


# TEST REPORT

**Report No.**..... : **KS2203S1203E02**  
**FCC ID**..... : 2ANPBRMSLP4-G2  
**Applicant**..... : RNG International Inc.  
**Address**..... : 5050 S Archibald Ave, Ontario, CA 91762  
**Manufacturer**..... : RENOGY New Energy Co., Ltd.  
**Address**..... : Room 624-625, Taicang German Overseas Students Pioneer Park, No.66 Ningbo East Road, Taicang Economic Development Zone, Taicang, JiangSu, 215000 China.  
**Product Name**..... : **Renogy ONE M1**  
**Trade Mark**..... :   
**Model/Type reference**..... : RMS-LP4-G2  
**Listed Model(s)**..... : N/A  
**Standard**..... : **FCC 15.247**  
**Date of Receipt**..... : Mar. 28,2022  
**Date of Test Date**..... : Mar. 29, 2022~May. 23, 2022  
**Date of issue**..... : May. 24, 2022  
**Test result**..... : **Pass**

Supervised by:

( Printed name + Signature)

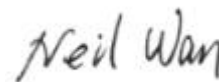
Sky Dong



Approved by:

( Printed name + Signature)

Neil Wan


**Testing Laboratory Name**..... : **KSIGN(Guangdong) Testing Co., Ltd.**
**Address**..... : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

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## 1. TEST SUMMARY

### 1.1. Test Standards

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Operation within the bands of 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz.

**KDB 558074 D01** : The measurement guidance provided herein is applicable only to Digital Transmission System (DTS) devices operating in the 902-928 MHz. 2400-2483.5 MHz and/or 5725-5850 MHz bands under §15.247 of the FCC rules (Title 47 of the Code of Federal Regulations)

**ANSI C63.10-2020:** American National Standard for Testing Unlicensed Wireless Devices.

### 1.2. Report Version

| Revised No. | Date of issue | Description |
|-------------|---------------|-------------|
| 01          | May. 24, 2022 | Original    |
|             |               |             |
|             |               |             |

### 1.3. Test Description

| FCC Part 15 Subpart C(15.247)  |  |        |               |
|--------------------------------|--|--------|---------------|
| Test Item                      | Standard Section                                 | Result | Test Engineer |
|                                | FCC  |        |               |
| Antenna Requirement            | 15.203   | Pass   | Cyril Cai     |
| Conducted Emission             | 15.207   | Pass   | Cyril Cai     |
| Radiated Emission              | 15.205&15.209                                    | Pass   | Cyril Cai     |
| Radiated Band Edge             | 15.205&15.247(d)                                 | Pass   | Cyril Cai     |
| Peak Output Power              | 15.247(b)  | Pass   | Cyril Cai     |
| Power Spectral Density         | 15.247(e)  | Pass   | Cyril Cai     |
| 6dB Bandwidth                  | 15.247(a)(2)                                     | Pass   | Cyril Cai     |
| Duty Cycle                     | 558074 D01 15.247 Meas Guidance v05r02 Chapter 6 | Pass   | Cyril Cai     |
| Conducted Band edge            | 15.247(d)  | Pass   | Cyril Cai     |
| Spurious RF Conducted Emission | 15.247(d)  | Pass   | Cyril Cai     |

Note:

The measurement uncertainty is not included in the test result.

## 1.4. Test Facility

### Address of the report laboratory

#### **KSIGN(Guangdong) Testing Co., Ltd.**

West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, People's Republic of China

### Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### **CNAS-Lab Code: L13261**

KSIGN(Guangdong) Testing Co., Ltd. has been assessed and proved to be in Compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### **A2LA-Lab Cert. No.: 5457.01**

KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### **IC Registration No.: CN0096**

The 3m alternate test site of KSIGN(Guangdong) Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: CN0096

#### **FCC-Registration No.: CN1272**

KSIGN(Guangdong) 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.

## 1.5. Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics; Part 2" and is documented in the KSIGN(Guangdong) Testing Co., Ltd. system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Below is the best measurement capability for KSIGN(Guangdong) Testing Co., Ltd.

| Test Items                              | Measurement Uncertainty | Notes |
|---|-------------------------|-------|
| Transmitter power conducted             | 0.42 dB                 | (1)   |
| Transmitter power Radiated              | 2.14 dB                 | (1)   |
| Conducted spurious emissions 9kHz~40GHz | 1.60 dB                 | (1)   |
| Radiated spurious emissions 9kHz~40GHz  | 2.20 dB                 | (1)   |
| Conducted Emissions 9kHz~30MHz          | 3.20 dB                 | (1)   |
| Radiated Emissions 30~1000MHz           | 4.70 dB                 | (1)   |
| Radiated Emissions 1~18GHz              | 5.00 dB                 | (1)   |
| Radiated Emissions 18~40GHz             | 5.54 dB                 | (1)   |
| Occupied Bandwidth                      | 2.80 dB                 | (1)   |

Note (1): This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=1.96$ .


## 1.6. Environmental Conditions

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

|                    |             |
|--------------------|-------------|
| Temperature:       | 15~35°C     |
| Relative Humidity: | 30~60 %     |
| Air Pressure:      | 950~1050mba |

## 2. GENERAL INFORMATION

### 2.1. General Description Of EUT

|                        |   |
|------------------------|---|
| Test Sample Number 1:  | 1-1-1(Normal Sample),1-1-2(Engineering Sample )                                   |
| Product Name:          | Renogy ONE M1   |
| Trade Mark:            |  |
| Model/Type reference:  | RMS-LP4-G2  |
| Listed Model(s):       | N/A   |
| Model Difference:      | N/A   |
| Power Supply(Adapter): | Input voltage: DC12V<br>Power current: DC5A<br>Rated voltage: AC120V/60Hz         |
| Power Supply(Battery): | N/A   |
| Hardware Version:      | mb_1.2  |
| Software Version:      | V1.0.30   |
| <b>Bluetooth</b>       |   |
| Modulation:            | GFSK  |
| Operation frequency:   | 2402MHz~2480MHz   |
| Max Peak Output Power: | 2.05dBm   |
| Channel number:        | 40  |
| Channel separation:    | 2MHz  |
| Antenna type:          | Integrated Antenna  |
| Antenna gain:          | 2.0dBi  |

## 2.2. Operation State

Operation Frequency List: The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. BLE, 40 channels are provided to the EUT. Channels 00/19/39 were selected for testing.

### Operation Frequency List:

| Channel   | Frequency (MHz) |
|-----------|-----------------|
| <b>00</b> | <b>2402</b>     |
| 01        | 2404            |
| :         | :               |
| <b>19</b> | <b>2440</b>     |
| 20        | 2442            |
| 21        | 2444            |
| :         | :               |
| 38        | 2478            |
| <b>39</b> | <b>2480</b>     |

Note: The display in grey were the channel selected for testing.

### Test Channel

| Channel | Channel | Frequency (MHz) |
|---------|---------|-----------------|
| Low     | 00      | 2402            |
| Middle  | 19      | 2440            |
| High    | 39      | 2480            |

### Test mode

| NO. | TEST MODE DESCRIPTION       |
|-----|-----------------------------|
| 1   | Low channel TX (2402MHz)    |
| 2   | Middle channel TX (2440MHz) |
| 3   | High channel TX (2480MHz)   |

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. The test software is the SecureCRTSecure\_V7.0.0.326 which can set the EUT into the individual test modes.



## 2.3. Measurement Instruments List

| Tonscend JS0806-2 Test system |                                     |              |           |            |            |
|-------------------------------|-------------------------------------|--------------|-----------|------------|------------|
| Item                          | Test Equipment                      | Manufacturer | Model No. | Serial No. | Cal. Until |
| 1                             | Spectrum Analyzer                   | R&S          | FSV40-N   | 101798     | 03/04/2023 |
| 2                             | Vector Signal Generator             | Agilent      | N5182A    | MY50142520 | 03/04/2023 |
| 3                             | Analog Signal Generator             | HP           | 83752A    | 3344A00337 | 03/04/2023 |
| 4                             | Power Sensor                        | Agilent      | E9304A    | MY50390009 | 03/04/2023 |
| 5                             | Power Sensor                        | Agilent      | E9300A    | MY41498315 | 03/04/2023 |
| 6                             | Wideband Radio Communication Tester | R&S          | CMW500    | 157282     | 03/04/2023 |
| 7                             | Climate Chamber                     | Angul        | AGNH80L   | 1903042120 | 03/04/2023 |
| 8                             | Dual Output DC Power Supply         | Agilent      | E3646A    | MY40009992 | 03/04/2023 |
| 9                             | RF Control Unit                     | Tonscend     | JS0806-2  | /          | 03/04/2023 |

| Radiated Emission |  |                     |              |            |            |
|-------------------|--|---------------------|--------------|------------|------------|
| Item              | Test Equipment                             | Manufacturer        | Model No.    | Serial No. | Cal. Until |
| 1                 | EMI Test Receiver                          | R&S                 | ESR          | 102525     | 03/04/2023 |
| 2                 | High Pass Filter                           | Chengdu E-Microwave | OHF-3-18-S   | 0E01901038 | 03/04/2023 |
| 3                 | High Pass Filter                           | Chengdu E-Microwave | OHF-6.5-18-S | 0E01901039 | 03/04/2023 |
| 4                 | Spectrum Analyzer                          | HP                  | 8593E        | 3831U02087 | 03/04/2023 |
| 5                 | Ultra-Broadband logarithmic period Antenna | Schwarzbeck         | VULB 9163    | 01230      | 12/04/2023 |
| 6                 | Loop Antenna                               | Beijin ZHINAN       | ZN30900C     | 18050      | 03/15/2023 |
| 7                 | Spectrum Analyzer                          | R&S                 | FSV40-N      | 101798     | 03/04/2023 |
| 8                 | Horn Antenna                               | Schwarzbeck         | BBHA 9120 D  | 2023       | 03/29/2023 |
| 9                 | Pre-Amplifier                              | Schwarzbeck         | BBV 9745     | 9745#129   | 03/04/2023 |
| 10                | Pre-Amplifier                              | EMCI                | EMC051835SE  | 980662     | 03/04/2023 |

| Conducted Emission |                   |              |           |              |            |
|--------------------|-------------------|--------------|-----------|--------------|------------|
| Item               | Test Equipment    | Manufacturer | Model No. | Serial No.   | Cal. Until |
| 1                  | LISN              | R&S          | ENV432    | 1326.6105.02 | 03/04/2023 |
| 2                  | EMI Test Receiver | R&S          | ESR       | 102524       | 03/04/2023 |
| 3                  | Manual RF Switch  | JS TOYO      | /         | MSW-01/002   | 03/04/2023 |

Note:

1)The Cal. Interval was one year.

2)The cable loss has calculated in test result which connection between each test instruments.

TRF No. FCC Part 15.247\_R1

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## 2.4. Test Software

| Software name                           | Model    | Version       |
|---|----------|---------------|
| Conducted emission Measurement Software | EZ-EMC   | EMC-Con 3A1.1 |
| Radiated emission Measurement Software  | EZ-EMC   | FA-03A.2.RE   |
| Bluetooth and WIFI Test System          | JS1120-3 | 2.5.77.0418   |

## 2.5. Ancillary Equipment list

| Equipment | Model | S/N | Manufacturer | Certificate type |
|-----------|-------|-----|--------------|------------------|
| /         | /     | /   | /            | /                |

## 2.6. Description Of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment | Brand | Model/Type No. | Series No. | Note |
|------|-----------|-------|----------------|------------|------|
| 1    | Adapter   | /     | GA-QC810       | /          |      |
| 2    | USB Cable | /     | /              | /          |      |

Note:

1. The support equipment was authorized by Declaration of Confirmation.
2. For detachable type I/O cable should be specified the length in cm in 『Length』 column.

### 3. TEST ITEM AND RESULTS

#### 3.1. Antenna Requirement

##### Requirement

##### **FCC CFR Title 47 Part 15 Subpart C Section 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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

##### **FCC CFR Title 47 Part 15 Subpart C Section 15.247(c) (1)(i):**

(i) Systems operating in the 2400~2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

##### Test Result

The EUT antenna is Integrated Antenna (2.0dBi), the directional gain of the antenna less than 6dBi. It comply with the standard requirement. In case of replacement of broken antenna the same antenna type must be used.

Antenna structure please refer to the EUT internal photographs antenna photo.

## 3.2. Conducted Emission

### Limit

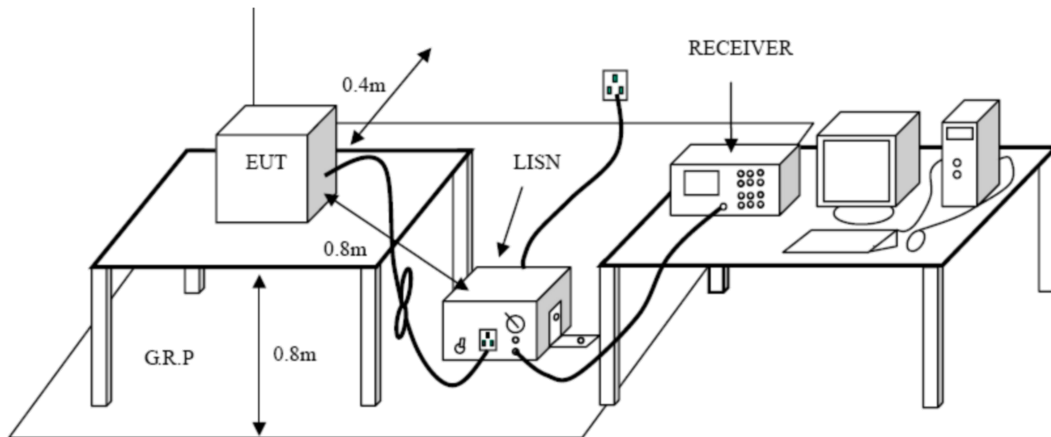
Conducted Emission Test Limit

| Frequency     | Maximum RF Line Voltage (dB $\mu$ V) |               |
|---------------|--------------------------------------|---------------|
|               | Quasi-peak Level                     | Average Level |
| 150kHz~500kHz | 66 ~ 56 *                            | 56 ~ 46 *     |
| 500kHz~5MHz   | 56                                   | 46            |
| 5MHz~30MHz    | 60                                   | 50            |

Notes:

1. \*Decreasing linearly with logarithm of the frequency.
2. The lower limit shall apply at the transition frequencies.
3. The limit decrease in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### Test Configuration



### Test Procedure

1. The EUT was setup according to ANSI C63.10:2020 requirements.
2. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface.
3. The EUT and simulators are connected to the main power through a line impedances stabilization network (LISN). The LISN provides a 50ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)
4. Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.
5. The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.
6. Conducted Emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.
7. During the above scans, the emissions were maximized by cable manipulation.

### Test Mode:

Please refer to the clause 2.2.

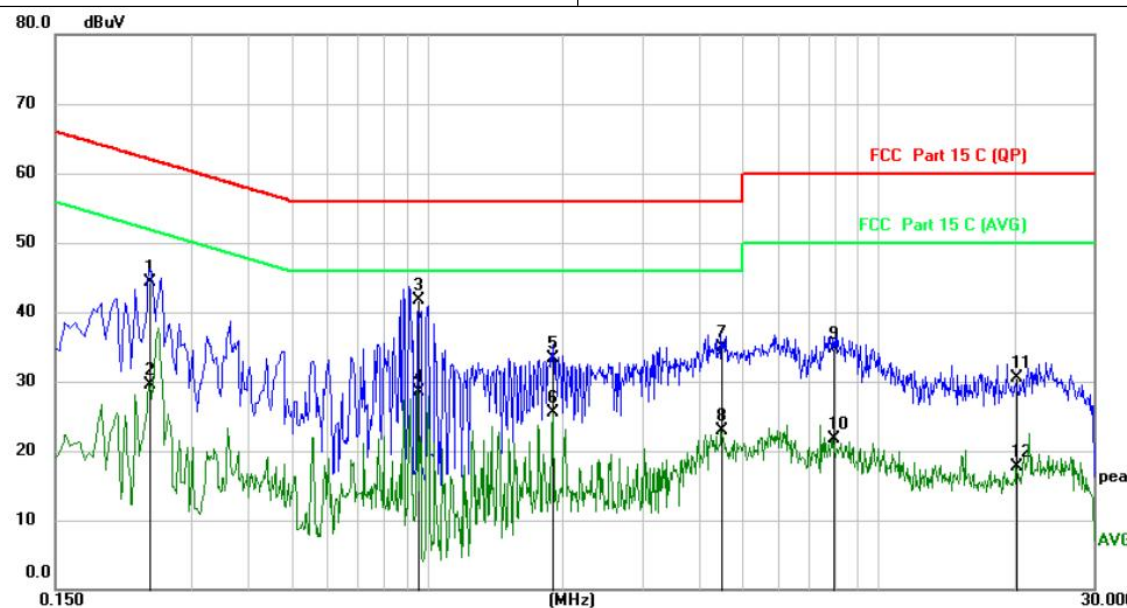
### Test Results

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|               |              |
|---------------|--------------|
| Test Voltage: | AC 120V/60Hz |
| Terminal:     | Line         |
| Test Mode:    | BLE          |



| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measurement | Limit | Over       |
|-----|-----|---------|---------------|----------------|-------------|-------|------------|
|     |     | MHz     | dBuV          | dB             | dBuV        | dBuV  | dB         |
|     |     |         |               |                |             |       | Detector   |
| 1   |     | 0.2419  | 33.40         | 10.95          | 44.35       | 62.03 | -17.68 QP  |
| 2   |     | 0.2419  | 18.55         | 10.95          | 29.50       | 52.03 | -22.53 AVG |
| 3   | *   | 0.9576  | 30.63         | 11.07          | 41.70       | 56.00 | -14.30 QP  |
| 4   |     | 0.9576  | 17.53         | 11.07          | 28.60       | 46.00 | -17.40 AVG |
| 5   |     | 1.8973  | 22.16         | 11.10          | 33.26       | 56.00 | -22.74 QP  |
| 6   |     | 1.8973  | 14.33         | 11.10          | 25.43       | 46.00 | -20.57 AVG |
| 7   |     | 4.4858  | 23.63         | 11.19          | 34.82       | 56.00 | -21.18 QP  |
| 8   |     | 4.4858  | 11.76         | 11.19          | 22.95       | 46.00 | -23.05 AVG |
| 9   |     | 7.9458  | 23.62         | 11.12          | 34.74       | 60.00 | -25.26 QP  |
| 10  |     | 7.9458  | 10.58         | 11.12          | 21.70       | 50.00 | -28.30 AVG |
| 11  |     | 20.2576 | 18.99         | 11.53          | 30.52       | 60.00 | -29.48 QP  |
| 12  |     | 20.2576 | 6.09          | 11.53          | 17.62       | 50.00 | -32.38 AVG |

Remarks:  
1.Measurement = Reading Level+ Correct Factor  
2.Over = Measurement -Limit

Remarks:

1.Measurement = Reading Level+ Correct Factor

2.Over = Measurement -Limit

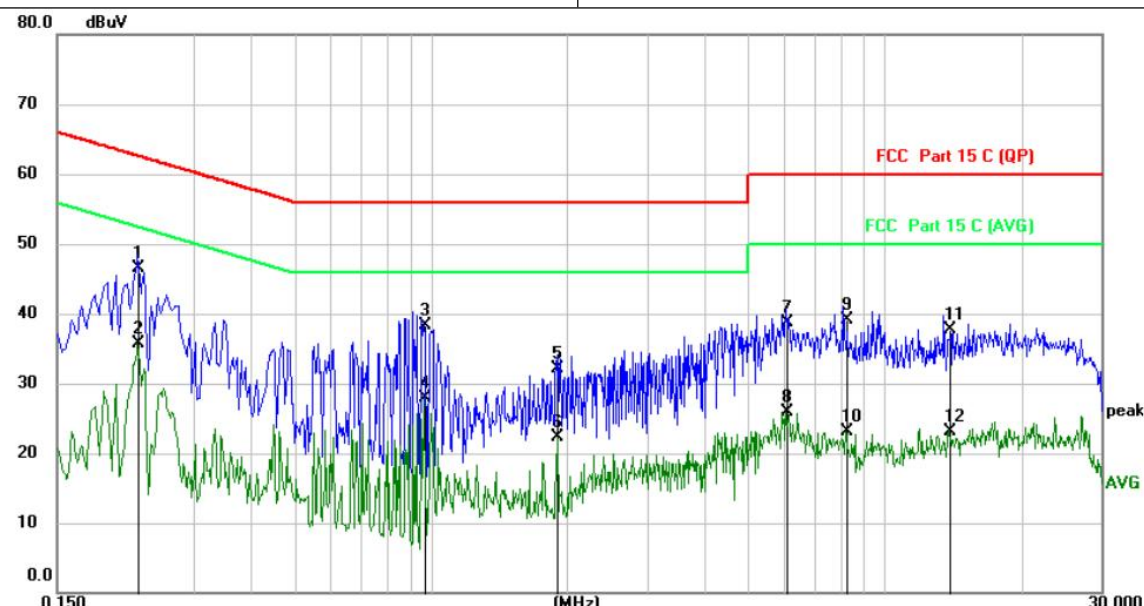
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|               |              |
|---------------|--------------|
| Test Voltage: | AC 120V/60Hz |
| Terminal:     | Neutral      |
| Test Mode:    | BLE          |



| No. | Mk. | Freq.   | Reading Level | Correct Factor | Measure-ment | Limit | Over   |          |
|-----|-----|---------|---------------|----------------|--------------|-------|--------|----------|
|     |     | MHz     | dBuV          | dB             | dBuV         | dBuV  | dB     | Detector |
| 1   | *   | 0.2260  | 35.97         | 10.51          | 46.48        | 62.60 | -16.12 | QP       |
| 2   |     | 0.2260  | 25.10         | 10.51          | 35.61        | 52.60 | -16.99 | AVG      |
| 3   |     | 0.9657  | 27.49         | 10.79          | 38.28        | 56.00 | -17.72 | QP       |
| 4   |     | 0.9657  | 17.16         | 10.79          | 27.95        | 46.00 | -18.05 | AVG      |
| 5   |     | 1.8973  | 21.20         | 10.87          | 32.07        | 56.00 | -23.93 | QP       |
| 6   |     | 1.8973  | 11.45         | 10.87          | 22.32        | 46.00 | -23.68 | AVG      |
| 7   |     | 6.0617  | 27.75         | 11.05          | 38.80        | 60.00 | -21.20 | QP       |
| 8   |     | 6.0617  | 14.92         | 11.05          | 25.97        | 50.00 | -24.03 | AVG      |
| 9   |     | 8.2057  | 28.09         | 11.08          | 39.17        | 60.00 | -20.83 | QP       |
| 10  |     | 8.2057  | 11.96         | 11.08          | 23.04        | 50.00 | -26.96 | AVG      |
| 11  |     | 13.8739 | 26.19         | 11.42          | 37.61        | 60.00 | -22.39 | QP       |
| 12  |     | 13.8739 | 11.78         | 11.42          | 23.20        | 50.00 | -26.80 | AVG      |

Remarks:  
1.Measurement = Reading Level+ Correct Factor  
2.Over = Measurement -Limit

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### 3.3. Spurious Emission (Radiated)

#### Limit

**Radiated Emission Limits (9 kHz~1000 MHz)**

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

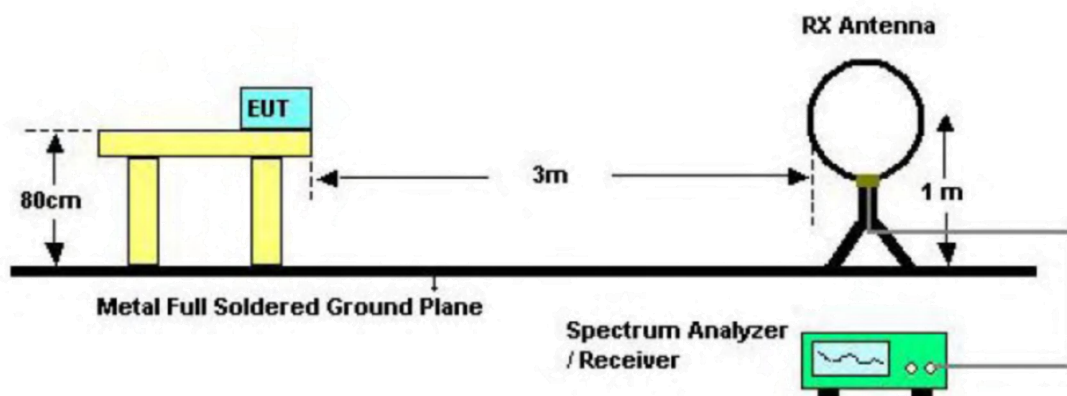
**Radiated Emission Limit (Above 1000MHz)**

| Frequency (MHz) | Distance Meters(at 3m) |         |
|-----------------|------------------------|---------|
|                 | Peak                   | Average |
| Above 1000      | 74                     | 54      |

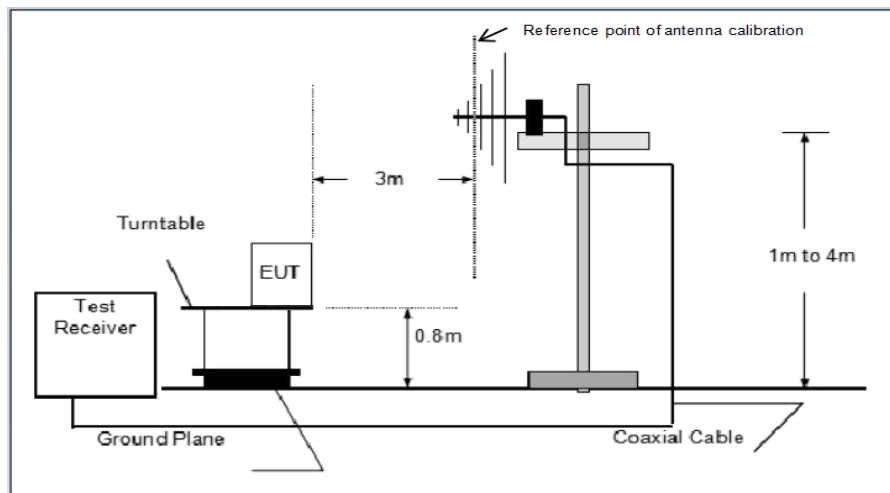
Note:

1. The tighter limit applies at the band edges.
2. Emission Level (dBuV/m)=20log Emission Level (uV/m).

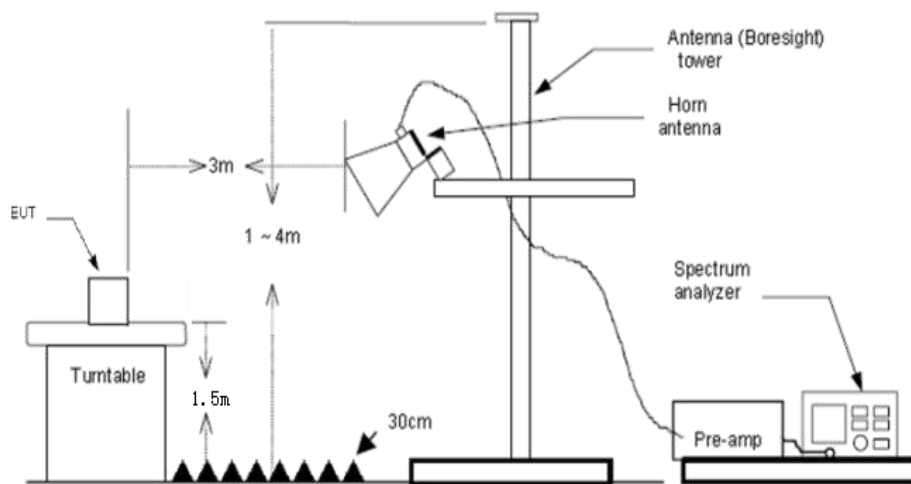
#### Test Configuration



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

### Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2020
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings
  - (1) Span shall wide enough to fully capture the emission being measured;
  - (2) Below 1 GHz:  
RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;



If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

(3) From 1 GHz to 10<sup>th</sup> harmonic:

RBW=1MHz, VBW=3MHz Peak detector for Peak value.

RBW=1MHz, VBW=10Hz Peak detector for Peak value.

### **Test Mode**

Please refer to the clause 2.2.

### **Test Result**

#### **9 KHz - 30 MHz**

| Freq. | Reading  | Limit    | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB)   | P/F   |
| --    | --       | --       | --     | Pass  |
| --    | --       | --       | --     | Pass  |

Note:

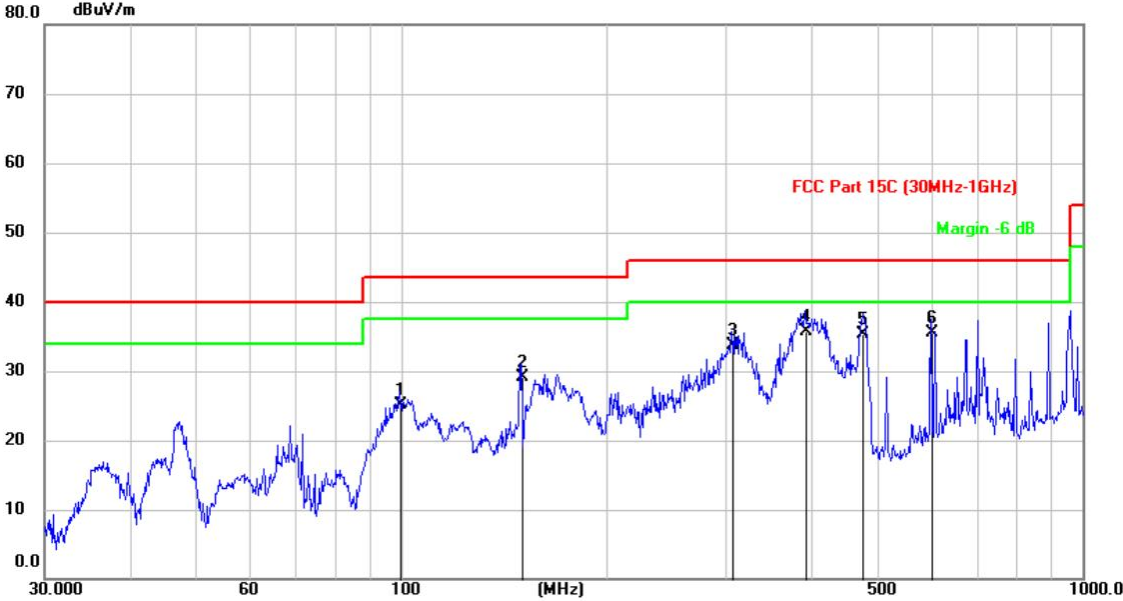
1. For 9kHz-30MHz, the amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);
3. Limit line = specific limits (dBuV) + distance extrapolation factor.

Note:

- 1) Measurement = Reading level + Correct Factor  
Correct Factor = Antenna Factor + Cable Loss - Preamplifier Factor
- 2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.
- 3) The emission levels of other frequencies are very lower than the limit and not show in test report.
- 4) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

### 30MHz - 1GHz

|               |                     |
|---------------|---------------------|
| Test voltage: | 120Vac              |
| Ant. Pol.:    | Horizontal          |
| Test Mode:    | TX BLE Mode 2402MHz |

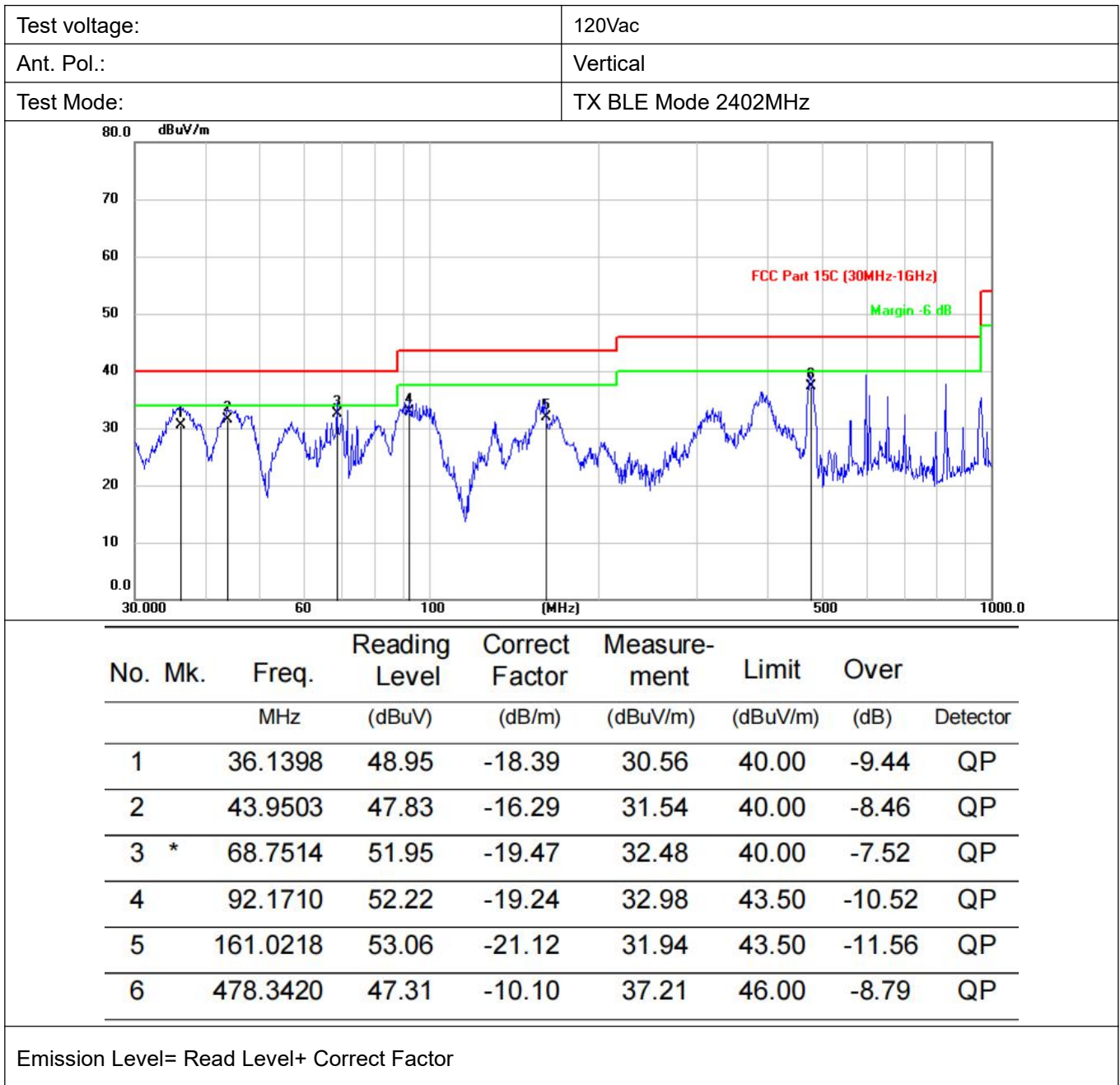
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>(dBuV) | Correct<br>Factor<br>(dB/m) | Measure-<br>ment<br>(dBuV/m) | Limit<br>(dBuV/m) | Over<br>(dB) | Detector |
|-----|-----|--------------|----------------------------|-----------------------------|------------------------------|-------------------|--------------|----------|
| 1   |     | 99.5979      | 42.85                      | -17.70                      | 25.15                        | 43.50             | -18.35       | QP       |
| 2   |     | 150.0634     | 50.59                      | -21.40                      | 29.19                        | 43.50             | -14.31       | QP       |
| 3   |     | 306.1090     | 48.04                      | -14.41                      | 33.63                        | 46.00             | -12.37       | QP       |
| 4   | *   | 392.2325     | 46.80                      | -11.16                      | 35.64                        | 46.00             | -10.36       | QP       |
| 5   |     | 475.8326     | 45.42                      | -10.11                      | 35.31                        | 46.00             | -10.69       | QP       |
| 6   |     | 600.1624     | 43.18                      | -7.67                       | 35.51                        | 46.00             | -10.49       | QP       |

Emission Level= Read Level+ Correct Factor

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# Above 1GHz

| Frequency(MHz): |                        | 2402                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 4804.00         | 55.81                  | -5.92                | 18.19                | 74             | 31.42     | PK         |
| 4804.00         | 42.33                  | -5.92                | 11.67                | 54             | 31.42     | AV         |
| 7206.00         | 51.29                  | -1.81                | 22.71                | 74             | 37.03     | PK         |
| 7206.00         | 44.11                  | -1.81                | 9.89                 | 54             | 37.03     | AV         |

| Frequency(MHz): |                        | 2402                 |                      | Polarity:      |           | VERTICAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|----------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector |
| 4804.00         | 56.69                  | -5.92                | 50.77                | 74             | 23.23     | PK       |
| 4804.00         | 43.54                  | -5.92                | 37.62                | 54             | 16.38     | AV       |
| 7206.00         | 52.37                  | -1.81                | 50.56                | 74             | 23.44     | PK       |
| 7206.00         | 44.89                  | -1.81                | 43.08                | 54             | 10.92     | AV       |

| Frequency(MHz): |                        | 2440                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 4880.00         | 53.97                  | -5.71                | 48.26                | 74             | 25.74     | PK         |
| 4880.00         | 43.95                  | -5.71                | 38.24                | 54             | 15.76     | AV         |
| 7320.00         | 53.59                  | -0.36                | 53.23                | 74             | 20.77     | PK         |
| 7320.00         | 43.32                  | -0.36                | 42.96                | 54             | 11.04     | AV         |

| Frequency(MHz): |                        | 2440                 |                      | Polarity:      |           | VERTICAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|----------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector |
| 4880.00         | 54.32                  | -5.71                | 48.61                | 74             | 25.39     | PK       |
| 4880.00         | 44.66                  | -5.71                | 38.95                | 54             | 15.05     | AV       |
| 7320.00         | 53.99                  | -0.36                | 53.63                | 74             | 20.37     | PK       |
| 7320.00         | 43.86                  | -0.36                | 43.50                | 54             | 10.50     | AV       |

| Frequency(MHz): |                        | 2480                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 4960.00         | 53.57                  | -5.51                | 48.06                | 74             | 25.94     | PK         |
| 4960.00         | 43.36                  | -5.51                | 37.85                | 54             | 16.15     | AV         |
| 7440.00         | 53.56                  | 0.99                 | 54.55                | 74             | 19.45     | PK         |
| 7440.00         | 43.41                  | 0.99                 | 44.40                | 54             | 9.60      | AV         |

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| Frequency(MHz): |                        | 2480                 |                      | Polarity:      |           | VERTICAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|----------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector |
| 4804.00         | 53.98                  | -5.51                | 48.47                | 74             | 25.53     | PK       |
| 4804.00         | 44.42                  | -5.51                | 38.91                | 54             | 15.09     | AV       |
| 7206.00         | 53.98                  | 0.99                 | 54.97                | 74             | 19.03     | PK       |
| 7206.00         | 43.89                  | 0.99                 | 44.88                | 54             | 9.12      | AV       |

Note:

1.18GHz-26.5GHz is the background of the site, there is no radiated spurious.

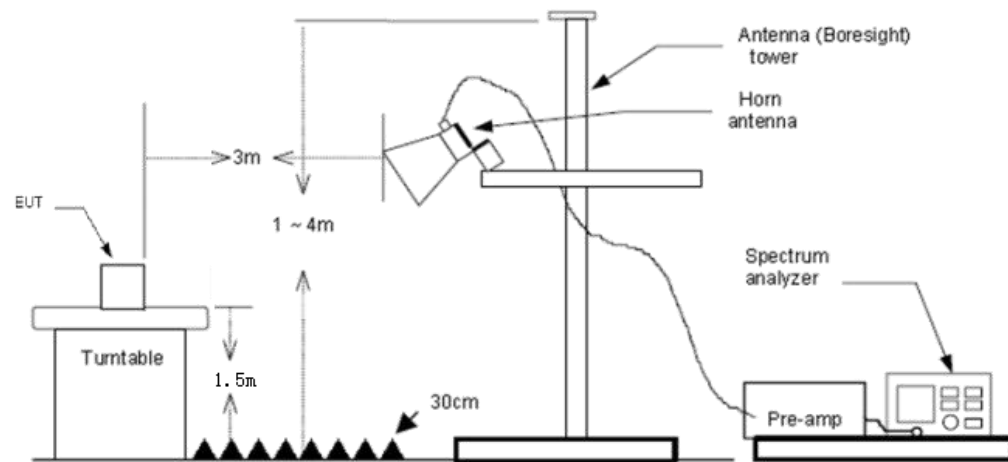
### 3.4. Band Edge Emissions(Radiated)

#### Limit

| Restricted Frequency Band<br>(MHz) | (dBuV/m)(at 3m) |         |
|------------------------------------|-----------------|---------|
|                                    | Peak            | Average |
| 2310 ~2390                         | 74              | 54      |
| 2483.5 ~2500                       | 74              | 54      |

Note: All restriction bands have been tested, only the worst case is reported.

#### Test Configuration



#### Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2020 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2020 on radiated measurement.
5. The receiver set as follow:  
RBW=1MHz, VBW=3MHz Peak detector for Peak value.  
RBW=1MHz, VBW=10Hz with Peak detector for Average value.

#### Test Mode

Please refer to the clause 2.2.

#### Test Results

Note:

1. Measurement = Reading level + Correct Factor
2. Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

| Frequency(MHz): |                        | 2402                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 2390.00         | 56.11                  | -10.92               | 45.19                | 74             | 28.81     | PK         |
| 2390.00         | 42.63                  | -10.92               | 31.71                | 54             | 22.29     | AV         |

| Frequency(MHz): |                        | 2402                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 2390.00         | 56.69                  | -10.92               | 45.77                | 74             | 28.23     | PK         |
| 2390.00         | 43.44                  | -10.92               | 32.52                | 54             | 21.48     | AV         |

| Frequency(MHz): |                        | 2480                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 2483.50         | 54.45                  | -10.88               | 43.57                | 74             | 30.43     | PK         |
| 2483.50         | 44.36                  | -10.88               | 33.48                | 54             | 20.52     | AV         |

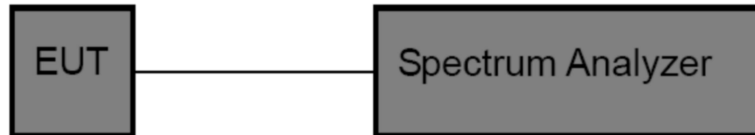
| Frequency(MHz): |                        | 2480                 |                      | Polarity:      |           | HORIZONTAL |
|-----------------|------------------------|----------------------|----------------------|----------------|-----------|------------|
| Frequency (MHz) | Reading Level (dBuV/m) | Correc Factor (dB/m) | Measurement (dBuV/m) | Limit (dBuV/m) | Over (dB) | Detector   |
| 2483.50         | 55.02                  | -10.88               | 44.14                | 74             | 29.86     | PK         |
| 2483.50         | 43.27                  | -10.88               | 32.39                | 54             | 21.61     | AV         |

### 3.5. Peak Output Power

#### Limit

| Test Item         | Limit            | Frequency Range(MHz) |
|-------------------|------------------|----------------------|
| Peak Output Power | 1 Watt or 30 dBm | 2400~2483.5          |

#### Test Configuration



#### Test Procedure

1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:  
Peak Detector:  $RBW \geq DTS \text{ Bandwidth}$ ,  $VBW \geq 3 * RBW$ .  
Sweep time=Auto.  
Detector= Peak.  
Trace mode= Maxhold.  
Allow trace to fully stabilize. Then use the peak marker function to determine the maximum amplitude level.

#### Test Mode

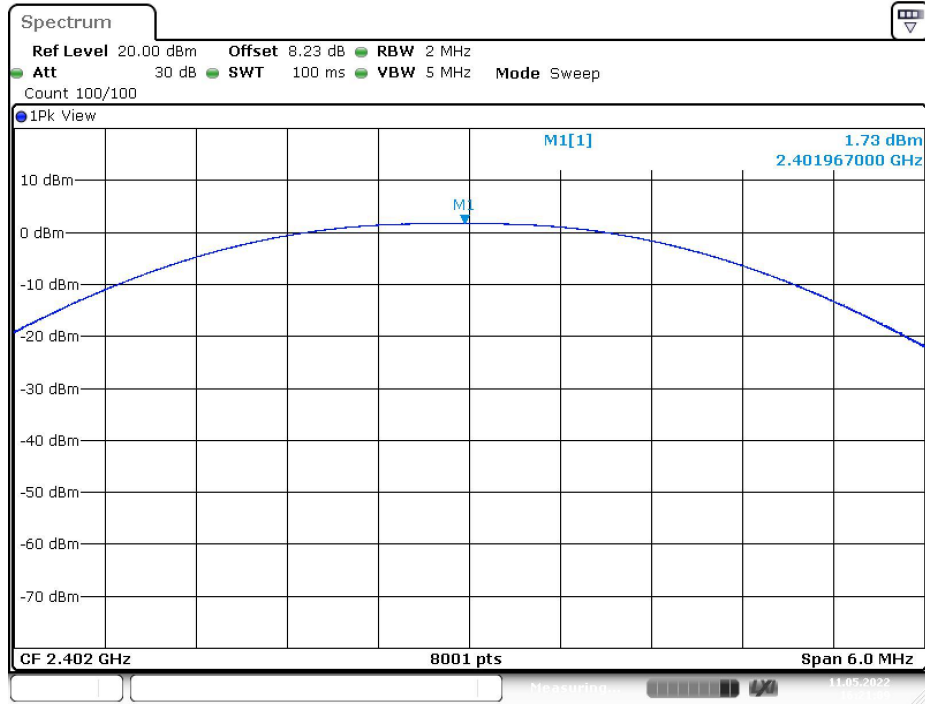
Please refer to the clause 2.2.

#### Test Result

| Test Channel | Frequency (MHz) | Maximum Conducted Output Power(PK) (dBm) | Limit (dBm) | Result |
|--------------|-----------------|--|-------------|--------|
| CH00         | 2402            | 1.73                                     | 30          | Pass   |
| CH19         | 2440            | 1.36                                     | 30          | Pass   |
| CH39         | 2480            | 1.00                                     | 30          | Pass   |

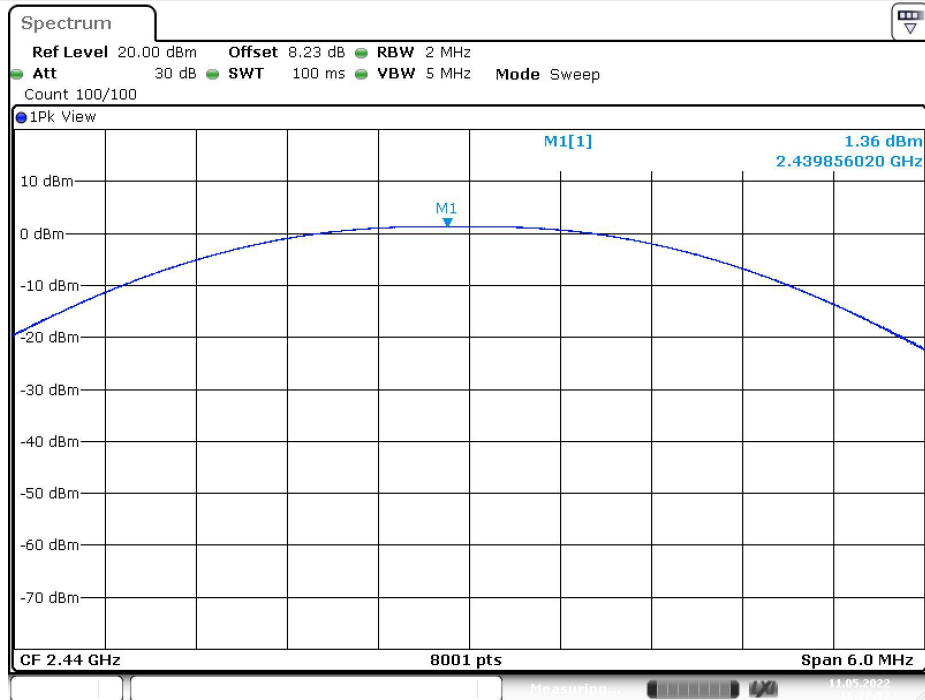


### 2402 MHz



Date: 11.MAY.2022 16:21:10

### 2440 MHz

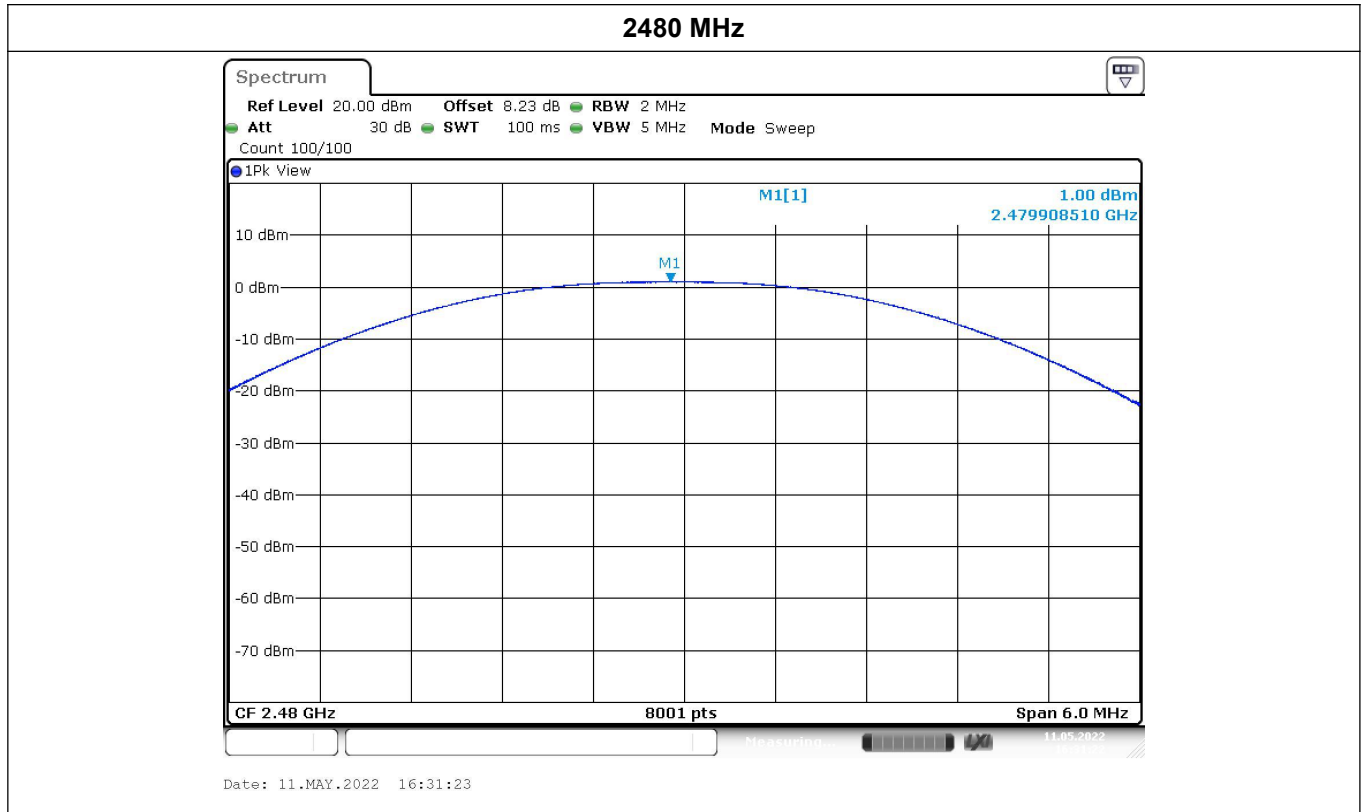


Date: 11.MAY.2022 16:27:52

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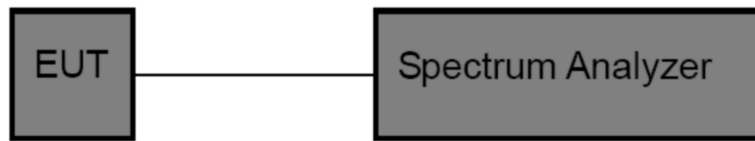
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### 3.6. Power Spectral Density

#### Limit

| FCC Part 15 Subpart C(15.247) |                    |                      |
|-------------------------------|--------------------|----------------------|
| Test Item                     | Limit              | Frequency Range(MHz) |
| Power Spectral Density        | 8dBm(in any 3 kHz) | 2400~2483.5          |

#### Test Configuration



#### Test Procedure

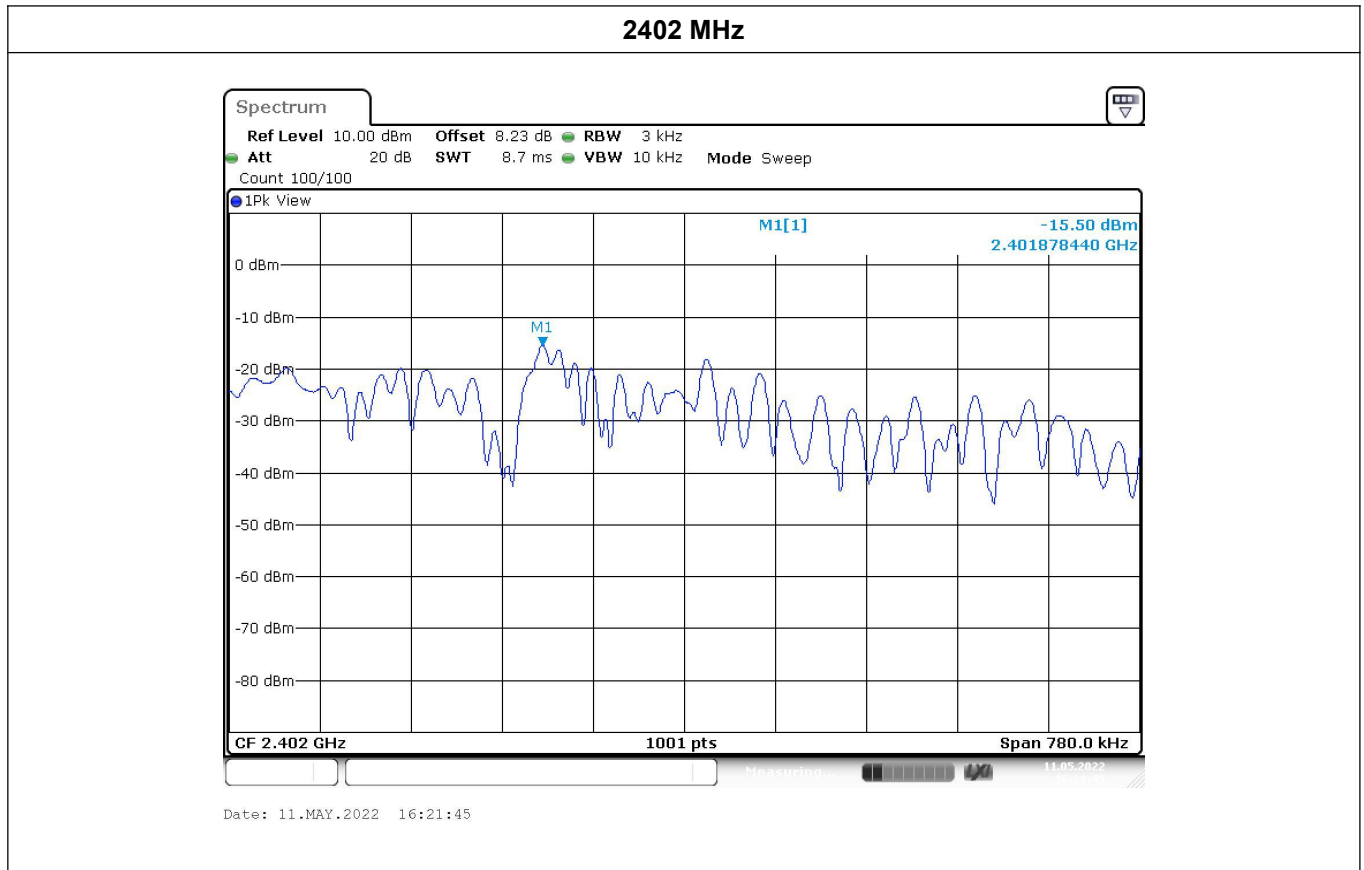
1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. The EUT was directly connected to the Spectrum Analyzer and antenna output port as show in the block diagram above. The measurement according to section 10.b-6.ii of KDB 558074 D01 DTS Meas Guidance v05r02.
3. Spectrum Setting:
  - Set analyzer center frequency to DTS channel center frequency.
  - Set the span to 1.5 times the DTS bandwidth.
  - Set the RBW  $\geq 3$  kHz
  - Set the VBW  $\geq 3 \times$  RBW
  - Detector: peak
  - Sweep time: auto couple
  - Allow trace to fully stabilize.
  - Use the peak marker function to determine the maximum amplitude level.
  - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### Test Mode

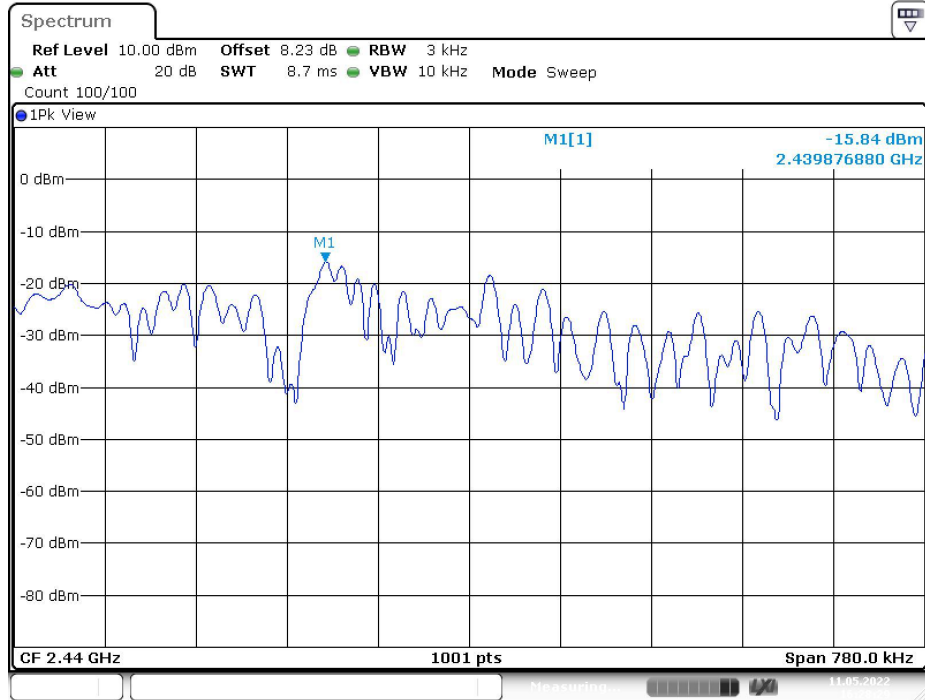
Please refer to the clause 2.2.

#### Test Result

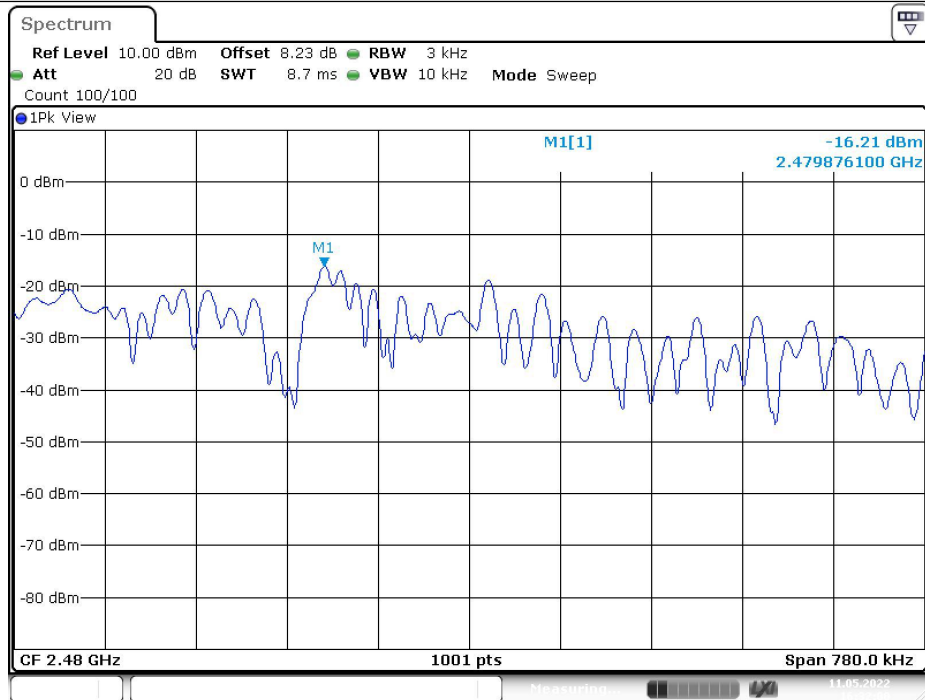
| Frequency | Power Density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|-----------|--------------------------|------------------|--------|
| 2402 MHz  | -15.5                    | 8                | Pass   |
| 2440 MHz  | -15.84                   | 8                | Pass   |
| 2480 MHz  | -16.21                   | 8                | Pass   |



### 2440 MHz



### 2480 MHz



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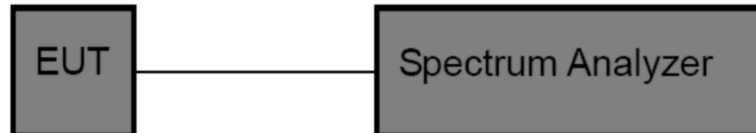
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### 3.7. 6dB Bandwidth

#### Limit

| Test Item | Limit                             | Frequency Range(MHz) |
|-----------|-----------------------------------|----------------------|
| Bandwidth | $\geq 500$ KHz<br>(6dB bandwidth) | 2400~2483.5          |

#### Test Configuration



#### Test Procedure

1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.
3. The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission.
4. Spectrum Setting:  
6dB bandwidth:
  - (1) Set RBW = 100 kHz.
  - (2) Set the video bandwidth (VBW)  $\geq 3$  RBW.
  - (3) Detector = Peak.
  - (4) Trace mode = Max hold.
  - (5) Sweep = Auto couple.
  - (6) Allow the trace to stabilize.
  - (7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

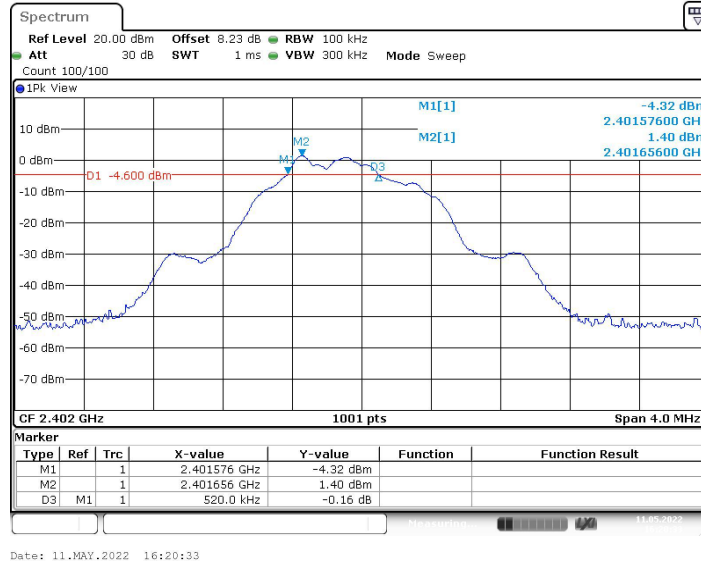
#### Test Mode

Please refer to the clause 2.2.

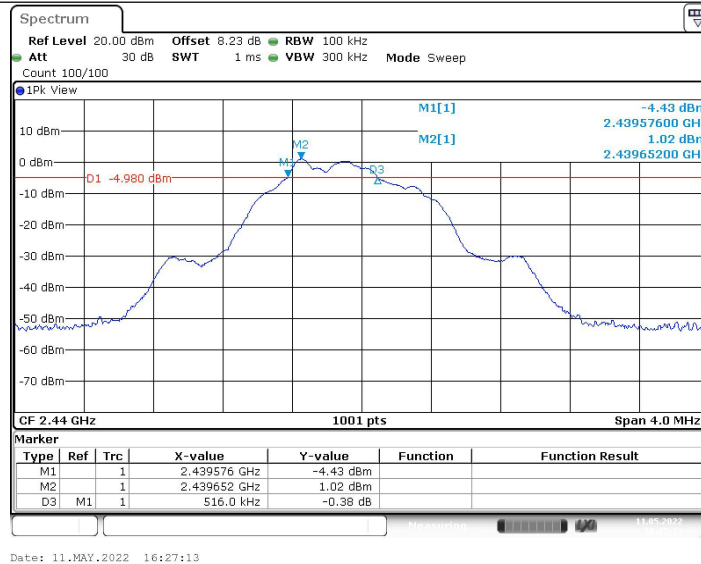
## Test Results

| Channel | Frequency (MHz) | 6dB bandwidth (kHz) | Limit (kHz) | Result |
|---------|-----------------|---------------------|-------------|--------|
| Low     | 2402            | 520                 | 500         | Pass   |
| Middle  | 2440            | 516                 | 500         | Pass   |
| High    | 2480            | 516                 | 500         | Pass   |

### 2402 MHz



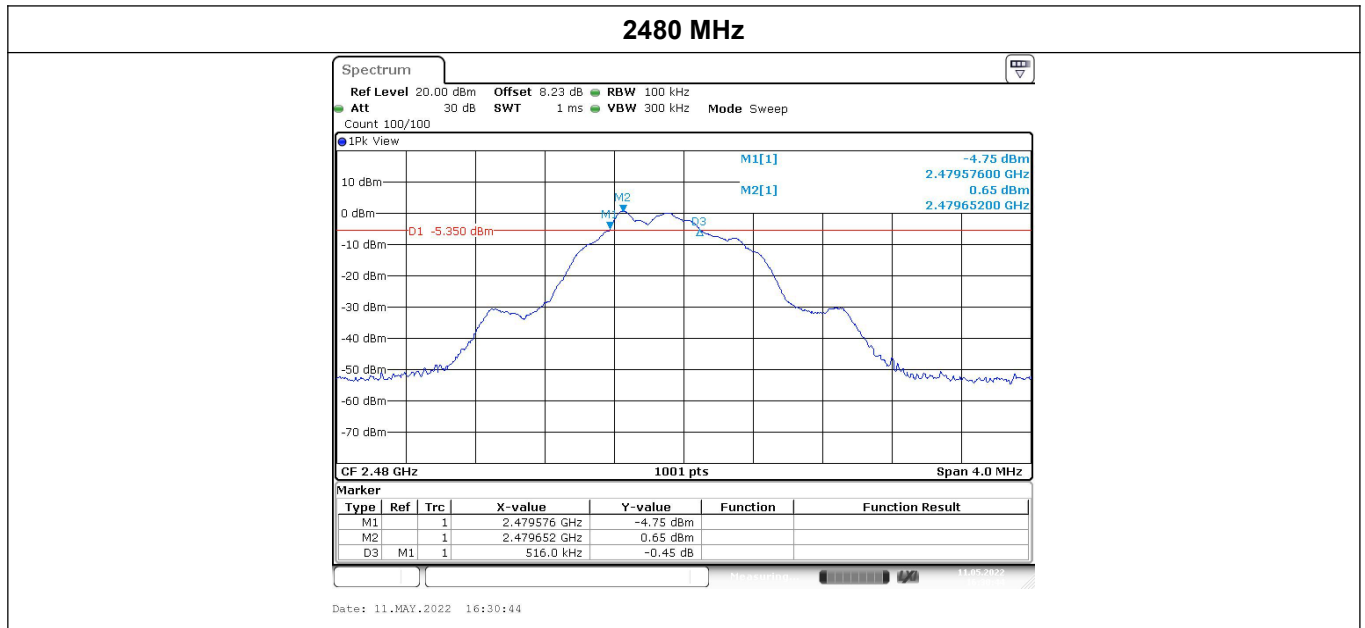
### 2440 MHz



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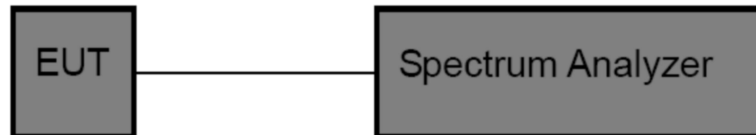


### 3.8. Duty Cycle

#### Limit

| Test Item  | Limit                | Frequency Range(MHz) |
|------------|----------------------|----------------------|
| Duty Cycle | No limit requirement | 2400~2483.5          |

#### Test Configuration



#### Test Procedure

The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on and off times of the transmitted signal. Set the center frequency of the instrument to the center frequency of the transmission. Set RBW  $\geq$  OBW if possible; otherwise, set RBW to the largest available value. Set VBW  $\geq$  RBW. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are  $> 50/T$  and the number of sweep points across duration T exceeds 100. (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if  $T \leq 16.7$  microseconds.)

The transmitter output is connected to the Spectrum Analyzer. We tested according to the zero-span measurement method, 6.0(b) in KDB 558074 D01 DTS Meas Guidance v05r02.

The largest available value of RBW is 8 MHz and VBW is 50 MHz. The zero-span method of measuring duty cycle shall not be used if  $T \leq 6.25$  microseconds. ( $50/6.25 = 8$ )

The zero-span method was used because all measured T data are  $> 6.25$  microseconds and both RBW and VBW are  $> 50/T$ .

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.

Set to the maximum power setting and enable the EUT transmit continuously.

The EUT was operating in controlled its channel.

Use the following spectrum analyzer settings:

Span = Zero Span

RBW = 8MHz (the largest available value)

VBW = 8MHz ( $\geq$  RBW)

Number of points in Sweep  $> 100$

Detector function = peak

Trace = Clear write

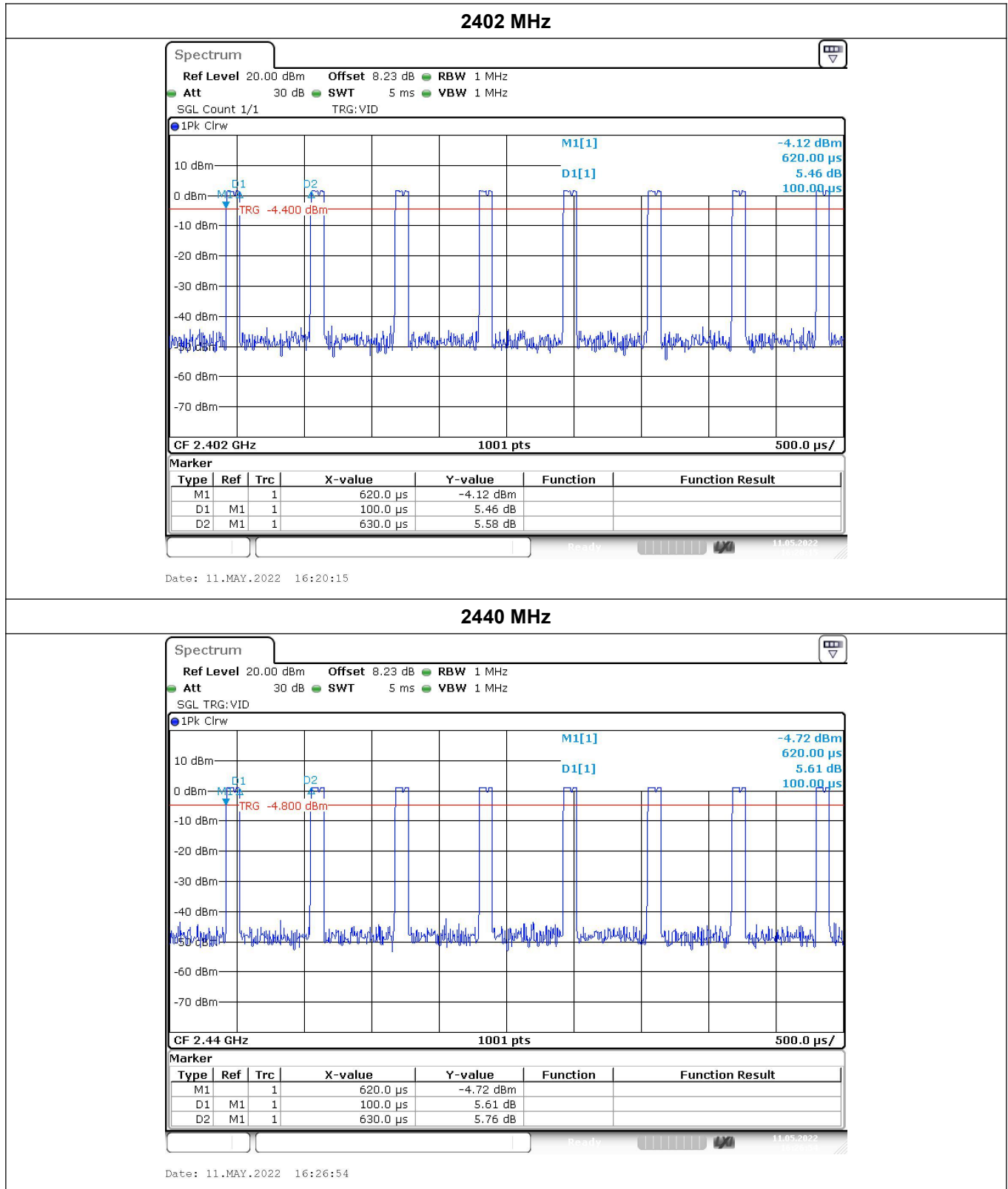
Measure Total and Ton

Calculate Duty Cycle = Ton / Total

## Test Mode

Please refer to the clause 2.2.

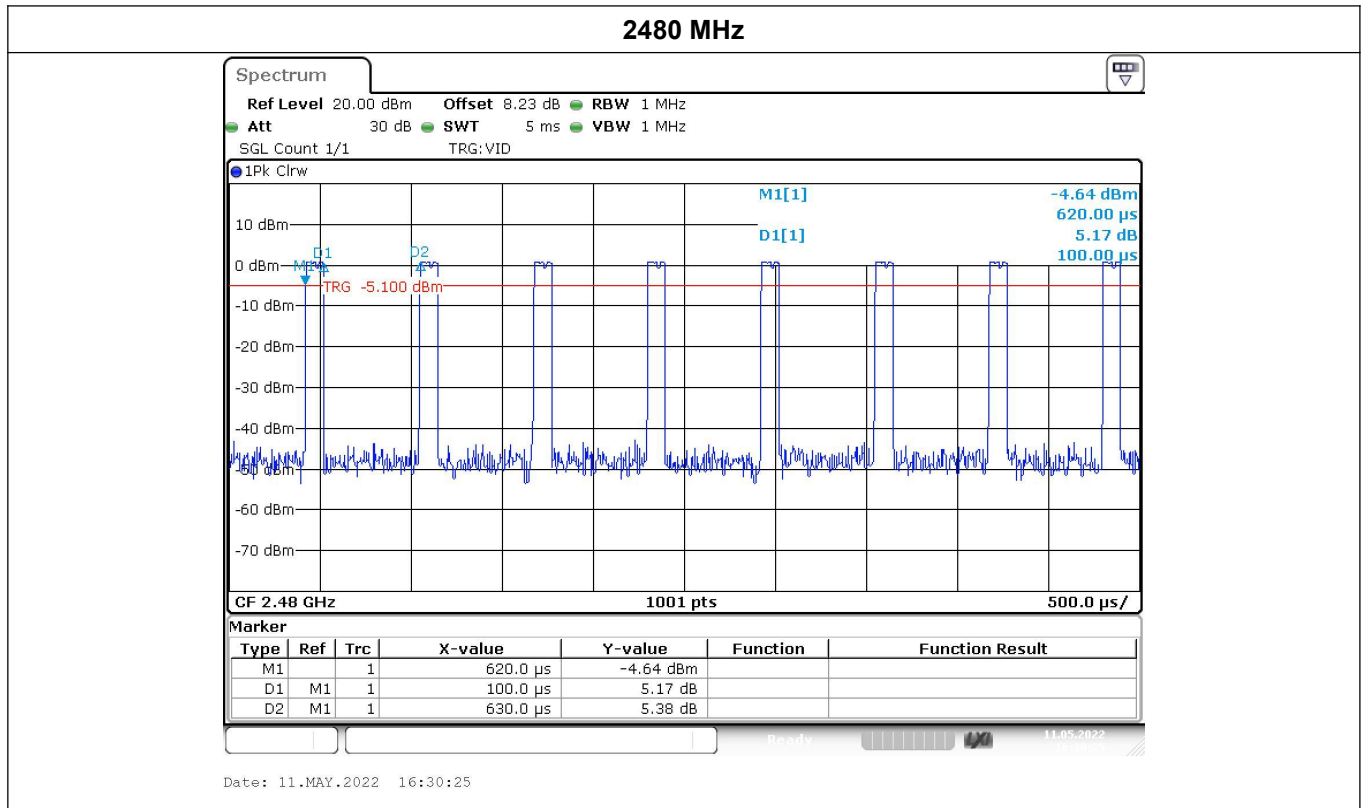
## Test Results



TRF No. FCC Part 15.247\_R1

Add : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

Tel : +(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail : info@gdkesign.cn Web: www.gdkesign.com



TRF No. FCC Part 15.247\_R1

Add : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

Tel : +(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail : info@gdksign.cn Web: www.gdksign.com

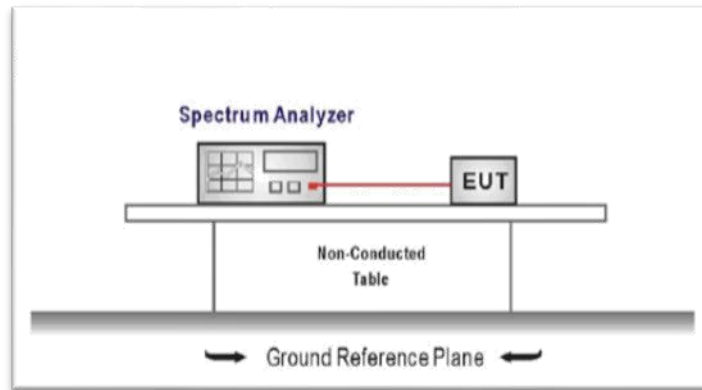
### 3.9. Conducted Band Edge

#### Limit

#### **FCC CFR Title 47 Part 15 Subpart C Section 15.247 (d):**

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### **Test Configuration**



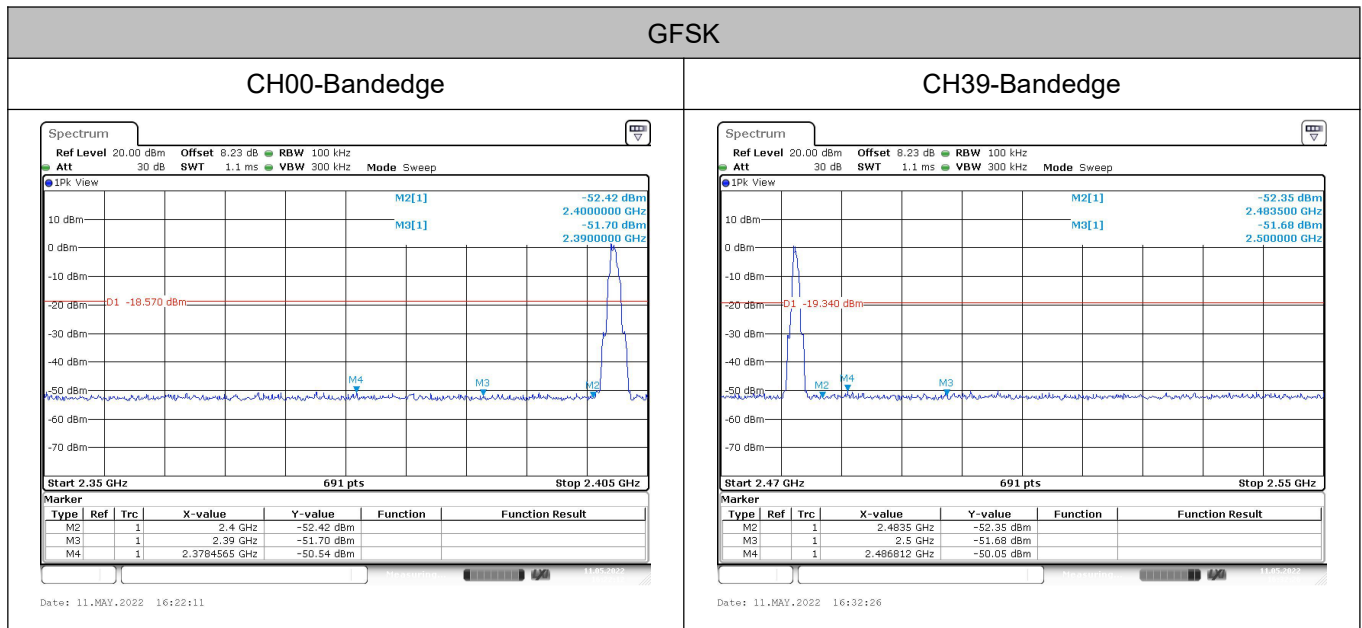
#### **Test Procedure**

1. Connect EUT RF Output port to the Spectrum Analyzer through an RF attenuator.
2. Spectrum Setting:
  - RBW=100KHz
  - VBW=300KHz.
  - Detector function: Peak.
  - Trace: Max hold.
  - Sweep = Auto couple.
  - Allow the trace to stabilize.

#### **Test Mode**

Please refer to the clause 2.2.

## Test Results



TRF No. FCC Part 15.247\_R1

Add : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

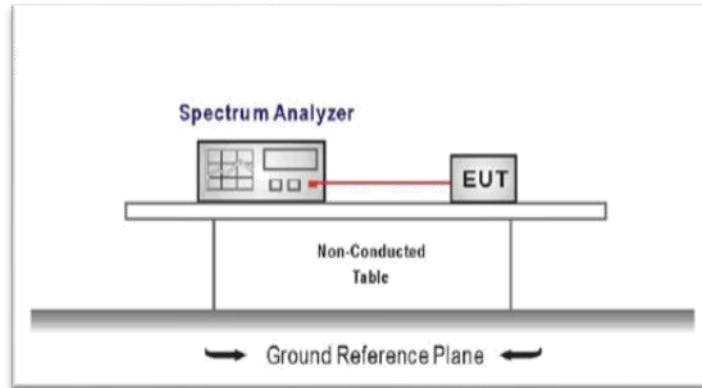
Tel : +(86) 0755-2985 2678 Fax: +(86) 0755-2985 2397 E-mail : info@gdksign.cn Web: www.gdksign.com

### 3.10. Spurious RF Conducted Emission

#### Limit

Below -20dB of the highest emission level in operating band.

#### Test Configuration



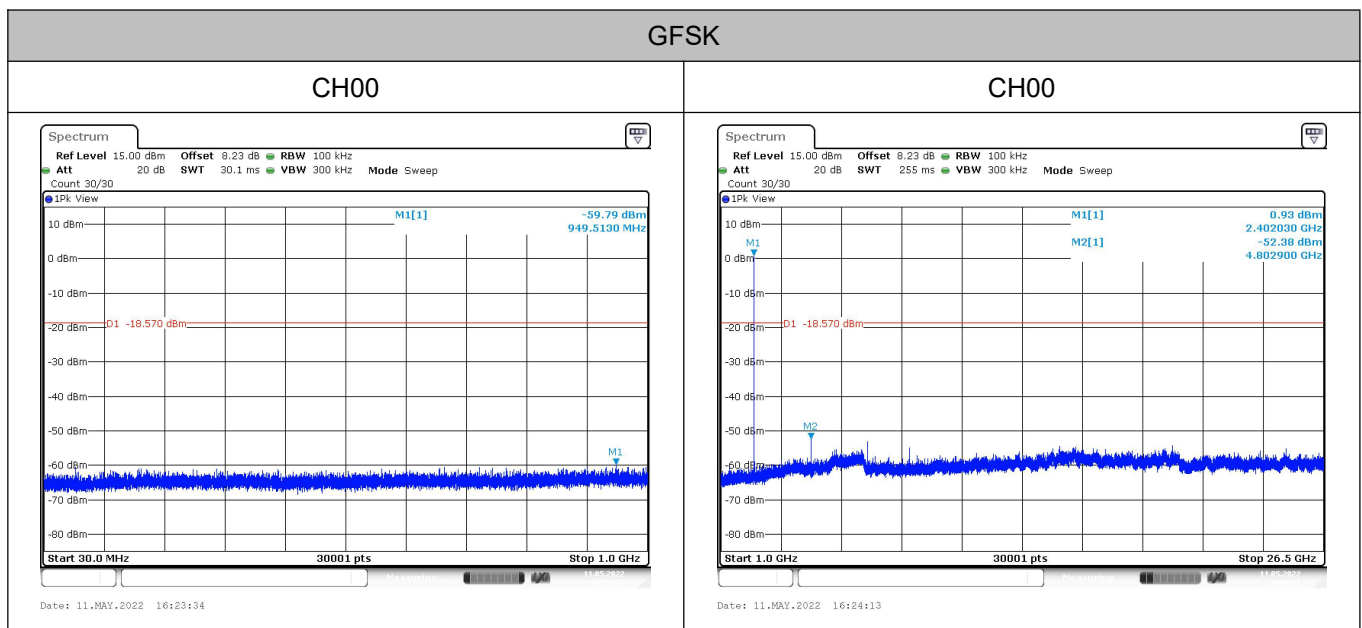
#### Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW=100kHz and VBW= 300kHz to measure the peak field strength, and measure frequency range from 9kHz to 26.5GHz.

#### Test Mode

Please refer to the clause 2.2.

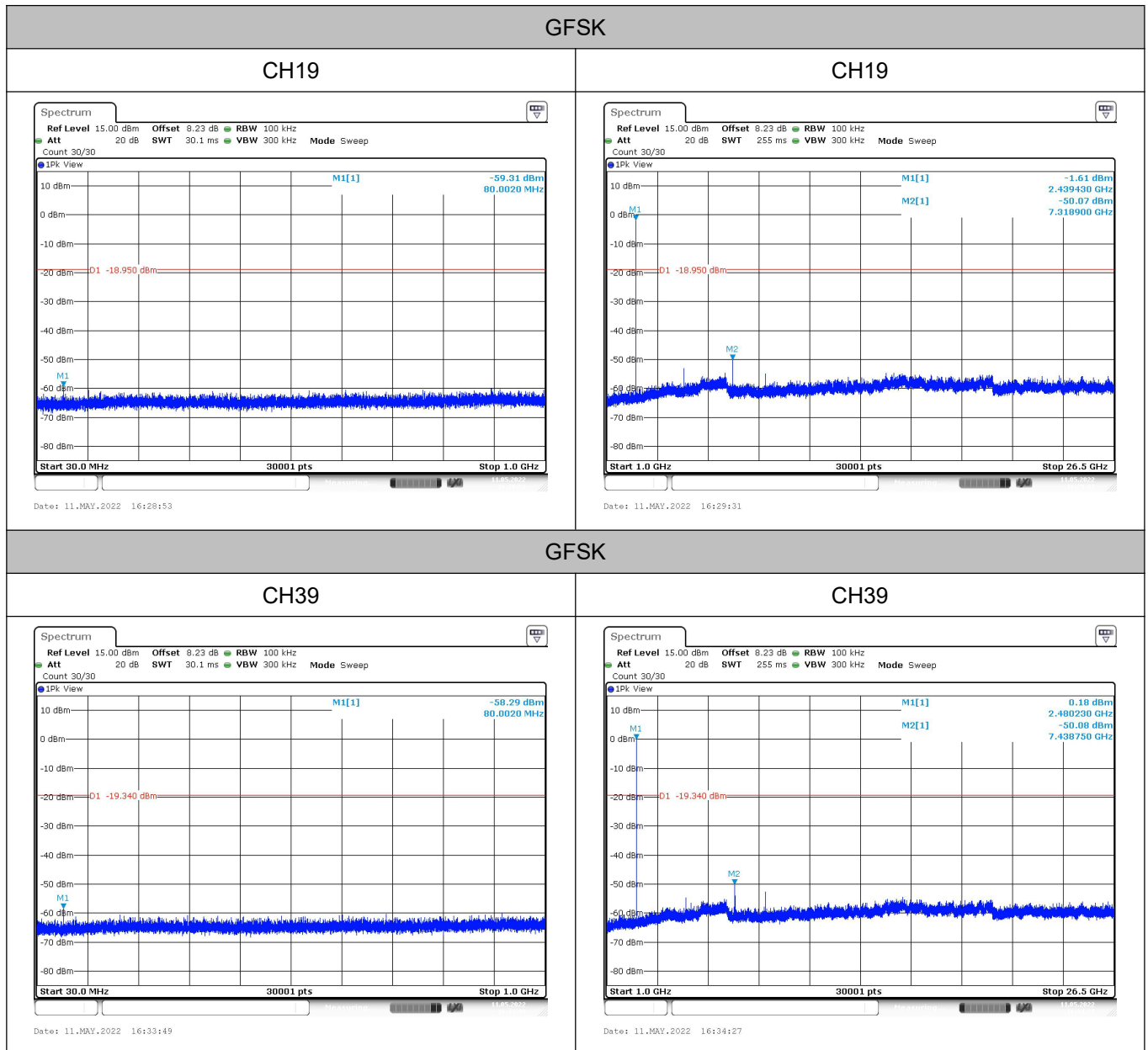
#### Test Results



TRF No. FCC Part 15.247\_R1

Add : West Side of 1/F., Building C, Zone A, Fuyuan New Factory, Jiujiu Industrial Park, Minzhu, Shatou, Shajing, Bao'an District, Shenzhen, Guangdong, China

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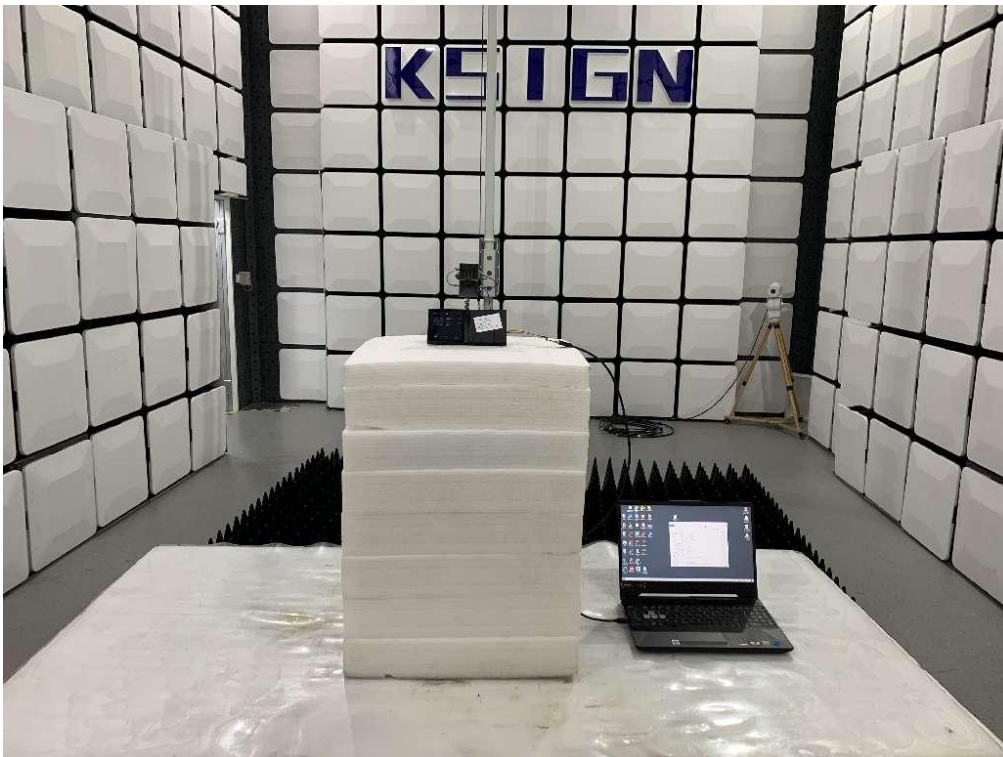


## 4.EUT TEST PHOTOS

Radiated Measurement (Below 1GHz)



Radiated Measurement (Above 1GHz)





## RF Conducted



## 5.PHOTOGRAPHS OF EUT CONSTRUCTIONAL

Please refer to the report Report No.:KS2203S1203E01

**--THE END--**