



Project No: TM-2303000568P  
Report No.: TMWK2303000980KR

FCC ID: 2BALUHCM-ADP-01

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## FCC 47 CFR PART 15 SUBPART C

### TEST REPORT

For

**Smart Breath-actuated Mesh Nebulizer**

**Model No.: HCM-ADP-01**

**Trade Name: AdheResp**

Issued to

**HCmed Innovations Co., Ltd.  
Rm. B, 10F., No. 319, Sec. 2, Dunhua S. Rd., Da'an Dist., Taipei City 106,  
Taiwan**

Issued by

**Compliance Certification Services Inc.  
Wugu Laboratory  
No.11, Wugong 6th Rd., Wugu Dist.,  
New Taipei City, Taiwan.  
Issued Date: June 13, 2023**

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

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## **Revision History**

| Rev. | Issue Date    | Revisions     | Effect Page | Revised By |
|------|---------------|---------------|-------------|------------|
| 00   | June 13, 2023 | Initial Issue | ALL         | Doris Chu  |

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## 1. TEST RESULT CERTIFICATION

**Applicant:** HCmed Innovations Co., Ltd.  
Rm. B, 10F., No. 319, Sec. 2, Dunhua S. Rd., Da'an Dist.,  
Taipei City 106, Taiwan

**Manufacturer:** HCmed Innovations Co., Ltd.  
Rm. B, 10F., No. 319, Sec. 2, Dunhua S. Rd., Da'an Dist.,  
Taipei City 106, Taiwan

**Equipment Under Test:** Smart Breath-actuated Mesh Nebulizer

**Trade Name:** AdheResp

**Model No.:** HCM-ADP-01

**Date of Test:** April 7 ~ 14, 2023

| APPLICABLE STANDARDS                                                                                                                                |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| STANDARD                                                                                                                                            | TEST RESULT |
| FCC 47 CFR Part 15 Subpart C                                                                                                                        | Compliance  |
| Statements of Conformity                                                                                                                            |             |
| Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty. |             |

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.225.

The test results of this report relate only to the tested sample identified in this report.

Approved by:



Dally Hong  
Sr. Engineer

## 2. EUT DESCRIPTION

|                             |                                                                                                                                       |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>              | Smart Breath-actuated Mesh Nebulizer                                                                                                  |
| <b>Model No.</b>            | HCM-ADP-01                                                                                                                            |
| <b>Model Discrepancy</b>    | N/A                                                                                                                                   |
| <b>Trade</b>                | AdheResp                                                                                                                              |
| <b>Received Date</b>        | March 31, 2023                                                                                                                        |
| <b>Power Supply</b>         | Power from Adapter.<br>I/P: 100-240VAC, 50/60Hz, 0.16-0.12A<br>O/P: 5.0VDC, 1.0A, 5.0W                                                |
| <b>Frequency Range</b>      | 13.56MHz                                                                                                                              |
| <b>Modulation Technique</b> | ASK                                                                                                                                   |
| <b>Number of Channels</b>   | 1 Channel                                                                                                                             |
| <b>Antenna Requirement</b>  | Loop Antenna / Gain: 0 dBi                                                                                                            |
| <b>S.W Version</b>          | U5 / PN7362AUHN/C300E                                                                                                                 |
| <b>H.W Version</b>          | 1. Main board / ADP_Main_20221115 V1.0<br>2. Button board / ADP_01_Button_20221115 V1.0<br>3. Sensor board / ADP_Sensor_20221115 V1.0 |

### Remark:

1. For more details, please refer to the User's manual of the EUT.
2. Disclaimer: Antenna information is provided by the applicant, test results of this report are applicable to the sample EUT received.
3. The antenna was permanently attached to the EUT, fulfill the requirement of this section 15.203, please refer to the EUT photos.

### 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10: 2013 and FCC CFR 47 Part 15.207, 15.209, 15.225.

#### 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### 3.2 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| 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 -         | 2483.5 - 2500   | 17.7 - 21.4      |
| 8.37625 - 8.38675          | 156.52525           | 2655 - 2900     | 22.01 - 23.12    |
| 8.41425 - 8.41475          | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0      |
| 12.29 - 12.293             | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8      |
| 12.51975 - 12.52025        | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5     |
| 12.57675 - 12.57725        | 240 - 285           | 3600 - 4400     | ( <sup>2</sup> ) |
| 13.36 - 13.41              | 322 - 335.4         |                 |                  |

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

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### 3.3 DESCRIPTION OF TEST MODES

The EUT had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.

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

| Radiated Emission Measurement Below 1G |                                                                                                                                            |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Test Condition                         | Radiated Emission Below 1G                                                                                                                 |
| Power supply Mode                      | Mode 1: EUT power by Adapter                                                                                                               |
| Worst Mode                             | <input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4 |

*Remark:*

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

## 4. TEST SUMMARY

| FCC Standard Sec. | Chapter | Test Item                                   | Result |
|-------------------|---------|---------------------------------------------|--------|
| 15.203            | 2       | Antenna Requirement                         | Pass   |
| 15.215            | 7.1     | Occupied Bandwidth (99%) and 20dB Bandwidth | Pass   |
| 15.209 & 15.225   | 7.2     | Radiated Emissions                          | Pass   |
| 15.225            | 7.3     | Frequency Stability                         | Pass   |
| 15.207            | 7.4     | AC Power-line Conducted Emission            | Pass   |



## 5. INSTRUMENT CALIBRATION

### 5.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

### 5.2 MEASUREMENT EQUIPMENT USED

#### Equipment Used for Emissions Measurement

| RF Conducted Test Site |                       |           |               |                  |                 |
|------------------------|-----------------------|-----------|---------------|------------------|-----------------|
| Name of Equipment      | Manufacturer          | Model     | Serial Number | Calibration Date | Calibration Due |
| Loop Probe             | LANGER<br>EMV-TECHNIK | RF-R 50-1 | 02-2644       | 2023-01-13       | 2024-01-12      |
| EXA Signal Analyzer    | KEYSIGHT              | N9010B    | MY60242460    | 2023-02-02       | 2024-02-01      |
| Software               | N/A                   |           |               |                  |                 |

| 3M 966 Chamber Test Site |                       |              |                    |            |            |
|--------------------------|-----------------------|--------------|--------------------|------------|------------|
| Equipment                | Manufacturer          | Model        | S/N                | Cal Date   | Cal Due    |
| PXA Signal Analyzer      | Keysight Technologies | N9030B       | MY62291089         | 2022-10-14 | 2023-10-13 |
| Loop Antenna             | SCHWARZBECK           | FMZB 1513_60 | 1513_60_028        | 2022-12-27 | 2023-12-26 |
| Preamplifier             | EMEC                  | EM330        | 060609             | 2023-02-22 | 2024-02-21 |
| Thermo-Hygro Meter       | WISEWIND              | 1206         | D07                | 2022-12-19 | 2023-12-18 |
| Bi-Log Antenna           | Sunol Sciences        | JB3          | A030105            | 2022-08-03 | 2023-08-02 |
| Cable                    | Huber+Suhner          | 104PEA       | 20995+21000+182330 | 2023-02-22 | 2024-02-21 |
| Turn Table               | CCS                   | CC-T-1F      | N/A                | N.C.R      | N.C.R      |
| Controller               | CCS                   | CC-C-1F      | N/A                | N.C.R      | N.C.R      |
| Antenna Tower            | CCS                   | CC-A-1F      | N/A                | N.C.R      | N.C.R      |
| Software                 | e3 6.11-20180419c     |              |                    |            |            |

| AC Conducted Emissions Test Site |                         |           |        |            |            |
|----------------------------------|-------------------------|-----------|--------|------------|------------|
| Equipment                        | Manufacturer            | Model     | S/N    | Cal Date   | Cal Due    |
| EMI Test Receiver                | R&S                     | ESCI      | 100064 | 2022-06-17 | 2023-06-16 |
| LISN                             | TESEQ                   | LN2-16N   | 22012  | 2023-03-08 | 2024-03-07 |
| Cable                            | EMCI                    | CFD300-NL | CERF   | 2022-06-27 | 2023-06-26 |
| Software                         | EZ-EMC(CCS-3A1-CE-WUGU) |           |        |            |            |

#### Remark:

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

### 5.3 MEASUREMENT UNCERTAINTY

| PARAMETER                       | UNCERTAINTY  |
|---------------------------------|--------------|
| AC Powerline Conducted Emission | $\pm 2.1183$ |
| Channel Bandwidth               | $\pm 2.1863$ |
| Frequency Stability             | $\pm 2.0730$ |
| Radiated Emission_9kHz-30MHz    | $\pm 3.814$  |
| Radiated Emission_30MHz-200MHz  | $\pm 4.272$  |
| Radiated Emission_200MHz-1GHz   | $\pm 4.619$  |

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

### 5.4 FACILITIES AND TEST LOCATION

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

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

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

CAB identifier: TW1309

| Test site          | Test Engineer | Remark |
|--------------------|---------------|--------|
| AC Conduction Room | Tony Chao     | -      |
| Radiation          | Ray Li        | -      |
| RF Conducted       | David Li      | -      |

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

## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix A for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

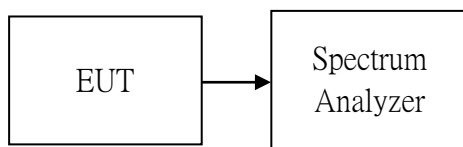
| No. | Device Type | Brand | Model | Series No. | FCC ID |
|-----|-------------|-------|-------|------------|--------|
|     | N/A         |       |       |            |        |

#### Remark:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 7. FCC PART 15.225 REQUIREMENTS

### 7.1 OCCUPIED BANDWIDTH(99%) AND 20 dB BANDWIDTH TEST CONFIGURATION



### TEST PROCEDURE

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW & VBW (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth (VBW) shall not be smaller than three times the RBW value.
4. For the RBW setting that is too low, it will affect the actual waveform characteristics, so it will be set to the lowest RBW of 1kHz.
5. Record the max. reading.

### TEST RESULTS

compliance.

**Temperature:** 24°C

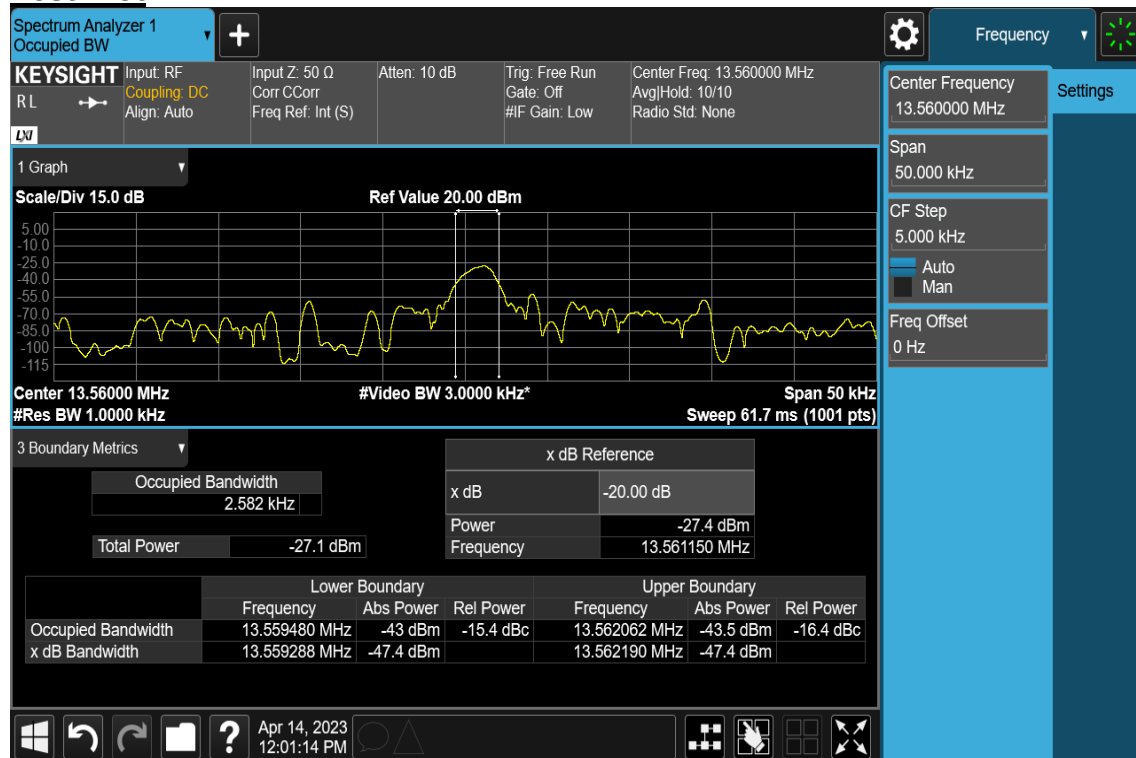
**Humidity:** 60% RH

**Tested by:** David Li

**Test Date:** April 14, 2023

| Test Condition | Frequency(MHz) | Occupied Bandwidth<br>99% (kHz) | 20 dB Bandwidth<br>(kHz) |
|----------------|----------------|---------------------------------|--------------------------|
| NFC            | 13.56          | 2.582                           | 2.902                    |

## Test Plot



## 7.2 FUNDAMENTAL AND RADIATED EMISSIONS

### LIMIT

According to §15.225

- (a) The field strength of any emissions within the band 13.553 – 13.567 MHz shall not exceed 15,848 microvolts / meter at 30 meters.
- (b) Within the bands 13.410 – 13.553 MHz and 13.567 -13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts / meter at 30 meters.
- (c) Within the bands 13.110 – 13.410 MHz and 13.710 – 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts / meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 – 14.010 MHz and shall not exceed the general radiated emission limits in §15.209.

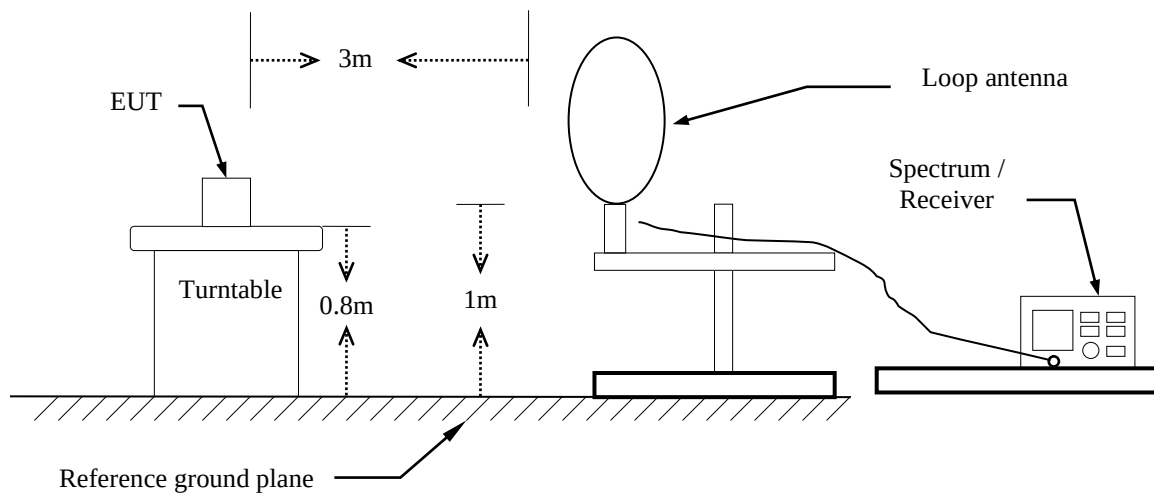
According to §15.225, except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency<br>(MHz) | Field Strength<br>( $\mu$ V/m at meter) | Measurement Distance<br>(meter) |
|--------------------|-----------------------------------------|---------------------------------|
| 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                               |

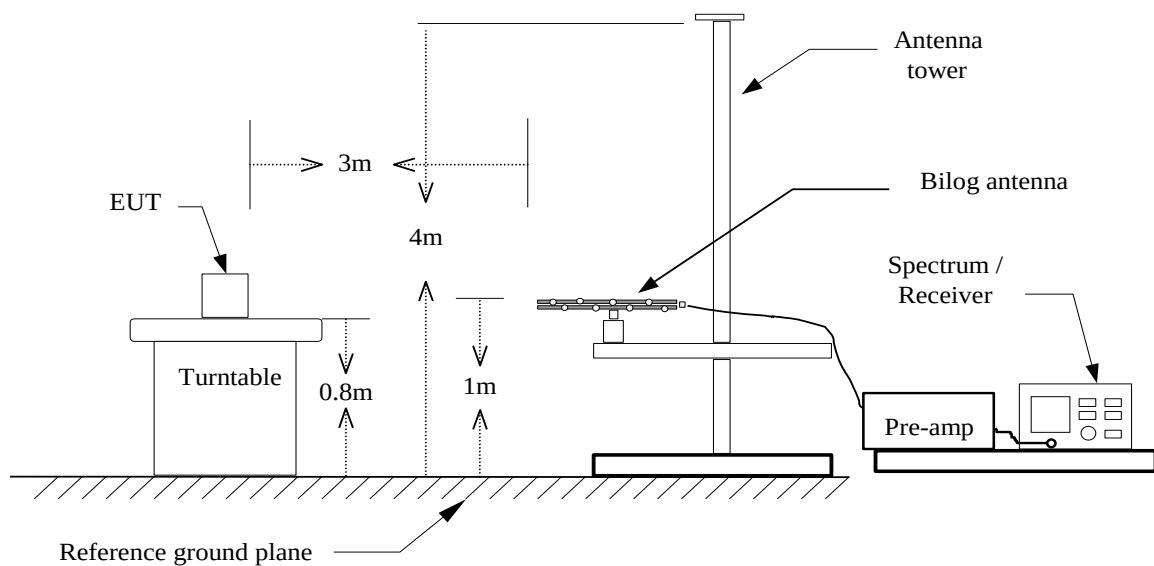
\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

## Test Configuration

### 9kHz ~ 30MHz



### 30MHz ~ 1GHz



## **TEST PROCEDURE**

### **For 9kHz ~ 30MHz**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, The center of the loop shall be 1 m above the ground then to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. Set the spectrum analyzer in the following setting as:  
9KHz-490KHz : RBW=200Hz / VBW=1kHz / Sweep=AUTO  
490KHz-30MHz : RBW=10kHz / VBW=30kHz / Sweep=AUTO
6. Repeat above procedures until the measurements for all frequencies are complete.

### **For 30MHz ~ 1GHz**

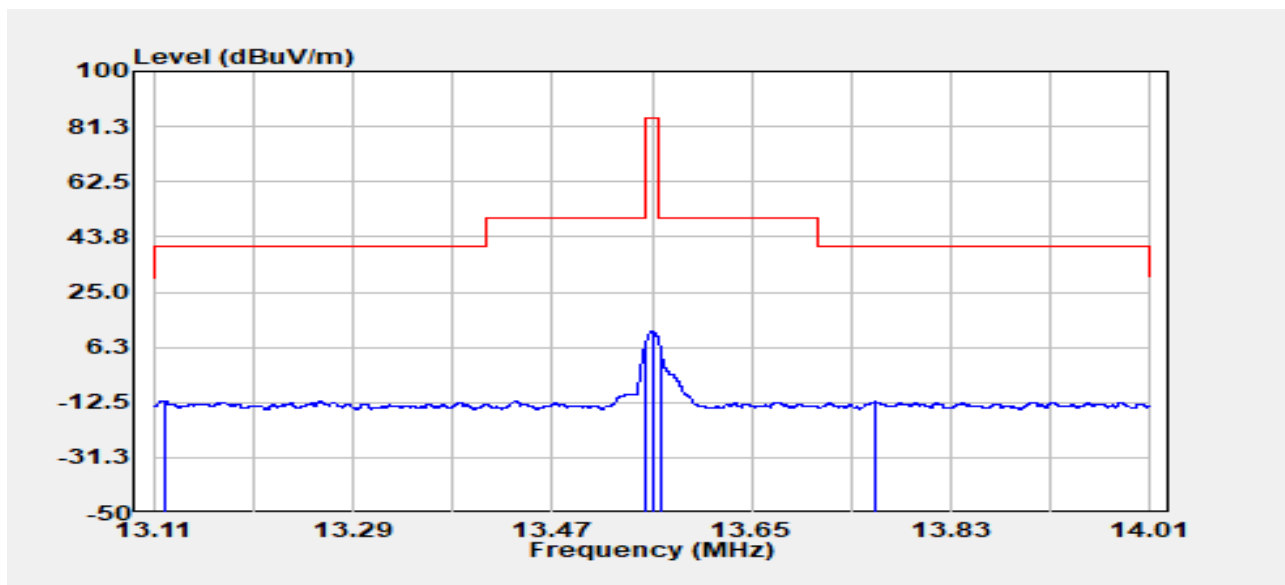
1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:  
RBW=100kHz / VBW=300kHz / Sweep=AUTO
7. Repeat above procedures until the measurements for all frequencies are complete.

### **Remark :**

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



|                        |         |                   |                |
|------------------------|---------|-------------------|----------------|
| <b>Operation Mode:</b> | TX mode | <b>Test Date:</b> | April 13, 2023 |
| <b>Temperature:</b>    | 24.5°C  | <b>Tested by:</b> | Ray Li         |
| <b>Humidity:</b>       | 57 % RH | <b>Polarity:</b>  | Hor.           |



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 13.12        | Peak                         | -43.22                         | 31.27        | -11.94                 | 40.51           | -52.45       |
| 13.55        | Peak                         | -60.87                         | 66.56        | 5.69                   | 50.47           | -44.78       |
| 13.56        | Peak                         | -66.76                         | 78.34        | 11.58                  | 84.00           | -72.42       |
| 13.57        | Peak                         | -61.92                         | 68.67        | 6.75                   | 50.47           | -43.72       |
| 13.76        | Peak                         | -42.83                         | 30.48        | -12.35                 | 40.51           | -52.86       |

#### Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBUV/m) – Limit (dBUV/m).
4. The measurement distance is 3m, the distance of Actual FS is convert to 30m.

Operation Mode: TX mode

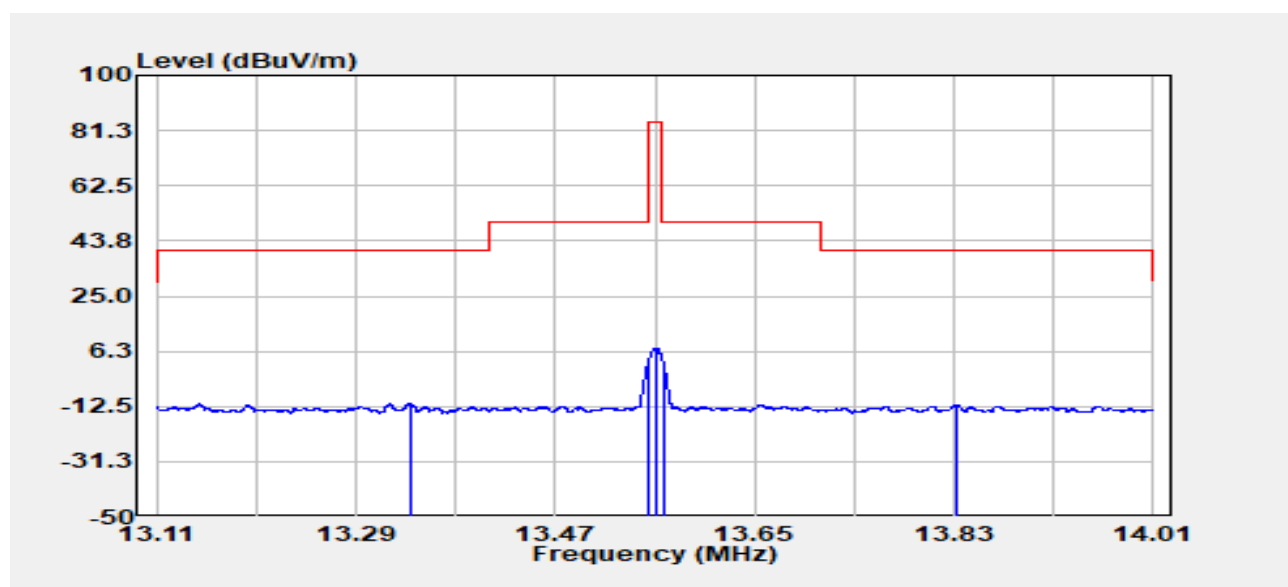
Test Date: April 13, 2023

Temperature: 24.5°C

Tested by: Ray Li

Humidity: 57 % RH

Polarity: Ver.



| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 13.34        | Peak                         | -43.60                         | 32.04        | -11.57                 | 40.51           | -52.07       |
| 13.55        | Peak                         | -56.39                         | 57.60        | 1.21                   | 50.47           | -49.26       |
| 13.56        | Peak                         | -62.44                         | 69.70        | 7.26                   | 84.00           | -76.74       |
| 13.57        | Peak                         | -57.83                         | 60.47        | 2.65                   | 50.47           | -47.82       |
| 13.83        | Peak                         | -43.35                         | 31.51        | -11.84                 | 40.51           | -52.34       |

**Remark:**

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBUV/m) – Limit (dBUV/m).
4. The measurement distance is 3m, the distance of Actual FS is convert to 30m.

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Operation Mode: TX mode

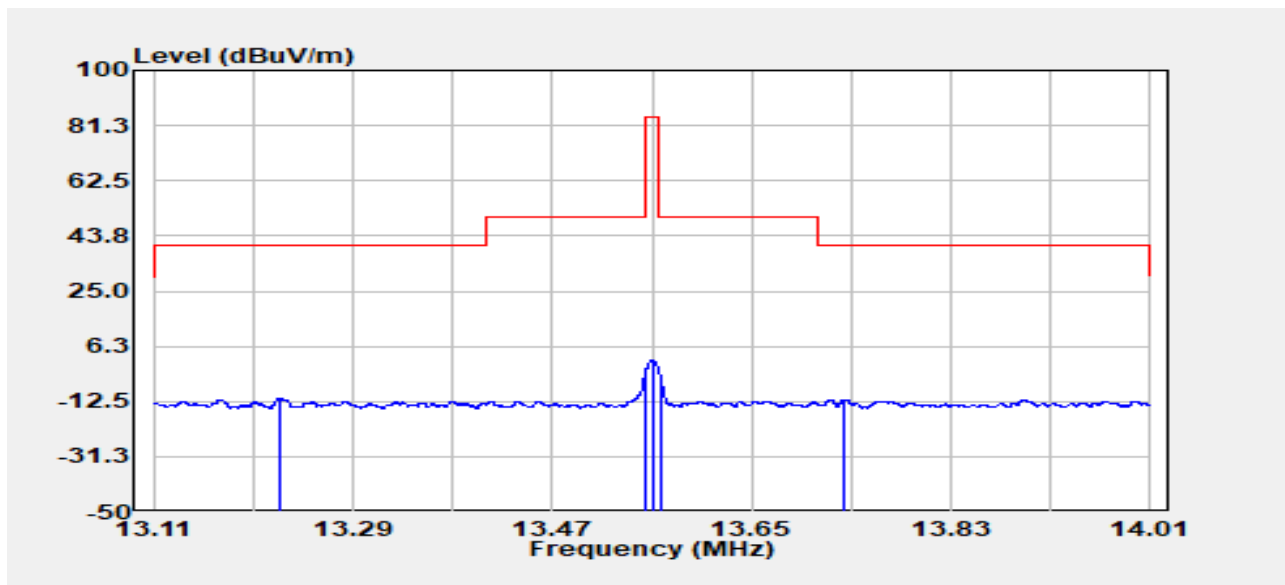
Test Date: April 13, 2023

Temperature: 24.5°C

Tested by: Ray Li

Humidity: 57 % RH

Polarity: Ground



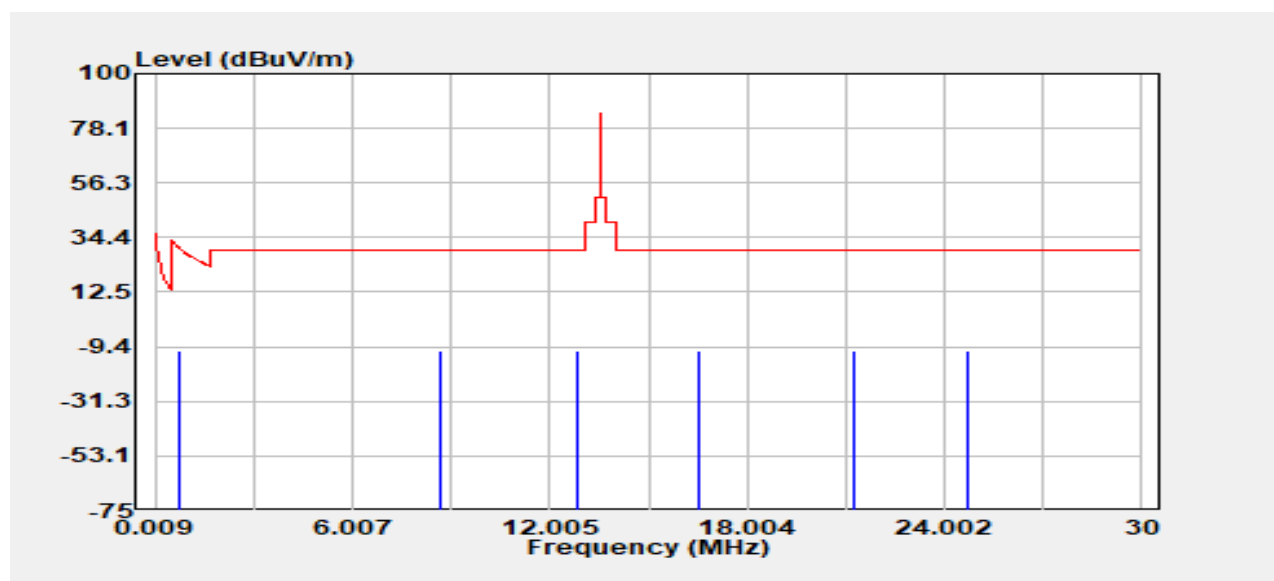
| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Read Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBUV/m | Limit<br>dBUV/m | Margin<br>dB |
|--------------|------------------------------|--------------------------------|--------------|------------------------|-----------------|--------------|
| 13.22        | Peak                         | -43.64                         | 32.11        | -11.53                 | 40.51           | -52.03       |
| 13.55        | Peak                         | -50.80                         | 46.42        | -4.38                  | 50.47           | -54.85       |
| 13.56        | Peak                         | -56.71                         | 58.24        | 1.53                   | 84.00           | -82.47       |
| 13.57        | Peak                         | -51.75                         | 48.33        | -3.42                  | 50.47           | -53.89       |
| 13.73        | Peak                         | -43.37                         | 31.56        | -11.81                 | 40.51           | -52.32       |

## Remark:

1. Radiated emissions measured were made with an instrument using peak/quasi-peak/average detector mode.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Margin (dB) = Result (dBUV/m) – Limit (dBUV/m).
4. The measurement distance is 3m, the distance of Actual FS is convert to 30m.

## 9kHz ~ 30MHz

**Operation Mode:** TX mode      **Test Date:** April 13, 2023  
**Temperature:** 24.5°C      **Tested by:** Ray Li  
**Humidity:** 57 % RH      **Polarity:** Horizontal



| Freq.<br>MHz | Detector<br>Mode | Spectrum<br>Read<br>Level<br>@3m<br>dBμV | Factor<br>@3m<br>dB | Actual<br>FS<br>@3m<br>dBμV/m | Factor<br>@30m&300m<br>dB | Actual<br>FS<br>@30m&300m<br>dBμV/m | Limit<br>dBμV/m | Margin<br>dB |
|--------------|------------------|------------------------------------------|---------------------|-------------------------------|---------------------------|-------------------------------------|-----------------|--------------|
| 0.78         | Peak             | 15.53                                    | 13.58               | 29.12                         | -40.00                    | -10.88                              | 29.73           | -40.62       |
| 8.66         | Peak             | 14.44                                    | 14.84               | 29.28                         | -40.00                    | -10.72                              | 29.54           | -40.26       |
| 12.82        | Peak             | 13.65                                    | 15.16               | 28.81                         | -40.00                    | -11.19                              | 29.54           | -40.73       |
| 16.54        | Peak             | 13.63                                    | 15.25               | 28.88                         | -40.00                    | -11.12                              | 29.54           | -40.66       |
| 21.24        | Peak             | 14.22                                    | 15.11               | 29.34                         | -40.00                    | -10.66                              | 29.54           | -40.20       |
| 24.74        | Peak             | 14.85                                    | 14.50               | 29.35                         | -40.00                    | -10.65                              | 29.54           | -40.19       |

### Remark:

1. the measurement distance is 3m, the distance of Actual FS is convert to 30m or 300m.

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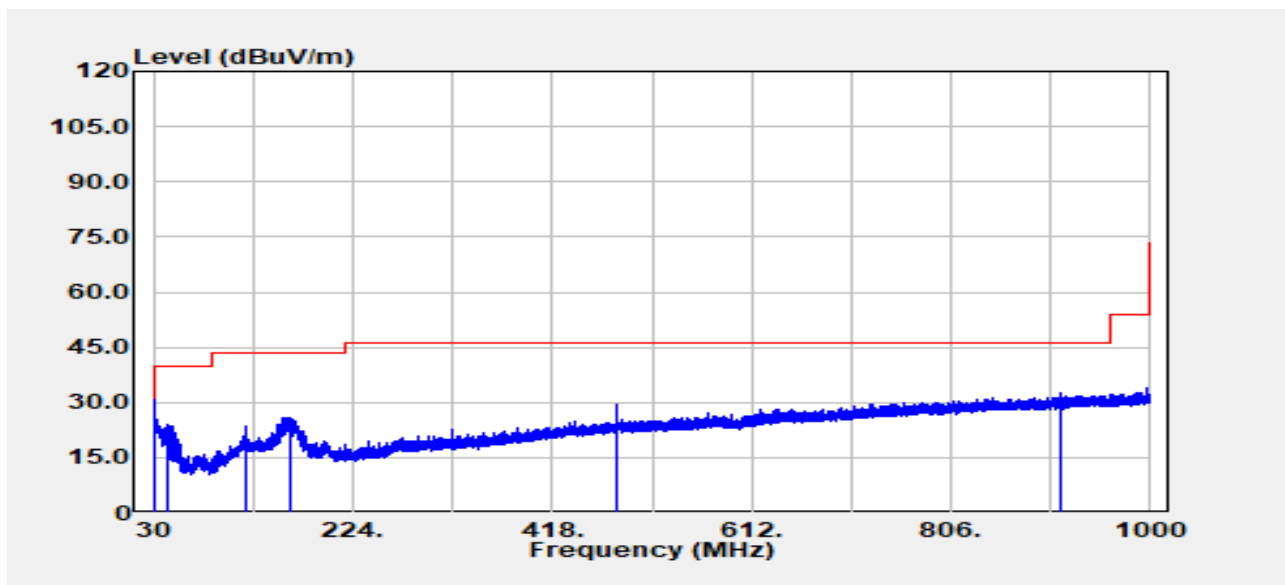
Rev.: 00

### 30MHz ~ 1GHz

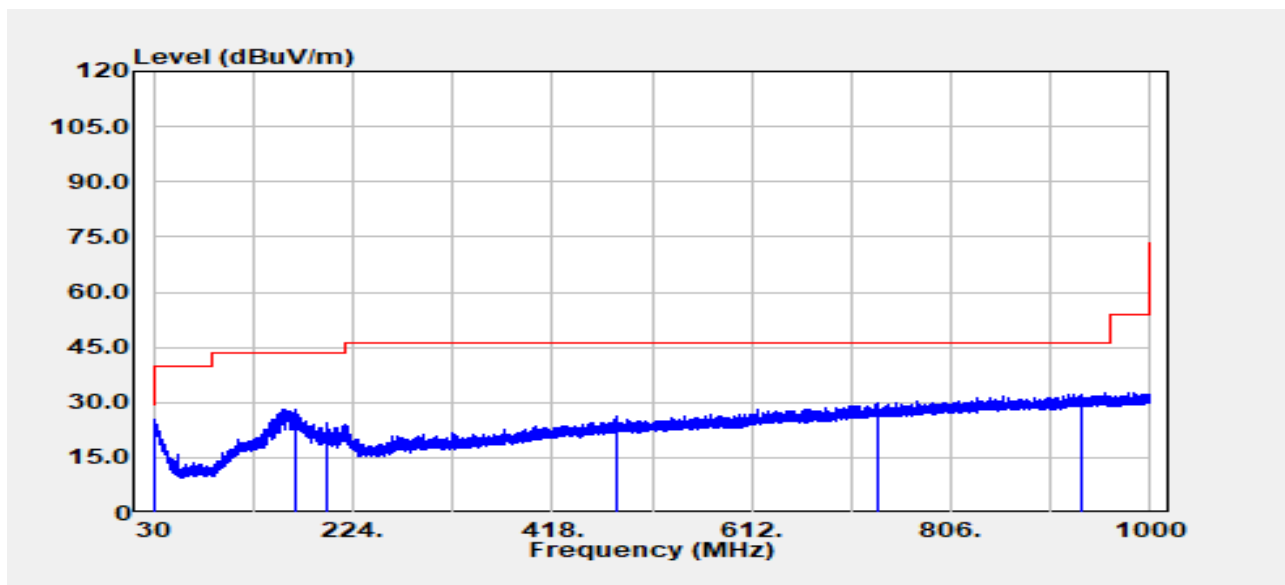
**Operation Mode:** TX mode      **Test Date:** April 13, 2023  
**Temperature:** 24.5°C      **Tested by:** Ray Li  
**Humidity:** 57 % RH      **Polarity:** Ver. / Hor.

| Freq.<br>MHz | Detector<br>Mode<br>PK/QP/AV | Spectrum<br>Reading Level<br>dBμV | Factor<br>dB | Actual<br>FS<br>dBμV/m | Limit<br>@3m<br>dBμV/m | Margin<br>dB | Polarity |
|--------------|------------------------------|-----------------------------------|--------------|------------------------|------------------------|--------------|----------|
| 30.04        | Peak                         | 33.91                             | -3.12        | 30.79                  | 40.00                  | -9.21        | V        |
| 44.55        | Peak                         | 37.28                             | -13.06       | 24.22                  | 40.00                  | -15.78       | V        |
| 119.99       | Peak                         | 32.93                             | -9.20        | 23.73                  | 43.50                  | -19.77       | V        |
| 162.23       | Peak                         | 36.70                             | -10.72       | 25.98                  | 43.50                  | -17.52       | V        |
| 479.99       | Peak                         | 33.15                             | -3.59        | 29.56                  | 46.00                  | -16.44       | V        |
| 913.05       | Peak                         | 29.51                             | 2.95         | 32.46                  | 46.00                  | -13.54       | V        |
| 30.71        | Peak                         | 29.11                             | -3.58        | 25.53                  | 40.00                  | -14.47       | H        |
| 169.11       | Peak                         | 39.10                             | -11.09       | 28.00                  | 43.50                  | -15.50       | H        |
| 199.84       | Peak                         | 33.98                             | -9.74        | 24.24                  | 43.50                  | -19.26       | H        |
| 480.04       | Peak                         | 29.67                             | -3.59        | 26.08                  | 46.00                  | -19.92       | H        |
| 735.10       | Peak                         | 29.40                             | 0.62         | 30.02                  | 46.00                  | -15.98       | H        |
| 932.89       | Peak                         | 28.88                             | 3.48         | 32.37                  | 46.00                  | -13.63       | H        |

## Vertical



## Horizontal



## 7.3 FREQUENCY STABILITY

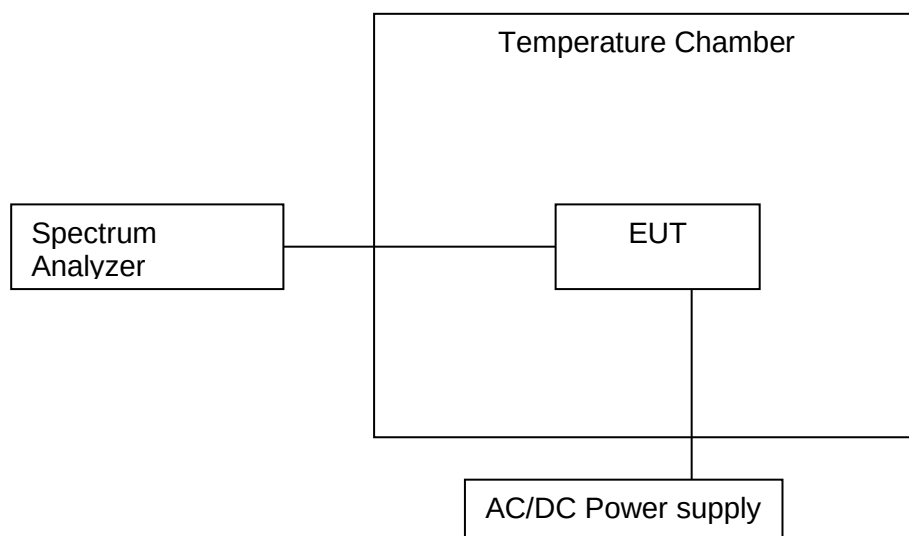
### LIMIT

According to §15.225(e),

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency over a temperature variation of  $-20$  degrees to  $+50$  degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

### Test Configuration

**Temperature and Voltage Measurement (under normal and extreme test conditions)**



### TEST PROCEDURE

1. Turn the EUT off, and place it inside the environmental temperature chamber.
2. Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
3. Set the spectrum analyzer as RBW=1kHz, VBW = RBW, Span = 200kHz, Sweep = auto.
4. Turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized.
5. Switch off the EUT and Lower the chamber temperature by not more than 10 °C and allow the temperature inside the chamber to stabilize.
6. Mark the peak frequency and measure the frequency tolerance using frequency counter function.
7. Repeat step 4 through step 6 down to the lowest specified temperature.

## TEST RESULTS

No non-compliance noted.

**Temperature:** 24°C

**Humidity:** 60% RH

**Tested by:** David Li

**Test Date:** April 14, 2023

## TEST DATA

| Startup                     |                  |            |             |             |
|-----------------------------|------------------|------------|-------------|-------------|
| A. Temperature Variation    |                  |            |             |             |
| Power Supply                | Environment      | Frequency  | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)      |             |             |
| 5                           | -20              | 13.560584  | 584.00      | +/- 1356    |
| 5                           | -10              | 13.560648  | 648.00      | +/- 1356    |
| 5                           | 0                | 13.560758  | 758.00      | +/- 1356    |
| 5                           | 10               | 13.560244  | 244.00      | +/- 1356    |
| 5                           | 20               | 13.560854  | 854.00      | +/- 1356    |
| 5                           | 30               | 13.560124  | 124.00      | +/- 1356    |
| 5                           | 40               | 13.5602127 | 212.70      | +/- 1356    |
| 5                           | 50               | 13.5607645 | 764.50      | +/- 1356    |
| B. Supply Voltage Variation |                  |            |             |             |
| Power Supply                | Environment      | Frequency  | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)      |             |             |
| 5.25                        | 20               | 13.560321  | 321.00      | +/- 1356    |
| 5                           | 20               | 13.560854  | 854.00      | +/- 1356    |
| 4.75                        | 20               | 13.560247  | 247.00      | +/- 1356    |



| 2 minutes                   |                  |            |             |             |
|-----------------------------|------------------|------------|-------------|-------------|
| A. Temperature Variation    |                  |            |             |             |
| Power Supply                | Environment      | Frequency  | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)      |             |             |
| 5                           | -20              | 13.560924  | 924.00      | +/- 1356    |
| 5                           | -10              | 13.560684  | 684.00      | +/- 1356    |
| 5                           | 0                | 13.560728  | 728.00      | +/- 1356    |
| 5                           | 10               | 13.560631  | 631.00      | +/- 1356    |
| 5                           | 20               | 13.560615  | 615.00      | +/- 1356    |
| 5                           | 30               | 13.560254  | 254.00      | +/- 1356    |
| 5                           | 40               | 13.5606284 | 628.40      | +/- 1356    |
| 5                           | 50               | 13.560749  | 749.00      | +/- 1356    |
| B. Supply Voltage Variation |                  |            |             |             |
| Power Supply                | Environment      | Frequency  | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)      |             |             |
| 5.25                        | 20               | 13.560654  | 654.00      | +/- 1356    |
| 5                           | 20               | 13.560854  | 854.00      | +/- 1356    |
| 4.75                        | 20               | 13.560884  | 884.00      | +/- 1356    |

| 5 minutes                   |                  |           |             |             |
|-----------------------------|------------------|-----------|-------------|-------------|
| A. Temperature Variation    |                  |           |             |             |
| Power Supply                | Environment      | Frequency | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)     |             |             |
| 5                           | -20              | 13.560724 | 724.00      | +/- 1356    |
| 5                           | -10              | 13.560842 | 842.00      | +/- 1356    |
| 5                           | 0                | 13.560824 | 824.00      | +/- 1356    |
| 5                           | 10               | 13.560311 | 311.00      | +/- 1356    |
| 5                           | 20               | 13.560162 | 162.00      | +/- 1356    |
| 5                           | 30               | 13.560175 | 175.00      | +/- 1356    |
| 5                           | 40               | 13.560724 | 724.00      | +/- 1356    |
| 5                           | 50               | 13.56043  | 430.00      | +/- 1356    |
| B. Supply Voltage Variation |                  |           |             |             |
| Power Supply                | Environment      | Frequency | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)     |             |             |
| 5.25                        | 20               | 13.560783 | 783.00      | +/- 1356    |
| 5                           | 20               | 13.560854 | 854.00      | +/- 1356    |
| 4.75                        | 20               | 13.560623 | 623.00      | +/- 1356    |

| 10 minutes                  |                  |           |             |             |
|-----------------------------|------------------|-----------|-------------|-------------|
| A. Temperature Variation    |                  |           |             |             |
| Power Supply                | Environment      | Frequency | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)     |             |             |
| 5                           | -20              | 13.560835 | 835.00      | +/- 1356    |
| 5                           | -10              | 13.560356 | 356.00      | +/- 1356    |
| 5                           | 0                | 13.560802 | 802.00      | +/- 1356    |
| 5                           | 10               | 13.560807 | 807.00      | +/- 1356    |
| 5                           | 20               | 13.560741 | 741.00      | +/- 1356    |
| 5                           | 30               | 13.560869 | 869.00      | +/- 1356    |
| 5                           | 40               | 13.560757 | 757.00      | +/- 1356    |
| 5                           | 50               | 13.560462 | 462.00      | +/- 1356    |
| B. Supply Voltage Variation |                  |           |             |             |
| Power Supply                | Environment      | Frequency | Delta (kHz) | Limit (kHz) |
| Vdc                         | Temperature (°C) | (MHz)     |             |             |
| 5.25                        | 20               | 13.560871 | 871.00      | +/- 1356    |
| 5                           | 20               | 13.560854 | 854.00      | +/- 1356    |
| 4.75                        | 20               | 13.560786 | 786.00      | +/- 1356    |

## 7.4 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §15.207(a), for an intentional radiator 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, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency Range<br>(MHz) | Limits<br>(dB $\mu$ V) |           |
|--------------------------|------------------------|-----------|
|                          | Quasi-peak             | Average   |
| 0.15 to 0.50             | 66 to 56*              | 56 to 46* |
| 0.50 to 5                | 56                     | 46        |
| 5 to 30                  | 60                     | 50        |

\* Decreases with the logarithm of the frequency.

### TEST PROCEDURE

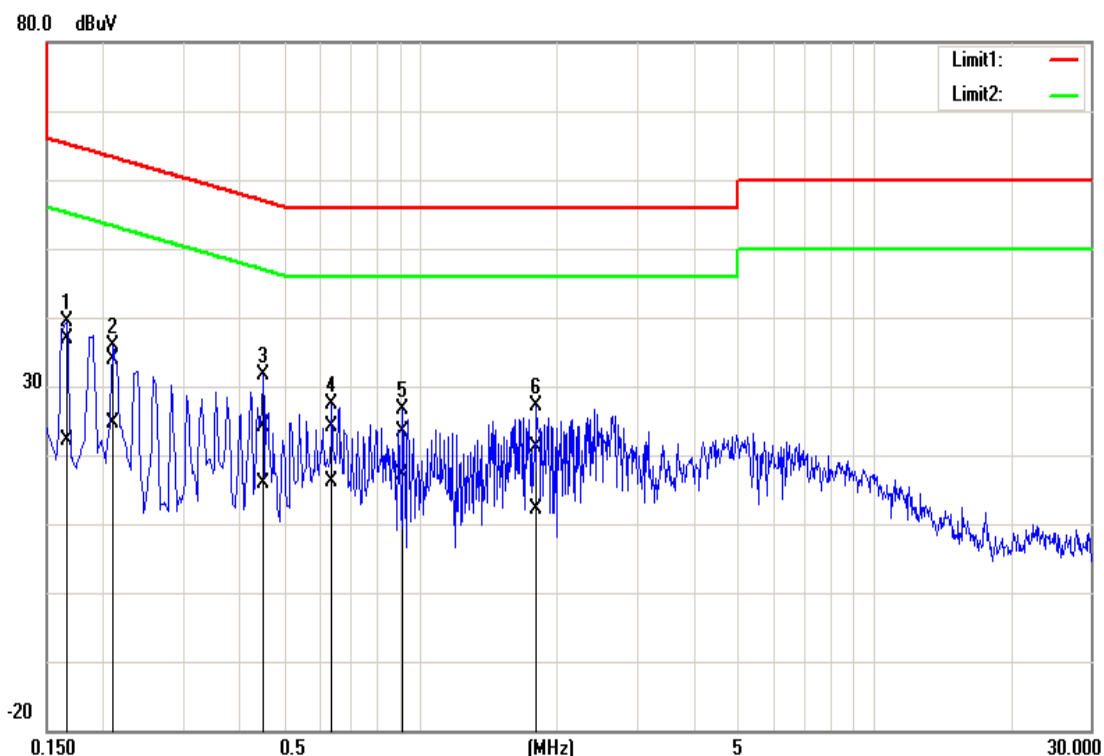
1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### TEST RESULTS

### PASS

## Test Data

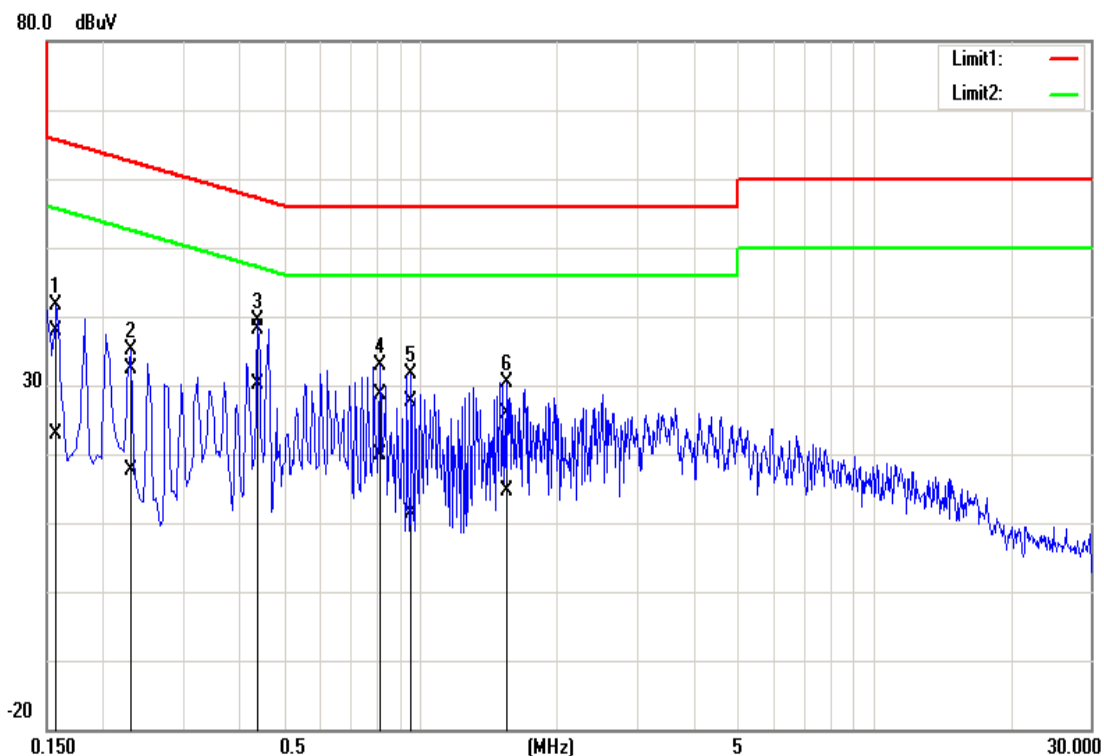
|            |        |               |                 |
|------------|--------|---------------|-----------------|
| Test Mode: | Mode 1 | Temp/Hum      | 22.7(°C)/ 54%RH |
| Phase:     | Line   | Test Date     | April 7, 2023   |
|            |        | Test Engineer | Tony Chao       |



| Frequency<br>(MHz) | Quasi<br>Peak<br>reading<br>(dBuV) | Average<br>reading<br>(dBuV) | Correction<br>factor<br>(dB) | Quasi<br>Peak<br>result<br>(dBuV) | Average<br>result<br>(dBuV) | Quasi<br>Peak<br>limit<br>(dBuV) | Average<br>limit<br>(dBuV) | Quasi<br>Peak<br>margin<br>(dB) | Average<br>margin<br>(dB) | Remark |
|--------------------|------------------------------------|------------------------------|------------------------------|-----------------------------------|-----------------------------|----------------------------------|----------------------------|---------------------------------|---------------------------|--------|
| 0.1660             | 36.78                              | 21.96                        | 0.15                         | 36.93                             | 22.11                       | 65.16                            | 55.16                      | -28.23                          | -33.05                    | Pass   |
| 0.2100             | 33.76                              | 24.49                        | 0.15                         | 33.91                             | 24.64                       | 63.21                            | 53.21                      | -29.30                          | -28.57                    | Pass   |
| 0.4500             | 23.88                              | 15.76                        | 0.15                         | 24.03                             | 15.91                       | 56.88                            | 46.88                      | -32.85                          | -30.97                    | Pass   |
| 0.6380             | 23.97                              | 16.04                        | 0.15                         | 24.12                             | 16.19                       | 56.00                            | 46.00                      | -31.88                          | -29.81                    | Pass   |
| 0.9180             | 23.16                              | 16.93                        | 0.16                         | 23.32                             | 17.09                       | 56.00                            | 46.00                      | -32.68                          | -28.91                    | Pass   |
| 1.8060             | 20.89                              | 11.85                        | 0.20                         | 21.09                             | 12.05                       | 56.00                            | 46.00                      | -34.91                          | -33.95                    | Pass   |

Note: Correction factor = LISN loss + Cable loss.

|            |         |               |                 |
|------------|---------|---------------|-----------------|
| Test Mode: | Mode 1  | Temp/Hum      | 22.7(°C)/ 54%RH |
| Phase:     | Neutral | Test Date     | April 7, 2023   |
|            |         | Test Engineer | Tony Chao       |



| Frequency<br>(MHz) | Quasi<br>Peak<br>reading<br>(dBuV) | Average<br>reading<br>(dBuV) | Correctio<br>n factor<br>(dB) | Quasi<br>Peak<br>result<br>(dBuV) | Average<br>result<br>(dBuV) | Quasi<br>Peak<br>limit<br>(dBuV) | Average<br>limit<br>(dBuV) | Quasi<br>Peak<br>margin<br>(dB) | Average<br>margin<br>(dB) | Remark |
|--------------------|------------------------------------|------------------------------|-------------------------------|-----------------------------------|-----------------------------|----------------------------------|----------------------------|---------------------------------|---------------------------|--------|
| 0.1580             | 37.57                              | 22.60                        | 0.20                          | 37.77                             | 22.80                       | 65.57                            | 55.57                      | -27.80                          | -32.77                    | Pass   |
| 0.2300             | 32.21                              | 17.33                        | 0.19                          | 32.40                             | 17.52                       | 62.45                            | 52.45                      | -30.05                          | -34.93                    | Pass   |
| 0.4380             | 37.88                              | 29.84                        | 0.19                          | 38.07                             | 30.03                       | 57.10                            | 47.10                      | -19.03                          | -17.07                    | Pass   |
| 0.8140             | 28.50                              | 19.69                        | 0.21                          | 28.71                             | 19.90                       | 56.00                            | 46.00                      | -27.29                          | -26.10                    | Pass   |
| 0.9540             | 27.35                              | 11.24                        | 0.21                          | 27.56                             | 11.45                       | 56.00                            | 46.00                      | -28.44                          | -34.55                    | Pass   |
| 1.5460             | 25.64                              | 14.36                        | 0.24                          | 25.88                             | 14.60                       | 56.00                            | 46.00                      | -30.12                          | -31.40                    | Pass   |

Note: Correction factor = LISN loss + Cable loss.

- End of Test Report -