5.59                     | Vertical   | Peak     |
| 7320.00         | 40.63                  | 54.00          | -13.37      | 1.50               | 310                  | 35.04              | 5.59                     | Vertical   | Average  |

#### Remark:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) - Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. Tnly the antenna height (from 1m to 4m) and turntable angle (from 0 degrees to 360 degrees) at maximum reading are recorded.



| GFSK_2480MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                   |                |                          |                            |                          |                             |            |          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------|----------------|--------------------------|----------------------------|--------------------------|-----------------------------|------------|----------|
| Frequency<br>(MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Emssion<br>Level<br>(dBuV/m) | Limit<br>(dBuV/m) | Margin<br>(dB) | Antenna<br>Height<br>(m) | Table<br>Angle<br>(Degree) | Raw<br>Value<br>(dBuV/m) | Correction Factor<br>(dB/m) | Polarity   | Detector |
| 2483.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 53.87                        | 74.00             | -20.13         | 1.60                     | 120                        | 58.62                    | -4.75                       | Horizontal | Peak     |
| 2483.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 43.96                        | 54.00             | -10.04         | 1.60                     | 120                        | 48.71                    | -4.75                       | Horizontal | Average  |
| 4960.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 45.70                        | 74.00             | -28.30         | 1.60                     | 120                        | 45.46                    | 0.24                        | Horizontal | Peak     |
| 4960.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 35.90                        | 54.00             | -18.10         | 1.60                     | 120                        | 35.66                    | 0.24                        | Horizontal | Average  |
| 7440.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 49.05                        | 74.00             | -24.95         | 1.60                     | 120                        | 43.23                    | 5.82                        | Horizontal | Peak     |
| 7440.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 39.54                        | 54.00             | -14.46         | 1.60                     | 120                        | 33.72                    | 5.82                        | Horizontal | Average  |
| 2483.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 53.50                        | 74.00             | -20.50         | 1.50                     | 310                        | 58.25                    | -4.75                       | Vertical   | Peak     |
| 2483.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 43.74                        | 54.00             | -10.26         | 1.50                     | 310                        | 48.49                    | -4.75                       | Vertical   | Average  |
| 4960.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 44.39                        | 74.00             | -29.61         | 1.50                     | 310                        | 44.15                    | 0.24                        | Vertical   | Peak     |
| 4960.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 35.66                        | 54.00             | -18.34         | 1.50                     | 310                        | 35.42                    | 0.24                        | Vertical   | Average  |
| 7440.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 50.74                        | 74.00             | -23.26         | 1.50                     | 310                        | 44.92                    | 5.82                        | Vertical   | Peak     |
| 7440.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 40.48                        | 54.00             | -13.52         | 1.50                     | 310                        | 34.66                    | 5.82                        | Vertical   | Average  |
| <p><i>Remark:</i></p> <p>1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)</p> <p>2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) - Pre-Amplifier Factor(dB)</p> <p>3. Margin value = Emission Level – Limit value</p> <p>4. The emission levels of other frequencies are very lower than the limit and not show in test report.</p> <p>5. Tnly the antenna height (from 1m to 4m) and turntable angle (from 0 degrees to 360 degrees) at maximum reading are recorded.</p> |                              |                   |                |                          |                            |                          |                             |            |          |

## 2.7. AC Power Line Conducted Emission

### 2.7.1. Limit of AC Power Line Conducted Emission

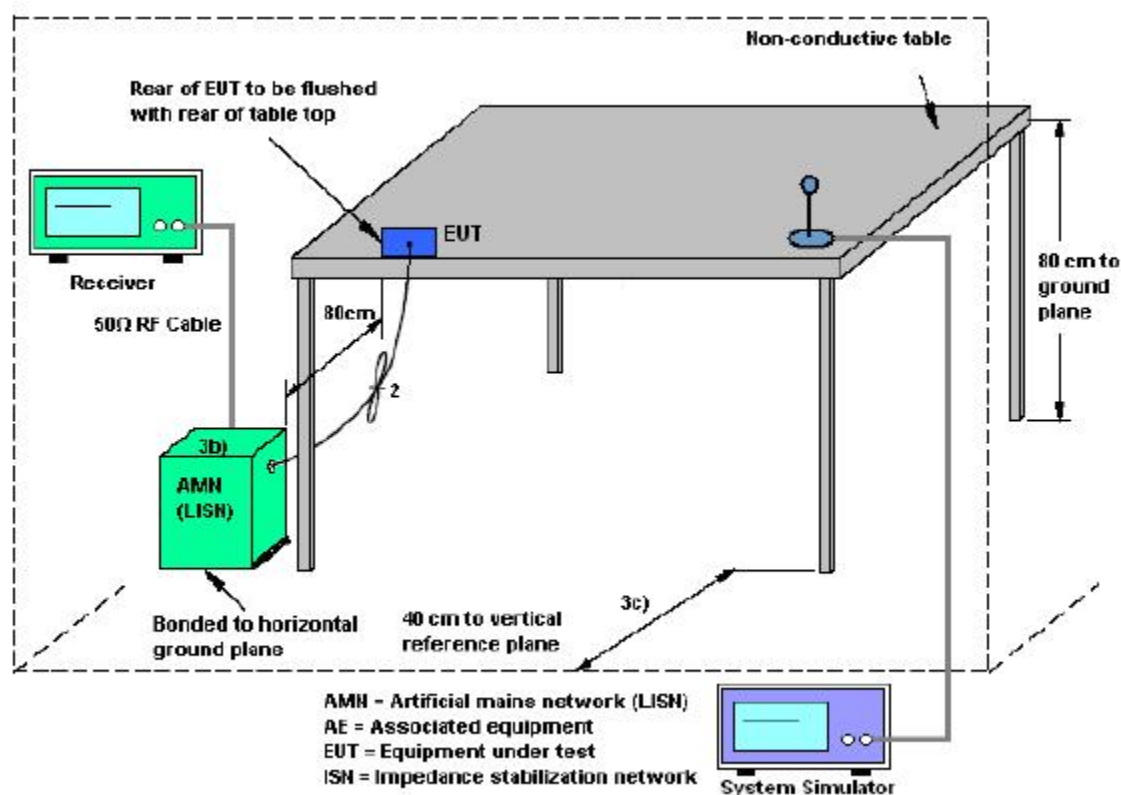
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

| Frequency range (MHz) | Conducted Limit (dB $\mu$ V) |          |
|-----------------------|------------------------------|----------|
|                       | Quai-peak                    | Average  |
| 0.15 - 0.50           | 66 to 56                     | 56 to 46 |
| 0.50 - 5              | 56                           | 46       |
| 5 - 30                | 60                           | 50       |

### 2.7.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

### 2.7.3. Test Setup



#### **2.7.4. Test Procedures**

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 micrometry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

#### **2.7.5. Test Results of Conducted Emission**

Not applicable, the EUT is powered from a 3V DC supply.

### 3. List of measuring equipment

| Item | Test Equipment                    | Manufacturer  | Model No.                 | Serial No. | Cal Date   | Due Date   |
|------|-----------------------------------|---------------|---------------------------|------------|------------|------------|
| 1    | 5M Anechoic Chamber               | Albatross     | SAC-5MAC<br>12.8x6.8x6.4m | A0304210   | 2022.06.09 | 2026.06.08 |
| 2    | EMI Test Receiver                 | ROHDE&SCHWARZ | ESW26                     | A180502935 | 2023.06.08 | 2024.06.07 |
| 3    | Loop Antenna                      | Schwarz beck  | HFH2-Z2                   | A0304220   | 2022.05.02 | 2025.05.01 |
| 4    | Broadband antenna<br>(30MHz~1GHz) | R&S           | HL562                     | A0304224   | 2023.06.08 | 2024.06.07 |
| 5    | EMI Horn Ant.<br>(1~18G)          | ETC           | MCTD-1209                 | A150402241 | 2023.05.16 | 2026.05.15 |
| 6    | Horn antenna<br>(18GHz~26.5GHz)   | AR            | AT4510                    | A0804450   | 2023.06.01 | 2024.05.31 |
| 7    | Amplifier 30M~1GHz                | MILMEGA       | 80RF1000-10004            | A140101634 | 2023.10.20 | 2024.10.19 |
| 8    | Amplifier 1G~18GHz                | MILMEGA       | AS0104R-800/400           | A160302517 | 2023.10.20 | 2024.10.19 |
| 9    | Spectrum Analyzer                 | KEYSIGHT      | N9030A                    | A160702554 | 2023.02.20 | 2024.02.19 |
| 10   | Test Receiver                     | R&S           | ESIB7                     | A0501375   | 2023.03.16 | 2024.03.15 |
| 11   | Broadband Ant.                    | 2786          | ETC                       | A150402240 | 2021.09.16 | 2024.03.03 |
| 12   | 3M Anechoic Chamber               | Albatross     | SAC-3MAC<br>9*6*6m        | A0412375   | 2019.03.26 | 2024.03.25 |
| 13   | Temperature<br>chamber            | ESPEC         | SU-642                    | A150802409 | 2023.03.18 | 2024.03.17 |
| 14   | Test Receiver                     | KEYSIGHT      | N9038A                    | A141202036 | 2023.06.12 | 2024.06.11 |
| 15   | LISN                              | ROHDE&SCHWARZ | ENV216                    | A140701847 | 2023.06.08 | 2024.06.07 |

#### 4. Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All the measurement uncertainty value were shown with a coverage  $K=2$  to indicate 95% level of confidence . The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of AC Power Line Conducted Emission Measurement (150kHz~30MHz)

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 2.8dB |
|-----------------------------------------------------------------------|-------|

Uncertainty of Radiated Emission Measurement (9kHz~30MHz)

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 3.5dB |
|-----------------------------------------------------------------------|-------|

Uncertainty of Radiated Emission Measurement (30MHz~1GHz)

|                                                                       |        |
|-----------------------------------------------------------------------|--------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 3.91dB |
|-----------------------------------------------------------------------|--------|

Uncertainty of Radiated Emission Measurement (1GHz~18GHz)

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 4.5dB |
|-----------------------------------------------------------------------|-------|

Uncertainty of Radiated Emission Measurement (18GHz~40GHz)

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 4.9dB |
|-----------------------------------------------------------------------|-------|

Uncertainty of RF Conducted Measurement (9kHz~40GHz)

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| Measuring Uncertainty for a level of confidence of 95%( $U=2U_c(y)$ ) | 1.3dB |
|-----------------------------------------------------------------------|-------|



## Appendix A

### RF Output Power

#### Test Result and Data

| BLE Maximum Output Power - 1Mbps |             |             |        |
|----------------------------------|-------------|-------------|--------|
| Test Frequency                   | Power (dBm) | Limit (dBm) | Result |
| 2402                             | 5.388       | 30          | Pass   |
| 2440                             | 6.381       | 30          | Pass   |
| 2480                             | 6.435       | 30          | Pass   |

Output Power: 2402MHz



Output Power: 2440MHz



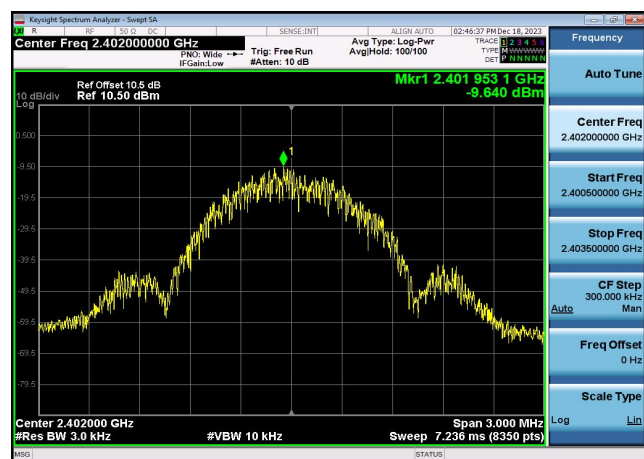
Output Power: 2480MHz



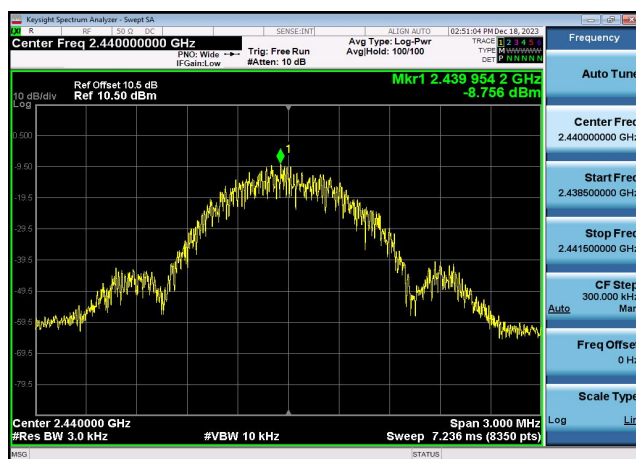
## Power Spectral Density Test Result and Data

| BLE - 1Mbps    |               |                 |        |
|----------------|---------------|-----------------|--------|
| Test Frequency | PSD(dBm/3KHz) | Limit(dBm/3KHz) | Result |
| 2402           | -9.640        | 8               | Pass   |
| 2440           | -8.756        |                 | Pass   |
| 2480           | -8.653        |                 | Pass   |

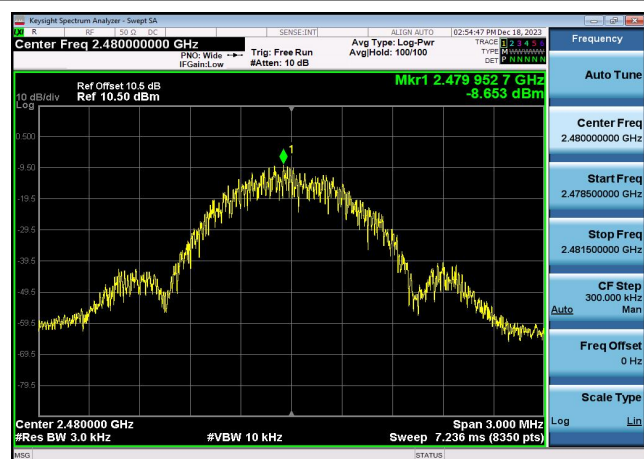
Power spectral density: 2402MHz



Power spectral density: 2440MHz



Power spectral density: 2480MHz



## 6dB and 99% Occupied BandWidth Test Result and Data

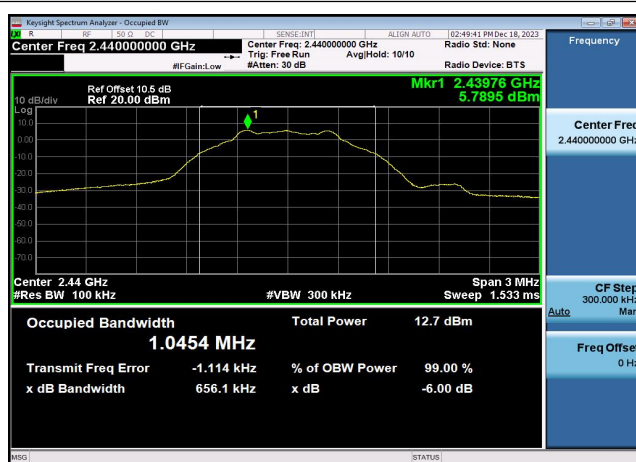
| BLE 6dB Bandwidth - 1Mbps |                             |            |        |
|---------------------------|-----------------------------|------------|--------|
| Test Frequency            | 6dB Emission Bandwidth(kHz) | Limit(kHz) | Result |
| 2402                      | 657.299                     | > 500      | Pass   |
| 2440                      | 656.061                     |            | Pass   |
| 2480                      | 657.986                     |            | Pass   |

| BLE 99% Occupied Bandwidth - 1Mbps |                           |            |        |
|------------------------------------|---------------------------|------------|--------|
| Test Frequency                     | 99% Occupy Bandwidth(MHz) | Limit(kHz) | Result |
| 2402                               | 1.021                     | N/A        | Pass   |
| 2440                               | 1.022                     |            | Pass   |
| 2480                               | 1.021                     |            | Pass   |

6dB Bandwidth: 2402MHz



6dB Bandwidth: 2440MHz

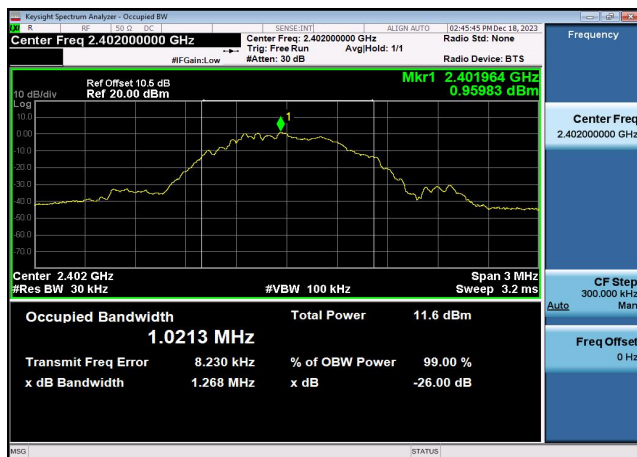


6dB Bandwidth: 2480MHz

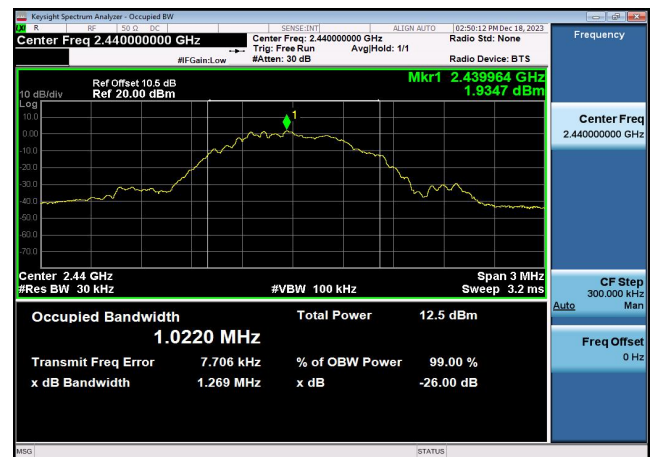




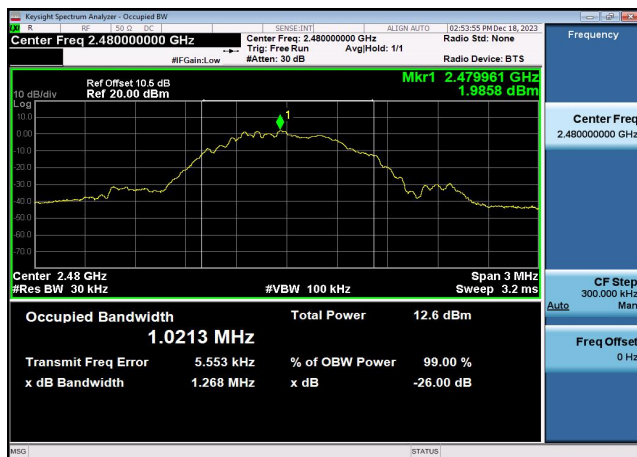
## 99% Bandwidth: 2402MHz



## 99% Bandwidth: 2440MHz



## 99% Bandwidth: 2480MHz



# Conducted Band Edges and Spurious Emissions

## BLE 1Mbps:

,Plot ,1Transmitter Spurious Emission  
: 2402,Referecy Level



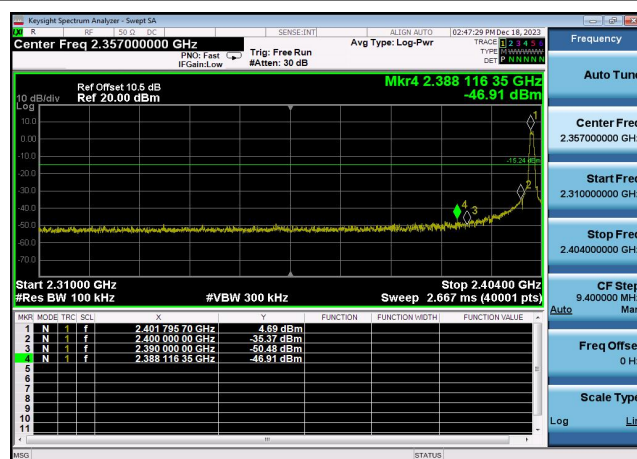
,Plot ,1Transmitter Spurious Emission  
: 2440,Referecy Level



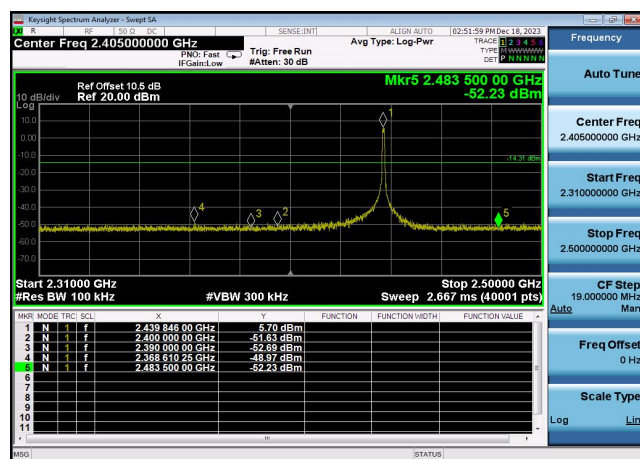
,Plot ,1Transmitter Spurious Emission  
: 2480,Referecy Level



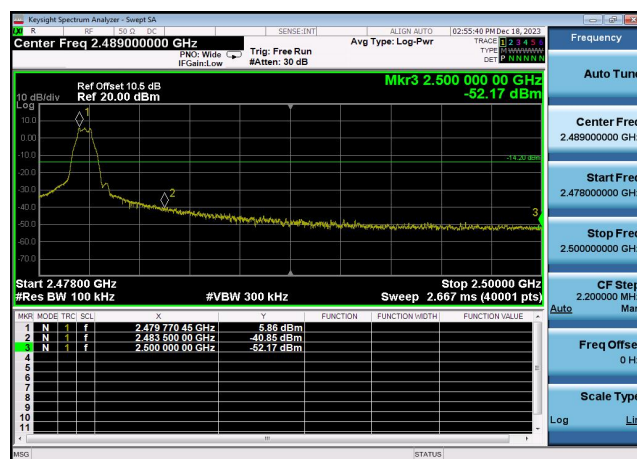
,Plot ,2Conducted Emission: 2402  
,Band Edge



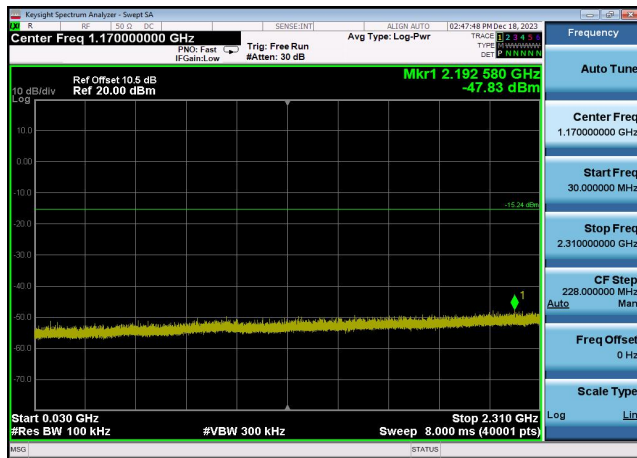
,Plot ,2Conducted Emission: 2440  
,Band Edge



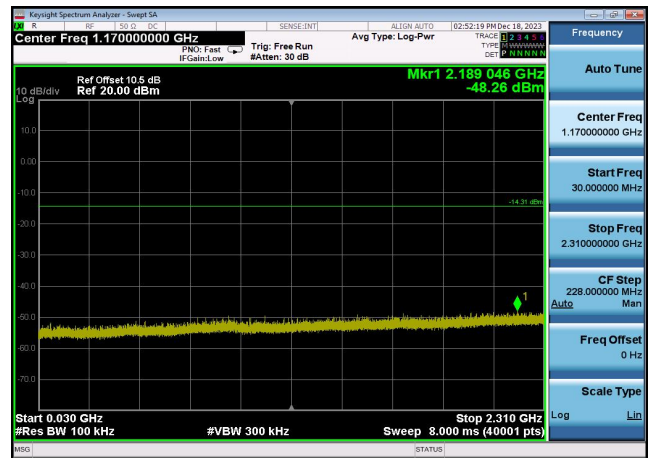
,Plot ,2Conducted Emission: 2480  
,Band Edge



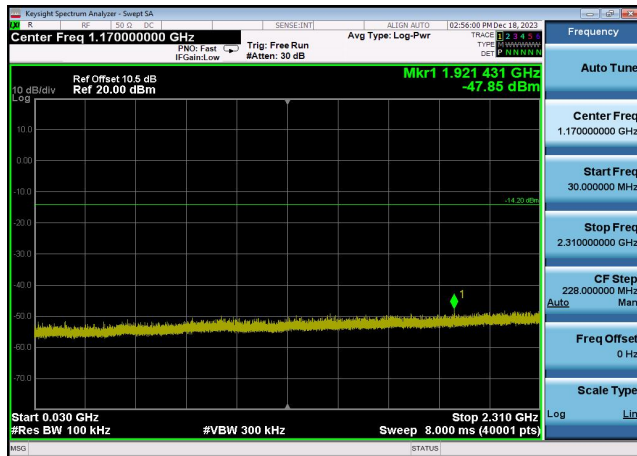
,Plot ,3Transmitter Spurious Emission  
: 2402,30MHz~2310MHz



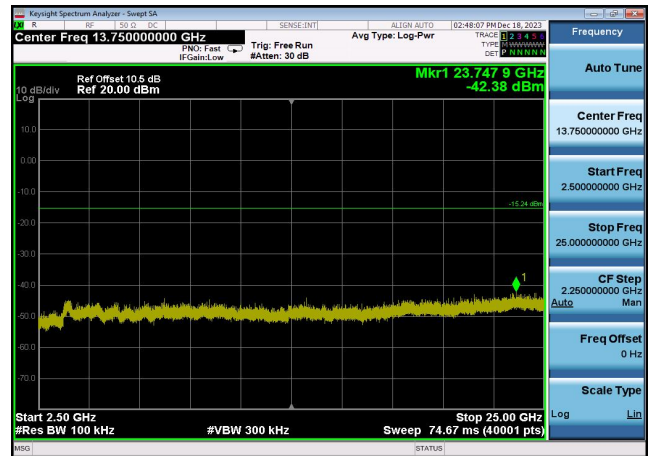
,Plot ,3Transmitter Spurious Emission  
: 2440,30MHz~2310MHz



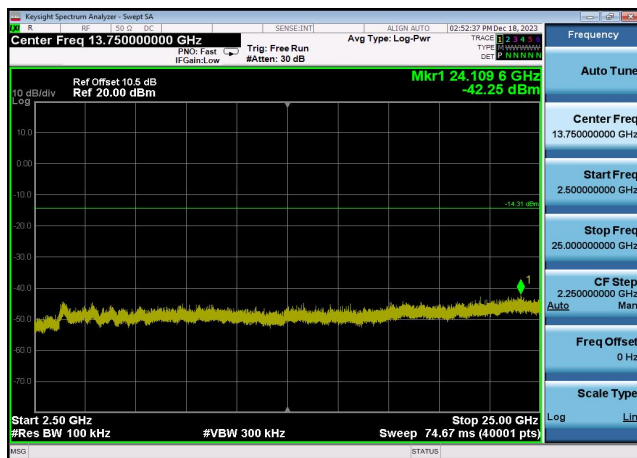
,Plot ,3Transmitter Spurious Emission  
: 2480,30MHz~2310MHz



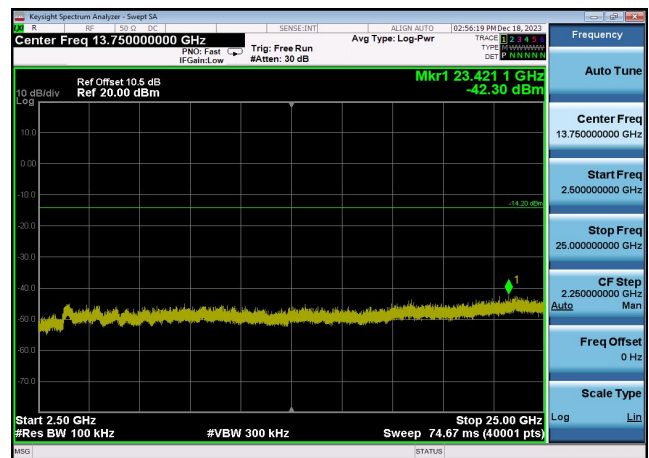
,Plot ,4Transmitter Spurious Emission  
: 2402,2500MHz~25000MHz



,Plot ,4Transmitter Spurious Emission  
: 2440,2500MHz~25000MHz



,Plot ,4Transmitter Spurious Emission  
: 2480,2500MHz~25000MHz



\*\*END OF REPORT\*\*