

# FCC Radio Test Report

## FCC ID: 2AQPW-SB465

The output power tested by sample of FCC ID: 2AQPW-SB465, model name: UB4-65. Meanwhile, the conducted emissions and radiated emissions of above 1GHz have been re-evaluated the worst case and recorded in this report, others test data were reissue from the FCC ID: 2AQPW-SB450, model name: UB4-50. The conducted emissions please see the Appendix A. The radiated emissions of above 1GHz please see the Appendix B, the output power test data please see Appendix C. Model difference: The difference is that model UB4-65 is 65 inch and model UB4-50 is 50 inch.

### This report concerns: Original Grant

**Project No.** : 2103T149  
**Equipment** : Ultra Bright LCD Display with LED Backlight  
**Brand Name** : Seura  
**Test Model** : UB4-65  
**Series Model** : N/A  
**Applicant** : Innolux Corporation  
**Address** : No. 160, Kesuyue Rd. Jhunan Science Park, Miaoli County, Taiwan 350  
**Manufacturer** : Innolux Corporation  
**Address** : No. 160, Kesuyue Rd. Jhunan Science Park, Miaoli County, Taiwan 350  
**Factory** : Keewin Display (Suzhou) Co., LTD  
**Address** : No. 17 Chengpu Rd, Suzhou Industrial Park, Jiangsu  
**Date of Receipt** : Mar. 30, 2021  
**Date of Test** : Mar. 30, 2021 ~ May 11, 2021, Jul. 02, 2021  
**Issued Date** : Jul. 05, 2021  
**Report Version** : R02  
**Test Sample** : Engineering Sample No.: DG20210325161  
**Standard(s)** : FCC CFR Title 47, Part 15, Subpart C  
FCC KDB 558074 D01 15.247 Meas Guidance v05r02  
ANSI C63.10-2013

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

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TESTING CERT #5123.02

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**Declaration**

**BTL** represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

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**BTL** is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

**Limitation**

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

| <b>Table of Contents</b>                                     | <b>Page</b> |
|--------------------------------------------------------------|-------------|
| <b>REPORT ISSUED HISTORY</b>                                 | <b>5</b>    |
| <b>1 . SUMMARY OF TEST RESULTS</b>                           | <b>6</b>    |
| 1.1 TEST FACILITY                                            | 7           |
| 1.2 MEASUREMENT UNCERTAINTY                                  | 7           |
| 1.3 TEST ENVIRONMENT CONDITIONS                              | 7           |
| <b>2 . GENERAL INFORMATION</b>                               | <b>8</b>    |
| 2.1 GENERAL DESCRIPTION OF EUT                               | 8           |
| 2.2 DESCRIPTION OF TEST MODES                                | 10          |
| 2.3 PARAMETERS OF TEST SOFTWARE                              | 10          |
| 2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED | 11          |
| 2.5 SUPPORT UNITS                                            | 11          |
| <b>3 . AC POWER LINE CONDUCTED EMISSIONS</b>                 | <b>12</b>   |
| 3.1 LIMIT                                                    | 12          |
| 3.2 TEST PROCEDURE                                           | 12          |
| 3.3 DEVIATION FROM TEST STANDARD                             | 12          |
| 3.4 TEST SETUP                                               | 13          |
| 3.5 EUT OPERATING CONDITIONS                                 | 13          |
| 3.6 TEST RESULTS                                             | 13          |
| <b>4 . RADIATED EMISSIONS</b>                                | <b>14</b>   |
| 4.1 LIMIT                                                    | 14          |
| 4.2 TEST PROCEDURE                                           | 14          |
| 4.3 DEVIATION FROM TEST STANDARD                             | 15          |
| 4.4 TEST SETUP                                               | 15          |
| 4.5 EUT OPERATING CONDITIONS                                 | 15          |
| 4.6 TEST RESULTS - ABOVE 1000 MHZ                            | 15          |
| <b>5 . MAXIMUM OUTPUT POWER &amp; E.I.R.P.</b>               | <b>16</b>   |
| 5.1 LIMIT                                                    | 16          |
| 5.2 TEST PROCEDURE                                           | 16          |
| 5.3 DEVIATION FROM STANDARD                                  | 16          |
| 5.4 TEST SETUP                                               | 16          |
| 5.5 EUT OPERATION CONDITIONS                                 | 16          |
| 5.6 TEST RESULTS                                             | 16          |
| <b>6 . MEASUREMENT INSTRUMENTS LIST</b>                      | <b>17</b>   |

**Table of Contents****Page**

|                                                        |           |
|--------------------------------------------------------|-----------|
| <b>7 . EUT TEST PHOTO</b>                              | <b>18</b> |
| <b>APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS</b>  | <b>21</b> |
| <b>APPENDIX B - RADIATED EMISSION - ABOVE 1000 MHZ</b> | <b>24</b> |
| <b>APPENDIX C - MAXIMUM OUTPUT POWER</b>               | <b>33</b> |
| <b>APPENDIX D - DECLARATION FOR BLUETOOTH DEVICE</b>   | <b>36</b> |

**REPORT ISSUED HISTORY**

| Report Version | Description                            | Issued Date   |
|----------------|----------------------------------------|---------------|
| R00            | Original Issue.                        | Jun. 18, 2021 |
| R01            | Changed the product name.              | Jun. 21, 2021 |
| R02            | Modified the comments of telefication. | Jul. 05, 2021 |

## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

| FCC CFR Title 47, Part 15, Subpart C |                                   |             |          |         |
|--------------------------------------|-----------------------------------|-------------|----------|---------|
| Standard(s) Section                  | Test Item                         | Test Result | Judgment | Remark  |
| 15.207                               | AC Power Line Conducted Emissions | APPENDIX A  | PASS     | Note(3) |
| 15.247(d)<br>15.205(a)<br>15.209(a)  | Radiated Emission                 | APPENDIX B  | PASS     | Note(3) |
| 15.247<br>(a)(1)(iii)                | Number of Hopping Frequency       | -----       | PASS     | Note(3) |
| 15.247<br>(a)(1)(iii)                | Average Time of Occupancy         | -----       | PASS     | Note(3) |
| 15.247(a)(1)                         | Hopping Channel Separation        | -----       | PASS     | Note(3) |
| 15.247(a)(1)                         | Bandwidth                         | -----       | PASS     | Note(3) |
| 15.247(a)(1)                         | Maximum Output Power              | APPENDIX C  | PASS     | Note(3) |
| 15.247(d)                            | Conducted Spurious Emission       | -----       | PASS     | Note(3) |
| 15.203                               | Antenna Requirement               | -----       | PASS     | Note(2) |

Note:

- (1) "N/A" denotes test is not applicable in this test report
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.
- (3) Reissue from the FCC ID: 2AQPW-SB450. Report No.: BTL-FCCP-1-2103T148.

## 1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3, Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China  
BTL's Test Firm Registration Number for FCC: 357015  
BTL's Designation Number for FCC: CN1240

## 1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ( $k=2$ ))  
The BTL measurement uncertainty as below table:

### A. AC power line conducted emissions test:

| Test Site | Method | Measurement Frequency Range | U, (dB) |
|-----------|--------|-----------------------------|---------|
| DG-C02    | CISPR  | 150kHz ~ 30MHz              | 2.68    |

### B. Radiated emissions test:

| Test Site | Method | Measurement Frequency Range | Ant.<br>H / V | U, (dB) |
|-----------|--------|-----------------------------|---------------|---------|
| DG-CB03   | CISPR  | 1GHz ~ 6GHz                 | -             | 3.96    |
|           |        | 6GHz ~ 18GHz                | -             | 5.24    |
|           |        | 18GHz ~ 26.5GHz             | -             | 3.62    |
|           |        | 26.5GHz ~ 40GHz             | -             | 4.00    |

### C. Other Measurement:

| Test Item            | Uncertainty   |
|----------------------|---------------|
| Maximum Output Power | $\pm 0.95$ dB |
| Temperature          | $\pm 0.08$ °C |
| Humidity             | $\pm 1.5\%$   |

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

## 1.3 TEST ENVIRONMENT CONDITIONS

| Test Item                         | Temperature | Humidity | Test Voltage | Tested By  |
|-----------------------------------|-------------|----------|--------------|------------|
| AC Power Line Conducted Emissions | 25°C        | 53%      | AC 120V/60Hz | Hand Huang |
| Radiated Emissions-Above 1000 MHz | 26°C        | 52%      | AC 120V/60Hz | Grani Zhou |
| Maximum Output Power              | 24°C        | 52%      | AC 120V/60Hz | Jesse Wang |

## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                         |                                             |
|-------------------------|---------------------------------------------|
| Equipment               | Ultra Bright LCD Display with LED Backlight |
| Brand Name              | Seura                                       |
| Test Model              | UB4-65                                      |
| Series Model            | N/A                                         |
| Model Difference(s)     | N/A                                         |
| Power Source            | AC Mains.                                   |
| Power Rating            | AC 110V, 5.5A                               |
| Operation Frequency     | 2402 MHz ~ 2480 MHz                         |
| Modulation Type         | GFSK, $\pi/4$ -DQPSK, 8-DPSK                |
| Bit Rate of Transmitter | 1Mbps, 2Mbps, 3Mbps                         |
| Max. Output Power       | 3Mbps: 8.87 dBm (0.0077 W)                  |

Note:

- For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

#### 2. Channel List:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 27      | 2429            | 54      | 2456            |
| 01      | 2403            | 28      | 2430            | 55      | 2457            |
| 02      | 2404            | 29      | 2431            | 56      | 2458            |
| 03      | 2405            | 30      | 2432            | 57      | 2459            |
| 04      | 2406            | 31      | 2433            | 58      | 2460            |
| 05      | 2407            | 32      | 2434            | 59      | 2461            |
| 06      | 2408            | 33      | 2435            | 60      | 2462            |
| 07      | 2409            | 34      | 2436            | 61      | 2463            |
| 08      | 2410            | 35      | 2437            | 62      | 2464            |
| 09      | 2411            | 36      | 2438            | 63      | 2465            |
| 10      | 2412            | 37      | 2439            | 64      | 2466            |
| 11      | 2413            | 38      | 2440            | 65      | 2467            |
| 12      | 2414            | 39      | 2441            | 66      | 2468            |
| 13      | 2415            | 40      | 2442            | 67      | 2469            |
| 14      | 2416            | 41      | 2443            | 68      | 2470            |
| 15      | 2417            | 42      | 2444            | 69      | 2471            |
| 16      | 2418            | 43      | 2445            | 70      | 2472            |
| 17      | 2419            | 44      | 2446            | 71      | 2473            |
| 18      | 2420            | 45      | 2447            | 72      | 2474            |
| 19      | 2421            | 46      | 2448            | 73      | 2475            |
| 20      | 2422            | 47      | 2449            | 74      | 2476            |
| 21      | 2423            | 48      | 2450            | 75      | 2477            |
| 22      | 2424            | 49      | 2451            | 76      | 2478            |
| 23      | 2425            | 50      | 2452            | 77      | 2479            |
| 24      | 2426            | 51      | 2453            | 78      | 2480            |
| 25      | 2427            | 52      | 2454            |         |                 |
| 26      | 2428            | 53      | 2455            |         |                 |

## 3. Table for Filed Antenna:

| Ant. | Manufacturer                                                           | Model Name  | Antenna Type | Connector | Gain (dBi) |
|------|------------------------------------------------------------------------|-------------|--------------|-----------|------------|
| 1    | SHENZHEN ZHONGTIAN<br>XUN Communication<br>Technology Shares Co., Ltd. | 61005-00244 | Internal     | N/A       | 2.99       |

## Note:

The antenna gain is provided by the manufacturer.

## 2.2 DESCRIPTION OF TEST MODES

The test system was pre-tested based on the consideration of all possible combinations of EUT operation mode.

| Pretest Mode | Description                    |
|--------------|--------------------------------|
| Mode 1       | TX Mode_1Mbps Channel 00/39/78 |
| Mode 2       | TX Mode_2Mbps Channel 00/39/78 |
| Mode 3       | TX Mode_3Mbps Channel 00/39/78 |
| Mode 4       | TX Mode_1Mbps Channel 78       |
| Mode 5       | TX Mode_3Mbps Channel 39       |

Following mode(s) was (were) found to be the worst case(s) and selected for the final test.

| AC power line conducted emissions test |                          |
|----------------------------------------|--------------------------|
| Final Test Mode                        | Description              |
| Mode 5                                 | TX Mode_3Mbps Channel 39 |

| Radiated emissions test - Above 1GHz |                          |
|--------------------------------------|--------------------------|
| Final Test Mode                      | Description              |
| Mode 4                               | TX Mode_1Mbps Channel 78 |
| Mode 5                               | TX Mode_3Mbps Channel 39 |

| Maximum Output Power test |                                |
|---------------------------|--------------------------------|
| Final Test Mode           | Description                    |
| Mode 1                    | TX Mode_1Mbps Channel 00/39/78 |
| Mode 2                    | TX Mode_2Mbps Channel 00/39/78 |
| Mode 3                    | TX Mode_3Mbps Channel 00/39/78 |

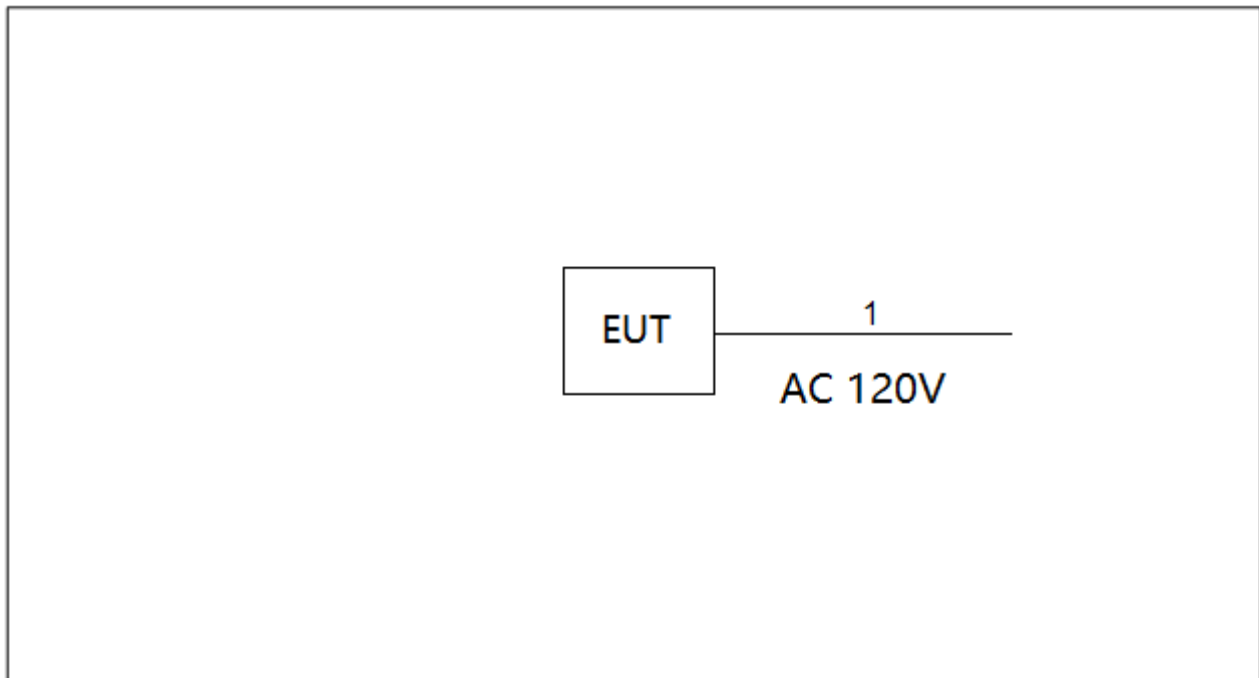
Note:

- (1) For radiated emission above 1 GHz test, the spurious points of 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.
- (2) This product has the mode of BT AFH, which was considered during testing, but this mode is not the worst case mode, and this report only shows the worst case mode.
- (3) For AC power line conducted emissions and radiated spurious emissions below 1 GHz test, the 3Mbps Channel 39 are found to be the worst case and recorded.

## 2.3 PARAMETERS OF TEST SOFTWARE

|                       |           |
|-----------------------|-----------|
| Test Software Version | IPOP V4.0 |
|-----------------------|-----------|

## 2.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED



## 2.5 SUPPORT UNITS

| Item | Equipment | Brand | Model No. | Series No. |
|------|-----------|-------|-----------|------------|
| -    | -         | -     | -         | -          |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|------|------------|---------------|--------------|--------|
| 1    | AC Cable   | NO            | NO           | 1.2m   |

### 3. AC POWER LINE CONDUCTED EMISSIONS

#### 3.1 LIMIT

| Frequency of Emission (MHz) | Limit (dBμV) |           |
|-----------------------------|--------------|-----------|
|                             | Quasi-peak   | Average   |
| 0.15 - 0.5                  | 66 to 56*    | 56 to 46* |
| 0.5 - 5.0                   | 56           | 46        |
| 5.0 - 30.0                  | 60           | 50        |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

#### 3.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipment powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

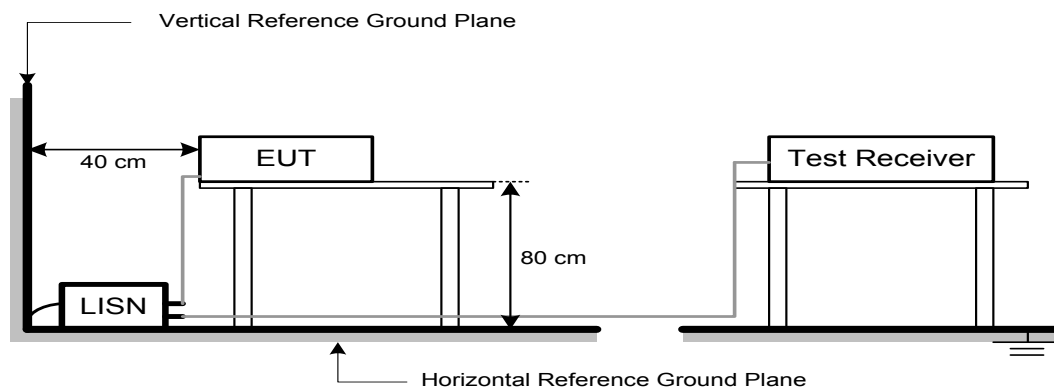
The following table is the setting of the receiver:

| Receiver Parameters | Setting  |
|---------------------|----------|
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

#### 3.3 DEVIATION FROM TEST STANDARD

No deviation.

### 3.4 TEST SETUP



### 3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical function (as a customer would normally use it), EUT was programmed to be in continuously transmitting data or hopping on mode.

### 3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

- (1) All readings are QP Mode value unless otherwise stated AVG in column of 『Note』 . If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform in this case, a “\*” marked in AVG Mode column of Interference Voltage Measured.
- (2) Measuring frequency range from 150 kHz to 30 MHz.

## 4. RADIATED EMISSIONS

### 4.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

| Frequency<br>(MHz) | (dBuV/m at 3 m) |         |
|--------------------|-----------------|---------|
|                    | Peak            | Average |
| Above 1000         | 74              | 54      |

Note:

- (1) The limit for radiated test was performed according to FCC CFR Title 47, Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

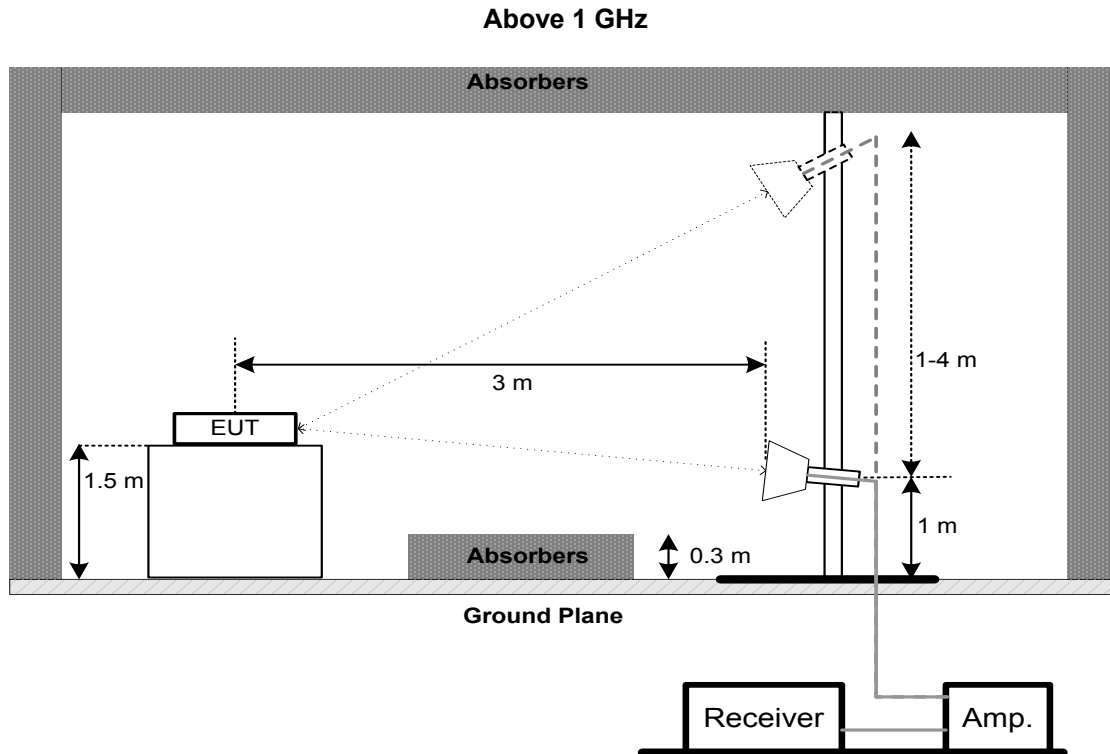
### 4.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1 GHz)
- b. The height of the equipment or of the substitution antenna shall be 0.8m or 1.5m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- c. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights find the maximum reading (used Bore sight function).
- d. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.
- e. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- f. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1 GHz)
- g. For the actual test configuration, please refer to the related Item –EUT Test Photos.

#### 4.3 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.4 TEST SETUP



#### 4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

#### 4.6 TEST RESULTS - ABOVE 1000 MHz

Please refer to the APPENDIX B.

Remark:

- (1) No limit: This is fundamental signal, the judgment is not applicable.  
For fundamental signal judgment was referred to Peak output test.

## 5. MAXIMUM OUTPUT POWER & E.I.R.P.

### 5.1 LIMIT

| Section          | Test Item            | Limit                    |
|------------------|----------------------|--------------------------|
| FCC 15.247(a)(1) | Maximum Output Power | 0.1250 Watt or 20.97 dBm |

Note: Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

### 5.2 TEST PROCEDURE

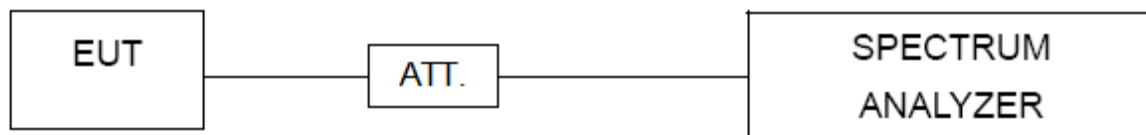
- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- The following table is the setting of the spectrum analyzer:

| Spectrum Parameters | Setting                                                                      |
|---------------------|------------------------------------------------------------------------------|
| Span Frequency      | Approximately five times the 20 dB bandwidth, centered on a hopping channel. |
| RBW                 | 3 MHz                                                                        |
| VBW                 | 3 MHz                                                                        |
| Detector            | Peak/RMS                                                                     |
| Trace               | Max Hold                                                                     |
| Sweep Time          | Auto                                                                         |

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP



### 5.5 EUT OPERATION CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

### 5.6 TEST RESULTS

Please refer to the APPENDIX C.

## 6. MEASUREMENT INSTRUMENTS LIST

| AC Power Line Conducted Emissions |                      |              |                          |            |                  |
|-----------------------------------|----------------------|--------------|--------------------------|------------|------------------|
| Item                              | Kind of Equipment    | Manufacturer | Type No.                 | Serial No. | Calibrated until |
| 1                                 | EMI Test Receiver    | R&S          | ESCI                     | 100382     | Feb. 28, 2022    |
| 2                                 | LISN                 | EMCO         | 3816/2                   | 52765      | Feb. 27, 2022    |
| 3                                 | TWO-LINE V-NETWORK   | R&S          | ENV216                   | 101447     | Feb. 27, 2022    |
| 4                                 | 50Ω Terminator       | SHX          | TF5-3                    | 15041305   | Feb. 27, 2022    |
| 5                                 | Measurement Software | Farad        | EZ-EMC<br>Ver.NB-03A1-01 | N/A        | N/A              |
| 6                                 | Cable                | N/A          | RG223                    | 12m        | Mar. 09, 2022    |
| 7                                 | 643 Shield Room      | ETS          | 6*4*3m                   | N/A        | N/A              |

| Radiated Emissions - Above 1 GHz |                                     |                |                          |               |                  |
|----------------------------------|-------------------------------------|----------------|--------------------------|---------------|------------------|
| Item                             | Kind of Equipment                   | Manufacturer   | Type No.                 | Serial No.    | Calibrated until |
| 1                                | Double Ridged Guide Antenna         | ETS            | 3115                     | 75789         | May 12, 2021     |
| 2                                | Broad-Band Horn Antenna             | Schwarzbeck    | BBHA 9170                | 9170319       | Jul. 07, 2021    |
| 3                                | Amplifier                           | Agilent        | 8449B                    | 3008A02584    | Jul. 25, 2021    |
| 4                                | Microwave Preamplifier With Adaptor | EMC INSTRUMENT | EMC2654045               | 980039 & HA01 | Feb. 28, 2022    |
| 5                                | Receiver                            | Agilent        | N9038A                   | MY52130039    | Jul. 25, 2021    |
| 6                                | Controller                          | CT             | SC100                    | N/A           | N/A              |
| 7                                | Controller                          | MF             | MF-7802                  | MF780208416   | N/A              |
| 8                                | Cable                               | N/A            | EMC104-SM-SM-6000        | N/A           | Oct. 16, 2021    |
| 9                                | Measurement Software                | Farad          | EZ-EMC<br>Ver.NB-03A1-01 | N/A           | N/A              |
| 10                               | Filter                              | STI            | STI15-9912               | N/A           | Jul. 25, 2021    |
| 11                               | 966 Chambe Room                     | RM             | 9*6*6m                   | N/A           | Jul. 25, 2021    |

| Maximum Output Power |                   |              |          |            |                  |
|----------------------|-------------------|--------------|----------|------------|------------------|
| Item                 | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1                    | Spectrum Analyzer | R&S          | FSP40    | 100185     | Jul. 25, 2021    |
| 2                    | Attenuator        | WOKEN        | 6SM3502  | VAS1214NL  | Feb. 07, 2022    |
| 3                    | RF Cable          | Tongkaichuan | N/A      | N/A        | N/A              |
| 4                    | DC Block          | Mini         | N/A      | N/A        | N/A              |

Remark "N/A" denotes no model name, serial no. or calibration specified.

All calibration period of equipment list is one year.

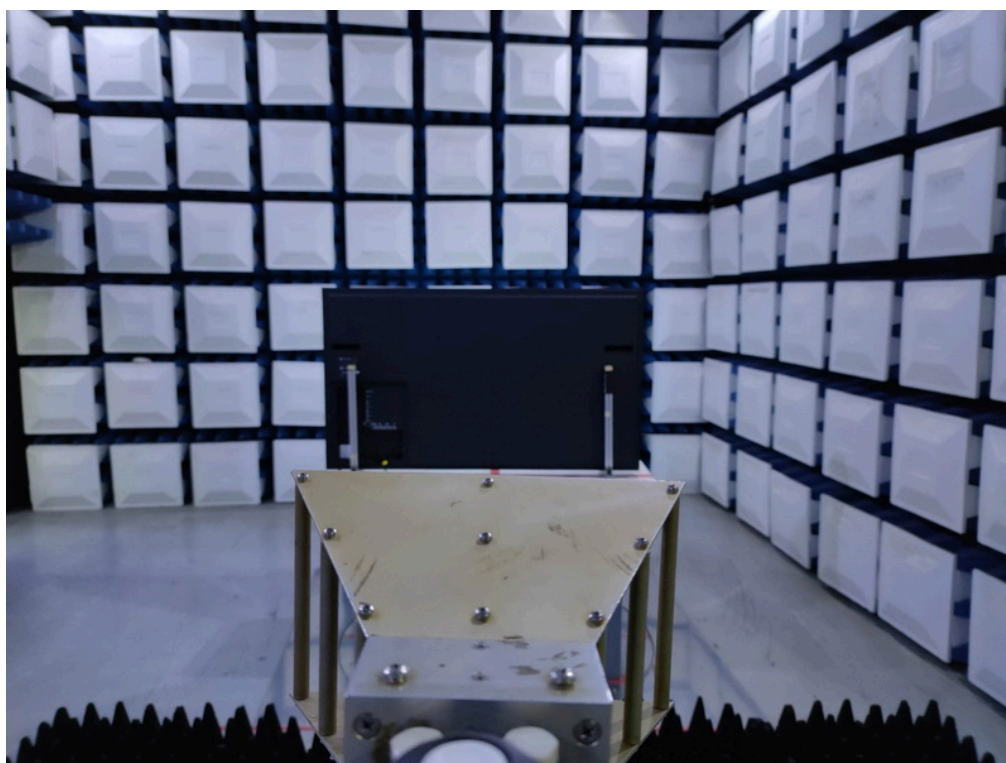
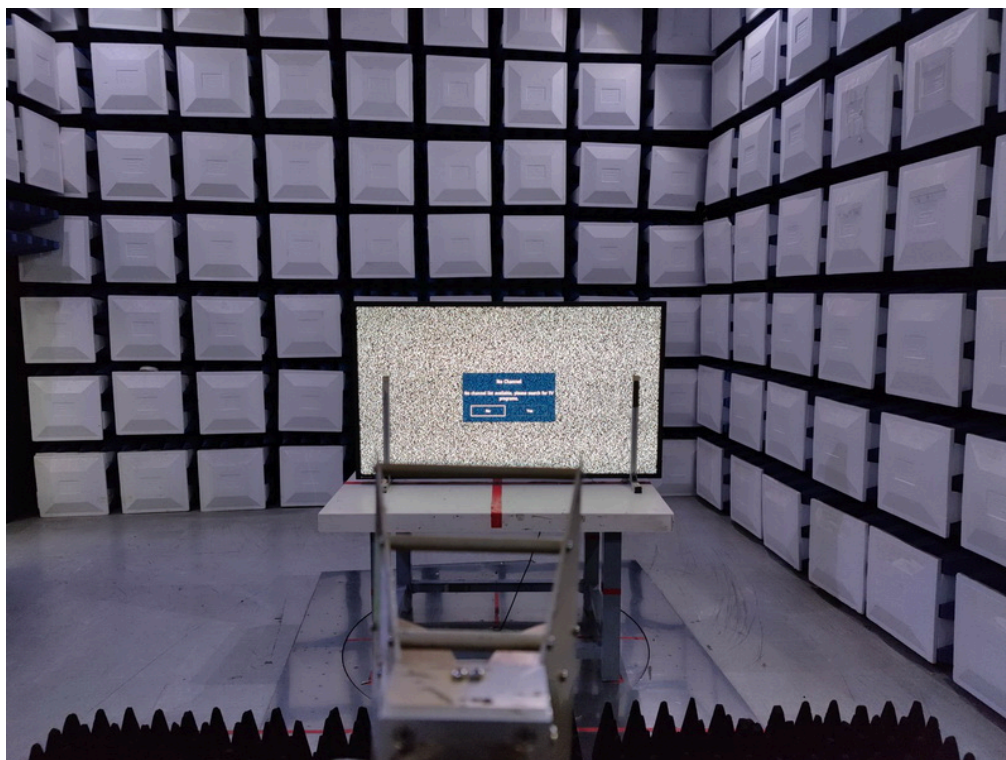
## 7. EUT TEST PHOTO

### AC Power Line Conducted Emissions Test Photos

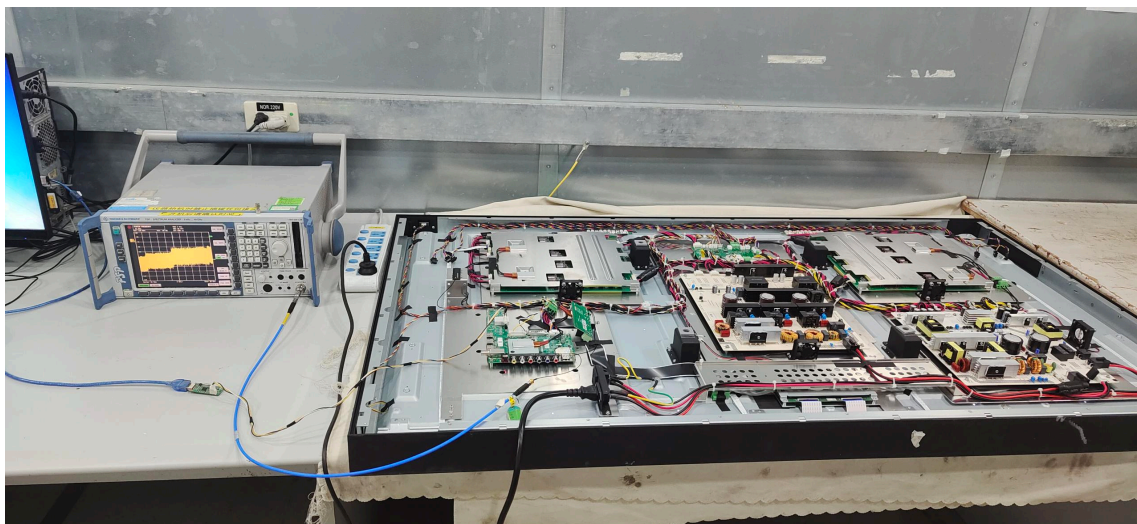


## Radiated Emissions Test Photos

### Above 1 GHz

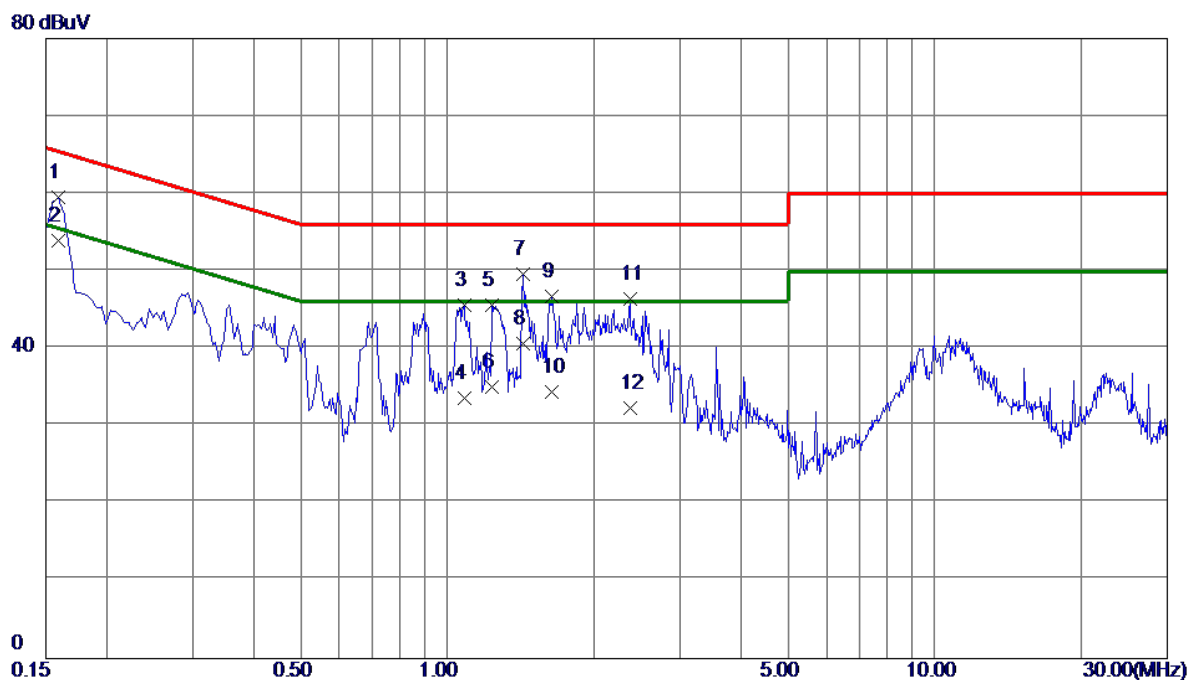


### Conducted Test Photos



## **APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS**

|           |                          |       |      |
|-----------|--------------------------|-------|------|
| Test Mode | TX Mode_3Mbps Channel 39 | Phase | Line |
|-----------|--------------------------|-------|------|

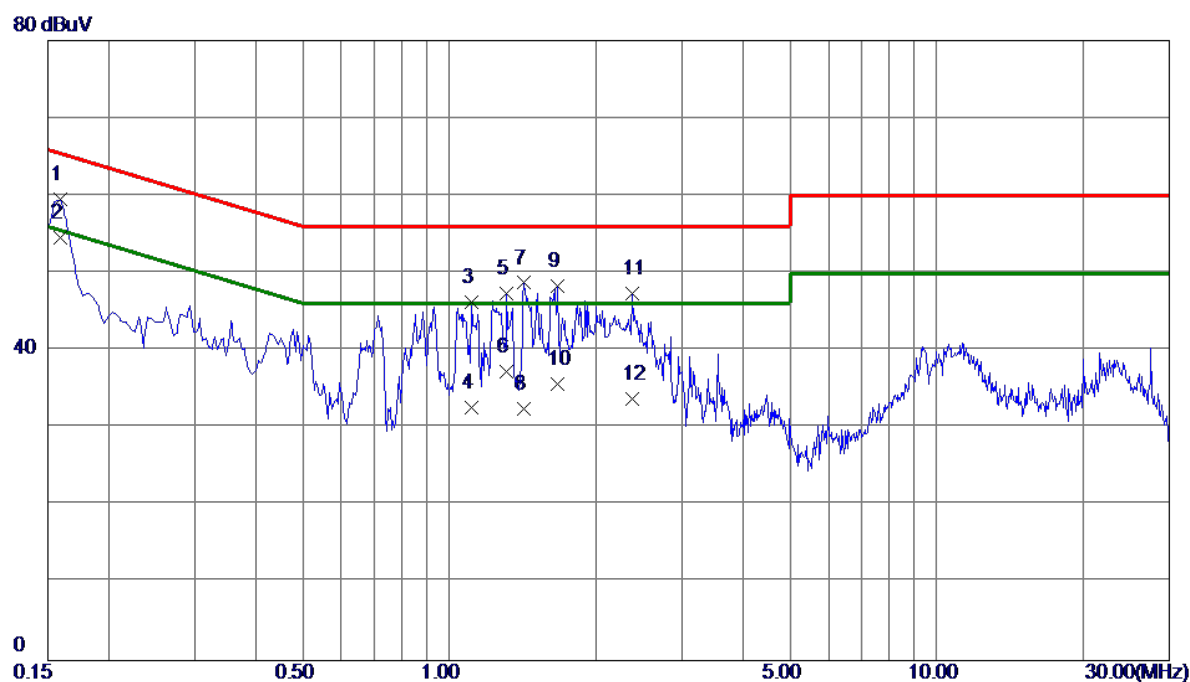


| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|-----|--------------|--------------------------|-------------------------|-------------------------|---------------|--------------|----------|---------|
| 1   | 0.1590       | 49.81                    | 9.74                    | 59.55                   | 65.52         | -5.97        | Peak     |         |
| 2 * | 0.1590       | 44.19                    | 9.74                    | 53.93                   | 55.52         | -1.59        | AVG      |         |
| 3   | 1.0815       | 35.54                    | 9.98                    | 45.52                   | 56.00         | -10.48       | Peak     |         |
| 4   | 1.0815       | 23.60                    | 9.98                    | 33.58                   | 46.00         | -12.42       | AVG      |         |
| 5   | 1.2345       | 35.53                    | 9.99                    | 45.52                   | 56.00         | -10.48       | Peak     |         |
| 6   | 1.2345       | 25.00                    | 9.99                    | 34.99                   | 46.00         | -11.01       | AVG      |         |
| 7   | 1.4280       | 39.53                    | 10.01                   | 49.54                   | 56.00         | -6.46        | Peak     |         |
| 8   | 1.4280       | 30.60                    | 10.01                   | 40.61                   | 46.00         | -5.39        | AVG      |         |
| 9   | 1.6395       | 36.75                    | 10.02                   | 46.77                   | 56.00         | -9.23        | Peak     |         |
| 10  | 1.6395       | 24.40                    | 10.02                   | 34.42                   | 46.00         | -11.58       | AVG      |         |
| 11  | 2.3685       | 36.25                    | 10.08                   | 46.33                   | 56.00         | -9.67        | Peak     |         |
| 12  | 2.3685       | 22.31                    | 10.08                   | 32.39                   | 46.00         | -13.61       | AVG      |         |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.  
(2) Margin Level = Measurement Value - Limit Value.

|           |                          |       |         |
|-----------|--------------------------|-------|---------|
| Test Mode | TX Mode_3Mbps Channel 39 | Phase | Neutral |
|-----------|--------------------------|-------|---------|



| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV | Limit<br>dBuV | Margin<br>dB | Detector | Comment |
|-----|--------------|--------------------------|-------------------------|-------------------------|---------------|--------------|----------|---------|
| 1   | 0.1590       | 49.74                    | 9.81                    | 59.55                   | 65.52         | -5.97        | Peak     |         |
| 2 * | 0.1590       | 44.80                    | 9.81                    | 54.61                   | 55.52         | -0.91        | AVG      |         |
| 3   | 1.1130       | 36.03                    | 10.28                   | 46.31                   | 56.00         | -9.69        | Peak     |         |
| 4   | 1.1130       | 22.31                    | 10.28                   | 32.59                   | 46.00         | -13.41       | AVG      |         |
| 5   | 1.3110       | 37.04                    | 10.31                   | 47.35                   | 56.00         | -8.65        | Peak     |         |
| 6   | 1.3110       | 26.90                    | 10.31                   | 37.21                   | 46.00         | -8.79        | AVG      |         |
| 7   | 1.4235       | 38.40                    | 10.32                   | 48.72                   | 56.00         | -7.28        | Peak     |         |
| 8   | 1.4235       | 22.20                    | 10.32                   | 32.52                   | 46.00         | -13.48       | AVG      |         |
| 9   | 1.6665       | 38.02                    | 10.35                   | 48.37                   | 56.00         | -7.63        | Peak     |         |
| 10  | 1.6665       | 25.30                    | 10.35                   | 35.65                   | 46.00         | -10.35       | AVG      |         |
| 11  | 2.3730       | 36.88                    | 10.41                   | 47.29                   | 56.00         | -8.71        | Peak     |         |
| 12  | 2.3730       | 23.41                    | 10.41                   | 33.82                   | 46.00         | -12.18       | AVG      |         |

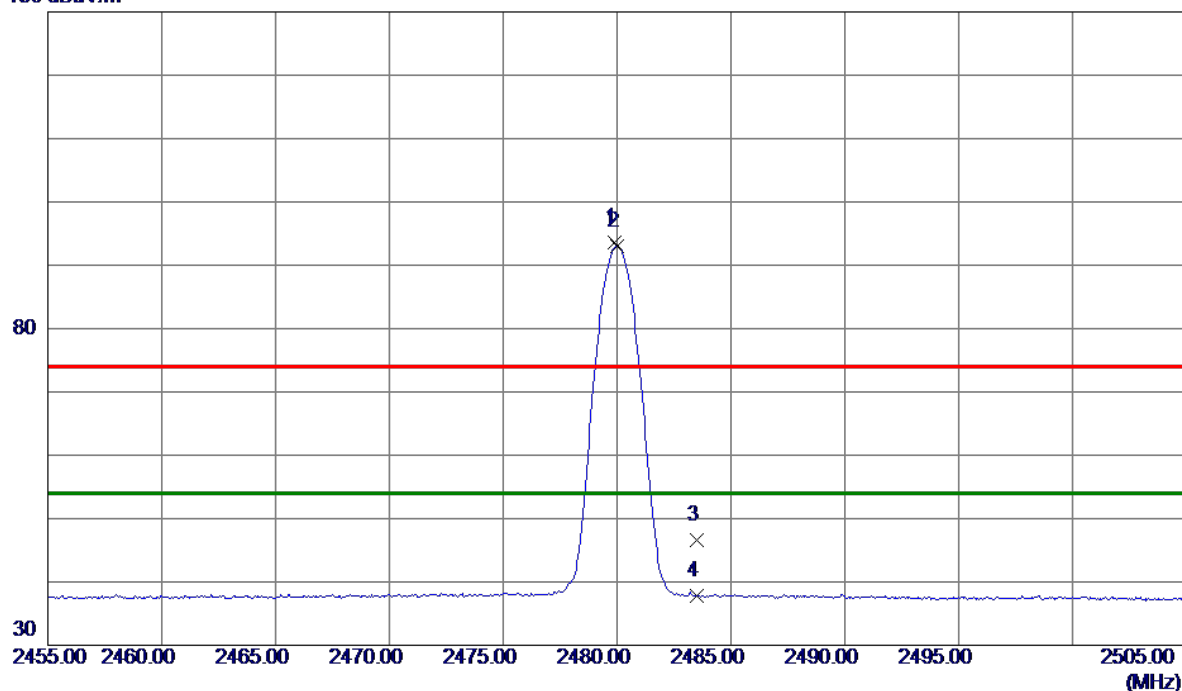
## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.  
(2) Margin Level = Measurement Value - Limit Value.

## **APPENDIX B - RADIATED EMISSION - ABOVE 1000 MHZ**

|           |                        |              |          |
|-----------|------------------------|--------------|----------|
| Test Mode | TX 2480 MHz_CH78_1Mbps | Polarization | Vertical |
|-----------|------------------------|--------------|----------|

130 dBuV/m



| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|----------|
| 1   | 2479.9000    | 86.29                      | 7.25                    | 93.54                     | 74.00           | 19.54        | Peak     | No Limit |
| 2 * | 2480.0000    | 85.72                      | 7.25                    | 92.97                     | 54.00           | 38.97        | AVG      | No Limit |
| 3   | 2483.5000    | 39.29                      | 7.25                    | 46.54                     | 74.00           | -27.46       | Peak     |          |
| 4   | 2483.5000    | 30.59                      | 7.25                    | 37.84                     | 54.00           | -16.16       | AVG      |          |

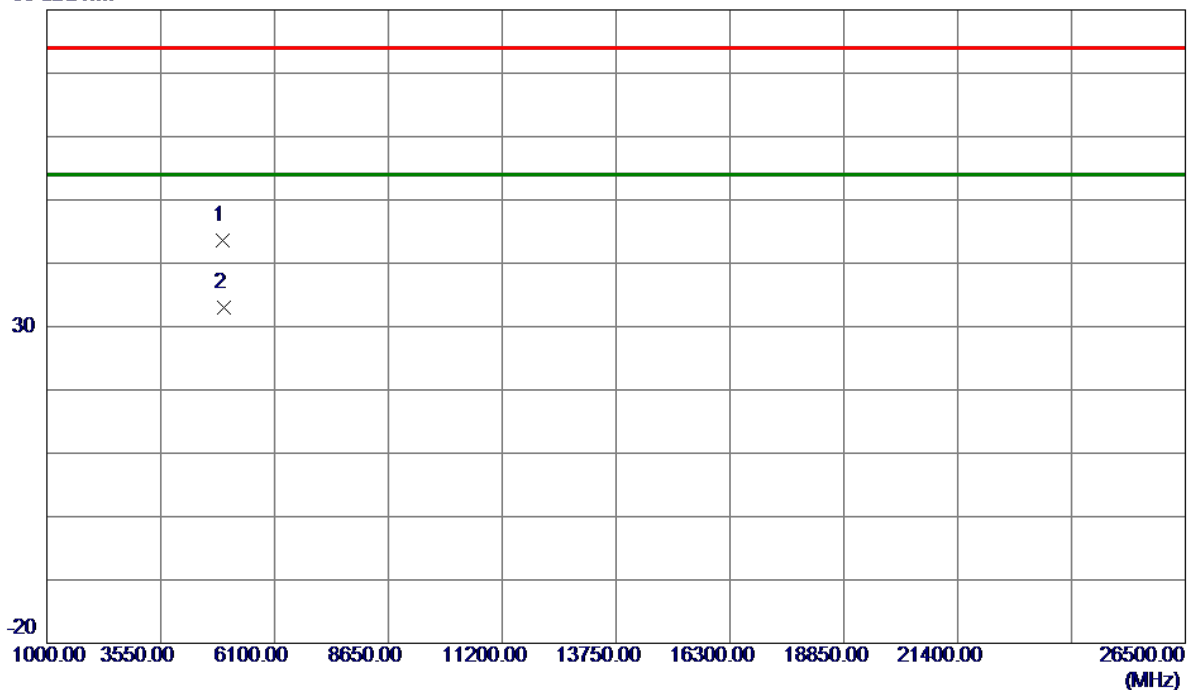
## REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |          |
|-----------|-------------------------|--------------|----------|
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Vertical |
|-----------|-------------------------|--------------|----------|

80 dBuV/m

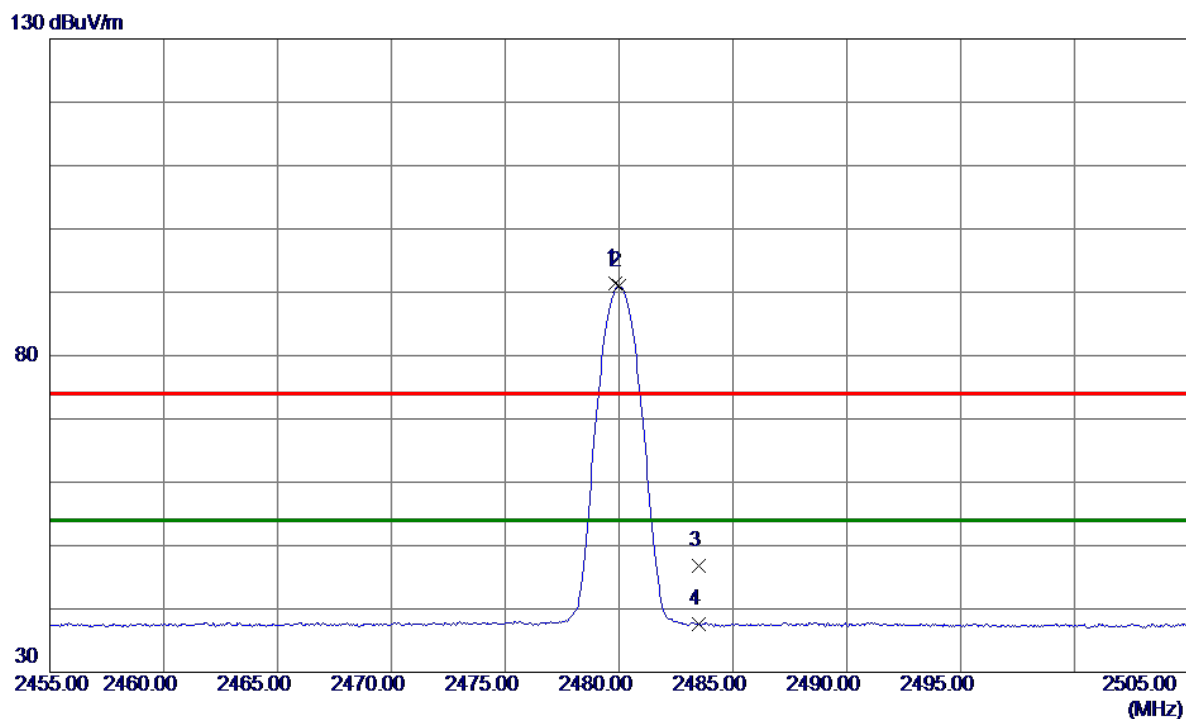


| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|---------|
| 1   | 4950.6600    | 38.73                      | 4.79                    | 43.52                     | 74.00           | -30.48       | Peak     |         |
| 2 * | 4966.2200    | 28.11                      | 4.83                    | 32.94                     | 54.00           | -21.06       | AVG      |         |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |            |
|-----------|-------------------------|--------------|------------|
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Horizontal |
|-----------|-------------------------|--------------|------------|



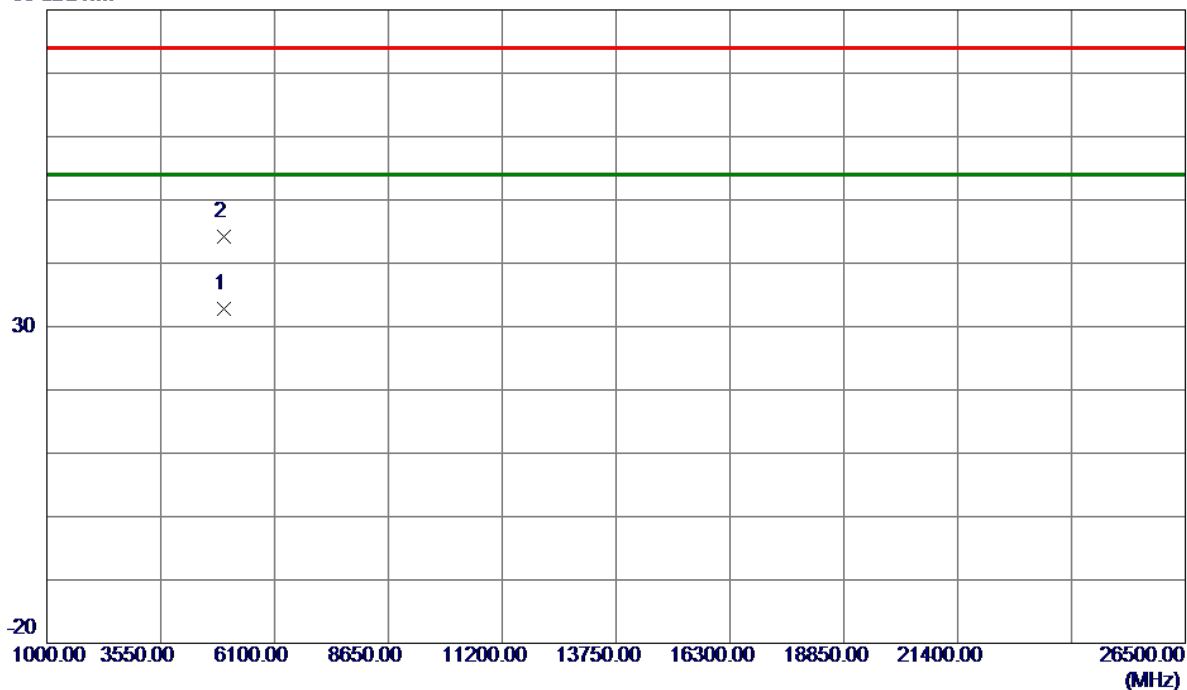
| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|----------|
| 1   | 2479.8500    | 84.24                      | 7.25                    | 91.49                     | 74.00           | 17.49        | Peak     | No Limit |
| 2 * | 2480.0000    | 83.67                      | 7.25                    | 90.92                     | 54.00           | 36.92        | AVG      | No Limit |
| 3   | 2483.5000    | 39.52                      | 7.25                    | 46.77                     | 74.00           | -27.23       | Peak     |          |
| 4   | 2483.5000    | 30.39                      | 7.25                    | 37.64                     | 54.00           | -16.36       | AVG      |          |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |            |
|-----------|-------------------------|--------------|------------|
| Test Mode | TX 2480 MHz _CH78_1Mbps | Polarization | Horizontal |
|-----------|-------------------------|--------------|------------|

80 dBuV/m



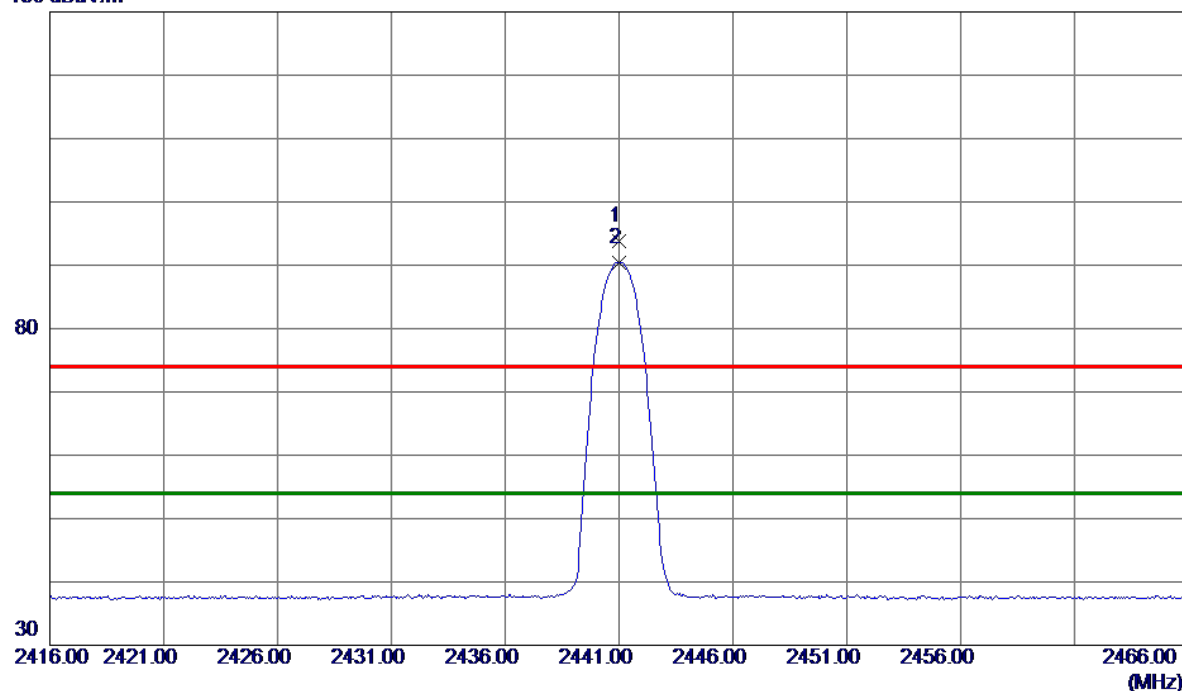
| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|---------|
| 1 * | 4955.2599    | 28.08                      | 4.80                    | 32.88                     | 54.00           | -21.12       | AVG      |         |
| 2   | 4965.4200    | 39.32                      | 4.83                    | 44.15                     | 74.00           | -29.85       | Peak     |         |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |          |
|-----------|-------------------------|--------------|----------|
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Vertical |
|-----------|-------------------------|--------------|----------|

130 dBuV/m



| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|----------|
| 1   | 2441.0000    | 86.63                      | 7.25                    | 93.88                     | 74.00           | 19.88        | Peak     | No Limit |
| 2 * | 2441.0000    | 83.23                      | 7.25                    | 90.48                     | 54.00           | 36.48        | AVG      | No Limit |

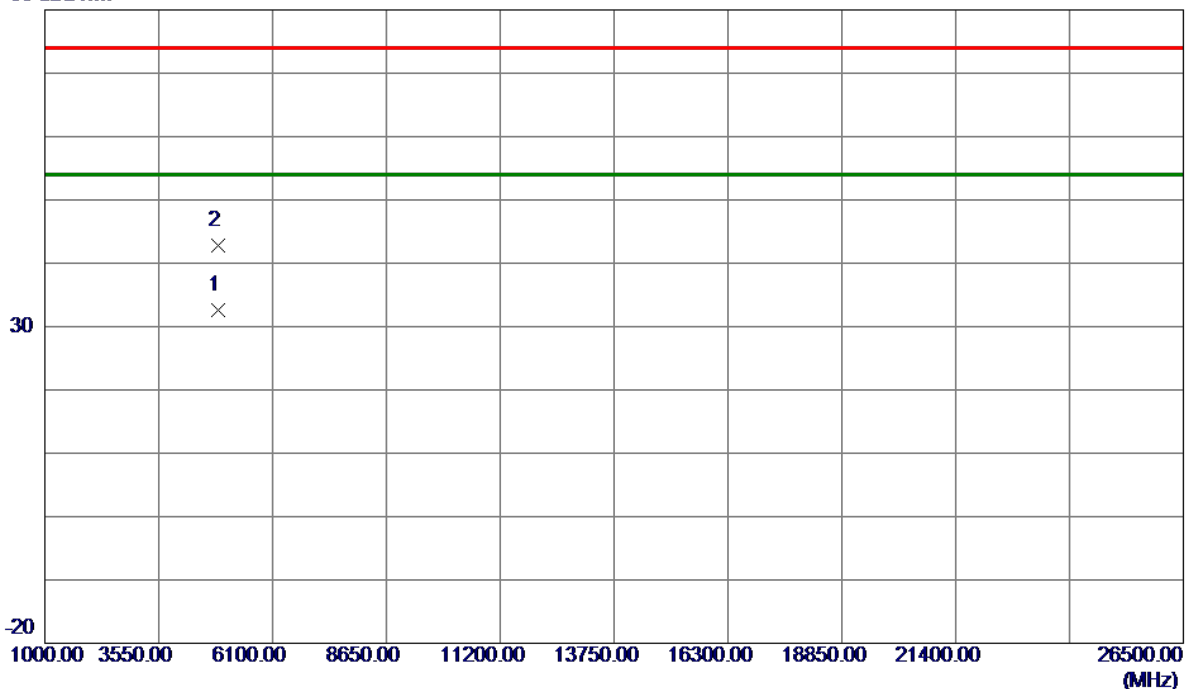
## REMARKS:

(1) Measurement Value = Reading Level + Correct Factor.

(2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |          |
|-----------|-------------------------|--------------|----------|
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Vertical |
|-----------|-------------------------|--------------|----------|

80 dBuV/m

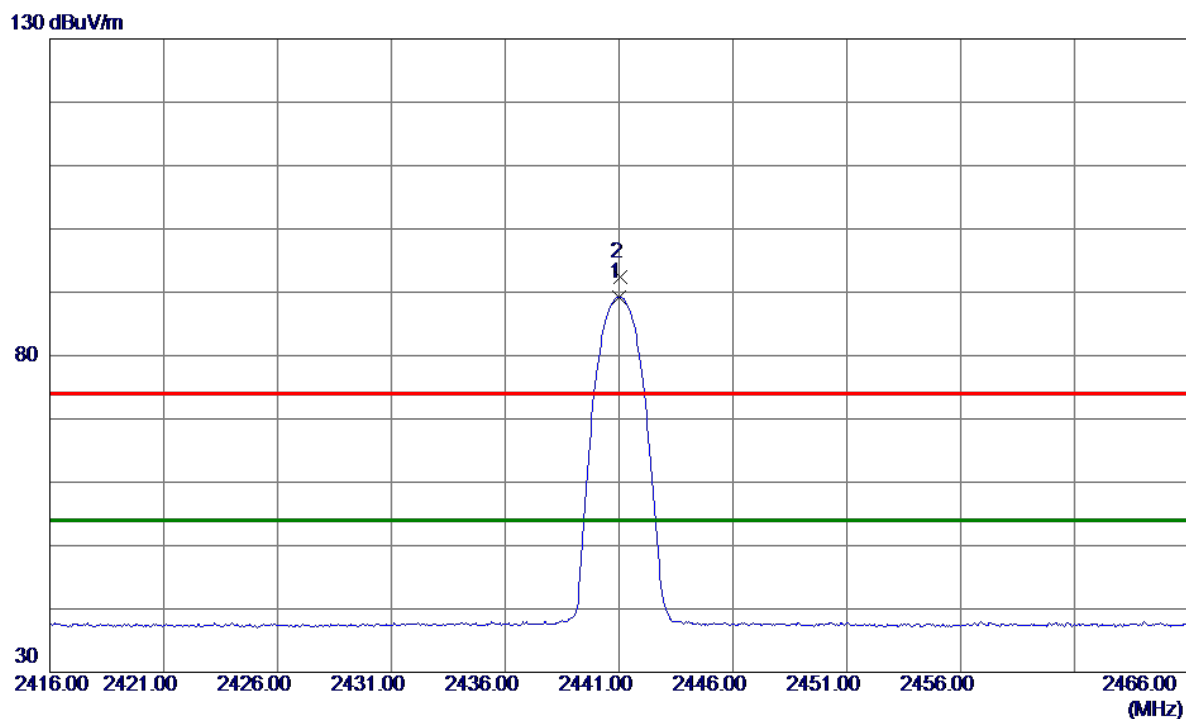


| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|---------|
| 1 * | 4878.2799    | 28.00                      | 4.60                    | 32.60                     | 54.00           | -21.40       | AVG      |         |
| 2   | 4888.9100    | 38.26                      | 4.62                    | 42.88                     | 74.00           | -31.12       | Peak     |         |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |            |
|-----------|-------------------------|--------------|------------|
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Horizontal |
|-----------|-------------------------|--------------|------------|



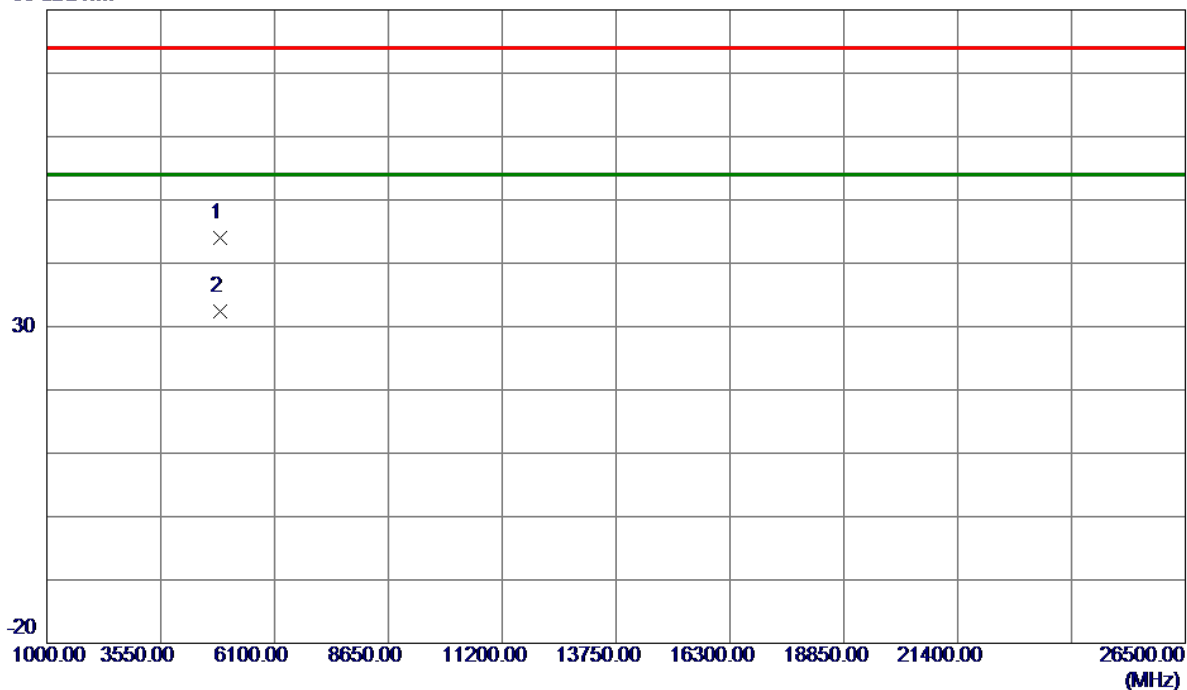
| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment  |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|----------|
| 1 * | 2441.0000    | 81.94                      | 7.25                    | 89.19                     | 54.00           | 35.19        | AVG      | No Limit |
| 2   | 2441.0500    | 85.24                      | 7.25                    | 92.49                     | 74.00           | 18.49        | Peak     | No Limit |

## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

|           |                         |              |            |
|-----------|-------------------------|--------------|------------|
| Test Mode | TX 2441 MHz _CH39_3Mbps | Polarization | Horizontal |
|-----------|-------------------------|--------------|------------|

80 dBuV/m



| No. | Freq.<br>MHz | Reading<br>Level<br>dBuV/m | Correct<br>Factor<br>dB | Measure<br>ment<br>dBuV/m | Limit<br>dBuV/m | Margin<br>dB | Detector | Comment |
|-----|--------------|----------------------------|-------------------------|---------------------------|-----------------|--------------|----------|---------|
| 1   | 4880.9580    | 39.31                      | 4.60                    | 43.91                     | 74.00           | -30.09       | Peak     |         |
| 2 * | 4884.2480    | 27.83                      | 4.61                    | 32.44                     | 54.00           | -21.56       | AVG      |         |

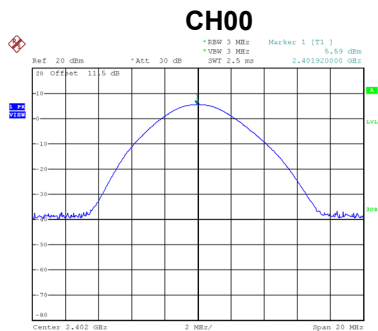
## REMARKS:

- (1) Measurement Value = Reading Level + Correct Factor.
- (2) Margin Level = Measurement Value - Limit Value.

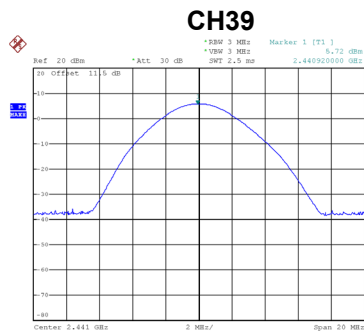
## **APPENDIX C - MAXIMUM OUTPUT POWER**

|           |                |
|-----------|----------------|
| Test Mode | TX Mode _1Mbps |
|-----------|----------------|

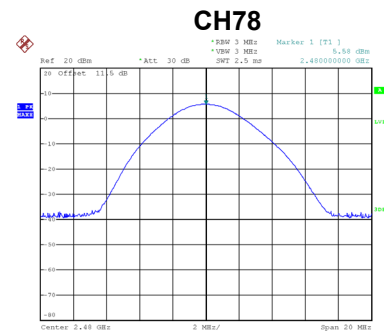
| Channel | Frequency (MHz) | Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---------|-----------------|--------------------|------------------|----------------|-------------|
| 00      | 2402            | 5.59               | 20.97            | 0.1250         | Pass        |
| 39      | 2441            | 5.72               | 20.97            | 0.1250         | Pass        |
| 78      | 2480            | 5.58               | 20.97            | 0.1250         | Pass        |



Date: 2.JUL.2021 16:15:48



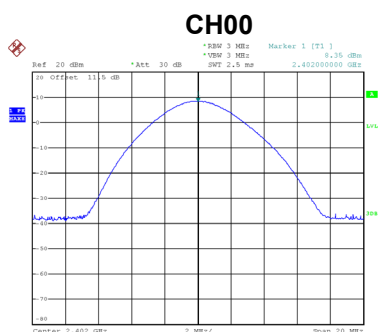
Date: 2.JUL.2021 16:20:04



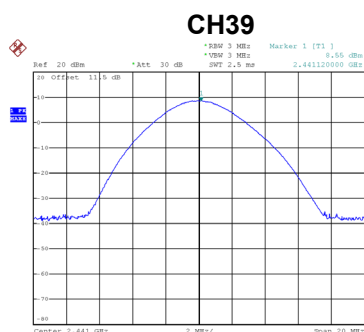
Date: 2.JUL.2021 16:22:41

|           |                |
|-----------|----------------|
| Test Mode | TX Mode _2Mbps |
|-----------|----------------|

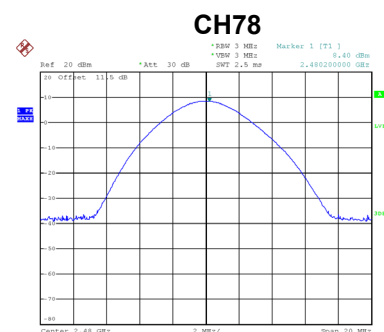
| Channel | Frequency (MHz) | Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---------|-----------------|--------------------|------------------|----------------|-------------|
| 00      | 2402            | 8.35               | 20.97            | 0.1250         | Pass        |
| 39      | 2441            | 8.55               | 20.97            | 0.1250         | Pass        |
| 78      | 2480            | 8.40               | 20.97            | 0.1250         | Pass        |



Date: 2.JUL.2021 16:24:54



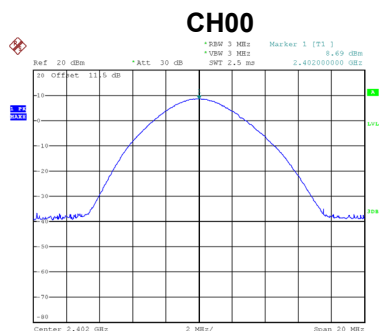
Date: 2.JUL.2021 16:25:40



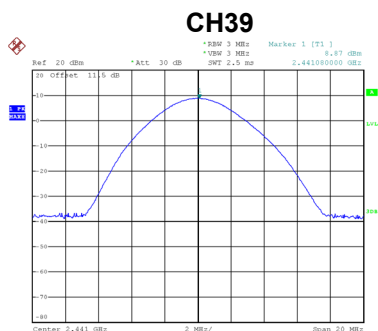
Date: 2.JUL.2021 16:26:11

|           |                |
|-----------|----------------|
| Test Mode | TX Mode _3Mbps |
|-----------|----------------|

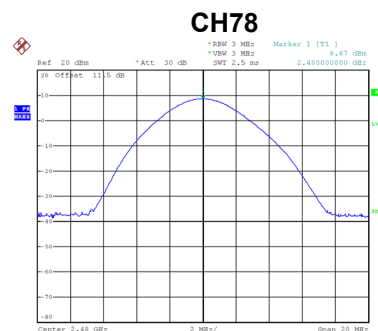
| Channel | Frequency (MHz) | Output Power (dBm) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---------|-----------------|--------------------|------------------|----------------|-------------|
| 00      | 2402            | 8.69               | 20.97            | 0.1250         | Pass        |
| 39      | 2441            | 8.87               | 20.97            | 0.1250         | Pass        |
| 78      | 2480            | 8.67               | 20.97            | 0.1250         | Pass        |



Date: 2.JUL.2021 16:27:37



Date: 2.JUL.2021 16:28:15



Date: 2.JUL.2021 16:29:30

## **APPENDIX D - DECLARATION FOR BLUETOOTH DEVICE**

**1. Output power and channel separation of a Bluetooth device in the different operating modes:**

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device has no influence on the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.

Only a different hopping sequence will be used. For this reason the check of these RF parameters in one op-mode is sufficient.

**2. Frequency range of a Bluetooth device:**

Hereby we declare that the maximum frequency of this device is: 2402 - 2480MHz. This is according to the Bluetooth Core Specification (+ critical errata) for devices which will be operated in the USA.

This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/04-E). Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification are not supported by this device.

**3. Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:**

Bluetooth units which want to communicate with other units must be organised in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from its BD address which is unique for each Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

**4. Example of a hopping sequence in data mode:**

Example of a 79 hopping sequence in data mode:

40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67, 56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59, 72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75, 09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06, 01, 51, 03, 55, 05, 04

**5. Equally average use of frequencies in data mode and behaviour for short transmissions:**

The generation of the hopping sequence in connection mode depends essentially on two input values:

- a) LAP/UAP of the master of the connection.
- b) Internal master clock.

The LAP (lower address part) are the 24 LSB's of the 48 BD\_ADDRESS. The BD\_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD\_ADDRESS.

The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronisation with other units only offset are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5  $\mu$ s. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire.

LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR- operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions the Bluetooth system has the following behaviour:

The first connection between the two devices is established, a hopping sequence was generated. For transmitting the wanted data the complete hopping sequence was not used. The connection ended.

The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5  $\mu$ s). The hopping sequence will always differ from the first one.

**6. Receiver input bandwidth and behaviour for repeated single or multiple packets:**

The input bandwidth of the receiver is 1 MHz. In every connection one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master.

Additionally the type of connection (e.g. single or multislot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing according to the packet type of the connection. Also the slave of the connection will use these settings.

Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence.

**End of Test Report**