## TEST REPORT On behalf of

#### Hisense Visual Technology Co., Ltd.

#### Product Name: REMOTE CONTROL

# Model No.: ERF3F80H, ERF3J80H, ERF3AA80H, ERF3AI80C, ERF3ZB80

#### FCC ID: 2AVIGBR0001

Prepared For: Hisense Visual Technology Co., Ltd. No.218 Qianwangang Road, Economy & Technology Development Zone, Qingdao, China

Prepared By: Audix Technology (Shanghai) Co., Ltd. 3F and 4F, 34Bldg, 680 Guiping Rd., Caohejing Hi-Tech Park, Shanghai 200233, China

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File No.:C1D2309020Report No.:ACI-F20301A4Date of Test:2023.09.01-04Date of Report:2023.09.15

The statement is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. government.

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FCC ID: 2AVIGBR0001

## TEST REPORT

| Applicant       | : | Hisense Visual Technology Co., Ltd. |   |                  |  |
|-----------------|---|-------------------------------------|---|------------------|--|
| EUT Description | : | REMOTE CONTROL                      |   |                  |  |
|                 |   | (A) Model No.                       | : | Refer to sec2.1  |  |
|                 |   | (B) Power Supply                    | : | DC 3V            |  |
|                 |   | (C) Test Voltage                    | : | DC 3V from AAA*2 |  |

#### **Test Procedure Used:**

#### FCC RULES AND REGULATIONS PART 15 SUBPART C AND ANSI C63.10-2013

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: Refer to Sec2.1), which was tested is technically compliance with the FCC limits.

This report applies to above tested Sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

| Date of Test :      | 2023.09.01-04                           | Date of Report : | 2023.09.15 |
|---------------------|---|------------------|------------|
| Producer :          | Manchy Wang<br>MINDY WANG / Assistant   |                  |            |
| Review :            | Byron Mu<br>BYRON WU Deputy Assistant M | Ianager          |            |
| Audix Technology (8 | Shanghai) Co., Ltd.                     |                  |            |
| Signatory :         | KAMPCHEN/Manager                        |                  |            |

## **1 SUMMARY OF STANDARDS AND RESULTS**

## 1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

| Description / Test Item                    | Test Standard                     | Results | Meets Limit  |  |  |  |
|--|-----------------------------------|---------|--------------|--|--|--|
| EMISSION                                   |                                   |         |              |  |  |  |
|  | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Conducted Emission                         | SUBPART C                         | N/A     | 15.207       |  |  |  |
|  | AND ANSI C63.10:2013              |         |              |  |  |  |
|  | FCC RULES AND REGULATIONS PART 15 |         | 15.209(a)    |  |  |  |
| Radiated Emission                          | SUBPART C                         | Pass    | 15.205(a)(c) |  |  |  |
|  | AND ANSI C63.10:2013              |         | 15.205(d)(C) |  |  |  |
| 6 dB Bandwidth                             | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Measurement                                | SUBPART C                         | Pass    | 15.247(a)(2) |  |  |  |
| Weasurement                                | AND ANSI C63.10:2013              |         |              |  |  |  |
| Maximum Peak Output                        | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Power Measurement                          | SUBPART C                         | Pass    | 15.247(b)(3) |  |  |  |
| rower measurement                          | AND ANSI C63.10:2013              |         |              |  |  |  |
| Emission Limitations                       | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Measurement                                | SUBPART C                         | Pass    | 15.247(d)    |  |  |  |
| Measurement                                | AND ANSI C63.10:2013              |         |              |  |  |  |
| Dand Edga                                  | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Band Edge<br>Measurement                   | SUBPART C                         | Pass    | 15.247(d)    |  |  |  |
| Measurement                                | AND ANSI C63.10:2013              |         |              |  |  |  |
| Downer Crossfuel Dorosity                  | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Power Spectral Density                     | SUBPART C                         | Pass    | 15.247(e)    |  |  |  |
| Measurement                                | AND ANSI C63.10:2013              |         |              |  |  |  |
|  | FCC RULES AND REGULATIONS PART 15 |         |              |  |  |  |
| Antenna Requirement                        | SUBPART C                         | Pass    | 15.203       |  |  |  |
| •  | AND ANSI C63.10:2013              |         |              |  |  |  |
| N/A is an abbreviation for Not Applicable. |                                   |         |              |  |  |  |

## 2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

| Description | : | REMOTE CONTROL |  |
|-------------|---|----------------|--|
|-------------|---|----------------|--|

| Type of EUT | : | Production | □ Pre-product | □ Pro-type |
|-------------|---|------------|---------------|------------|
|-------------|---|------------|---------------|------------|

Model Number : ERF3F80H, ERF3J80H, ERF3AA80H, ERF3AI80C, ERF3ZB80

Test model :

Note#1

: ERF3ZB80

: The modified histories of report are as follows:

| Report No.    | Model No.  | Rev. Summary   | Edition No. | Data of Rev. |
|---------------|--|--|-------------|--------------|
| ACI-F20301    | ERF3F80H,<br>ERF3J80H  | Original Report.   | 0           | 2020.11.23   |
| ACI- F20301A1 | ERF3ZB80H  | 1.To add one model   | Rev. A1     | 2021.09.29   |
| ACI- F20301A2 | ERF3AI80C  | 1.To add one model   | Rev. A2     | 2022.05.09   |
| ACI- F20301A3 | ERF3ZB80**,<br>ERF3ZB80  | To add two models  | Rev. A3     | 2022.08.26   |
| ACI- F20301A4 | ERF3F80H,<br>ERF3J80H,<br>ERF3AA80H,<br>ERF3AI80C,<br>ERF3ZB80 | 1.To add one model<br>2. Change PCB<br>layout and circuit. | Rev. A4     | 2023.09.15   |

| Note#2 | : | * represents 0-9 or A-L |
|--------|---|-------------------------|
|--------|---|-------------------------|

Note#3 : All models are the same expect for value of key.

Note#4 : According to the modification, all test items were re-tested. According to the result, we demonstrate that the EUT could be full compliance with the requirement of standards. FCC ID: 2AVIGBR0001

| 0, ,          |   | · · ·  |
|---------------|---|--|
| Radio Tech    | : | Bluetooth v4.2 BLE   |
| Channel Freq. | : | 2402MHz-2480MHz  |
| Tested Freq.  | : | 2402MHz, 2442MHz, 2480MHz  |
| Modulation    | : | GFSK   |
| Antenna Info. | : | Antenna Type: PCB Antenna<br>Antenna Gain: 1.21 dBi  |
| Applicant     | : | Hisense Visual Technology Co., Ltd.<br>No.218 Qianwangang Road, Economy & Technology<br>Development Zone, Qingdao, China |
| Manufacturer  | : | same as Applicant  |
| Factory       | : | same as Applicant  |

## 2.2 EUT Specifications Assessed in Current Report

| Mode | Modulation | Data Rate(Mbps) |
|------|------------|-----------------|
| BLE  | GFSK       | 1               |

| Channel List   |      |    |      |  |  |  |  |
|--|------|----|------|--|--|--|--|
| Channel No.Frequency (MHz)Channel No.Frequency (MHz) |      |    |      |  |  |  |  |
| 00   | 2402 | 20 | 2442 |  |  |  |  |
| 01   | 2404 | 21 | 2444 |  |  |  |  |
| 02   | 2406 | 22 | 2446 |  |  |  |  |
|  |      |    |      |  |  |  |  |
|  |      |    |      |  |  |  |  |
|  |      |    |      |  |  |  |  |
| 17   | 2436 | 37 | 2476 |  |  |  |  |
| 18   | 2438 | 38 | 2478 |  |  |  |  |
| 19   | 2440 | 39 | 2480 |  |  |  |  |

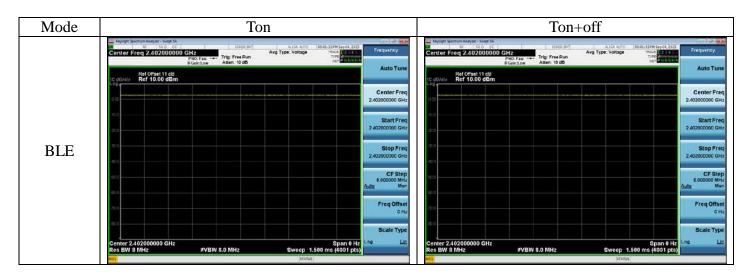
## 2.3 Test Information

The way "press three specific buttons simultaneously" was used to control EUT work in TX mode, Power Setting and select test channel.

| Mode | data rate<br>(Mbps) | Power<br>Setting | Test Channel |    | Frequency<br>(MHz) |
|------|---------------------|------------------|--------------|----|--------------------|
|      |                     | Default          | Low:         | 00 | 2402               |
| BLE  | 1                   | Default          | Middle:      | 20 | 2442               |
|      |                     | Default          | High:        | 39 | 2480               |

## 2.4 Duty Cycle Check

| Mode | Transmission<br>Duration (ms) | Transmission<br>Period (ms) | Duty Cycle (%) |  |
|------|-------------------------------|-----------------------------|----------------|--|
| BLE  | 1.5                           | 1.5                         | 100            |  |



## 2.5 Sample Description

| Test Item          | Model Number | Sample Number     | Date of receipted |
|--------------------|--------------|-------------------|-------------------|
| Conducted Emission | N/A          | N/A               | N/A               |
| Radiated Emission  | ERF3ZB80     | E2023090166-01/02 | 2023.09.01        |
| Conducted RF Test  | ERF3ZB80     | E2023090166-02/02 | 2023.09.01        |

## 2.6 Supported equipment

N/A

## 2.7 Description of Test Facility

| Name of Firm                  | : Audix Technology (Shanghai) Co., Ltd.   |
|-------------------------------|---|
| Site Location                 | : 3F, Building 34, No. 680 Guiping Rd.,<br>Caohejing, Hi-Tech Park,<br>Shanghai 200233, China |
| Accredited by NVLAP, Lab Code | : 200371-0  |
| FCC Designation Number        | : CN5027  |
| Test Firm Registration Number | : 954668  |

## **3 RADIATED EMISSION TEST**

## 3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

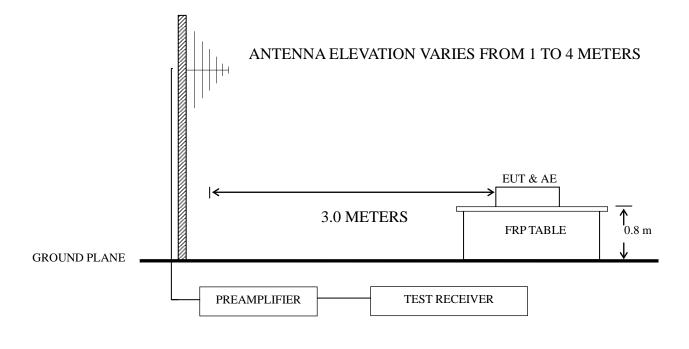
| Item | Туре                             | Manufacturer | Model No.  | Serial No.                | Cal. Date  | Cal. Interval |
|------|----------------------------------|--------------|--|---------------------------|------------|---------------|
| 1.   | Preamplifier                     | Agilent      | 8447D  | 2944A10548                | 2023.02.22 | 1 Year        |
| 2.   | Preamplifier                     | HP           | 8449B  | 3008A00864                | 2023.02.22 | 1 Year        |
| 3.   | Spectrum<br>Analyzer             | Agilent      | N9010A   | MY52221182                | 2023.08.09 | 1 Year        |
| 4.   | Test Receiver                    | R&S          | ESCI   | 101303                    | 2023.02.22 | 1 Year        |
| 5.   | Bilog Antenna+<br>6dB Attenuator | Schwarz beck | VULB 9168+<br>EMCI-N-6-06                        | 708+AT-N0638              | 2023.02.07 | 1 Year        |
| 6.   | Horn Antenna                     | EMCO         | 3115   | 96074878                  | 2022.09.23 | 1 Year        |
| 7.   | Horn Antenna                     | EMCO         | 3116   | 00062643                  | 2023.01.30 | 2 Year        |
| 8.   | Cavity Band<br>Rejection Filter  | Microwave    | WT-A3882-R10                                     | WT200312-1-1              | 2023.02.22 | 1 Year        |
| 9.   | Coaxial Switch                   | Anritsu      | MP59B  | 6200655086                | 2023.02.22 | 1 Year        |
| 10.  | Coaxial Cable                    | SCHAFFNER    | RG 212U-MIL C<br>17+N1K50-EW06<br>30-N1K50-15m-1 | RE-10m-001/<br>RE-15m-002 | 2023.02.22 | 1 Year        |
| 11.  | Software                         | Audix        | e3   | e3.v9.210616              |            |               |

## 3.2 Block Diagram of Test Setup

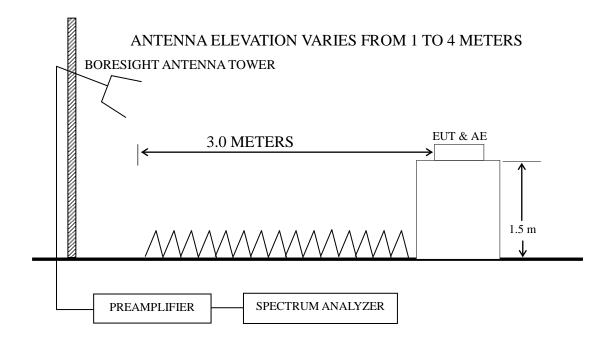
3.2.1 EUT & Peripherals



3.2.2 Below 1GHz



3.2.3 Above 1GHz



#### 3.3 Radiated Emission Limit (§15.209)

| Frequency  | Distance | Field strength limits ( $\mu$ V/m)                     |          |  |  |  |  |
|--|----------|--|----------|--|--|--|--|
| (MHz)  | (m)      | (µV/m)   | dB(µV/m) |  |  |  |  |
| 30 ~ 88  | 3        | 100  | 40.0     |  |  |  |  |
| 88 ~ 216   | 3        | 150  | 43.5     |  |  |  |  |
| 216 ~ 960  | 3        | 200  | 46.0     |  |  |  |  |
| Above 960  | 3        | 500  | 54.0     |  |  |  |  |
| <ul> <li>NOTE 1 - Emission Level dB (μV/m) = 20 log Emission Level (μV/m)</li> <li>NOTE 2 - The tighter limit applies at the band edges.</li> <li>NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.</li> </ul> |          |  |          |  |  |  |  |
|  |          | based on Quasi-peak valu<br>verage value detector abov |          |  |  |  |  |
|  |          | it on peak emission is 20 ission limit applicable to   |          |  |  |  |  |

#### 3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec.2.2) were installed as shown on Sec.4.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

#### 3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 4.2.

- 3.5.2 Turn the EUT on.
- 3.5.3 The way "press three specific buttons simultaneously" was used to control EUT work in TX mode.
- 3.5.4 Start test.
- 3.5.5 Repeat step 4.5.3 and 4.5.4, until the test of all modes finished.

#### 3.6 Test Procedures

Radiated emission test applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp is necessary for this measurement. For measurement above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

The EUT was placed on a turntable. Below 1 GHz, the table height is 80 cm above the reference ground plane. Above 1 GHz, the table height is 1.5 m. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the

interference cables were manipulated according to ANSI C63.10: 2013 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESCI was set at 120 kHz from 30MHz to 1000MHz.

The bandwidth of Agilent N9010A was set at 1MHz for above 1GHz.

The frequency range from 30 MHz to 25 GHz (Up to 10<sup>th</sup> harmonics from fundamental frequency) was checked.

All the test results are listed in Sec.4.7.

## 3.7 Test Results

#### <PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

| Eroqueney renges | halow | $1CU_{7}$ | Worst   | 0000 | amission | ` |
|------------------|-------|-----------|---------|------|----------|---|
| Frequency range: | Delow | IOnz      | ( WOISt | case | emission | ) |

| No. | Operation    | Mode | Channel | Frequency | Data Page |
|-----|--------------|------|---------|-----------|-----------|
| 1.  | Transmitting | BLE  | 00      | 2402 MHz  | P15-16    |

#### Frequency range: above 1GHz

| No. | Operation    | Mode | Channel | Frequency | Data Page |
|-----|--------------|------|---------|-----------|-----------|
| 1.  |              |      | 00      | 2402 MHz  | P17-18    |
| 2.  | Transmitting | BLE  | 20      | 2442 MHz  | P19-20    |
| 3.  |              |      | 39      | 2480 MHz  | P21-22    |

#### Band-Edge and Restricted bands:

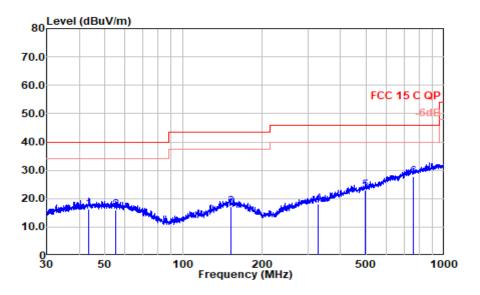
| No. | Operation      | Mode | Channel | Frequency | Data Page |
|-----|----------------|------|---------|-----------|-----------|
| 1.  | 2 Transmitting | DIE  | 00      | 2402 MHz  | P23-24    |
| 2.  |                | BLE  | 39      | 2480 MHz  | P25-26    |

- NOTE 1 Emission Level = Read Level + Antenna Factor + Cable Loss Preamp Factor Margin = Limits - Emission Level.
- NOTE 2 "QP" means "Quasi-Peak" values.
- NOTE  $3 0^{\circ}$  was the table front facing the antenna. Degree is calculated from  $0^{\circ}$  clockwise facing the antenna.
- NOTE 4 The emission levels which not reported are too low against the official limit.
- NOTE 5 The emission levels recorded below is data of EUT configured in Lying direction, for this direction was the maximum emission direction during the test. The data of Side & Standing direction are too low against the official limit to be reported.
- NOTE 6 All reading are Quasi-Peak values below or equal to 1GHz, Peak and Average values above 1GHz.
   For above 1GHz test, if the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.
- NOTE 7 The frequency range 2310-2390MHz & 2483.5-2500MHz were tested for Restricted bands.

## **Radiated emission < 1GHz**

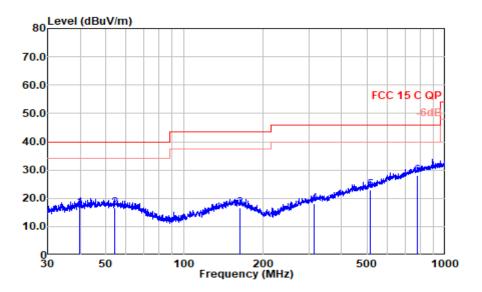
| Test Date: 2023.09.02 | Temp./Hum.: | 24°C/53%RH | Test By: | Jarey |  |
|-----------------------|-------------|------------|----------|-------|--|
|-----------------------|-------------|------------|----------|-------|--|

#### Mode: BLE CH2402



#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 43.659             | 25.69                       | 19.83                       | 0.72               | 29.90                    | 16.34                          | 40.00                  | 23.66          | QP     |
| 55.124             | 25.35                       | 19.69                       | 0.81               | 29.88                    | 15.97                          | 40.00                  | 24.03          | QP     |
| 152.664            | 25.98                       | 19.37                       | 1.36               | 29.39                    | 17.31                          | 43.50                  | 26.19          | QP     |
| 327.887            | 24.73                       | 20.20                       | 1.97               | 28.82                    | 18.09                          | 46.00                  | 27.91          | QP     |
| 496.805            | 26.44                       | 23.54                       | 2.49               | 29.49                    | 22.97                          | 46.00                  | 23.03          | QP     |
| 759.371            | 24.91                       | 27.99                       | 3.03               | 28.24                    | 27.68                          | 46.00                  | 18.32          | QP     |



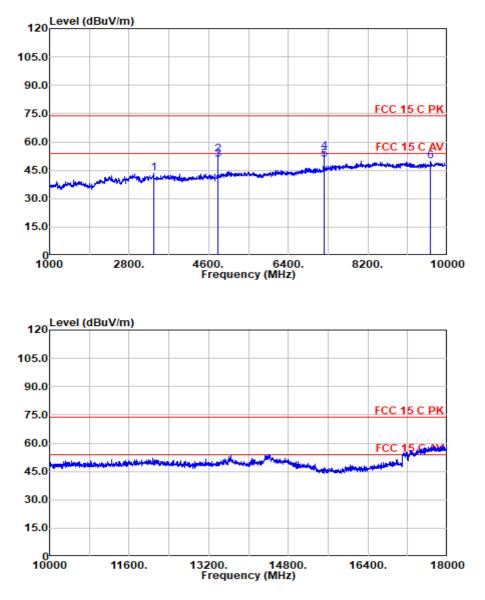
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 39.784             | 26.32                       | 19.56                       | 0.69               | 29.90                    | 16.66                          | 40.00                  | 23.34          | QP     |
| 54.356             | 25.97                       | 19.64                       | 0.80               | 29.88                    | 16.53                          | 40.00                  | 23.47          | QP     |
| 163.755            | 25.40                       | 19.12                       | 1.42               | 29.35                    | 16.59                          | 43.50                  | 26.91          | QP     |
| 313.826            | 25.14                       | 19.73                       | 1.95               | 28.76                    | 18.06                          | 46.00                  | 27.94          | QP     |
| 513.633            | 25.86                       | 23.87                       | 2.53               | 29.42                    | 22.84                          | 46.00                  | 23.16          | QP     |
| 779.607            | 25.26                       | 28.00                       | 3.08               | 28.12                    | 28.22                          | 46.00                  | 17.78          | QP     |

## **Radiated Emission > 1GHz**

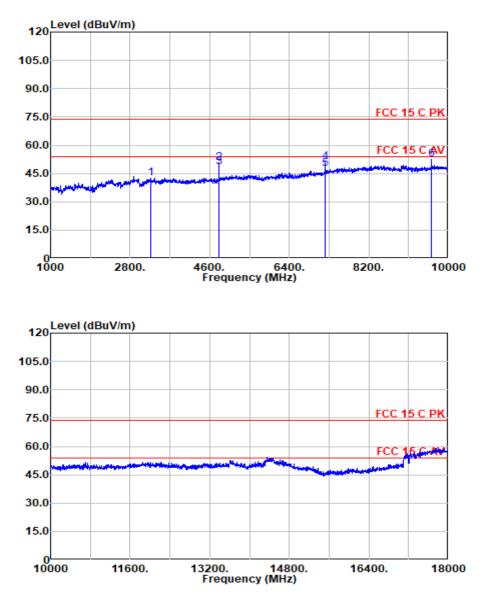
| Hum.: 24°C/53%RH Test By: Jarey | Test Date: 2023.09.02 Temp./Hum.: |
|---------------------------------|-----------------------------------|
|---------------------------------|-----------------------------------|

#### Mode: BLE CH2402



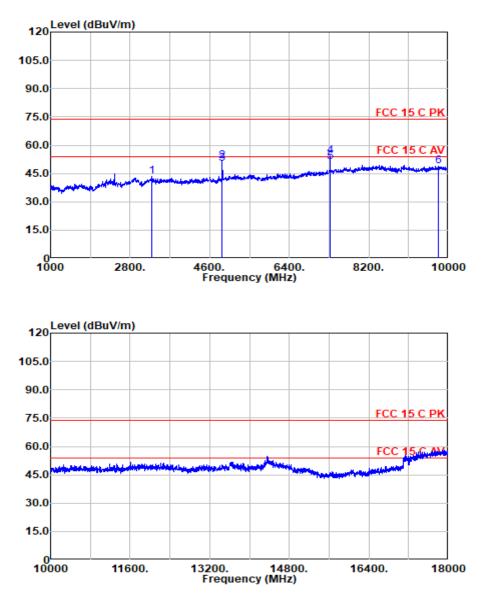
#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3353.500           | 41.27                       | 31.20                       | 6.21               | 35.25                    | 43.44                          | 74.00                  | 30.56          | Peak    |
| 4804.000           | 47.68                       | 32.90                       | 7.62               | 34.67                    | 53.53                          | 74.00                  | 20.47          | Peak    |
| 4804.000           | 44.86                       | 32.90                       | 7.62               | 34.67                    | 50.71                          | 54.00                  | 3.29           | Average |
| 7206.000           | 43.89                       | 36.15                       | 9.48               | 34.67                    | 54.86                          | 74.00                  | 19.14          | Peak    |
| 7206.000           | 39.87                       | 36.15                       | 9.48               | 34.67                    | 50.84                          | 54.00                  | 3.16           | Average |
| 9608.500           | 34.96                       | 38.40                       | 11.14              | 34.64                    | 49.86                          | 74.00                  | 24.14          | Peak    |



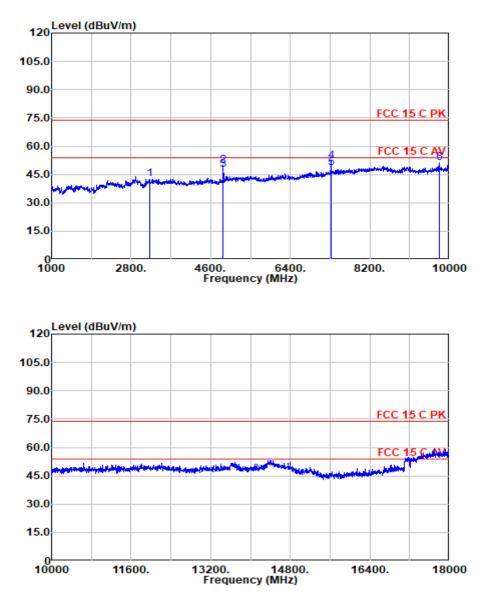
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3268.000           | 40.74                       | 31.07                       | 6.13               | 35.28                    | 42.66                          | 74.00                  | 31.34          | Peak    |
| 4804.000           | 44.86                       | 32.90                       | 7.62               | 34.67                    | 50.71                          | 74.00                  | 23.29          | Peak    |
| 4804.000           | 42.54                       | 32.90                       | 7.62               | 34.67                    | 48.39                          | 54.00                  | 5.61           | Average |
| 7206.000           | 40.24                       | 36.15                       | 9.48               | 34.67                    | 51.21                          | 74.00                  | 22.79          | Peak    |
| 7206.000           | 36.76                       | 36.15                       | 9.48               | 34.67                    | 47.73                          | 54.00                  | 6.27           | Average |
| 9608.500           | 37.43                       | 38.40                       | 11.14              | 34.64                    | 52.34                          | 74.00                  | 21.66          | Peak    |



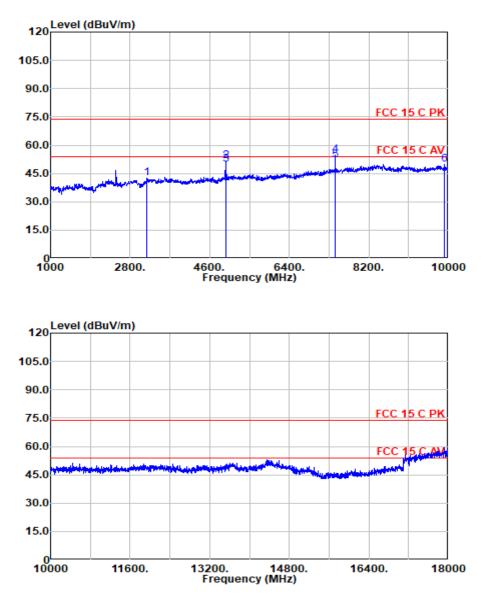
#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3286.000           | 41.32                       | 31.14                       | 6.15               | 35.27                    | 43.33                          | 74.00                  | 30.67          | Peak    |
| 4884.000           | 45.24                       | 33.14                       | 7.70               | 34.64                    | 51.43                          | 74.00                  | 22.57          | Peak    |
| 4884.000           | 43.97                       | 33.14                       | 7.70               | 34.64                    | 50.16                          | 54.00                  | 3.84           | Average |
| 7326.000           | 42.70                       | 36.85                       | 9.61               | 34.70                    | 54.45                          | 74.00                  | 19.55          | Peak    |
| 7326.000           | 39.45                       | 36.85                       | 9.61               | 34.70                    | 51.21                          | 54.00                  | 2.79           | Average |
| 9770.500           | 34.03                       | 38.23                       | 11.27              | 34.62                    | 48.91                          | 74.00                  | 25.09          | Peak    |



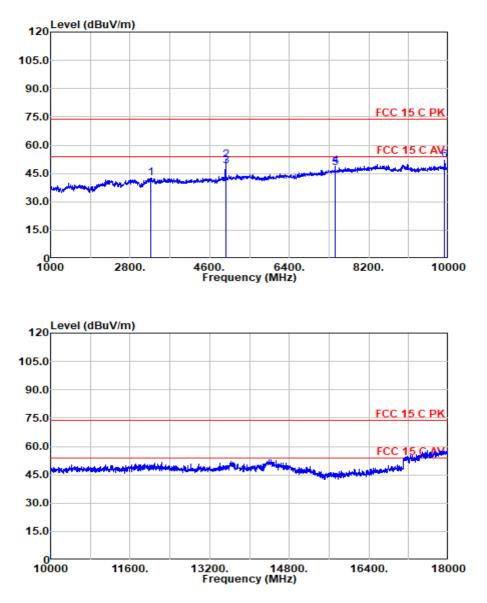
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3214.000           | 40.86                       | 30.93                       | 6.08               | 35.30                    | 42.57                          | 74.00                  | 31.43          | Peak    |
| 4884.000           | 43.48                       | 33.14                       | 7.70               | 34.64                    | 49.67                          | 74.00                  | 24.33          | Peak    |
| 4884.000           | 41.19                       | 33.14                       | 7.70               | 34.64                    | 47.38                          | 54.00                  | 6.62           | Average |
| 7326.000           | 40.22                       | 36.85                       | 9.61               | 34.70                    | 51.98                          | 74.00                  | 22.02          | Peak    |
| 7326.000           | 36.86                       | 36.85                       | 9.61               | 34.70                    | 48.62                          | 54.00                  | 5.38           | Average |
| 9770.500           | 36.30                       | 38.23                       | 11.27              | 34.62                    | 51.17                          | 74.00                  | 22.83          | Peak    |



#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3187.000           | 40.78                       | 30.86                       | 6.05               | 35.32                    | 42.37                          | 74.00                  | 31.63          | Peak    |
| 4960.000           | 45.14                       | 33.33                       | 7.77               | 34.61                    | 51.63                          | 74.00                  | 22.37          | Peak    |
| 4960.000           | 43.42                       | 33.33                       | 7.77               | 34.61                    | 49.90                          | 54.00                  | 4.10           | Average |
| 7440.000           | 42.71                       | 37.00                       | 9.73               | 34.74                    | 54.71                          | 74.00                  | 19.29          | Peak    |
| 7440.000           | 39.96                       | 37.00                       | 9.73               | 34.74                    | 51.96                          | 54.00                  | 2.04           | Average |
| 9919.000           | 34.50                       | 38.40                       | 11.39              | 34.61                    | 49.68                          | 74.00                  | 24.32          | Peak    |



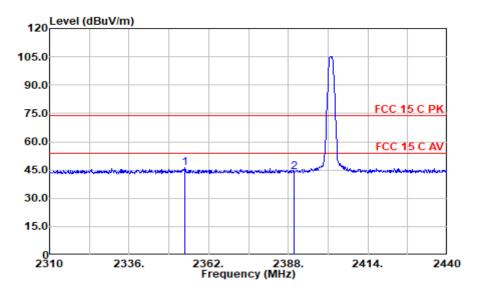
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 3268.000           | 40.61                       | 31.07                       | 6.13               | 35.28                    | 42.53                          | 74.00                  | 31.47          | Peak    |
| 4960.000           | 45.44                       | 33.33                       | 7.77               | 34.61                    | 51.92                          | 74.00                  | 22.08          | Peak    |
| 4960.000           | 42.59                       | 33.33                       | 7.77               | 34.61                    | 49.07                          | 54.00                  | 4.93           | Average |
| 7440.000           | 37.07                       | 37.00                       | 9.73               | 34.74                    | 49.07                          | 74.00                  | 24.93          | Peak    |
| 7440.000           | 35.79                       | 37.00                       | 9.73               | 34.74                    | 47.79                          | 54.00                  | 6.21           | Average |
| 9919.000           | 36.75                       | 38.40                       | 11.39              | 34.61                    | 51.92                          | 74.00                  | 22.08          | Peak    |

## **Band-Edge and Restricted bands:**

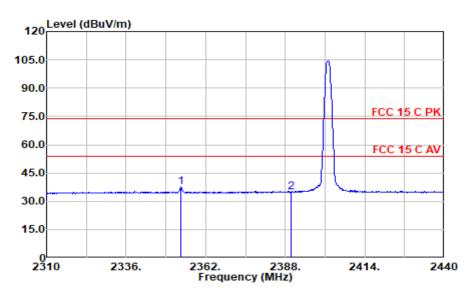
| Test Date: | 2023.09.02 | Temp./Hum.: | 24°C/53%RH | Test By: | Jarey |
|------------|------------|-------------|------------|----------|-------|

#### Mode: BLE CH2402



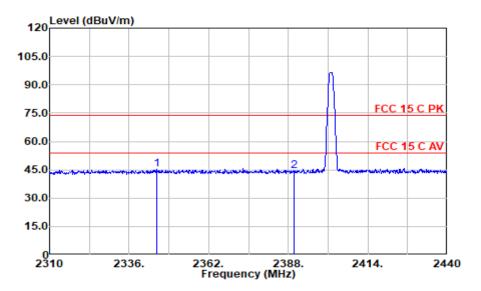
Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 2354.070           | 48.41                       | 28.40                       | 5.36               | 36.06                    | 46.11                          | 74.00                  | 27.89          | Peak   |
| 2390.000           | 46.14                       | 28.40                       | 5.39               | 36.02                    | 43.91                          | 74.00                  | 30.09          | Peak   |



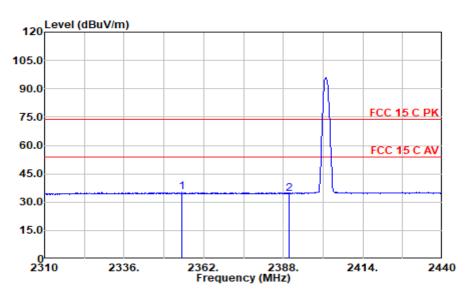
#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 2353.940           | 39.81                       | 28.40                       | 5.36               | 36.06                    | 37.51                          | 54.00                  | 16.49          | Average |
| 2390.000           | 37.32                       | 28.40                       | 5.39               | 36.02                    | 35.09                          | 54.00                  | 18.91          | Average |



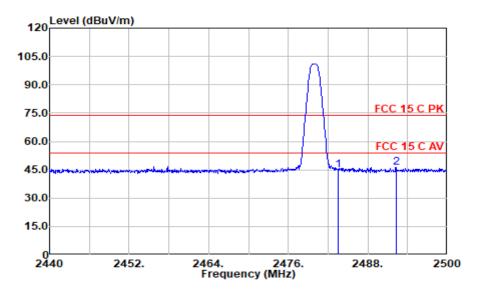
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 2345.100           | 47.78                       | 28.36                       | 5.35               | 36.07                    | 45.41                          | 74.00                  | 28.59          | Peak   |
| 2390.000           | 46.40                       | 28.40                       | 5.39               | 36.02                    | 44.18                          | 74.00                  | 29.82          | Peak   |



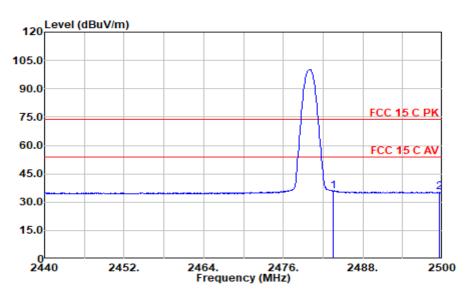
#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 2354.980           | 37.59                       | 28.40                       | 5.36               | 36.06                    | 35.29                          | 54.00                  | 18.71          | Average |
| 2390.000           | 36.83                       | 28.40                       | 5.39               | 36.02                    | 34.60                          | 54.00                  | 19.40          | Average |



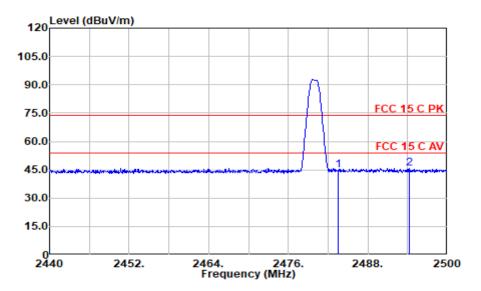
#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 2483.500           | 46.71                       | 28.43                       | 5.47               | 35.91                    | 44.70                          | 74.00                  | 29.30          | Peak   |
| 2492.260           | 48.36                       | 28.47                       | 5.48               | 35.90                    | 46.41                          | 74.00                  | 27.59          | Peak   |



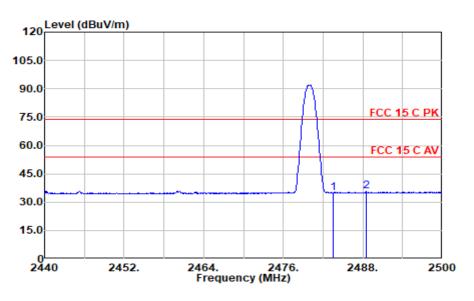
#### Polarization at Horizontal

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 2483.500           | 37.85                       | 28.43                       | 5.47               | 35.91                    | 35.84                          | 54.00                  | 18.16          | Average |
| 2499.520           | 37.29                       | 28.50                       | 5.48               | 35.90                    | 35.37                          | 54.00                  | 18.63          | Average |



#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|--------|
| 2483.500           | 46.69                       | 28.43                       | 5.47               | 35.91                    | 44.68                          | 74.00                  | 29.32          | Peak   |
| 2494.240           | 47.84                       | 28.48                       | 5.48               | 35.90                    | 45.89                          | 74.00                  | 28.11          | Peak   |



#### Polarization at Vertical

| Frequency<br>(MHz) | Meter<br>Reading<br>dB (µV) | Antenna<br>Factor<br>(dB/m) | Cable<br>Loss (dB) | Preamp<br>Factor<br>(dB) | Emission<br>Level dB<br>(µV/m) | Limits<br>dB<br>(µV/m) | Margin<br>(dB) | Remark  |
|--------------------|-----------------------------|-----------------------------|--------------------|--------------------------|--------------------------------|------------------------|----------------|---------|
| 2483.500           | 36.88                       | 28.43                       | 5.47               | 35.91                    | 34.88                          | 54.00                  | 19.12          | Average |
| 2488.480           | 37.56                       | 28.45                       | 5.47               | 35.91                    | 35.58                          | 54.00                  | 18.42          | Average |

## 4 6 dB BANDWIDTH MEASUREMENT

### 4.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

| Item | Туре                 | Manufacturer  | Model No.         | Serial No. | Cal. Date  | Cal. Interval |
|------|----------------------|---------------|-------------------|------------|------------|---------------|
| 1.   | Spectrum<br>Analyzer | Agilent       | N9010A            | MY52221182 | 2023.08.09 | 1 Year        |
| 2.   | RF Cable             | Mini-Circuits | FLC-3FT-SM<br>SM+ | 22022838   | 2023.08.09 | 1 Year        |
| 3.   | 10 dB Attenuator     | Mini-Circuits | BW-S10W2+         | 001        | 2023.02.22 | 1 Year        |

#### 4.2 Block Diagram of Test Setup



#### 4.3 Specification Limits (§15.247(a)(2))

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

## 4.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

#### 4.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with settings: RBW = 100kHz,  $VBW \ge 3 \times RBW$ .

The 6 dB bandwidth is defined as the total spectrum the power of which is lower than peak power minus 6 dB.

The test procedure is defined in ANSI C63.10-2013 (the 11.8.2 Measurement Procedure "Option 2" was used).

## 4.6 Test Results

## PASSED.

All the test results are attached in next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

| Mode | Channel | Frequency<br>(MHz) | 6dB Bandwidth<br>(kHz) | Limit   |
|------|---------|--------------------|------------------------|---------|
|      | 00      | 2402               | 673.1                  | 500 kHz |
| BLE  | 20      | 2442               | 672.8                  | 500 kHz |
|      | 39      | 2480               | 677.5                  | 500 kHz |

| BLE  |   |
|--|---|
| CH2402   | CH2442  |
| Consider Spectrum Analyzer - Occupied BW         ISING_DMT         ALION AUTO         (9):57:29PH Sp01, 2022.           Conter Freq 2.d02000000 GHz         Center Freq. 2.402000000 GHz         Center Freq. 2.402000000 GHz         Radio Std: None           #If Gaint.cow         #If Gaint.cow         Atten: 20 dB         AvglHold:>100/100         Radio Device: BTS | Trig: Free Run<br>#FGeint.ow Free Run Avg Hold>100/100<br>RFGeint.ow Ratten: 20 dB Radio Device: BTS  |
|  |   |
| Auto   | F Step<br>000 kHz         Span 3.000 MHz         CF Step<br>300 000 kHz           #VBW 300 kHz         Sweep 1.067 ms         300 000 kHz           Man         Automatic         Automatic |
|  | Occupied Bandwidth Total Power 9.24 dBm Freq Offset   |
| Transmit Freq Error -67.529 kHz % of OBW Power 99.00 %<br>x dB Bandwidth 673.1 kHz x dB -6.00 dB   | 0 Hz       Transmit Freq Error       -68.082 kHz       % of OBW Power       99.00 %       0 Hz         x dB Bandwidth       672.8 kHz       x dB       -6.00 dB                             |
| MSG BTATUS   | M5G STATUS  |
|  | er Freq   |
| #Res BW 100 KHZ #VBW 300 KHZ Sweep 1.067 ms 300.   | FStep<br>0000 kHz<br>Man  |
| Occupied Bandwidth Total Power 8.45 dBm  | i Offset<br>0 Hz  |
| 190  |   |
|  |   |

## **5 MAXIMUM PEAK OUTPUT POWER MEASUREMENT**

#### 5.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

| Item | Туре                 | Manufacturer  | Model No.         | Serial No. | Cal. Date  | Cal. Interval |
|------|----------------------|---------------|-------------------|------------|------------|---------------|
| 1.   | Spectrum<br>Analyzer | Agilent       | N9010A            | MY52221182 | 2023.08.09 | 1 Year        |
| 2.   | RF Cable             | Mini-Circuits | FLC-3FT-SM<br>SM+ | 22022838   | 2023.08.09 | 1 Year        |
| 3.   | 10 dB Attenuator     | Mini-Circuits | BW-S10W2+         | 001        | 2023.02.22 | 1 Year        |

#### 5.2 Block Diagram of Test Setup

The Same as Section. 5.2.

#### 5.3 Specification Limits ((§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

#### 5.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

#### 5.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a)  $RBW \ge DTS$  Bandwidth.
- b) VBW  $\geq$  [3 × RBW].
- c) Span  $\geq$  [3 × RBW].
- d) Sweep time = auto.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

The test procedure is defined in ANSI C63.10-2013 ( 11.9.1.1 Measurement Procedure " RBW  $\geq$  DTS bandwidth" was used).

## 5.6 Test Results

#### PASSED.

All the test results are listed below.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

| Mode | Channel | Frequency<br>(MHz) | Peak Output<br>Power (dBm) | Limit  |
|------|---------|--------------------|----------------------------|--------|
| BLE  | 00      | 2402               | 2.838                      | 30 dBm |
|      | 20      | 2442               | 2.239                      | 30 dBm |
|      | 39      | 2480               | 1.496                      | 30 dBm |

| BLE  |   |  |   |   |                          |
|--|---|--|---|---|--------------------------|
| CH2402   |   | CH2442   |   |   |                          |
| Certifyet Spectrum Analyzer - Sweet SA<br>Compared Spectrum Analyzer - Sweet SA<br>Compared Spectrum Analyzer - Sweet SA<br>Compared Spectrum Analyzer - Sweet SA<br>Interview - Sweet S | AUGN AUTO 04/39/04 PM Sep 04, 2023<br>Avg Type: Log-Pwr<br>Avg[Hold:>100/100<br>0ct - KKKKK K K                         | Sec         Sec <th>0 GHz<br/>PNO: Fast<br/>IFGain:Low Atten: 20 dB</th> <th>ALSH ALTO 04-99-50 PH Sep 04, 2020<br/>Avg Type: Log-Pwr<br/>AvgHold&gt;100100<br/>The Bank of the Control of t</th> <th>Peak Search<br/>Next Peak</th> | 0 GHz<br>PNO: Fast<br>IFGain:Low Atten: 20 dB | ALSH ALTO 04-99-50 PH Sep 04, 2020<br>Avg Type: Log-Pwr<br>AvgHold>100100<br>The Bank of the Control of t | Peak Search<br>Next Peak |
|  | Next P  | Log  | ↓<br>↓  |   | Next Pk Right            |
| -toe   | Next  | Left -100  |   |   | Next Pk Left             |
| -30.0  | Marke   | -300   |   |   | Marker Delta             |
| 40.0   |   |  |   |   | Mkr→CF                   |
| -70.0  | Mkr-+   | -70.0  |   |   | Mkr→RefLvl               |
| Center 2.402000 GHz<br>#Res BW 1.0 MHz #VBW 3.0 MHz  | Span 3.000 MHz<br>Sweep 1.067 ms (4001 pts)   | More<br>1 of 2<br>Center 2.442000 GHz<br>#Res BW 1.0 MHz   | #VBW 3.0 MHz                                  | Span 3.000 MHz<br>Sweep 1.067 ms (4001 pts)   | More<br>1 of 2           |
| CH2480   |   |  |   |   |                          |
| Register Section Andrew Section         58 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0   | AUGN AUTO 04185140PM Sep 04, 2023<br>Avg Type: Log-Pwr TRACE 2 4 3<br>Avg[Hold:>100/100 Type Trace 0 4 3<br>Det FANNANG |  |   |   |                          |
| 10 dB/div Ref 20.00 dBm  | 1.496 dBm   | Peak   |   |   |                          |
|  | 1 Next P  |  |   |   |                          |
| -100   | Next  |  |   |   |                          |
| -30.0  | Mark  | -CF  |   |   |                          |
| 400  | Mkr   |  |   |   |                          |
| -70.0  |   | Nore   |   |   |                          |
| Center 2.480000 GHz<br>#Res BW 1.0 MHz #VBW 3.0 MHz<br>MSG   | Span 3.000 MHz<br>Sweep 1.067 ms (4001 pts)   | 1 of 2   |   |   |                          |

## **6** EMISSION LIMITATIONS MEASUREMENT

## 6.1 Test Equipment

The following test equipment was used during the emission limitations test:

FCC ID: 2AVIGBR0001

Page 33 of 43

| Item | Туре                 | Manufacturer  | Model No.         | Serial No. | Cal. Date  | Cal. Interval |
|------|----------------------|---------------|-------------------|------------|------------|---------------|
| 1.   | Spectrum<br>Analyzer | Agilent       | N9010A            | MY52221182 | 2023.08.09 | 1 Year        |
| 2.   | RF Cable             | Mini-Circuits | FLC-3FT-SM<br>SM+ | 22022838   | 2023.08.09 | 1 Year        |
| 3.   | 10 dB Attenuator     | Mini-Circuits | BW-S10W2+         | 001        | 2023.02.22 | 1 Year        |

#### 6.2 Block Diagram of Test Setup

The Same as Section. 5.2.

### 6.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in \$15.205(a), must also comply with the radiated emission limits specified in \$15.209(a) (see \$15.205(c)). (%This test result attaching to Section. 3.7)

#### 6.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

#### 6.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to  $\geq 1.5$  times the DTS bandwidth.
- c) Set the RBW = 100 kHz.
- d) Set the VBW  $\geq$  [3 × RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Establish an emission level by using the following procedure:

a) Set the center frequency and span to encompass frequency range to be measured.

b) Set the RBW = 100 kHz.

c) Set the VBW  $\geq$  [3 × RBW].

- d) Detector = peak.
- e) Sweep time = auto couple.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use the peak marker function to determine the maximum amplitude level. Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) is attenuated by at least the minimum requirements specified in 11.11. Report the three highest emissions relative to the limit.

Scan up through 10<sup>th</sup> harmonic.

The test procedure is defined in ANSI C63.10-2013 (11.11.2 Reference level measurement and 11.11.3 Emission level measurement was used).

#### 6.6 Test Results

#### PASSED.

The test data was attached in the next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

| Mode | Channel | Frequency<br>(MHz) | Data Page |
|------|---------|--------------------|-----------|
|      | 00      | 2402               | P35       |
| BLE  | 20      | 2442               | P36       |
|      | 39      | 2480               | P37       |

| BLE  |  |   |  |
|--|--|---|--|
| CH2402   |  |   |  |
| Reference Level  |  | Lower Edge  |  |
| Koyudet Spectrum Analyzer - Sweet SA     Sec 201     Sec 201 | 104 AUTO (0448.00141 Sep 04.202)<br>oge Por<br>104 CE 102 CE 1 | Marker 2 2.40000000000 GHz<br>PRO: Fast Trig: Free Run<br>Arten: 10 dB Ary Type: Log-Pwr<br>Avg Hold:>100/100 Mkr2 2.40 Mkr2 2.40   | 200 PM Sep 04, 2023<br>The C B A A A A A A A A A A A A A A A A A A |
|  | Normal   |   | Normal   |
| 20.0   | 201.070 Jeen Deita   |   | Delta  |
| 40.0   | Fixed  | Center 2.40000 GHz Sp   | n 100.0 MHz  |
| eo c   | no   | #Res BW 100 kHz #VBW 300 kHz Sweep 9.600  | ms (4001 pts) Off  |
| 70.0   | Properties >   | 1         1         1         2.400.000 SHz         502.000 UBIII           4         5         5         5           5         5         5         5           7         1         1         1         1   | Properties •   |
| Center 2.402000 GHz<br>#Res BW 100 kHz #VBW 300 kHz S <sup>3</sup>   | More<br>Span 2.000 MHz 1 of 2<br>weep 1.067 ms (4001 pts)  |   | More<br>1 of 2   |
|  | STATUS   | INSO ITATUS   |  |
| Emission Level  Copyright Spectrum Analyses - Sweet SA Marker 1 94.8055000000 MHz PNO: FastTrig: Free Run It Galactow  Ref Offset 11 dB  | 004.40100 04.53.10PM Sep 04, 3022<br>000700 TRACE 10 2 + 32<br>TRACE 10 2 + 32<br>TRACE 10 2 + 32<br>TRACE 10 2 + 32<br>Marker<br>Select Marker<br>1<br>Select Marker<br>1<br>Normal<br>2 + 1102 @<br>Detta  | Marker 3 23.623750000000 GHz<br>PRO Fast Trig: Free Run<br>Arten: 10 dB Arg Type: Log-Pwr<br>Avg[Hold:>100/100<br>Rtf: 23.62<br>PWr 3 23.62<br>PWr | 23 75 GHz<br>0.225 dBm<br>Normal                                   |
|  | A<br>Fixed⊳  |   | <mark>}3</mark><br>Fixed⊳  |
| WR MODE TRC SCI X Y FUNCTION FUNC  | Stop 10.000 GHz<br>veep 953.1 ms (4001 pts)<br>nonworm Function value +  | Start 10.000 GHz         Sto         Sto           #Res BW 100 kHz         #VBW 300 kHz         Sweep 1.43           MMR MODE TRC SCL         X         Y         Function: Function worth F  | D 25.000 GHz<br>4 s (4001 pts) Off                                 |
| N         1         f         94.8 MHz         -66.427 (Bm)           2         N         1         f         4.8 00 1 GHz         -47.882 (Bm)           3         N         1         f         9.608 7 GHz         -42.508 dBm           6         6         6         6         6         6  | Properties   | T         N         1         f         13.663 T6 CHz         -64.742 dBm           2         N         1         f         18.891 26 CHz         -61.690 dBm           N         1         f         23.623 76 GHz         -60.225 dBm         -60.225 dBm           4         -   | Properties   |
|  | More<br>1 of 2   |   | More<br>1 of 2   |
| 50   | STATUS   | est and status  |  |

FCC ID: 2AVIGBR0001

### BLE

#### CH2442

#### Reference Level

| * 12.442174500000 GHz<br>PNO: Wide Trig: Fre<br>IFGain:Low Atten: 1 | Run Avg Hold:>100/100 Type                  | Marker<br>ect Mark |
|---|---|--------------------|
| Ref Offset 11 dB<br>div Ref 10.00 dBm                               | Mkr1 2.442 174 5 GHz<br>2.077 dBm           |                    |
|   |   | Nor                |
|   | 21,1.17 53 494                              | D                  |
|   |   | Fix                |
|   |   |                    |
|   |   | Properti           |
| rr 2.442000 GHz<br>BW 100 kHz #VBW 300 kHz                          | Span 2.000 MHz<br>Sweep 1.067 ms (4001 pts) | N<br>1             |

#### **Emission Level**

| Marker<br>Select Marker | 04:45:46 PM Sep 04, 2023<br>TRACE 2 4<br>TYPE N<br>DET RANKS 04  | AUSH AUTO<br>Avg Type: Log-Pwr<br>Avg Hold:>100/100  | Trig: Free Run<br>Atten: 10 dB            | R DC  | Marker 3 23.5825                    | Marker<br>Select Marker | 04:40:27 PM Sep 04, 2023<br>TRACE 2 2 4 1<br>TIPE M | ALISN AUTO<br>Avg Type: Log-Pwr<br>Avg Hold:>100/100 | Trig: Free Run<br>Atten: 10 dB            |   | ≋   50 g   0<br>≋   50 g   0<br>2.0090450000 | -                      |
|-------------------------|--|--|---|---|-------------------------------------|-------------------------|---|--|---|---|--|------------------------|
| 3*                      | 23.582 50 GHz<br>-59.696 dBm   | Mkr3   |   | 1 dB<br>dBm                                     | Ref Offse<br>10 dB/div Ref 10.      | 1*                      | r1 2.009 0 GHz<br>-67.208 dBm                       | Mki  |   | (   | Ref Offset 11 dB<br>Ref 10.00 dB             | 0 dB/div               |
| Normal                  | 0.1-17.52 dbs  |  |   |   | 10.0                                | Normal                  | C(1-47.52 80%                                       |  |   |   |  | 100                    |
| Deita                   |  |  |   |   | 30.0<br>40.0<br>50.0                | Deita                   |   |  |   |   |  | 40.0<br>40.0           |
| Fixed⊅                  | and a state of the | 2 and the second s |   | <sup>1</sup>                                    | -60 0<br>-70 0<br>-60 0             | Fixed>                  | 3<br>   |  |   | haring and second                         | <u>}</u>                                     | 10 0<br>70 0<br>80,5   |
|                         | Stop 25.000 GHz<br>1.434 s (4001 pts)  | Sweep  | V 300 kHz                                 | #VB   | Start 10.000 GHz<br>#Res BW 100 kHz | on                      | Stop 10.000 GHz<br>53.1 ms (4001 pts)               |  | W 300 kHz                                 | #VB                                       | 00 kHz                                       | Start 30<br>Res BV     |
| Properties►             |  | TORCHOR TORCHOR HIDT   | -64.476 dBm<br>-62.797 dBm<br>-59.696 dBm | 13,667 50 GHz<br>19,030 00 GHz<br>23,582 50 GHz | 1 N 1 f<br>2 N 1 f<br>3 N 1 f       | Properties►             |   |  | -67.208 dBm<br>-45.556 dBm<br>-64.437 dBm | 2.009 0 GHz<br>4.885 4 GHz<br>8.095 7 GHz | 1  | 1 N<br>2 N<br>3 4<br>5 |
| More<br>1 of 2          |  |  |   |   | 0<br>8<br>9<br>10<br>11             | More<br>1 of 2          |   |  |   |   |  | 7 8 9 10 11            |
|                         |  | STATUS   |   |   | MSG                                 |                         |   | STATUS   |   |   |  | 80                     |

| BLE   |                               |  |
|---|-------------------------------|--|
| CH2480  |                               |  |
| Reference Level   |                               | Higher Edge  |
| Ref Offset 11 dB         Mkr1 2.479 681 0 GHz           10 dB/div         Ref 10.00 dBm           1.272 dBm         1.272 dBm   | Marker<br>Select Marker       | Koysjell Spectrum Analyzer-Skept SA.         SNSE_DIT         AUDM ANTO         GH23:L1PH Sop 04, 2023         Marker           Marker 2 2.483:500:000000 GH2<br>IFGallow         Trig: Free Run<br>If Gallow         Avg Type: Log-Per<br>Avg/Hold::100/100         Trig: Free Run<br>Atten:: 10 dB         Avg Type: Log-Per<br>Avg/Hold::100/100         Trig: Free Run<br>Atten:: 10 dB         Marker<br>Avg Type: Log-Per<br>Avg/Hold::100/100         Strict Sop 00         Strict Sop 00         Strict Sop 00         Marker           10 dB/div         Ref 0nfset 11 dB         Mkr2 2.483 500 GHz<br>-65.899 dBm         Strict Sop 00         Strict Sop 00         2   |
|   | Normal                        | 0.00   |
|   | Fixed⊳                        | 600<br>700<br>700<br>800<br>700<br>800<br>700<br>800<br>700<br>800<br>700<br>800<br>700<br>800<br>700<br>800<br>700<br>800<br>8  |
|   | or                            | Center 2.48350 GHz         Span 100.0 MHz         Span 100.0 MHz           #Res BW 100 kHz         #VBW 300 kHz         Sweep 9.600 ms (4001 pts)         C           IMM MODE TRC: SCL         X         Y         FUNCTION         <   |
| 200   | Properties►<br>More<br>1 of 2 | A Properties   |
| Res BW 100 kHz     #VBW 300 kHz     Sweep 1.067 ms (4001 pts)       B01     B117108       Emission Level  |                               | MEG TATUS  |
| Organit Section Auditor: Sense St.         Standschrift         Allich Aufge         042704 PM Sep 04, 3223           Tarker 3 9,920240000000 CH2;<br>IFGain.Low         Trig: Free Run<br>Atten: 10 dB         Aug Type: Log-Per<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>CH2         Trice: Trive<br>Avg[Hold:>100/10<br>Avg[Hold:>100/10<br>CH2         Trice: Trive<br>Avg[Hold:>100/10<br>CH2           Ref Offset 11 dB<br>0 dB/div         Mkr3 9.9202 2 GH2<br>-00.111 dBm         -00.111 dBm  | Marker<br>Select Marker       | Nonpolit feetoma Analysis - Served Sa.         Strate Sarved SarvedS |
|   | Normal                        | 10 Barw Rei 1000 UDIN<br>100<br>100<br>100<br>20 a<br>20 a<br>20 a<br>20 a   |
|   | Delta<br>Fixed⊳               | 400<br>400<br>400<br>400<br>400<br>400<br>400<br>400   |
| Start 30 MHz         Stop 10.000 GHz           Res BW 100 kHz         #VBW 300 kHz         Sweep 953.1 ms (4001 pts)           MR MORE TRC SCI         X         Y         Function Motion         Participation Water  | no                            | 80 3         Start 10.000 GHz         Stop 25.000 GHz           #Res BW 100 kHz         #VEW 300 kHz         Sweep 1.434 s (4001 pts)           IMR Noce TRC: Sci.         X         Y           N         1         13.675.00 GHz   |
| 1         N         1         f         2.098 3 GHz         -86 549 dBm           2         N         1         f         4.989 CHz         -46 549 dBm           3         N         1         f         9.920 2 GHz         -80.111 dBm           5         6         -         -         -         -           6         -         -         -         -         -         -           7         - | Properties><br>More           | N         1         f         13.675.00 GHz         -53.822.dBm         Properties           2         N         1         f         23.582.50 GHz         -59.804 dBm         Properties           3         N         1         f         23.582.50 GHz         -59.804 dBm         Properties           6         -         -         -         -         -         -         Properties           6         -         -         -         -         -         -         Properties   |
|   | 1 of 2                        |  |

## 7 POWER SPECTRAL DENSITY MEASUREMENT

#### 7.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

| Item | Туре                 | Manufacturer  | Model No.         | Serial No. | Cal. Date  | Cal. Interval |
|------|----------------------|---------------|-------------------|------------|------------|---------------|
| 1.   | Spectrum<br>Analyzer | Agilent       | N9010A            | MY52221182 | 2022.09.15 | 1 Year        |
| 2.   | RF Cable             | Mini-Circuits | FLC-3FT-SM<br>SM+ | 22022838   | 2022.09.21 | 1 Year        |
| 3.   | 10 dB Attenuator     | Mini-Circuits | BW-S10W2+         | 001        | 2022.09.21 | 1 Year        |

#### 7.2 Block Diagram of Test Setup

The Same as section 5.2.

#### 7.3 Specification Limits (§15.247(e))

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

#### 7.4 Operating Condition of EUT

The way as section 2.3 was used to enable the EUT to change the test mode one by one.

#### 7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer.

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to 3 kHz  $\leq$  RBW  $\leq$  100 kHz.
- d) Set the VBW  $\geq$  [3  $\times$  RBW].
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

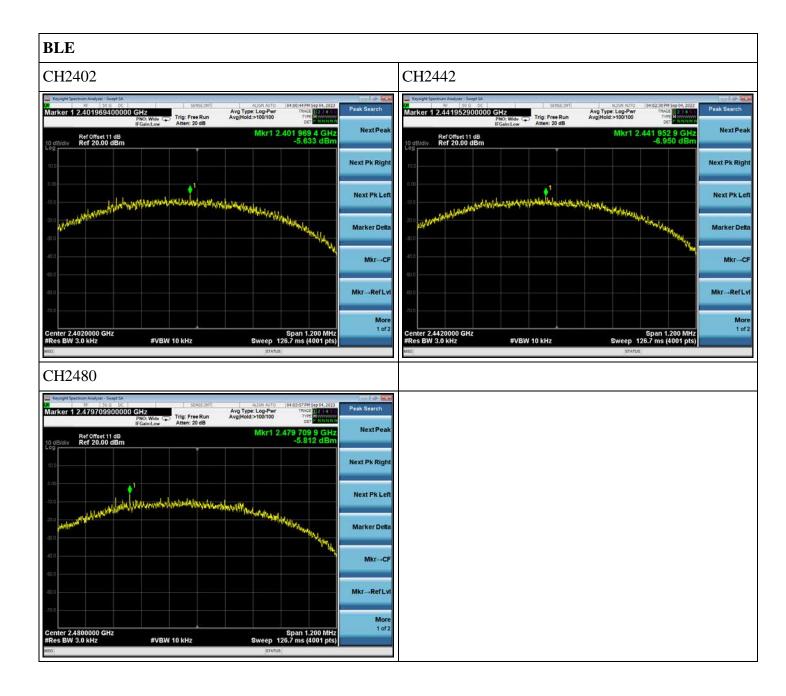
The test procedure is defined in ANSI C63.10-2013 (11.10.2 Measurement Procedure "Method PKPSD (peak PSD)" was used).

# 7.6 Test Results **PASSED**.

All the test results are attached in next pages.

(Test Date: 2023.09.04 Temperature: 23°C Humidity: 51 %)

| Mode | Channel | Frequency<br>(MHz) | Power Spectral<br>Density (dBm) | Limit |
|------|---------|--------------------|---------------------------------|-------|
| BLE  | 00      | 2402               | -5.633                          | 8 dBm |
|      | 20      | 2442               | -6.95                           | 8 dBm |
|      | 39      | 2480               | -5.812                          | 8 dBm |



## 8 ANTENNA REQUIREMENT

## 8.1 Specification Limits (§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.

## 8.2 Result

| According to KDB 353028 D1, the following describes the three ways that can |  |  |  |  |
|---|--|--|--|--|
| be used to demonstrate compliance to Section 15.203:                        |  |  |  |  |
| a) Antenna permanently attached.  |  |  |  |  |
| b) Unique (non-standard) antenna connector.                                 |  |  |  |  |
| c) Professional installation.   |  |  |  |  |
| For this product, the antenna is:   |  |  |  |  |
| Antenna permanently attached  |  |  |  |  |
| Unique (non-standard) antenna connector                                     |  |  |  |  |
| □ Professional installation   |  |  |  |  |
| $\Box$ not meet any of ways list above                                      |  |  |  |  |
| that  |  |  |  |  |
| ☑ compliant   |  |  |  |  |
| $\Box$ not compliant  |  |  |  |  |
| with the requirement of Section 15.203.                                     |  |  |  |  |

## **9 DEVIATION TO TEST SPECIFICATIONS**

None.

## **10 MEASUREMENT UNCERTAINTY LIST**

The measurement uncertainty was estimated for test on the EUT according to CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage of K=2. The uncertainties value is not used in determining the PASS/FAIL results.

| Test Items/Facilities                              | Frequency/Equipment/Unit   | Uncertainty |
|--|--|-------------|
|  | 9kHz~150kHz(50Ω/50µH -AMN)   | 3.74 dB     |
|  | 150kHz~30MHz(50Ω/50µH -AMN)  | 3.34 dB     |
|  | 150kHz~30MHz(50Ω/50µH –AMN-CAT 3)  | 3.46 dB     |
|  | 150kHz~30MHz(50Ω/50µH –AMN-CAT 5)  | 3.48 dB     |
| Estimation of Uncertainty                          | 150kHz~30MHz(50Ω/50µH –AMN-CAT 6)  | 3.60 dB     |
| for Conduction Emission<br>(Shielded Room-1)       | 9kHz~30MHz(VP, considering the effect of mains impedance when compared with AMN) | 24.64 dB    |
|  | 9kHz~30MHz(VP)   | 2.76 dB     |
|  | 9kHz~30MHz(CP, considering the effect of AE impedance when compared with AMN)    | 24.64 dB    |
|  | 9kHz~30MHz(CP)   | 2.82 dB     |
| Estimation of Uncertainty                          | 9kHz~150kHz(50Ω/50µH -AMN)   | 3.74 dB     |
| for Conduction Emission<br>(Shielded Room-3)       | 150kHz~30MHz(50Ω/50μH -AMN)  | 3.34 dB     |
| Estimation of Uncertainty<br>for Power Clamp       | 30MHz~300MHz (Absorbing Clamp)   | 3.68 dB     |
| Estimation of Uncertainty                          | 30MHz~300MHz (CDNE-M210)   | 3.68 dB     |
| for CDNE   | 30MHz~300MHz (CDNE-M310)   | 3.68 dB     |
| Estimation of Uncertainty<br>for EMF               | 20kHz~10MHz  | 1.54 dB     |
|  | 30M~200MHz (Vertical)  | 4.56dB      |
|  | 30M~200MHz (Horizontal)  | 4.44dB      |
| Estimation of Uncertainty                          | 200M~1000MHz (Vertical)  | 5.28dB      |
| Estimation of Uncertainty<br>for Radiated Emission | 200M~1000MHz (Horizontal)  | 3.88dB      |
|  | 1G~6GHz  | 4.34dB      |
|  | 6G~18G Hz  | 4.40dB      |
|  | 18G~40G Hz   | 4.04dB      |