

# FCC Radio Test Report

**FCC ID: 2AVVT-AD00A10057**

**Report No.** : BTL-FCCP-5-2004T194  
**Equipment** : Connectivity Control Unit - iTraMS  
**Model Name** : AD00A10057, CU-304-0503  
**Brand Name** : Bosch  
**Applicant** : Robert Bosch Engineering and Business Solutions Private Limited  
**Address** : RBEI/Pac, Ban601, Post Box No 3000 Hosur Road, Adugodi  
Bengaluru 560030 India (Republic Of)

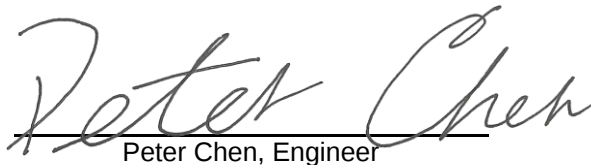
**Radio Function** : Bluetooth Low Energy

**FCC Rule Part(s)** : FCC Part15, Subpart C (15.247)  
**Measurement Procedure(s)** : ANSI C63.10-2013

**Date of Receipt** : 2020/5/13  
**Date of Test** : 2020/5/13 ~ 2020/6/23  
**Issued Date** : 2020/7/22

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

**Prepared by** :

  
Peter Chen, Engineer

**Approved by** :

  
Scott Hsu, Manager



**BTL Inc.**

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan

Tel: +886-2-2657-3299

Fax: +886-2-2657-3331

Web: [www.newbtl.com](http://www.newbtl.com)

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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.

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**REPORT ISSUED HISTORY**

| Report Version | Description     | Issued Date |
|----------------|-----------------|-------------|
| R00            | Original Issue. | 2020/7/22   |

## 1 SUMMARY OF TEST RESULTS

Test procedures according to the technical standards.

| FCC Part 15, Subpart C (15.247) |                                     |                          |           |         |
|---------------------------------|-------------------------------------|--------------------------|-----------|---------|
| Standard(s) Section             | Description                         | Test Result              | Judgement | Remark  |
| 15.207                          | AC Power Line Conducted Emissions   | -----                    | N/A       | NOTE(1) |
| 15.205<br>15.209<br>15.247(d)   | Radiated Emissions                  | APPENDIX A<br>APPENDIX B | Pass      | -----   |
| 15.247(a)(2)                    | Bandwidth                           | APPENDIX C               | Pass      | -----   |
| 15.247(b)(3)                    | Output Power                        | APPENDIX D               | Pass      | -----   |
| 15.247(e)                       | Power Spectral Density              | APPENDIX E               | Pass      | -----   |
| 15.247(d)                       | Antenna conducted Spurious Emission | APPENDIX F               | Pass      | -----   |
| 15.203                          | Antenna Requirement                 | -----                    | Pass      | -----   |

NOTE:

(1) "N/A" denotes test is not applicable in this Test Report.

(2) The report format version is TP.1.1.1.

## 1.1 TEST FACILITY

The test facilities used to collect the test data in this report:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan

The test sites and facilities are covered under FCC RN: 674415 and DN: TW0659.

☐ C05      ☐ CB08      ☐ CB11      ☒ CB15      ☐ CB16  
☒ SR06

## 1.2 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k = 2$ , providing a level of confidence of approximately **95 %**. The measurement instrumentation uncertainty considerations contained in CISPR 16-4-2. The BTL measurement uncertainty is less than the CISPR 16-4-2  $U_{\text{CISPR}}$  requirement.

### A. Radiated emissions test :

| Test Site | Measurement Frequency Range | $U_1$ (dB) |
|-----------|-----------------------------|------------|
| CB15      | 0.03 GHz ~ 0.2 GHz          | 4.17       |
|           | 0.2 GHz ~ 1 GHz             | 4.72       |
|           | 1 GHz ~ 6 GHz               | 5.21       |
|           | 6 GHz ~ 18 GHz              | 5.51       |
|           | 18 GHz ~ 26 GHz             | 3.69       |
|           | 26 GHz ~ 40 GHz             | 4.23       |

### B. Conducted test :

| Test Item                    | $U_1$ (dB) |
|------------------------------|------------|
| Bandwidth                    | 1.13       |
| Output power                 | 1.06       |
| Power Spectral Density       | 1.20       |
| Conducted Spurious emissions | 1.14       |
| Conducted Band edges         | 1.13       |

### 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                           | Environment Condition | Test Voltage | Tested by     |
|-------------------------------------|-----------------------|--------------|---------------|
| Radiated emissions below 1 GHz      | 22 °C, 65 %           | DC 32V       | Hunter Chiang |
| Radiated emissions above 1 GHz      | 22 °C, 65 %           | DC 32V       | Hunter Chiang |
| Bandwidth                           | 23.5 °C, 51 %         | DC 32V       | William Wei   |
| Output Power                        | 23.5 °C, 51 %         | DC 32V       | William Wei   |
| Power Spectral Density              | 23.5 °C, 51 %         | DC 32V       | William Wei   |
| Antenna conducted Spurious Emission | 23.5 °C, 51 %         | DC 32V       | William Wei   |

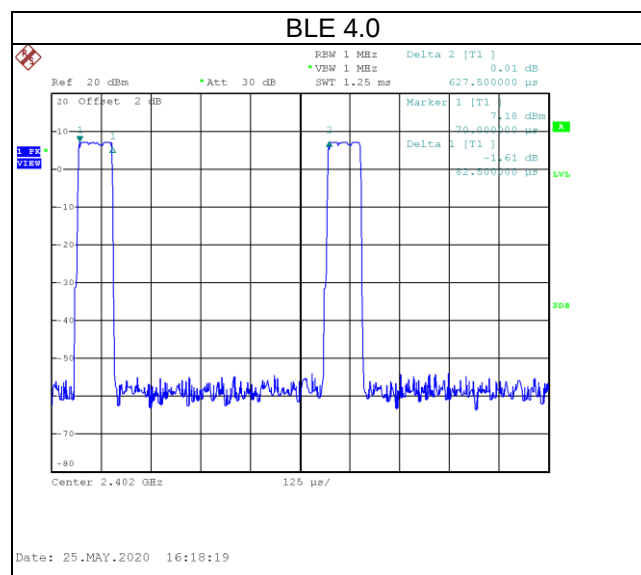
### 1.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

| Test Software   | CMD      |          |          |           |
|-----------------|----------|----------|----------|-----------|
| Modulation Mode | 2402 MHz | 2440 MHz | 2480 MHz | Data Rate |
| BLE 4.0         | DEF      | DEF      | DEF      | 1 Mbps    |

### 1.5 DUTY CYCLE

If duty cycle is  $\geq 98\%$ , duty factor is not required.

If duty cycle is  $< 98\%$ , duty factor shall be considered.



| Remark  | Delta 1 |              |                  | Delta 2              | On Time/Period | 10 log(1/Duty Cycle) |
|---------|---------|--------------|------------------|----------------------|----------------|----------------------|
| Mode    | ON (ms) | Numbers (ON) | On Time (B) (ms) | Period (ON+OFF) (ms) | Duty Cycle (%) | Duty Factor (dB)     |
| BLE 4.0 | 0.083   | 1            | 0.083            | 0.628                | 13.15%         | 8.81                 |

## 2 GENERAL INFORMATION

### 2.1 DESCRIPTION OF EUT

|                       |                                                     |
|-----------------------|-----------------------------------------------------|
| Equipment             | Connectivity Control Unit - iTraMS                  |
| Model Name            | AD00A10057, CU-304-0503                             |
| Brand Name            | Bosch                                               |
| Model Difference      | Different model distribute to different area.       |
| Power Source          | Supplied from Battery.                              |
| Power Rating          | DC 9-32V                                            |
| Products Covered      | N/A                                                 |
| Hardware Version      | B2LTE                                               |
| Software Version      | CCU_REL9.0 (uuu_512MB_FCC_wifi100_eMMC166_OnEngine) |
| RAM and eMMC details  | 512MB and 8GB                                       |
| Frequency Range       | 2400 MHz ~ 2483.5 MHz                               |
| Operation Frequency   | 2402 MHz ~ 2480 MHz                                 |
| Modulation Technology | GFSK                                                |
| Transfer Rate         | 1 Mbps                                              |
| Output Power Max.     | 11.04 dBm (0.0127 W)                                |
| Test Model            | AD00A10057                                          |
| Sample Status         | Engineering Sample                                  |
| EUT Modification(s)   | N/A                                                 |

#### NOTE:

- (1) 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) |
|---------|-----------------|---------|-----------------|
| 00      | 2402            | 20      | 2442            |
| 01      | 2404            | 21      | 2444            |
| 02      | 2406            | 22      | 2446            |
| 03      | 2408            | 23      | 2448            |
| 04      | 2410            | 24      | 2450            |
| 05      | 2412            | 25      | 2452            |
| 06      | 2414            | 26      | 2454            |
| 07      | 2416            | 27      | 2456            |
| 08      | 2418            | 28      | 2458            |
| 09      | 2420            | 29      | 2460            |
| 10      | 2422            | 30      | 2462            |
| 11      | 2424            | 31      | 2464            |
| 12      | 2426            | 32      | 2466            |
| 13      | 2428            | 33      | 2468            |
| 14      | 2430            | 34      | 2470            |
| 15      | 2432            | 35      | 2472            |
| 16      | 2434            | 36      | 2474            |
| 17      | 2436            | 37      | 2476            |
| 18      | 2438            | 38      | 2478            |
| 19      | 2440            | 39      | 2480            |

- (3) Table for Filed Antenna:

| Ant. | Brand                                                                               | Part number | Antenna Type      | Connector                        | Gain (dBi) |
|------|-------------------------------------------------------------------------------------|-------------|-------------------|----------------------------------|------------|
| CH0  |  | 146153      | Dipole (Internal) | Compatible I-PEX MHF I & MMCX-JW | 3.0        |

## 2.2 TEST MODES

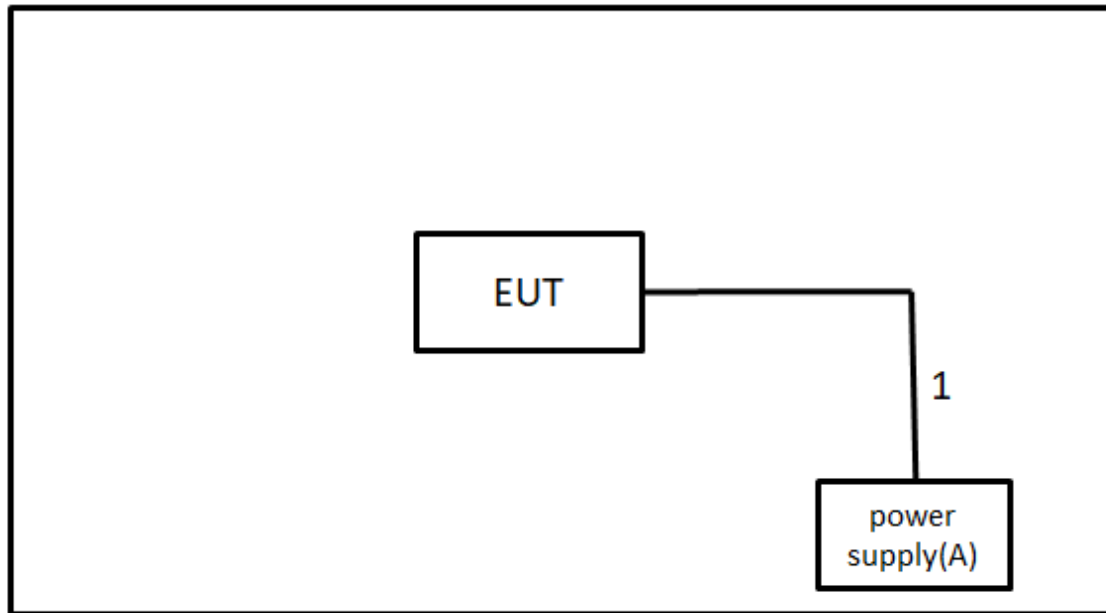
| Test Items                                     | Test mode | Channel  | Note     |
|------------------------------------------------|-----------|----------|----------|
| Transmitter Radiated Emissions<br>(below 1GHz) | BLE       | 39       | -        |
| Transmitter Radiated Emissions<br>(above 1GHz) | BLE       | 00/39    | Bandedge |
|                                                | BLE       | 00/19/39 | Harmonic |
| Bandwidth                                      | BLE       | 00/19/39 | -        |
| Output Power                                   | BLE       | 00/19/39 | -        |
| Power Spectral Density                         | BLE       | 00/19/39 | -        |
| Antenna conducted Spurious Emission            | BLE       | 00/19/39 | -        |

### NOTE:

- (1) The Radiated emissions test was verified based on the worst conducted power and Bandwidth test results reported in the original report.
- (2) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Horizontal) is recorded.
- (3) All X, Y and Z axes are evaluated, but only the worst case (Z axis) is recorded.
- (4) There were no emissions found below 30 MHz within 20 dB of the limit.

### 2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

Equipment letters and Cable numbers refer to item numbers described in the tables of clause 2.4.



### 2.4 SUPPORT UNITS

| Item | Equipment    | Brand  | Model No. | Series No. | Remarks                |
|------|--------------|--------|-----------|------------|------------------------|
| A    | Power supply | Twinex | TP-6010   | N/A        | Furnished by test lab. |

| Item | Shielded | Ferrite Core | Length | Cable Type  | Remarks                    |
|------|----------|--------------|--------|-------------|----------------------------|
| 1    | N/A      | N/A          | 1.5m   | Power cable | Supplied by test requester |

### 3 RADIATED EMISSIONS TEST

#### 3.1 LIMIT

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

#### LIMITS OF RADIATED EMISSIONS MEASUREMENT (9 kHz to 1000 MHz)

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|-----------------|-----------------------------------|-------------------------------|
| 0.009~0.490     | 2400/F(KHz)                       | 300                           |
| 0.490~1.705     | 24000/F(KHz)                      | 30                            |
| 1.705~30.0      | 30                                | 30                            |
| 30~88           | 100                               | 3                             |
| 88~216          | 150                               | 3                             |
| 216~960         | 200                               | 3                             |
| 960~1000        | 500                               | 3                             |

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

| Frequency (MHz) | Radiated Emissions (dBuV/m) |         | Measurement Distance (meters) |
|-----------------|-----------------------------|---------|-------------------------------|
|                 | Peak                        | Average |                               |
| Above 1000      | 74                          | 54      | 3                             |

#### NOTE:

- (1) The limit for radiated test was performed according to FCC Part 15, Subpart C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).
- (4) The test result calculated as following:  
 Measurement Value = Reading Level + Correct Factor  
 Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain(if use)  
 Margin Level = Measurement Value - Limit Value  
 Calculation example:

| Reading Level |   | Correct Factor |   | Measurement Value |
|---------------|---|----------------|---|-------------------|
| 41.91         | + | -8.36          | = | 33.55             |

| Measurement Value |   | Limit Value |   | Margin Level |
|-------------------|---|-------------|---|--------------|
| 33.55             | - | 43.50       | = | -9.95        |

| Spectrum Parameter                         | Setting                                         |
|--------------------------------------------|-------------------------------------------------|
| Attenuation                                | Auto                                            |
| Start Frequency                            | 1000 MHz                                        |
| Stop Frequency                             | 10th carrier harmonic                           |
| RBW / VBW<br>(Emission in restricted band) | 1MHz / 3MHz for Peak,<br>1MHz / 1/T for Average |

| Spectrum Parameter     | Setting                           |
|------------------------|-----------------------------------|
| Attenuation            | Auto                              |
| Start ~ Stop Frequency | 9KHz~90KHz for PK/AVG detector    |
| Start ~ Stop Frequency | 90KHz~110KHz for QP detector      |
| Start ~ Stop Frequency | 110KHz~490KHz for PK/AVG detector |
| Start ~ Stop Frequency | 490KHz~30MHz for QP detector      |
| Start ~ Stop Frequency | 30MHz~1000MHz for QP detector     |

### 3.2 TEST PROCEDURE

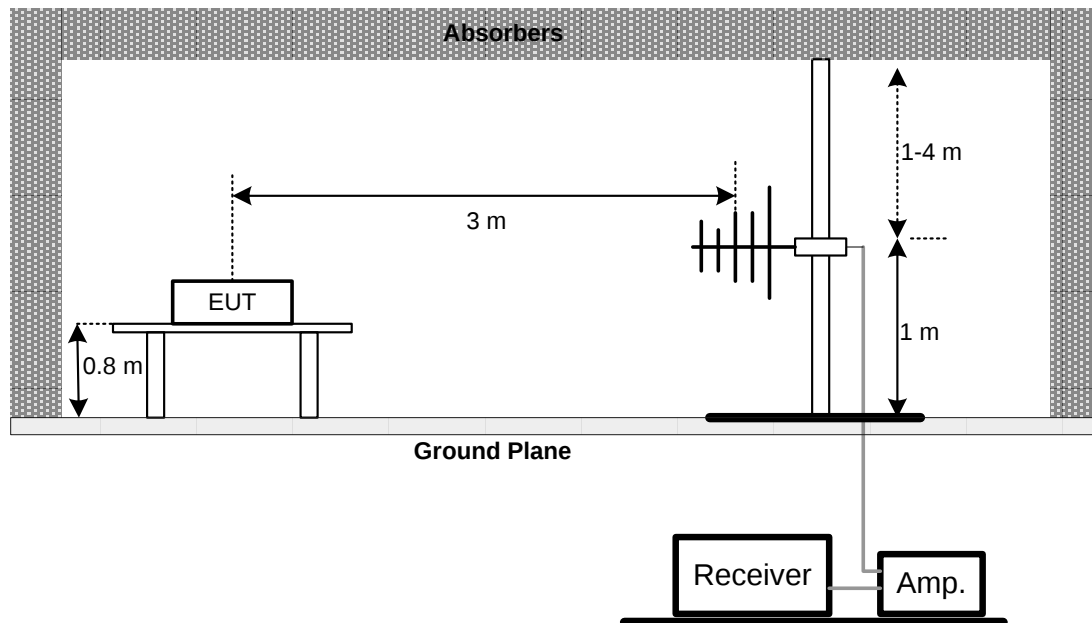
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8 m or 1.5 m, 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.
- d. 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).
- e. The receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1GHz.
- f. 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.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform. (below 1GHz)
- h. 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 1GHz)
- i. For the actual test configuration, please refer to the related Item – EUT TEST PHOTO.

### 3.3 DEVIATION FROM TEST STANDARD

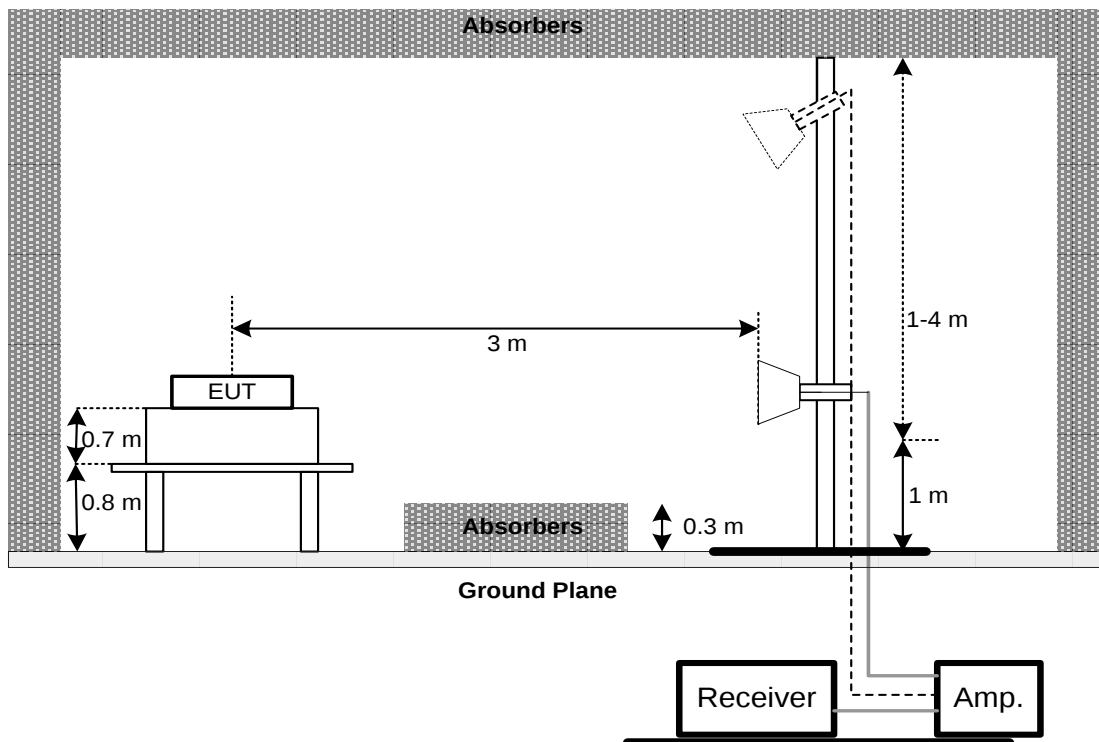
No deviation.

## 3.4 TEST SETUP

### 30 MHz to 1 GHz



### Above 1 GHz



**3.5 EUT OPERATING CONDITIONS**

The EUT was programmed to be in continuously transmitting mode.

**3.6 TEST RESULT – 30 MHZ TO 1 GHZ**

Please refer to the APPENDIX A.

**3.7 TEST RESULT – ABOVE 1 GHZ**

Please refer to the APPENDIX B.

**NOTE:**

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

## 4 BANDWIDTH TEST

### 4.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |           |                                         |                       |        |
|---------------------------------|-----------|-----------------------------------------|-----------------------|--------|
| Section                         | Test Item | Limit                                   | Frequency Range (MHz) | Result |
| 15.247(a)(2)                    | Bandwidth | $\geq 500\text{KHz}$<br>(6dB bandwidth) | 2400-2483.5           | PASS   |

### 4.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 2.5 ms.

### 4.3 DEVIATION FROM STANDARD

No deviation.

### 4.4 TEST SETUP



### 4.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 4.6 TEST RESULTS

Please refer to the APPENDIX C.

## 5 OUTPUT POWER TEST

### 5.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |                      |                 |                       |        |
|---------------------------------|----------------------|-----------------|-----------------------|--------|
| Section                         | Test Item            | Limit           | Frequency Range (MHz) | Result |
| 15.247(b)(3)                    | Maximum Output Power | 1 watt or 30dBm | 2400-2483.5           | PASS   |

### 5.2 TEST PROCEDURE

- The EUT was directly connected to the power meter and antenna output port as show in the block diagram below,
- The maximum peak conducted output power was performed in accordance with method 9.1.2 of FCC KDB 558074 D01 DTS Meas Guidance.

### 5.3 DEVIATION FROM STANDARD

No deviation.

### 5.4 TEST SETUP



### 5.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 5.6 TEST RESULTS

Please refer to the APPENDIX D.

## 6 POWER SPECTRAL DENSITY TEST

### 6.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |                        |                     |                       |        |
|---------------------------------|------------------------|---------------------|-----------------------|--------|
| Section                         | Test Item              | Limit               | Frequency Range (MHz) | Result |
| 15.247(e)                       | Power Spectral Density | 8 dBm (in any 3KHz) | 2400-2483.5           | PASS   |

### 6.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- Spectrum Setting: RBW=3KHz, VBW=10 KHz, Sweep time = auto.

### 6.3 DEVIATION FROM STANDARD

No deviation.

### 6.4 TEST SETUP



### 6.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 6.6 TEST RESULTS

Please refer to the APPENDIX E.

## 7 ANTENNA CONDUCTED SPURIOUS EMISSION

### 7.1 APPLIED PROCEDURES / LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits.

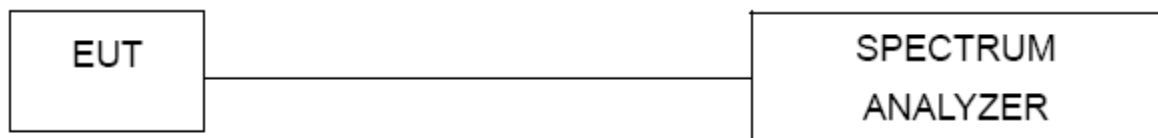
### 7.2 TEST PROCEDURE

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below,
- b. Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = 10 ms.

### 7.3 DEVIATION FROM STANDARD

No deviation.

### 7.4 TEST SETUP



### 7.5 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 3.5 unless otherwise a special operating condition is specified in the follows during the testing.

### 7.6 TEST RESULTS

Please refer to the APPENDIX F.

## 8 LIST OF MEASURING EQUIPMENTS

| Radiated Emissions |                          |              |                   |            |                 |                  |
|--------------------|--------------------------|--------------|-------------------|------------|-----------------|------------------|
| Item               | Kind of Equipment        | Manufacturer | Type No.          | Serial No. | Calibrated Date | Calibrated Until |
| 1                  | Preamplifier             | EMCI         | EMC001340         | 980555     | 2020/4/10       | 2021/4/9         |
| 2                  | Preamplifier             | EMCI         | EMC02325B         | 980217     | 2020/4/10       | 2021/4/9         |
| 3                  | Preamplifier             | EMCI         | EMC012645B        | 980267     | 2020/4/10       | 2021/4/9         |
| 4                  | Preamplifier             | EMCI         | EMC2654045        | 980030     | 2020/1/31       | 2021/1/30        |
| 5                  | Test Cable               | EMCI         | EMC104-SM-SM-800  | 150207     | 2020/4/10       | 2021/4/9         |
| 6                  | Test Cable               | EMCI         | EMC104-SM-SM-3000 | 151205     | 2020/4/10       | 2021/4/9         |
| 7                  | Test Cable               | EMCI         | EMC-SM-SM-7000    | 180408     | 2020/4/10       | 2021/4/9         |
| 8                  | MXE EMI Receiver         | Agilent      | N9038A            | MY55420127 | 2020/3/24       | 2021/3/23        |
| 9                  | Signal Analyzer          | Agilent      | N9010A            | MY56480554 | 2019/6/6        | 2020/6/5         |
| 10                 | Loop Ant                 | EMCO         | EMCI-LPA600       | 274        | 2019/5/31       | 2020/5/30        |
| 11                 | Horn Ant                 | SCHWARZBECK  | BBHA 9120D        | 9120D-1342 | 2019/6/10       | 2020/6/9         |
| 12                 | Horn Ant                 | Schwarzbeck  | BBHA 9170         | 187        | 2019/12/21      | 2020/12/20       |
| 13                 | Trilog-Broadband Antenna | Schwarzbeck  | VULB 9168         | 000992     | 2019/5/29       | 2020/5/28        |
| 14                 | 5dB Attenuator           | EMCI         | EMCI-N-6-05       | AT-N0508   | 2019/5/29       | 2020/5/28        |

| Bandwidth |                   |              |          |            |                 |                  |
|-----------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item      | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1         | Spectrum Analyzer | R&S          | FSP40    | 100129     | 2020/5/22       | 2021/5/21        |

| Output Power |                   |              |          |            |                 |                  |
|--------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item         | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1            | Spectrum Analyzer | R&S          | FSP40    | 100129     | 2020/5/22       | 2021/5/21        |
| 2            | Power Meter       | Anritsu      | ML2487A  | 6K00004714 | 2019/6/20       | 2020/6/19        |
| 3            | Power Sensor      | Anritsu      | MA2491A  | 1725282    | 2019/6/20       | 2020/6/19        |

| Power Spectral Density |                   |              |          |            |                 |                  |
|------------------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item                   | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1                      | Spectrum Analyzer | R&S          | FSP40    | 100129     | 2020/5/22       | 2021/5/21        |

| Antenna conducted Spurious Emission |                   |              |          |            |                 |                  |
|-------------------------------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item                                | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1                                   | Spectrum Analyzer | R&S          | FSP40    | 100129     | 2020/5/22       | 2021/5/21        |

Remark: "N/A" denotes no model name, no serial no. or no calibration specified.  
All calibration period of equipment list is one year.

**9 EUT TEST PHOTO**

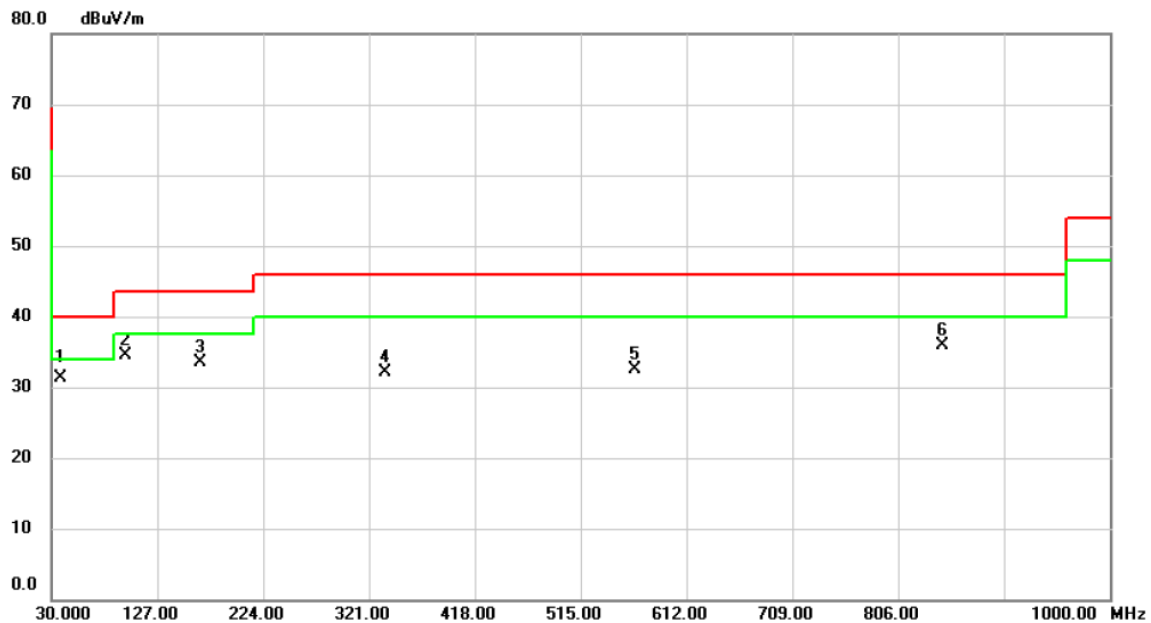
Please refer to document Appendix No.: TP-2004T194-FCCP-1 (APPENDIX-TEST PHOTOS).

**10 EUT PHOTOS**

Please refer to document Appendix No.: EP-2004T194-1 (APPENDIX-EUT PHOTOS).

## **APPENDIX A    RADIATED EMISSIONS - 30 MHZ TO 1 GHZ**

|                |                |              |          |
|----------------|----------------|--------------|----------|
| Test Mode      | BLE            | Test Date    | 2020/6/1 |
| Test Frequency | CH39: 2480 MHz | Polarization | Vertical |

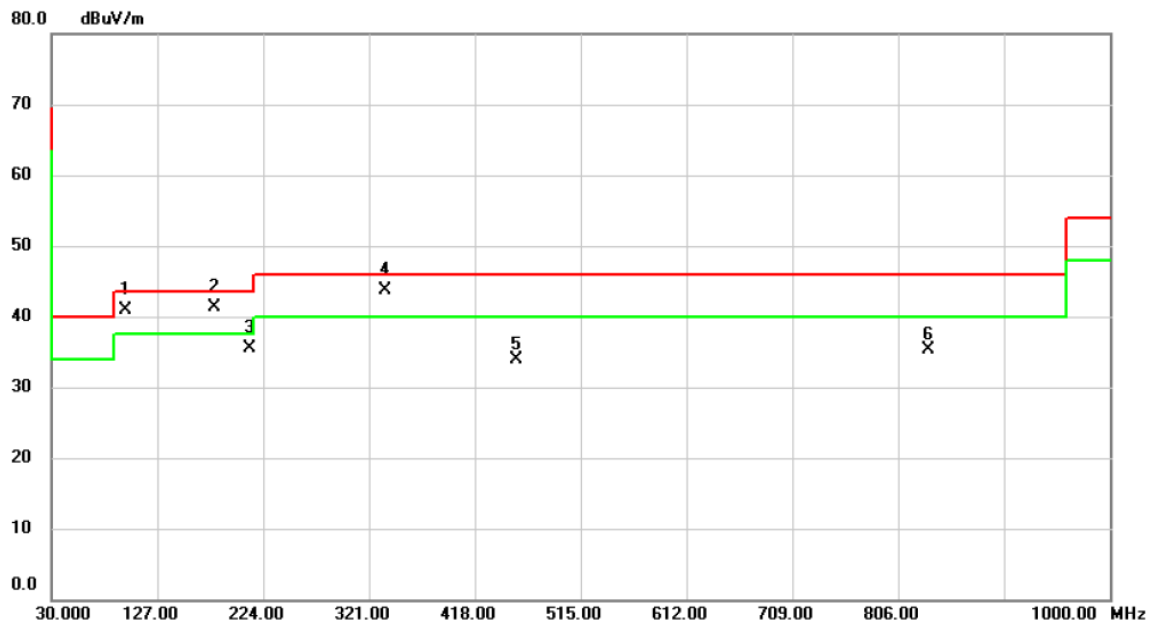


| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|---------|
| 1   | *   | 38.7300      | 40.19                    | -8.82                   | 31.37                      | 40.00           | -8.63      | QP       |         |
| 2   |     | 97.9000      | 47.90                    | -13.46                  | 34.44                      | 43.50           | -9.06      | peak     |         |
| 3   |     | 166.7700     | 41.87                    | -8.31                   | 33.56                      | 43.50           | -9.94      | peak     |         |
| 4   |     | 335.5500     | 38.58                    | -6.38                   | 32.20                      | 46.00           | -13.80     | peak     |         |
| 5   |     | 564.4700     | 33.42                    | -0.89                   | 32.53                      | 46.00           | -13.47     | peak     |         |
| 6   |     | 846.7400     | 32.24                    | 3.66                    | 35.90                      | 46.00           | -10.10     | peak     |         |

## REMARKS:

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

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/6/1   |
| Test Frequency | CH39: 2480 MHz | Polarization | Horizontal |



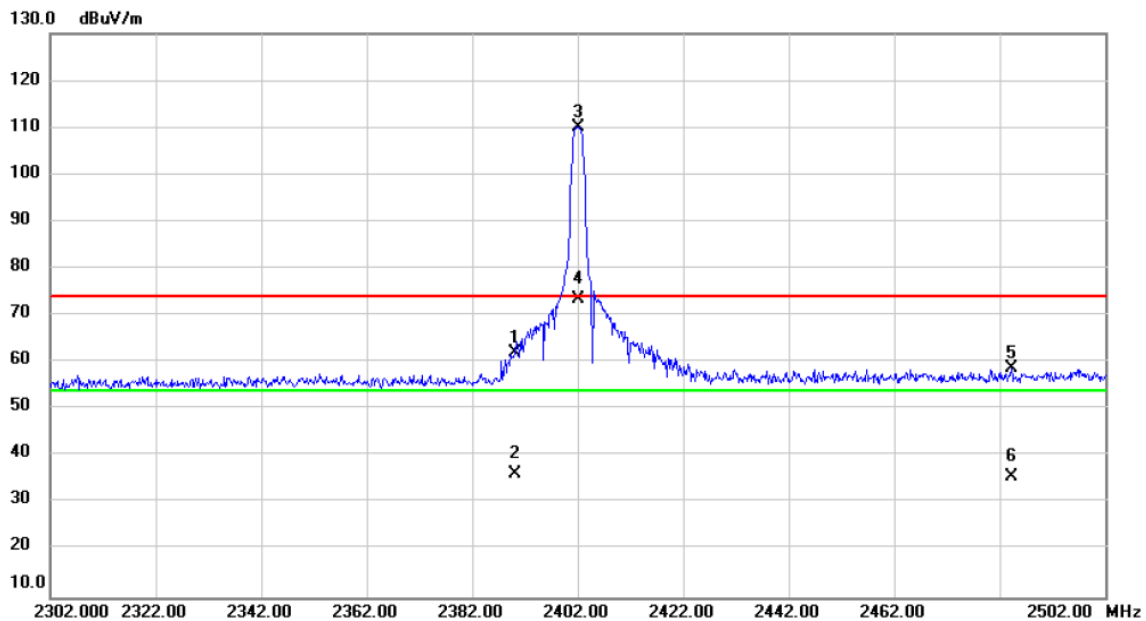
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|---------|
| 1   | !   | 97.9000      | 54.29                    | -13.46                  | 40.83                      | 43.50           | -2.67      | QP       |         |
| 2   | *   | 179.3800     | 50.72                    | -9.34                   | 41.38                      | 43.50           | -2.12      | QP       |         |
| 3   |     | 211.3900     | 46.13                    | -10.54                  | 35.59                      | 43.50           | -7.91      | QP       |         |
| 4   | !   | 335.5500     | 50.01                    | -6.38                   | 43.63                      | 46.00           | -2.37      | QP       |         |
| 5   |     | 455.8300     | 37.10                    | -3.25                   | 33.85                      | 46.00           | -12.15     | peak     |         |
| 6   |     | 833.1600     | 31.89                    | 3.45                    | 35.34                      | 46.00           | -10.66     | peak     |         |

## REMARKS:

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

**APPENDIX B    RADIATED EMISSIONS - ABOVE 1 GHZ**

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/5/19  |
| Test Frequency | CH00: 2402 MHz | Polarization | Horizontal |



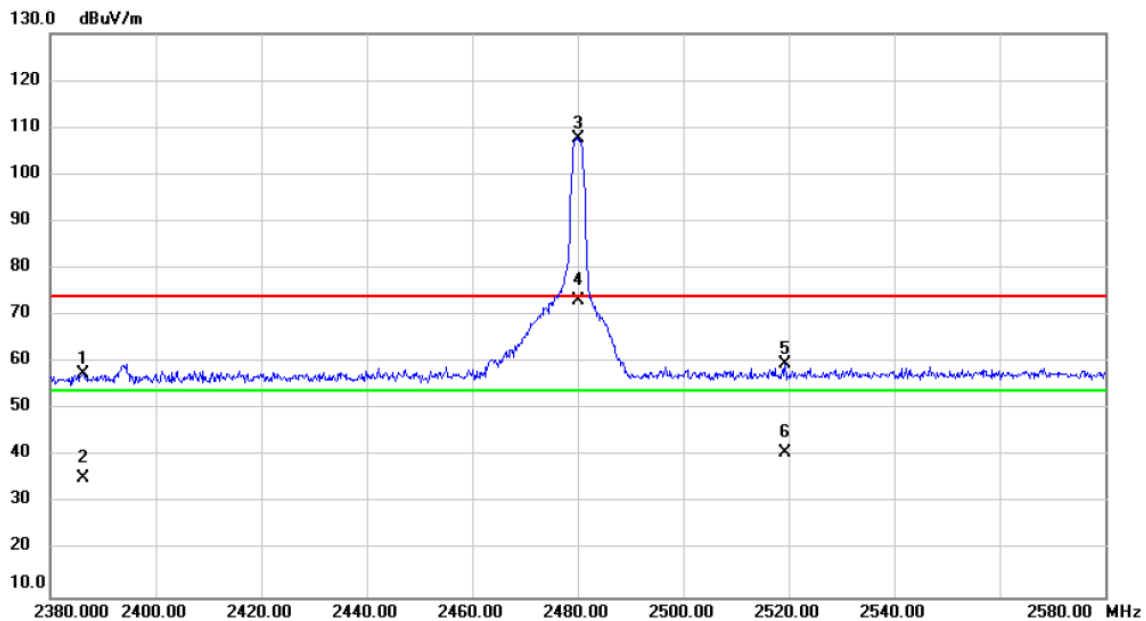
| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|----------|
| 1   |     | 2390.000     | 30.53                    | 31.38                   | 61.91                      | 74.00           | -12.09     | peak     |          |
| 2   |     | 2390.000     | 4.91                     | 31.38                   | 36.29                      | 54.00           | -17.71     | AVG      |          |
| 3   | *   | 2402.000     | 78.72                    | 31.43                   | 110.15                     | 74.00           | 36.15      | peak     | No Limit |
| 4   | X   | 2402.000     | 41.91                    | 31.43                   | 73.34                      | 54.00           | 19.34      | AVG      | No Limit |
| 5   |     | 2484.200     | 26.93                    | 31.76                   | 58.69                      | 74.00           | -15.31     | peak     |          |
| 6   |     | 2484.200     | 3.94                     | 31.76                   | 35.70                      | 54.00           | -18.30     | AVG      |          |

## REMARKS:

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

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

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/5/19  |
| Test Frequency | CH39: 2480 MHz | Polarization | Horizontal |

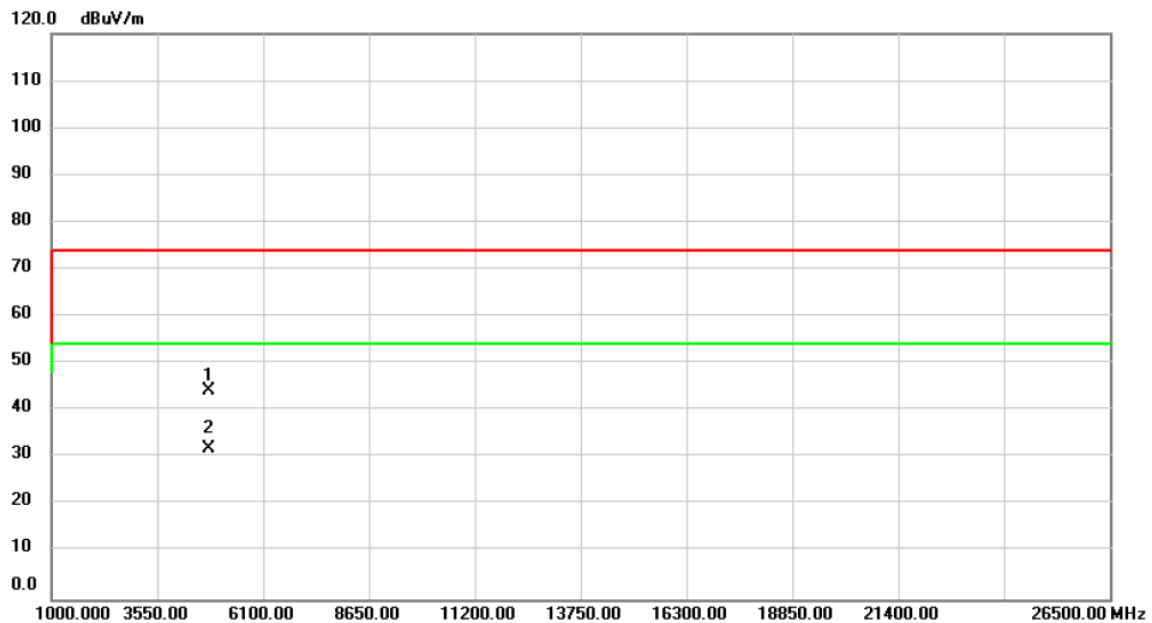


| No. | Mk. | Freq.<br>MHz | Reading<br>Level<br>dBuV | Correct<br>Factor<br>dB | Measure-<br>ment<br>dBuV/m | Limit<br>dBuV/m | Over<br>dB | Detector | Comment  |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|------------|----------|----------|
| 1   |     | 2386.200     | 26.04                    | 31.37                   | 57.41                      | 74.00           | -16.59     | peak     |          |
| 2   |     | 2386.200     | 3.87                     | 31.37                   | 35.24                      | 54.00           | -18.76     | AVG      |          |
| 3   | *   | 2480.000     | 75.99                    | 31.74                   | 107.73                     | 74.00           | 33.73      | peak     | No Limit |
| 4   | X   | 2480.000     | 41.42                    | 31.74                   | 73.16                      | 54.00           | 19.16      | AVG      | No Limit |
| 5   |     | 2519.400     | 27.88                    | 31.88                   | 59.76                      | 74.00           | -14.24     | peak     |          |
| 6   |     | 2519.400     | 8.88                     | 31.88                   | 40.76                      | 54.00           | -13.24     | AVG      |          |

## REMARKS:

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

|                |                |              |           |
|----------------|----------------|--------------|-----------|
| Test Mode      | BLE            | Test Date    | 2020/5/19 |
| Test Frequency | CH00: 2402 MHz | Polarization | Vertical  |

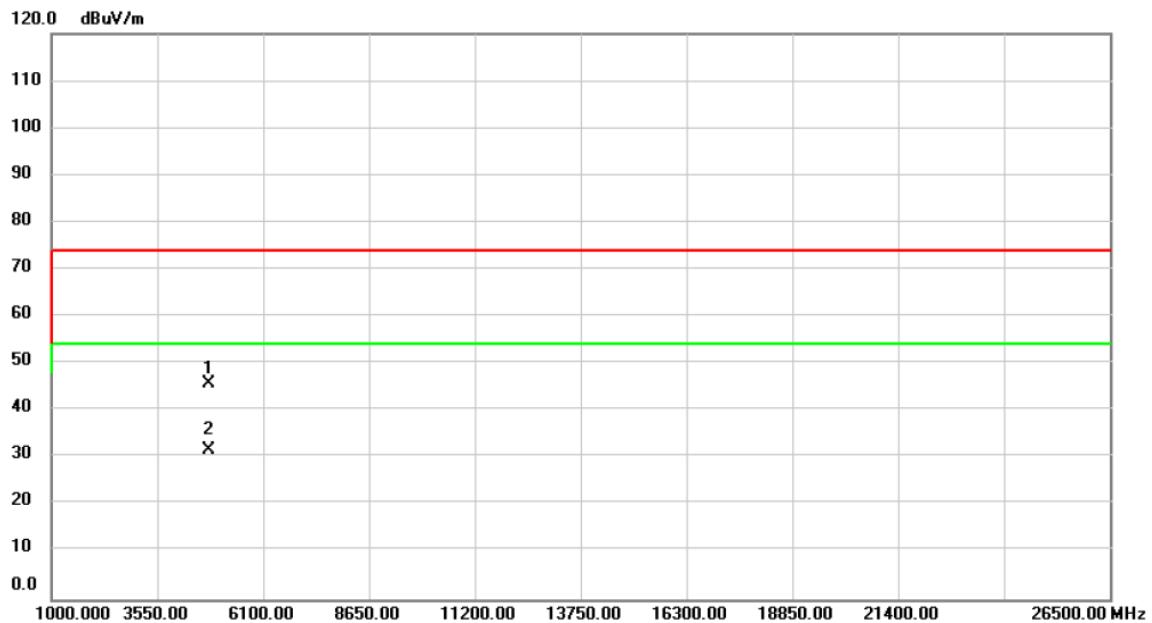


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4804.000 | 53.95         | -9.84          | 44.11       | 74.00  | -29.89 | peak     |         |
| 2   | *   | 4804.000 | 41.72         | -9.84          | 31.88       | 54.00  | -22.12 | AVG      |         |

## REMARKS:

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

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/5/19  |
| Test Frequency | CH00: 2402 MHz | Polarization | Horizontal |

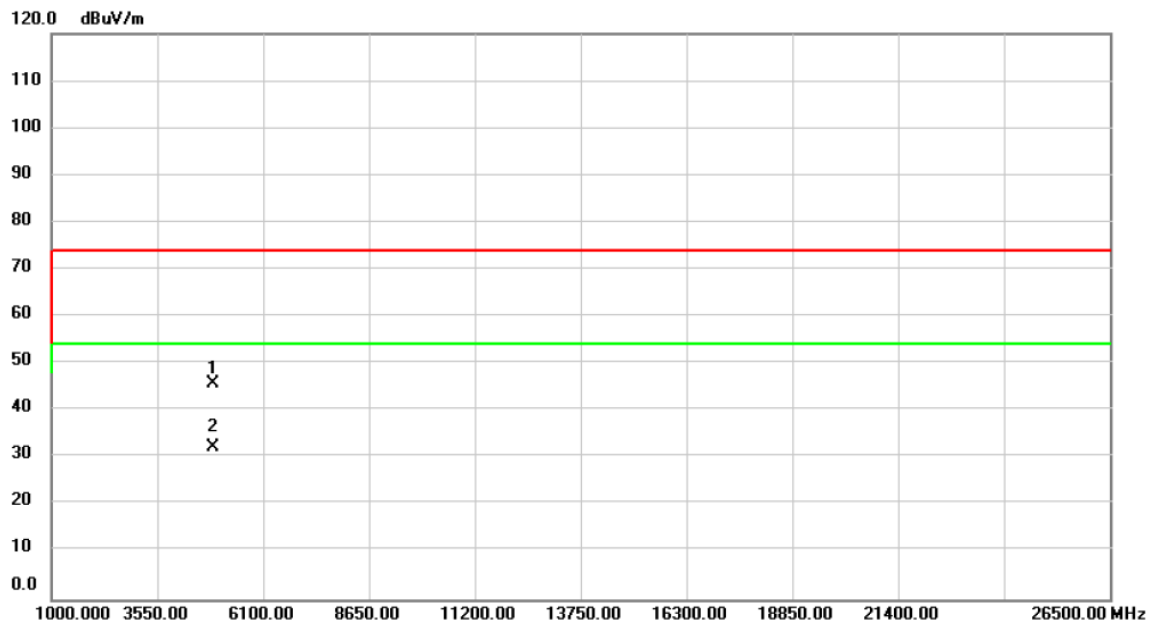


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4804.000 | 55.53         | -9.84          | 45.69       | 74.00  | -28.31 | peak     |         |
| 2   | *   | 4804.000 | 41.48         | -9.84          | 31.64       | 54.00  | -22.36 | AVG      |         |

## REMARKS:

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

|                |                |              |           |
|----------------|----------------|--------------|-----------|
| Test Mode      | BLE            | Test Date    | 2020/5/19 |
| Test Frequency | CH19: 2440 MHz | Polarization | Vertical  |

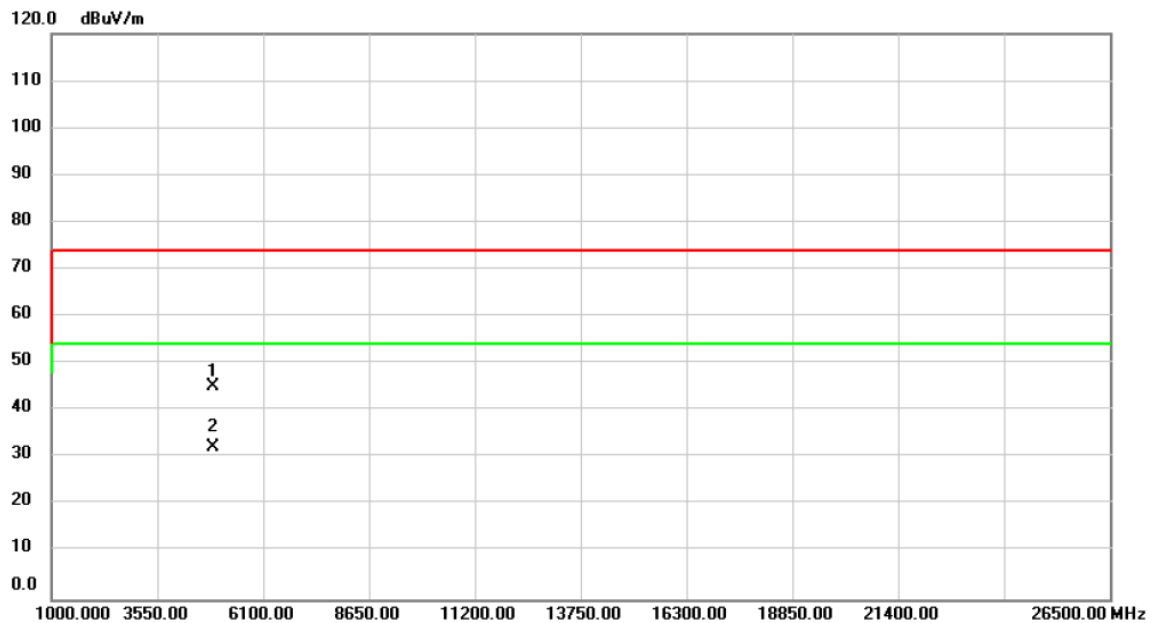


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4880.000 | 55.40         | -9.67          | 45.73       | 74.00  | -28.27 | peak     |         |
| 2   | *   | 4880.000 | 42.02         | -9.67          | 32.35       | 54.00  | -21.65 | AVG      |         |

## REMARKS:

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

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/5/19  |
| Test Frequency | CH19: 2440 MHz | Polarization | Horizontal |

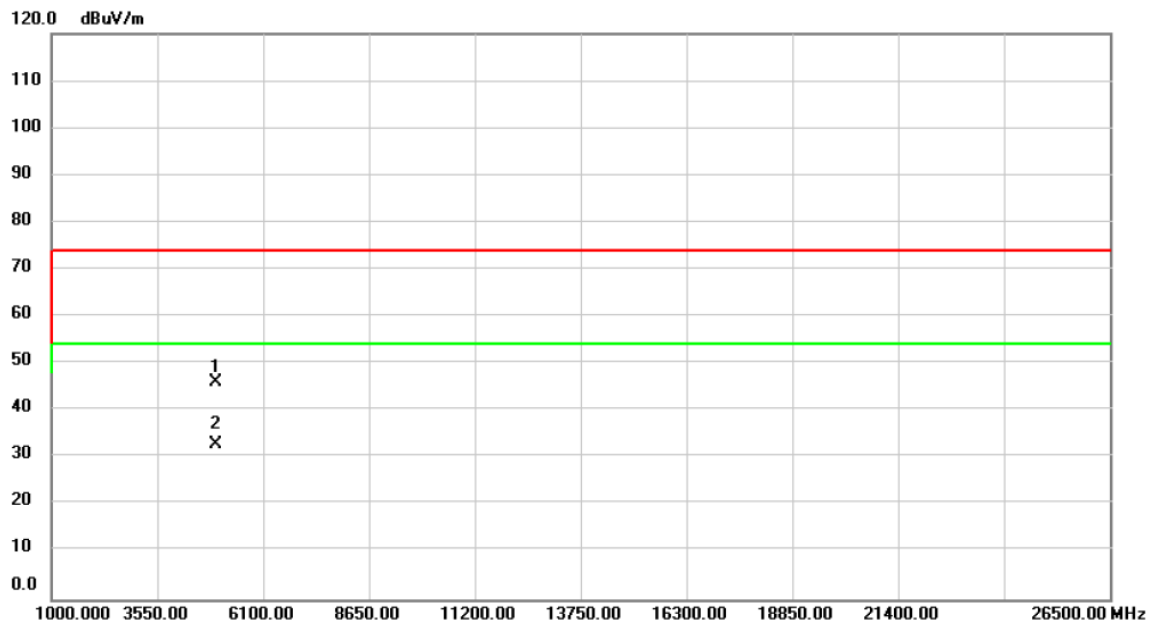


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4880.000 | 54.81         | -9.67          | 45.14       | 74.00  | -28.86 | peak     |         |
| 2   | *   | 4880.000 | 41.86         | -9.67          | 32.19       | 54.00  | -21.81 | AVG      |         |

## REMARKS:

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

|                |                |              |           |
|----------------|----------------|--------------|-----------|
| Test Mode      | BLE            | Test Date    | 2020/5/19 |
| Test Frequency | CH39: 2480 MHz | Polarization | Vertical  |

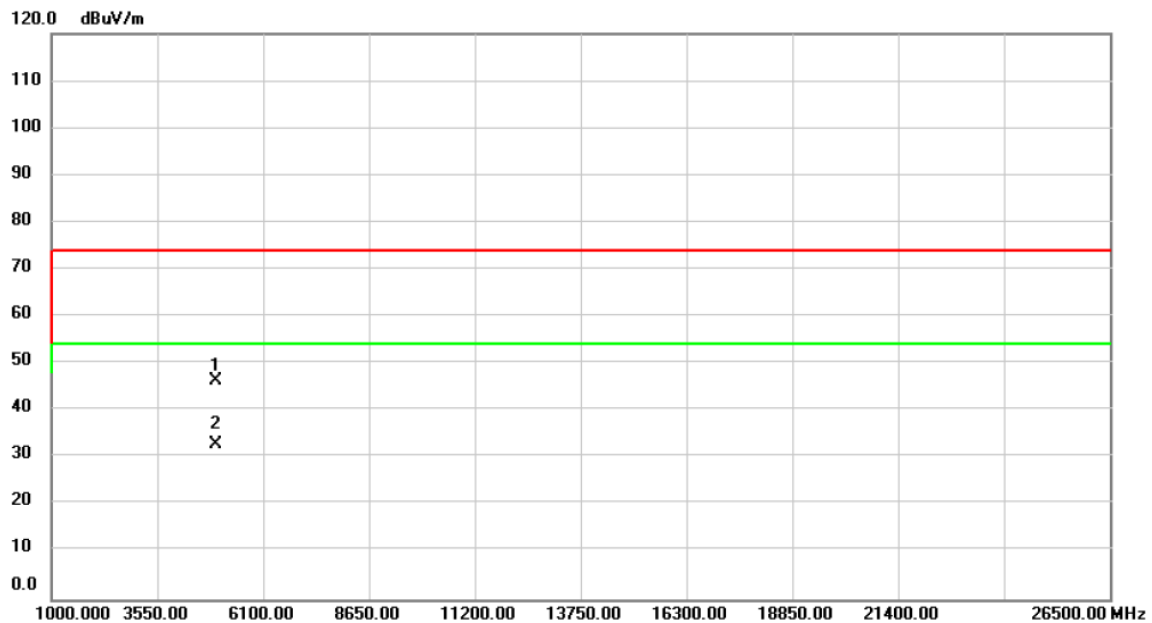


| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4960.000 | 55.45         | -9.48          | 45.97       | 74.00  | -28.03 | peak     |         |
| 2   | *   | 4960.000 | 42.42         | -9.48          | 32.94       | 54.00  | -21.06 | AVG      |         |

## REMARKS:

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

|                |                |              |            |
|----------------|----------------|--------------|------------|
| Test Mode      | BLE            | Test Date    | 2020/5/19  |
| Test Frequency | CH39: 2480 MHz | Polarization | Horizontal |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |         |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
|     |     | MHz      | dBuV          | dB             | dBuV/m      | dBuV/m | dB     | Detector | Comment |
| 1   |     | 4960.000 | 55.75         | -9.48          | 46.27       | 74.00  | -27.73 | peak     |         |
| 2   | *   | 4960.000 | 42.25         | -9.48          | 32.77       | 54.00  | -21.23 | AVG      |         |

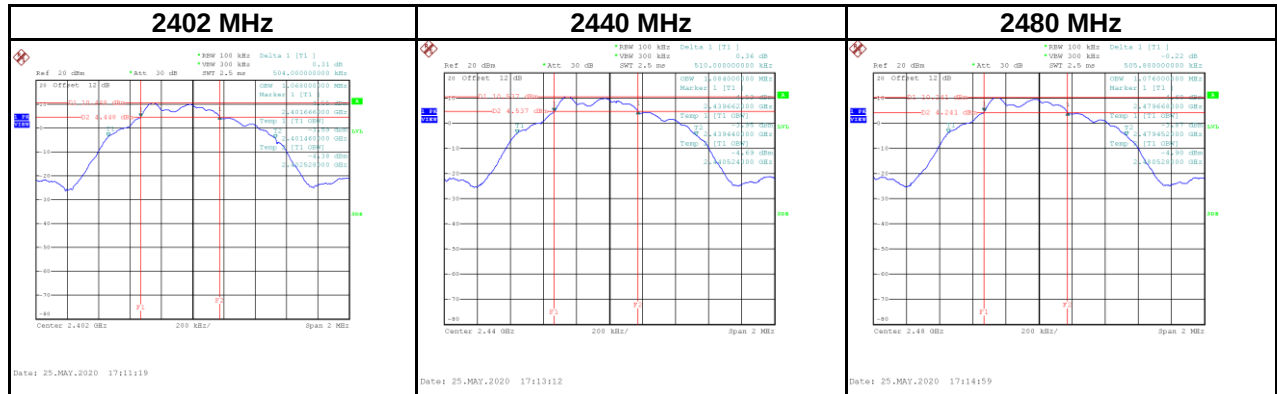
## REMARKS:

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

## **APPENDIX C    BANDWIDTH**

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

| Frequency (MHz) | 6dB Bandwidth (MHz) | 99% Occupied BW (MHz) | Min. Limit (kHz) | Test Result |
|-----------------|---------------------|-----------------------|------------------|-------------|
| 2402            | 0.50                | 1.07                  | 500              | Pass        |
| 2440            | 0.51                | 1.08                  | 500              | Pass        |
| 2480            | 0.51                | 1.08                  | 500              | Pass        |



## **APPENDIX D    OUTPUT POWER**

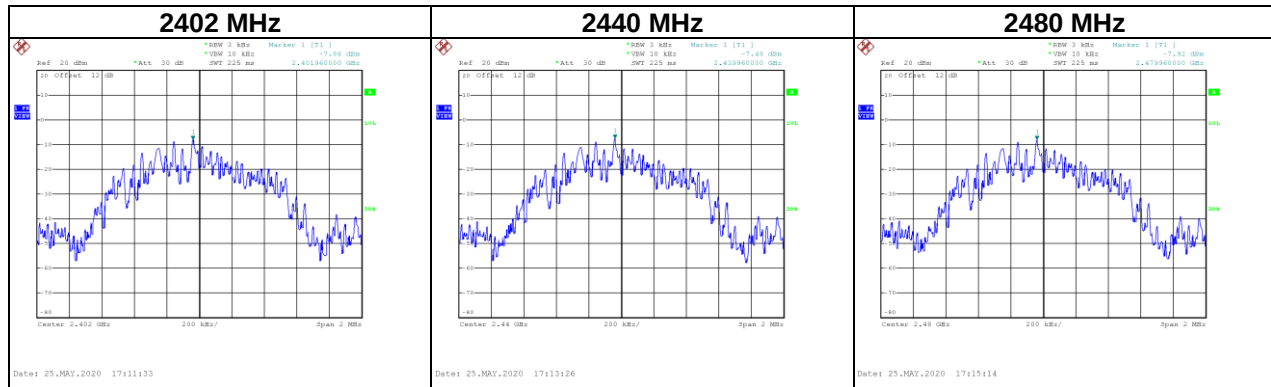
|             |                |             |           |
|-------------|----------------|-------------|-----------|
| Test Mode : | TX Mode _1Mbps | Tested Date | 2020/5/26 |
|-------------|----------------|-------------|-----------|

| Frequency (MHz) | Conducted Power (dBm) | Conducted Power (W) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|-----------------|-----------------------|---------------------|------------------|----------------|-------------|
| 2402            | 11.04                 | 0.0127              | 30.00            | 1.0000         | Pass        |
| 2440            | 10.80                 | 0.0120              | 30.00            | 1.0000         | Pass        |
| 2480            | 10.91                 | 0.0123              | 30.00            | 1.0000         | Pass        |

**APPENDIX E POWER SPECTRAL DENSITY TEST**

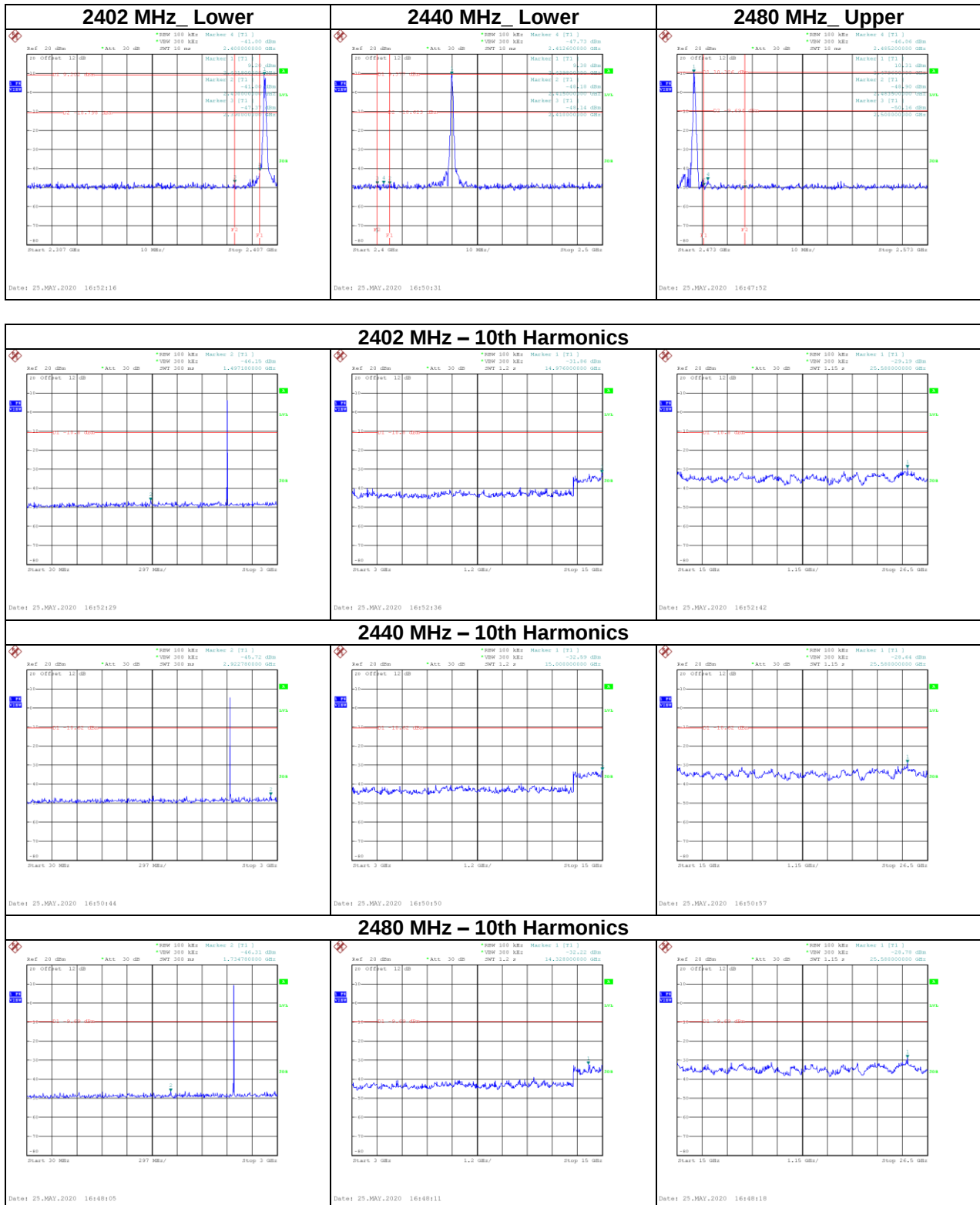
|            |                |
|------------|----------------|
| Test Mode: | TX Mode _1Mbps |
|------------|----------------|

| Frequency (MHz) | Power Density (dBm/3kHz) | Max. Limit (dBm/3kHz) | Test Result |
|-----------------|--------------------------|-----------------------|-------------|
| 2402            | -7.86                    | 8                     | Pass        |
| 2440            | -7.48                    | 8                     | Pass        |
| 2480            | -7.92                    | 8                     | Pass        |



## **APPENDIX F    ANTENNA CONDUCTED SPURIOUS EMISSION**

Test Mode : TX Mode \_1Mbps



End of Test Report