

FCC Radio Test Report

FCC ID: 2AVVT-CU413UCMPS1

Report No. : BTL-FCCP-7-2103T126
Equipment : iTraMS CCU
Model Name : CU-41-3U-CM-PS1
Brand Name : Bosch
Applicant : Robert Bosch Engineering and Business Solutions Private Limited
Address : RBEI/PAC, Ban 601, Post Box No 3000 Hosur Road, Adugodi, Bengaluru, Karnataka-560030, India.

Radio Function : Bluetooth Low Energy (4.0)

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


Date of Receipt : 2021/4/6
Date of Test : 2021/4/6 ~ 2021/7/26
Issued Date : 2021/9/27

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

Prepared by


Jerry Chuang, Supervisor

Approved by


Peter Chen, Vice 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

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).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

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.

CONTENTS

| | |
|--|----|
| REVISION HISTORY | 5 |
| 1 SUMMARY OF TEST RESULTS | 6 |
| 1.1 TEST FACILITY | 7 |
| 1.2 MEASUREMENT UNCERTAINTY | 7 |
| 1.3 TEST ENVIRONMENT CONDITIONS | 7 |
| 1.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING | 7 |
| 1.5 DUTY CYCLE | 8 |
| 2 GENERAL INFORMATION | 9 |
| 2.1 DESCRIPTION OF EUT | 9 |
| 2.2 TEST MODES | 11 |
| 2.3 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED | 12 |
| 2.4 SUPPORT UNITS | 12 |
| 3 RADIATED EMISSIONS TEST | 13 |
| 3.1 LIMIT | 13 |
| 3.2 TEST PROCEDURE | 14 |
| 3.3 DEVIATION FROM TEST STANDARD | 14 |
| 3.4 TEST SETUP | 15 |
| 3.5 EUT OPERATING CONDITIONS | 16 |
| 3.6 TEST RESULT – BELOW 30 MHZ | 16 |
| 3.7 TEST RESULT – 30 MHZ TO 1 GHZ | 16 |
| 3.8 TEST RESULT – ABOVE 1 GHZ | 16 |
| 4 BANDWIDTH TEST | 17 |
| 4.1 APPLIED PROCEDURES / LIMIT | 17 |
| 4.2 TEST PROCEDURE | 17 |
| 4.3 DEVIATION FROM STANDARD | 17 |
| 4.4 TEST SETUP | 17 |
| 4.5 EUT OPERATION CONDITIONS | 17 |
| 4.6 TEST RESULTS | 17 |
| 5 OUTPUT POWER TEST | 18 |
| 5.1 APPLIED PROCEDURES / LIMIT | 18 |
| 5.2 TEST PROCEDURE | 18 |
| 5.3 DEVIATION FROM STANDARD | 18 |
| 5.4 TEST SETUP | 18 |
| 5.5 EUT OPERATION CONDITIONS | 18 |
| 5.6 TEST RESULTS | 18 |
| 6 POWER SPECTRAL DENSITY TEST | 19 |
| 6.1 APPLIED PROCEDURES / LIMIT | 19 |
| 6.2 TEST PROCEDURE | 19 |
| 6.3 DEVIATION FROM STANDARD | 19 |
| 6.4 TEST SETUP | 19 |
| 6.5 EUT OPERATION CONDITIONS | 19 |
| 6.6 TEST RESULTS | 19 |
| 7 ANTENNA CONDUCTED SPURIOUS EMISSION | 20 |
| 7.1 APPLIED PROCEDURES / LIMIT | 20 |
| 7.2 TEST PROCEDURE | 20 |
| 7.3 DEVIATION FROM STANDARD | 20 |
| 7.4 TEST SETUP | 20 |

| | | |
|------------|--------------------------------------|----|
| 7.5 | EUT OPERATION CONDITIONS | 20 |
| 7.6 | TEST RESULTS | 20 |
| 8 | LIST OF MEASURING EQUIPMENTS | 21 |
| 9 | EUT TEST PHOTO | 22 |
| 10 | EUT PHOTOS | 22 |
| APPENDIX A | RADIATED EMISSIONS - 30 MHZ TO 1 GHZ | 23 |
| APPENDIX B | RADIATED EMISSIONS - ABOVE 1 GHZ | 26 |
| APPENDIX C | BANDWIDTH | 35 |
| APPENDIX D | OUTPUT POWER | 37 |
| APPENDIX E | POWER SPECTRAL DENSITY TEST | 39 |
| APPENDIX F | ANTENNA CONDUCTED SPURIOUS EMISSION | 41 |

REVISION HISTORY

| Report No. | Version | Description | Issued Date |
|---------------------|---------|------------------|-------------|
| BTL-FCCP-7-2103T126 | R00 | Original Report. | 2021/9/17 |
| BTL-FCCP-7-2103T126 | R01 | Revised Typo. | 2021/9/27 |

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(3) |
| 15.205 15.209 15.247(d) | Radiated Emissions | APPENDIX A 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.
- (3) This is a DC input device.

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
☒ SR05

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 $U_{\text{cisp}}^{\text{r}}$ requirement.

A. Radiated emissions test :

| Test Site | Measurement Frequency Range | U,(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,(dB) |
|------------------------------|--------|
| Occupied Bandwidth | 0.5334 |
| Output power | 0.3669 |
| Power Spectral Density | 0.6591 |
| Conducted Spurious emissions | 0.5416 |
| Conducted Band edges | 0.5348 |

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 | 23 °C, 54 % | AC 120V | Jay Kao |
| Radiated emissions above 1 GHz | 23 °C, 54 % | AC 120V | Jay Kao |
| Bandwidth | 25.9 °C, 34 % | AC 120V | Vincent Lee |
| Output Power | 25.9 °C, 34 % | AC 120V | Vincent Lee |
| Power Spectral Density | 25.9 °C, 34 % | AC 120V | Vincent Lee |
| Antenna conducted Spurious Emission | 25.9 °C, 34 % | AC 120V | Vincent Lee |

1.4 TABLE OF PARAMETERS OF TEXT SOFTWARE SETTING

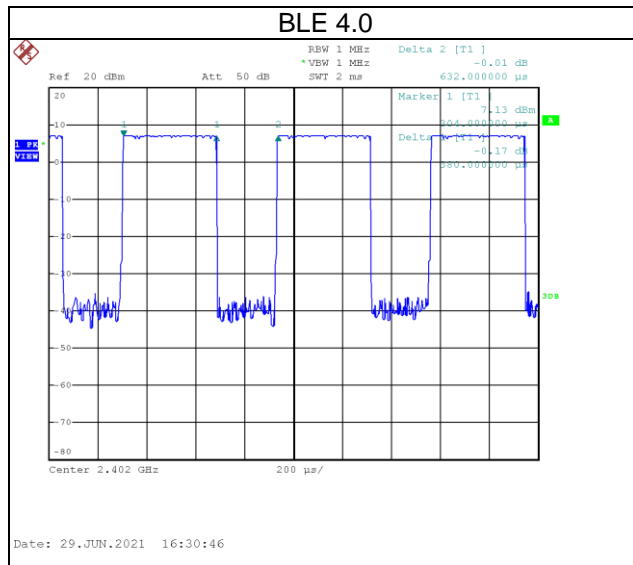
| Test Software | Tera Term V4.80 | | | |
|-----------------|-----------------|----------|----------|-----------|
| Modulation Mode | 2402 MHz | 2440 MHz | 2480 MHz | Data Rate |
| BLE 4.0 | 8 | 8 | 8 | 1 Mbps |

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 | 0.380 | 1 | 0.380 | 0.632 | 60.13% | 2.21 |



2 GENERAL INFORMATION

2.1 DESCRIPTION OF EUT

| | |
|-----------------------------|-------------------------------------|
| Equipment | iTraMS CCU |
| Model Name | CU-41-3U-CM-PS1 |
| Brand Name | Bosch |
| Model Difference | N/A |
| Power Source | DC Voltage supplied from DC Source. |
| Power Rating | DC 9-32V (12V or 24V) |
| Products Covered | N/A |
| Hardware Version/Test Model | AD00 A10 062 |
| Software Version | 1277401063 |
| Operation Band | 2400 MHz ~ 2483.5 MHz |
| Operation Frequency | 2402 MHz ~ 2480 MHz |
| Modulation Technology | GFSK |
| Transfer Rate | 1 Mbps |
| Output Power Max. | 2.03 dBm (0.0016 W) |
| Test Model | CU-41-3U-CM-PS1 |
| 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:
Group I:

| Antenna | Manufacture | Part No. | Type | Connector | Frequency (MHz) | Gain (dBi) |
|------------------|---|-----------------|--------|-----------|-----------------|------------|
| External antenna |  | MA250.A.LBI.001 | Dipole | SMA(M)ST | 2400-2500 | 2.72 |

Group II:

| Antenna | Manufacture | Part No. | Type | Connector | Frequency (MHz) | Gain (dBi) |
|----------------|---|------------|--------|-----------|-----------------|------------|
| Stubby antenna |  | TG.08.0723 | Dipole | SMA(M)ST | 2400-2500 | 3.29 |

Group III:

| Antenna | Manufacture | Part No. | Type | Connector | Frequency (MHz) | Gain (dBi) |
|----------------------|---|---------------|--------|-----------|-----------------|------------|
| Wi-Fi 2.4GHz antenna |  | MA240.LBI.001 | Dipole | SMA(M) | 2400-2500 | 2.70 |

NOTE: The EUT includes three groups of antenna, the Stubby antenna is the worst and recorded.

2.2 TEST MODES

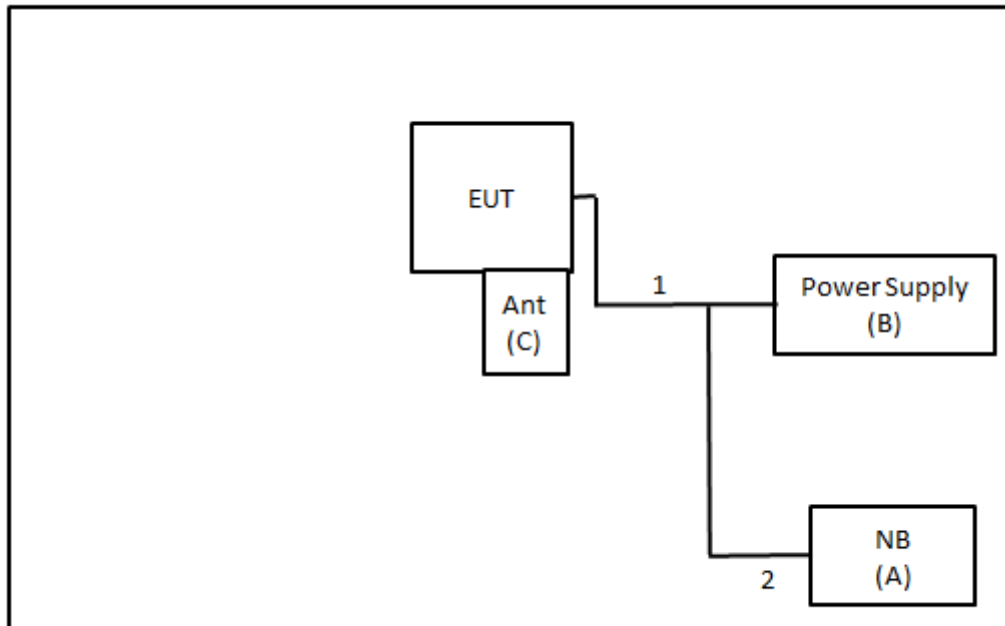
| Test Items | Test mode | Channel | Note |
|--|-----------|----------|----------|
| Transmitter Radiated Emissions (below 1GHz) | 1 Mbps | 39 | - |
| Transmitter Radiated Emissions (above 1GHz) | 1 Mbps | 00/39 | Bandedge |
| | 1 Mbps | 00/19/39 | Harmonic |
| Bandwidth | 1 Mbps | 00/19/39 | - |
| Output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

NOTE:

- (1) For radiated emission band edge test, both Vertical and Horizontal are evaluated, but only the worst case (Vertical) is recorded.
- (2) All X, Y and Z axes are evaluated, but only the worst case (X axis) is recorded.

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 | NB | HP | TPN-I119 | N/A | Furnished by test lab. |
| B | Power Supply | Twintex | TDS-60-15 | N/A | Furnished by test lab. |
| C | Stubby antenna | Taoglas | TG.08.0723 | N/A | Supplied by test requester |

| Item | Shielded | Ferrite Core | Length | Cable Type | Remarks |
|------|----------|--------------|--------|---------------|----------------------------|
| 1 | N/A | N/A | 2m | Power Cord | Supplied by test requester |
| 2 | N/A | N/A | 2.1m | RS 232 to USB | 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 (Emission in restricted band) | 1MHz / 3MHz for Peak, 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

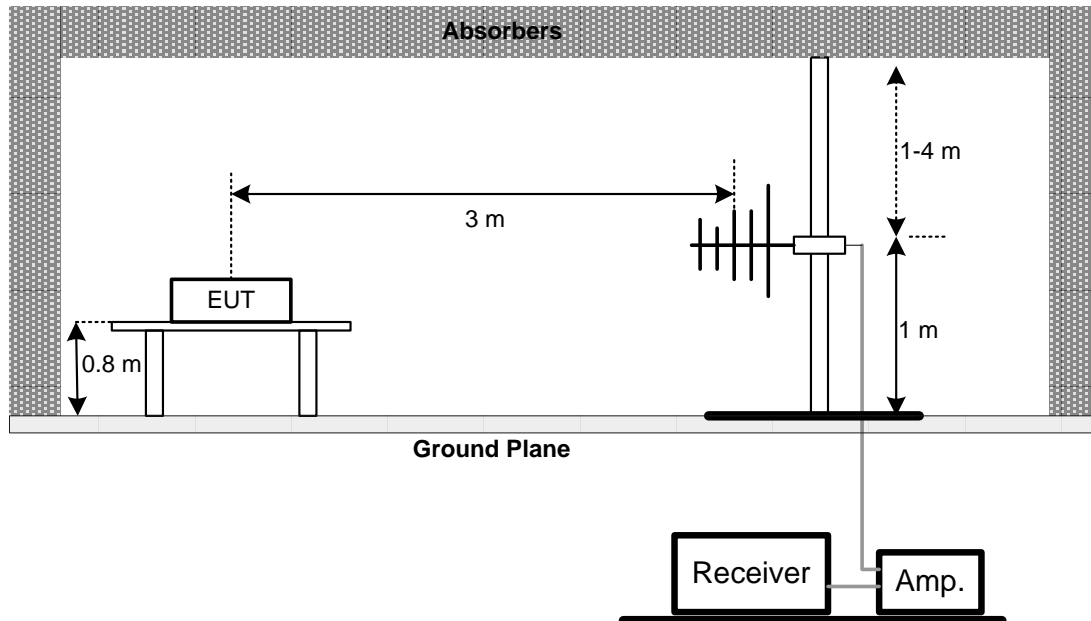
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance 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

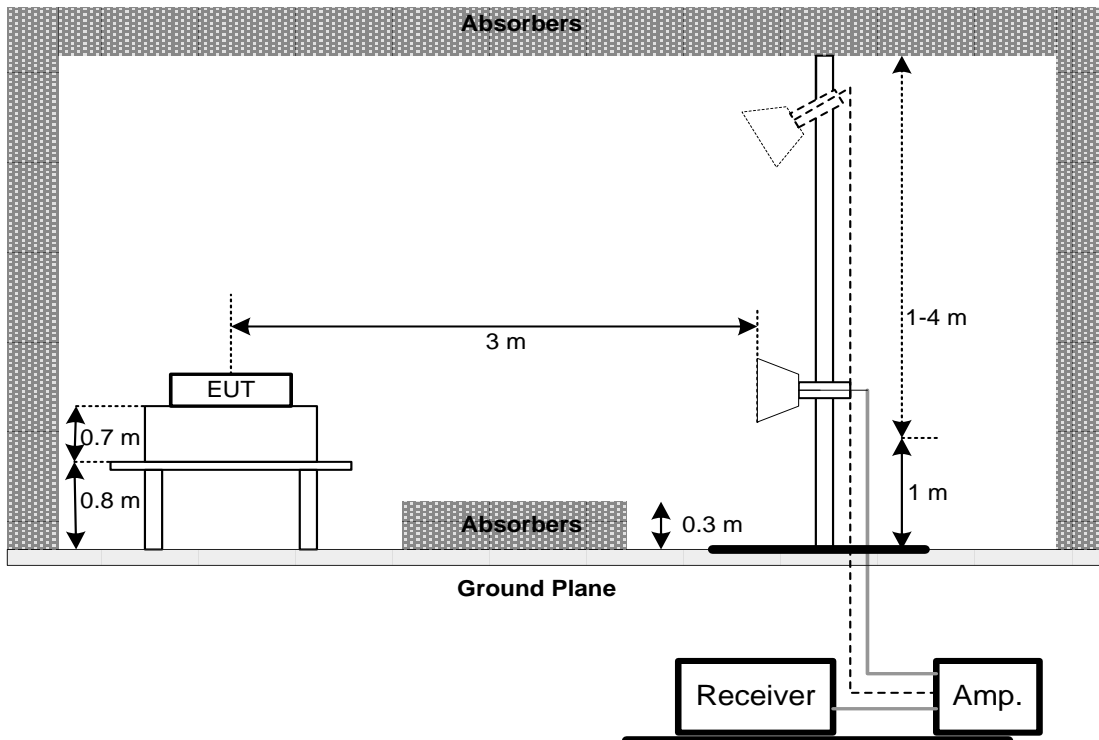
No deviation.

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 – BELOW 30 MHZ

There were no emissions found below 30 MHz within 20 dB of the limit.

3.7 TEST RESULT – 30 MHZ TO 1 GHZ

Please refer to the APPENDIX A.

3.8 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 | $\geq 500\text{KHz}$ (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 FCC KDB 558074 D01 15.247 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.

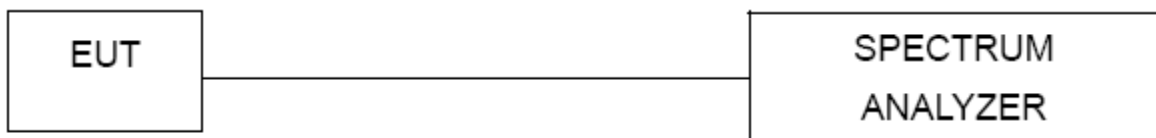
7.2 TEST PROCEDURE

- 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 = 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 | EMC02325B | 980217 | 2021/4/8 | 2022/4/7 |
| 2 | Preamplifier | EMCI | EMC012645B | 980267 | 2021/4/8 | 2022/4/7 |
| 3 | Preamplifier | EMCI | EMC001340 | 980555 | 2021/4/8 | 2022/4/7 |
| 4 | Test Cable | EMCI | EMC-SM-SM-100 0 | 180809 | 2021/4/8 | 2022/4/7 |
| 5 | Test Cable | EMCI | EMC104-SM-SM- 3000 | 151205 | 2021/4/8 | 2022/4/7 |
| 6 | Test Cable | EMCI | EMC-SM-SM-700 0 | 180408 | 2021/4/8 | 2022/4/7 |
| 7 | MXE EMI Receiver | Agilent | N9038A | MY554200087 | 2021/5/27 | 2022/5/26 |
| 8 | Signal Analyzer | Agilent | N9010A | MY56480554 | 2020/8/25 | 2021/8/24 |
| 9 | Loop Ant | Electro-Metrics | EMCI-LPA600 | 274 | 2021/6/1 | 2022/5/31 |
| 10 | Horn Ant | SCHWARZBECK | BBHA 9120D | 9120D-1342 | 2021/6/2 | 2022/6/1 |
| 11 | Horn Ant | Schwarzbeck | BBHA 9170 | BBHA 9170340 | 2021/7/9 | 2022/7/8 |
| 12 | Trilog-Broadband Antenna | Schwarzbeck | VULB 9168 | VULB 9168-352 | 2021/7/23 | 2022/7/22 |
| 13 | 5dB Attenuator | EMCI | EMCI-N-6-05 | AT-N0625 | 2021/7/23 | 2022/7/22 |
| 14 | Measurement Software | EZ | EZ EMC (Version NB-03A1-01) | N/A | N/A | N/A |

| Bandwidth | | | | | | |
|-----------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100129 | 2021/6/8 | 2022/6/7 |

| Output Power | | | | | | |
|--------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1 | Power Meter | Anritsu | ML2495A | 1128008 | 2021/5/26 | 2022/5/25 |
| 2 | Power Sensor | Anritsu | MA2411B | 1126001 | 2021/5/26 | 2022/5/25 |

| Power Spectral Density | | | | | | |
|------------------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100129 | 2021/6/8 | 2022/6/7 |

| Antenna conducted Spurious Emission | | | | | | |
|-------------------------------------|-------------------|--------------|----------|------------|-----------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated Date | Calibrated Until |
| 1 | Spectrum Analyzer | R&S | FSP 40 | 100129 | 2021/6/8 | 2022/6/7 |

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

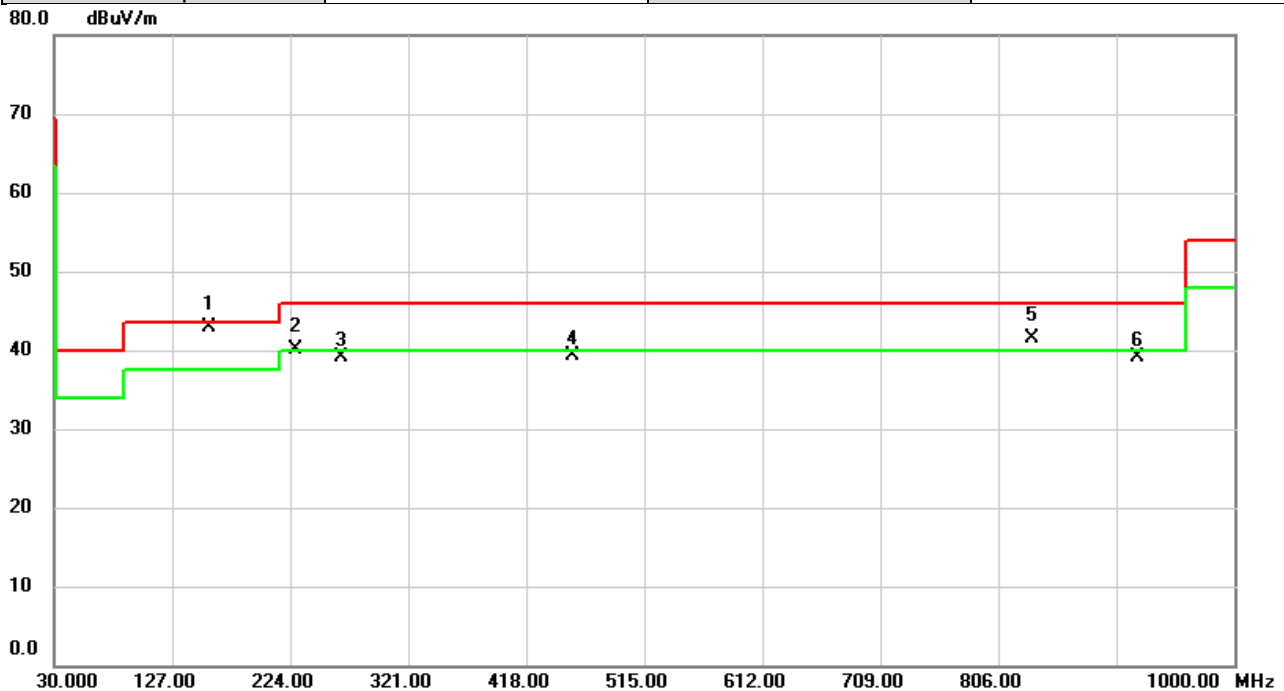
Please refer to document Appendix No.: TP-2103T126-FCCP-3 (APPENDIX-TEST PHOTOS).

10 EUT PHOTOS

Please refer to document Appendix No.: EP-2103T126-1 (APPENDIX-EUT PHOTOS).

APPENDIX A RADIATED EMISSIONS - 30 MHZ TO 1 GHZ

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2480MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |



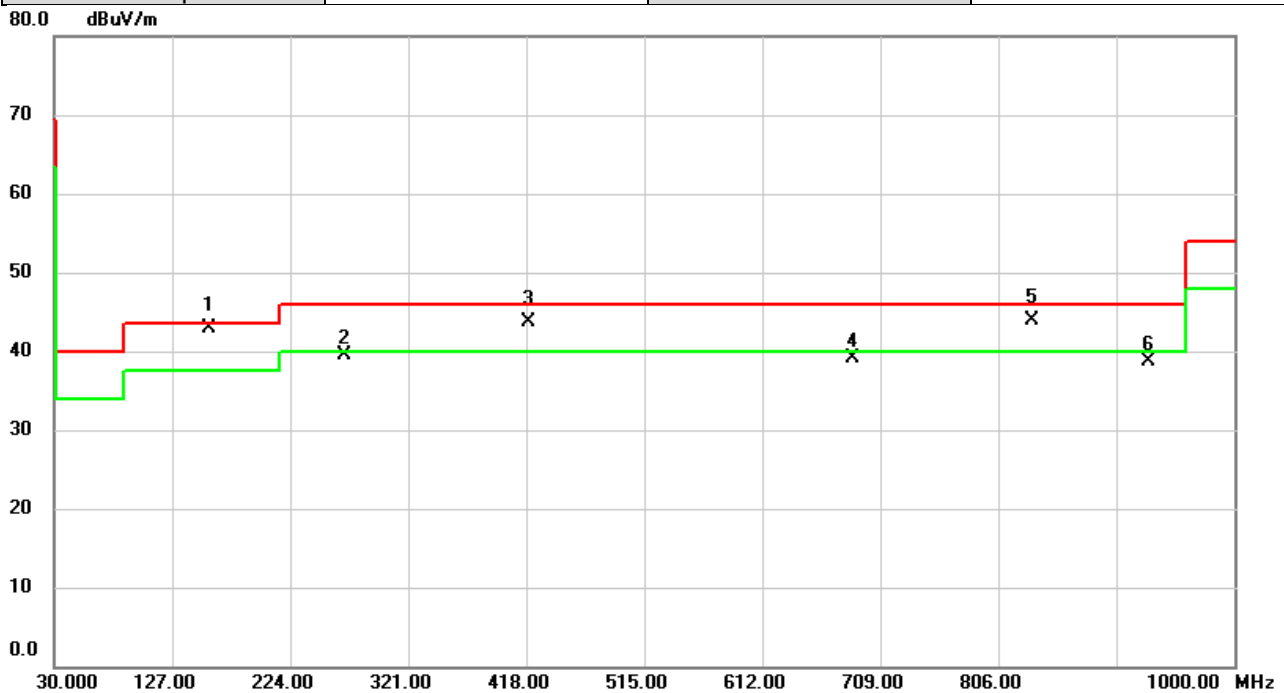
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|-------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 157.6520 | 51.25 | -8.34 | 42.91 | 43.50 | -0.59 | QP | |
| 2 | ! | 228.7530 | 50.52 | -10.37 | 40.15 | 46.00 | -5.85 | QP | |
| 3 | | 265.8070 | 47.69 | -8.57 | 39.12 | 46.00 | -6.88 | peak | |
| 4 | | 455.6360 | 42.92 | -3.59 | 39.33 | 46.00 | -6.67 | peak | |
| 5 | ! | 833.2893 | 38.52 | 3.04 | 41.56 | 46.00 | -4.44 | QP | |
| 6 | | 921.0420 | 34.53 | 4.49 | 39.02 | 46.00 | -6.98 | peak | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|------------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2480MHz | Polarization | Horizontal |
| Temp | 23°C | Hum. | 54% |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|-------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 157.6843 | 51.31 | -8.34 | 42.97 | 43.50 | -0.53 | QP | |
| 2 | | 268.5230 | 47.96 | -8.40 | 39.56 | 46.00 | -6.44 | peak | |
| 3 | ! | 419.6166 | 48.10 | -4.36 | 43.74 | 46.00 | -2.26 | QP | |
| 4 | | 685.9461 | 38.53 | 0.59 | 39.12 | 46.00 | -6.88 | peak | |
| 5 | ! | 833.2893 | 40.88 | 3.04 | 43.92 | 46.00 | -2.08 | QP | |
| 6 | | 929.9334 | 34.03 | 4.64 | 38.67 | 46.00 | -7.33 | peak | |

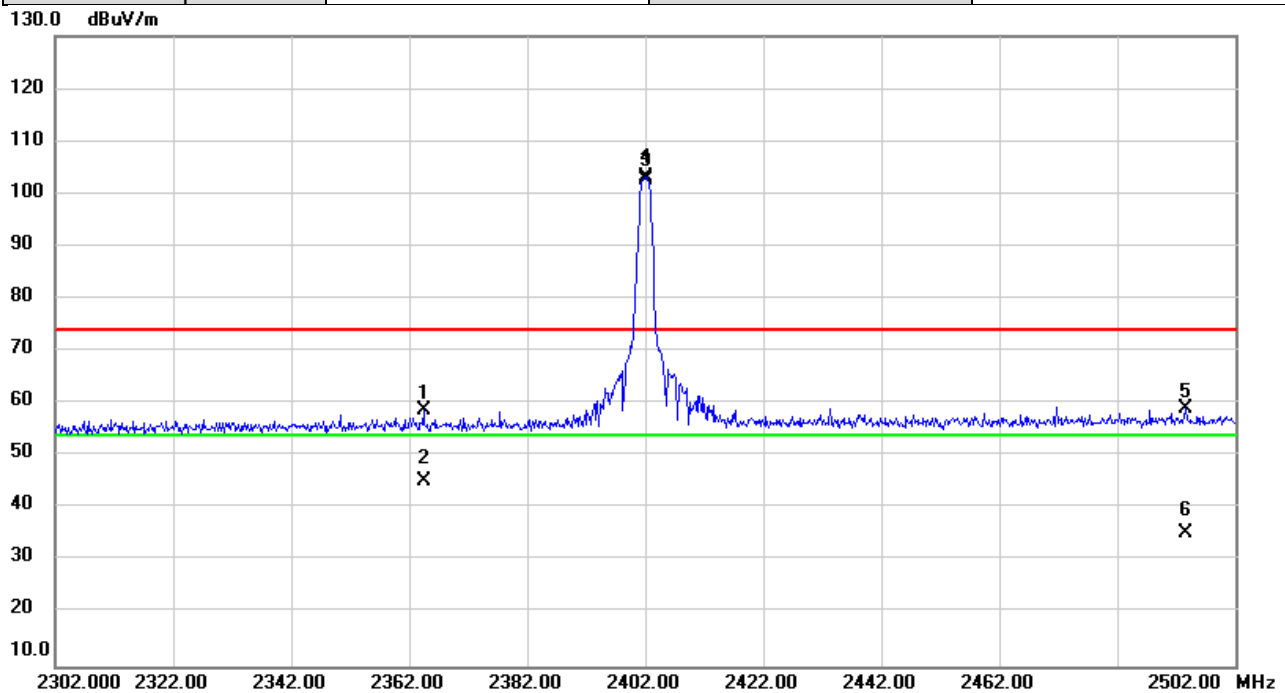
REMARKS:

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

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

APPENDIX B RADIATED EMISSIONS - ABOVE 1 GHZ

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2402MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |



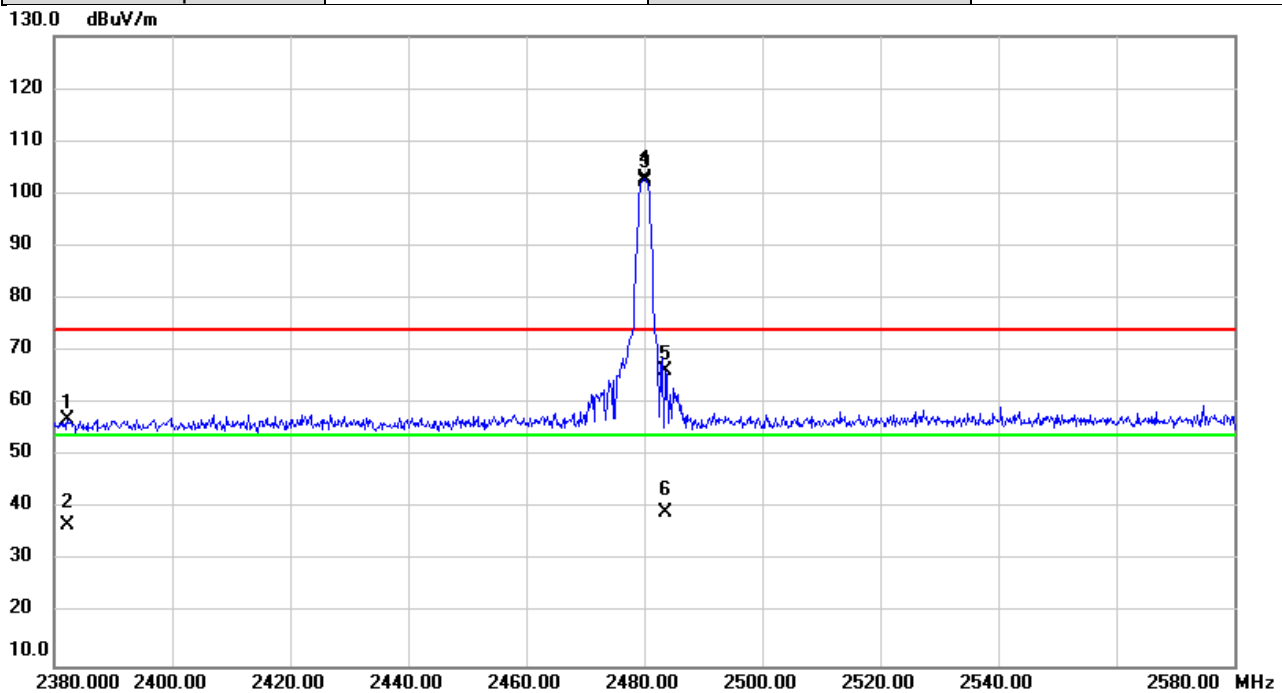
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2364.447 | 27.50 | 31.13 | 58.63 | 74.00 | -15.37 | peak | |
| 2 | | 2364.447 | 13.97 | 31.13 | 45.10 | 54.00 | -8.90 | AVG | |
| 3 | X | 2402.000 | 72.01 | 31.26 | 103.27 | 74.00 | 29.27 | peak | NoLimit |
| 4 | * | 2402.000 | 71.37 | 31.26 | 102.63 | 54.00 | 48.63 | AVG | NoLimit |
| 5 | | 2493.487 | 27.41 | 31.55 | 58.96 | 74.00 | -15.04 | peak | |
| 6 | | 2493.487 | 3.94 | 31.55 | 35.49 | 54.00 | -18.51 | AVG | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2480MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |

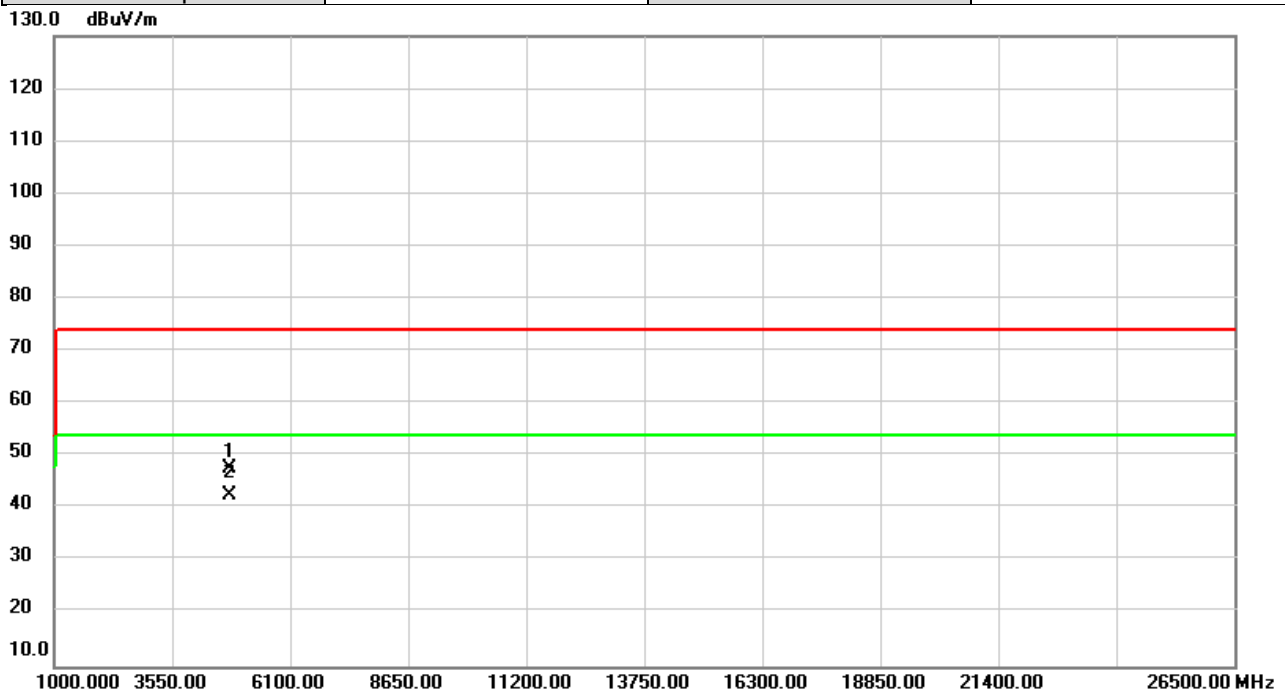


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2382.333 | 25.90 | 31.18 | 57.08 | 74.00 | -16.92 | peak | |
| 2 | | 2382.333 | 5.65 | 31.18 | 36.83 | 54.00 | -17.17 | AVG | |
| 3 | X | 2480.000 | 71.38 | 31.51 | 102.89 | 74.00 | 28.89 | peak | NoLimit |
| 4 | * | 2480.000 | 70.76 | 31.51 | 102.27 | 54.00 | 48.27 | AVG | NoLimit |
| 5 | | 2483.680 | 34.76 | 31.52 | 66.28 | 74.00 | -7.72 | peak | |
| 6 | | 2483.680 | 7.58 | 31.52 | 39.10 | 54.00 | -14.90 | AVG | |

REMARKS:

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

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2402MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |



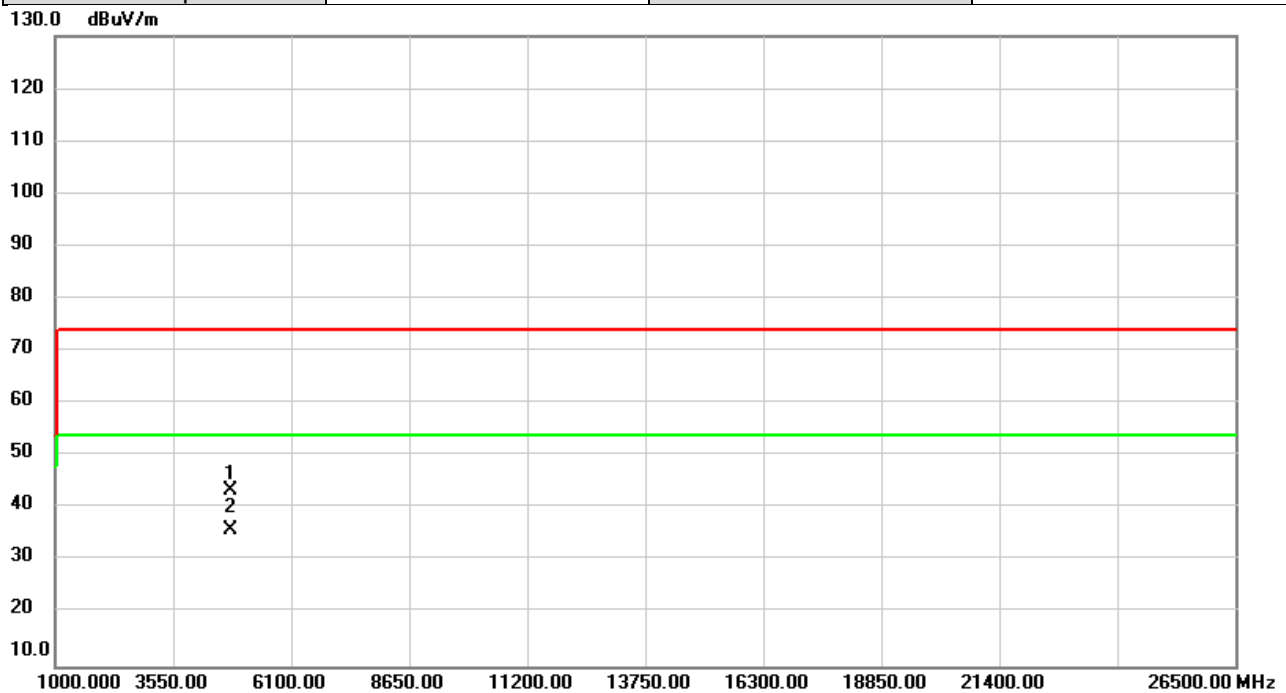
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4804.000 | 57.35 | -9.84 | 47.51 | 74.00 | -26.49 | peak | |
| 2 | * | 4804.000 | 52.42 | -9.84 | 42.58 | 54.00 | -11.42 | AVG | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|------------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2402MHz | Polarization | Horizontal |
| Temp | 23°C | Hum. | 54% |



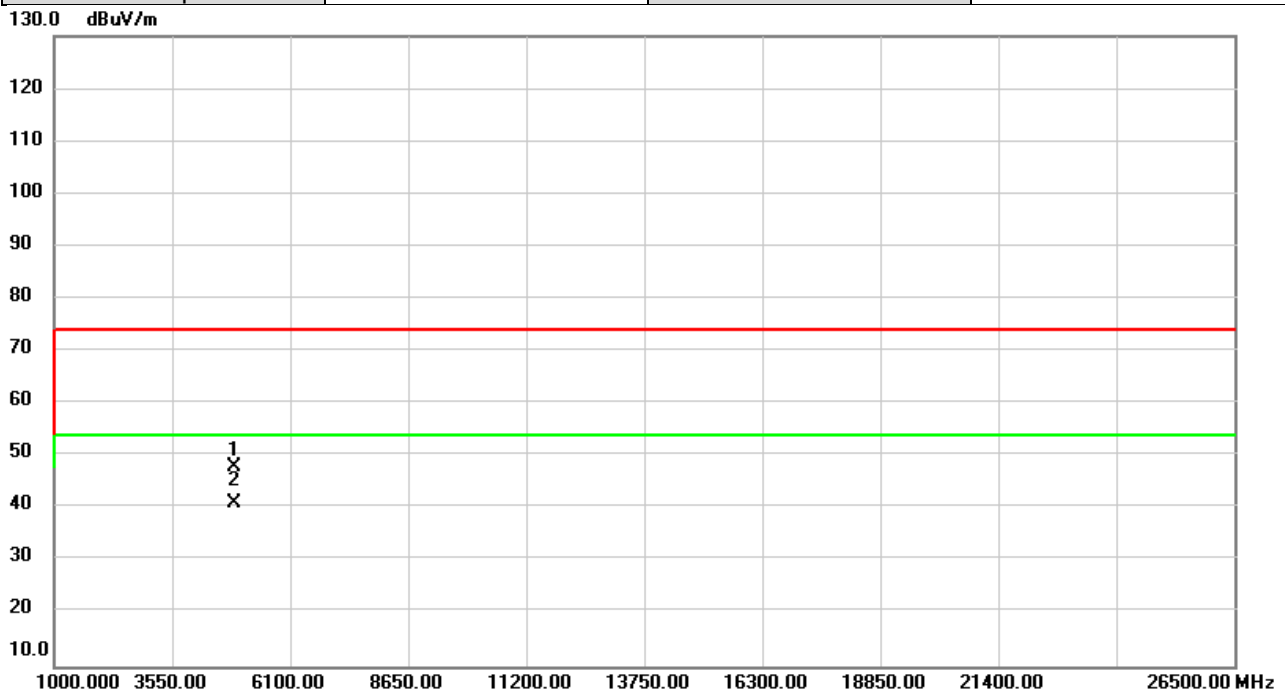
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4804.000 | 53.34 | -9.84 | 43.50 | 74.00 | -30.50 | peak | |
| 2 | * | 4804.000 | 45.65 | -9.84 | 35.81 | 54.00 | -18.19 | AVG | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2440MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |

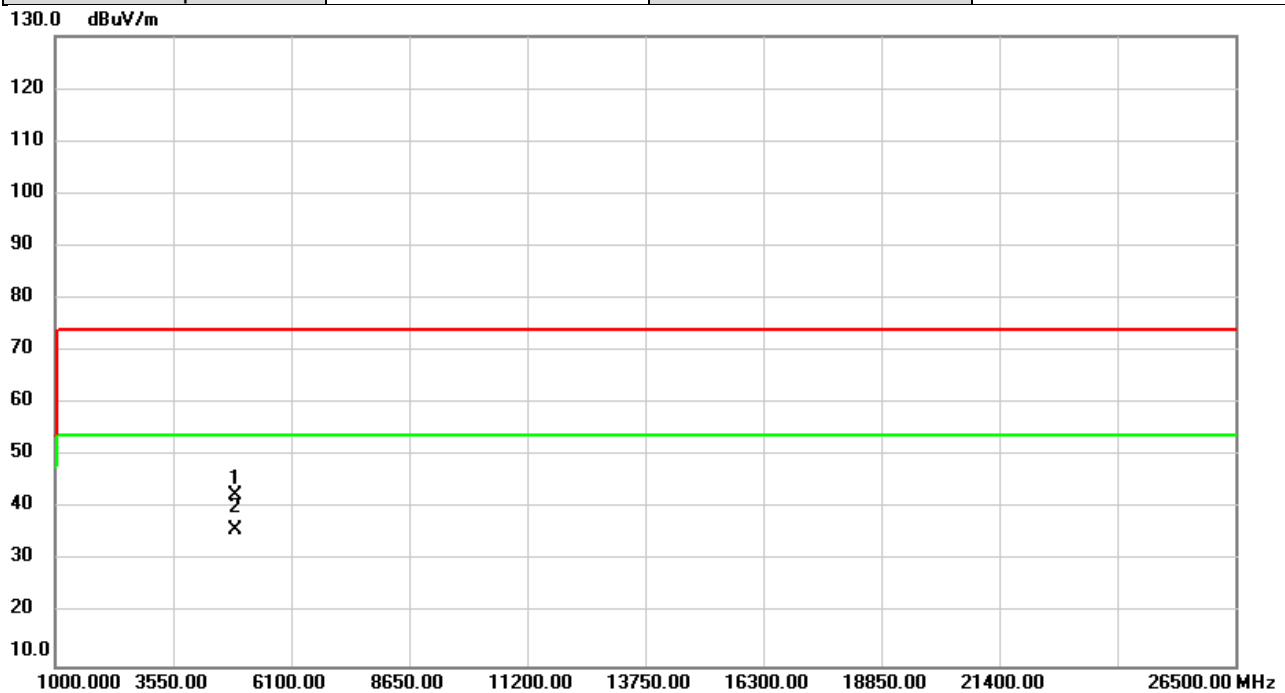


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4880.000 | 57.67 | -9.77 | 47.90 | 74.00 | -26.10 | peak | |
| 2 | * | 4880.000 | 50.95 | -9.77 | 41.18 | 54.00 | -12.82 | AVG | |

REMARKS:

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

| | | | |
|----------------|------------------|--------------|------------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2440MHz | Polarization | Horizontal |
| Temp | 23°C | Hum. | 54% |



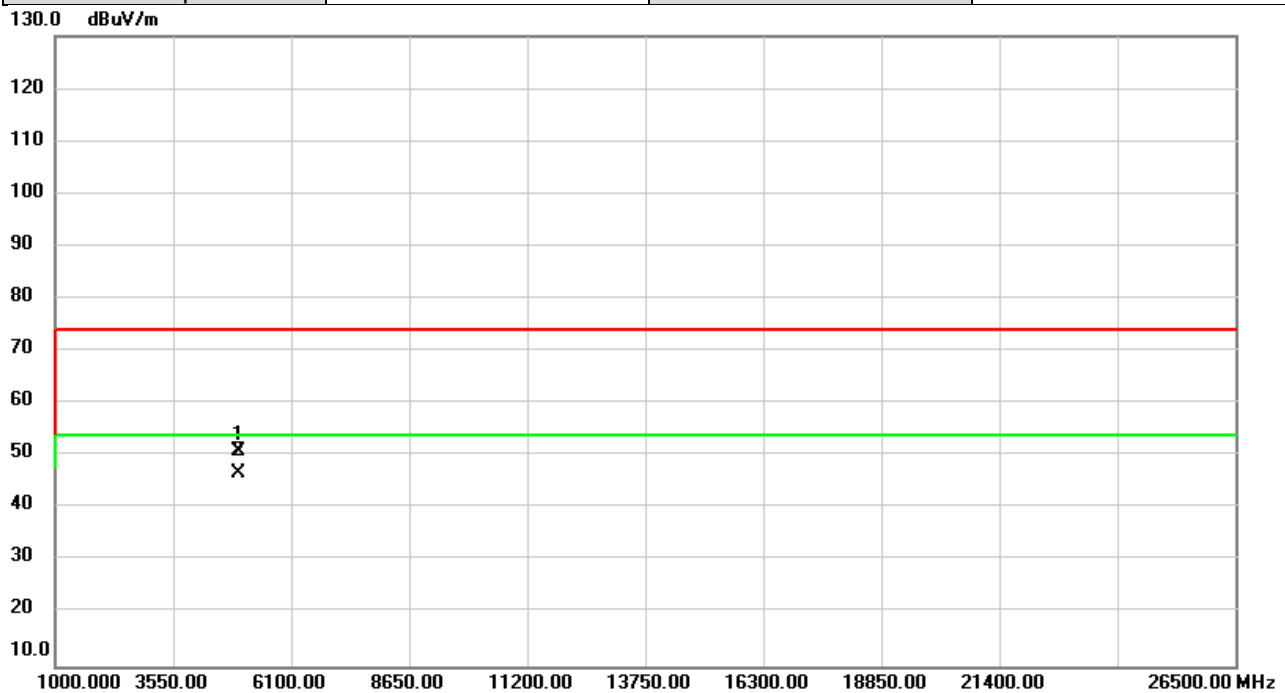
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4880.000 | 52.22 | -9.77 | 42.45 | 74.00 | -31.55 | peak | |
| 2 | * | 4880.000 | 45.77 | -9.77 | 36.00 | 54.00 | -18.00 | AVG | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|-----------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2480MHz | Polarization | Vertical |
| Temp | 23°C | Hum. | 54% |



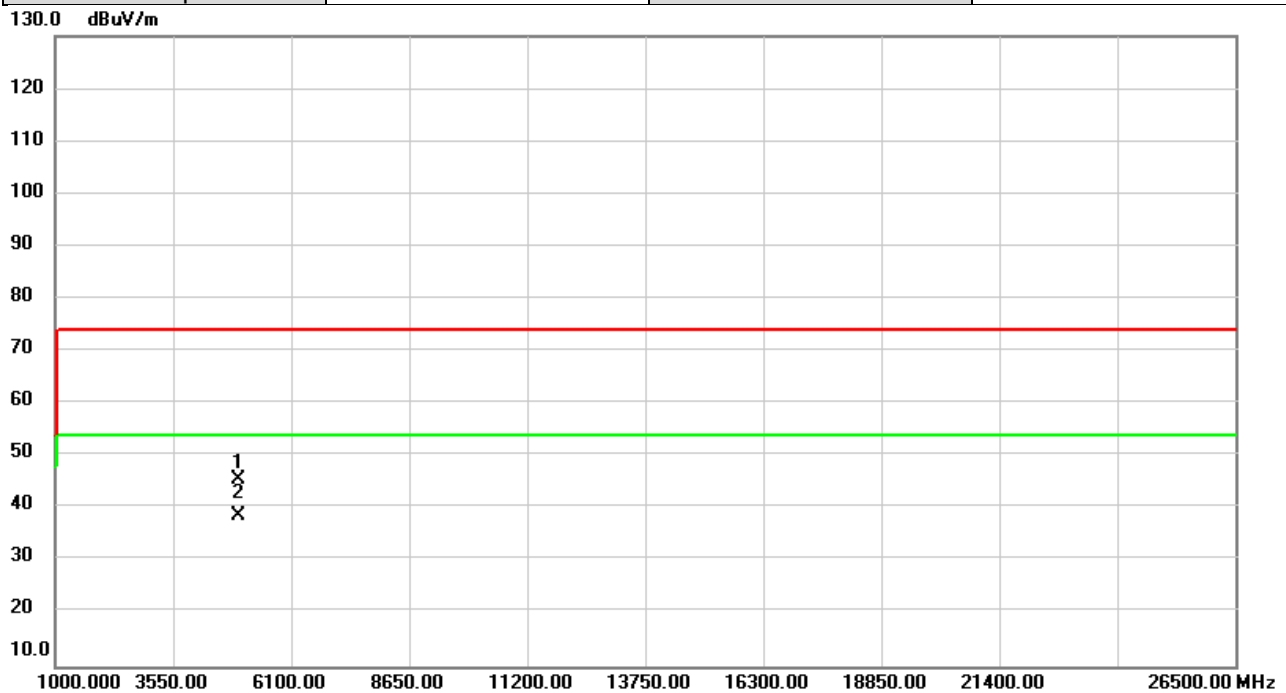
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4960.000 | 60.77 | -9.68 | 51.09 | 74.00 | -22.91 | peak | |
| 2 | * | 4960.000 | 56.35 | -9.68 | 46.67 | 54.00 | -7.33 | AVG | |

REMARKS:

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

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

| | | | |
|----------------|------------------|--------------|------------|
| Test Mode | BLE 4.0 (1 Mbps) | Test Date | 2021/6/26 |
| Test Frequency | 2480MHz | Polarization | Horizontal |
| Temp | 23°C | Hum. | 54% |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 4960.000 | 55.16 | -9.68 | 45.48 | 74.00 | -28.52 | peak | |
| 2 | * | 4960.000 | 48.43 | -9.68 | 38.75 | 54.00 | -15.25 | AVG | |

REMARKS:

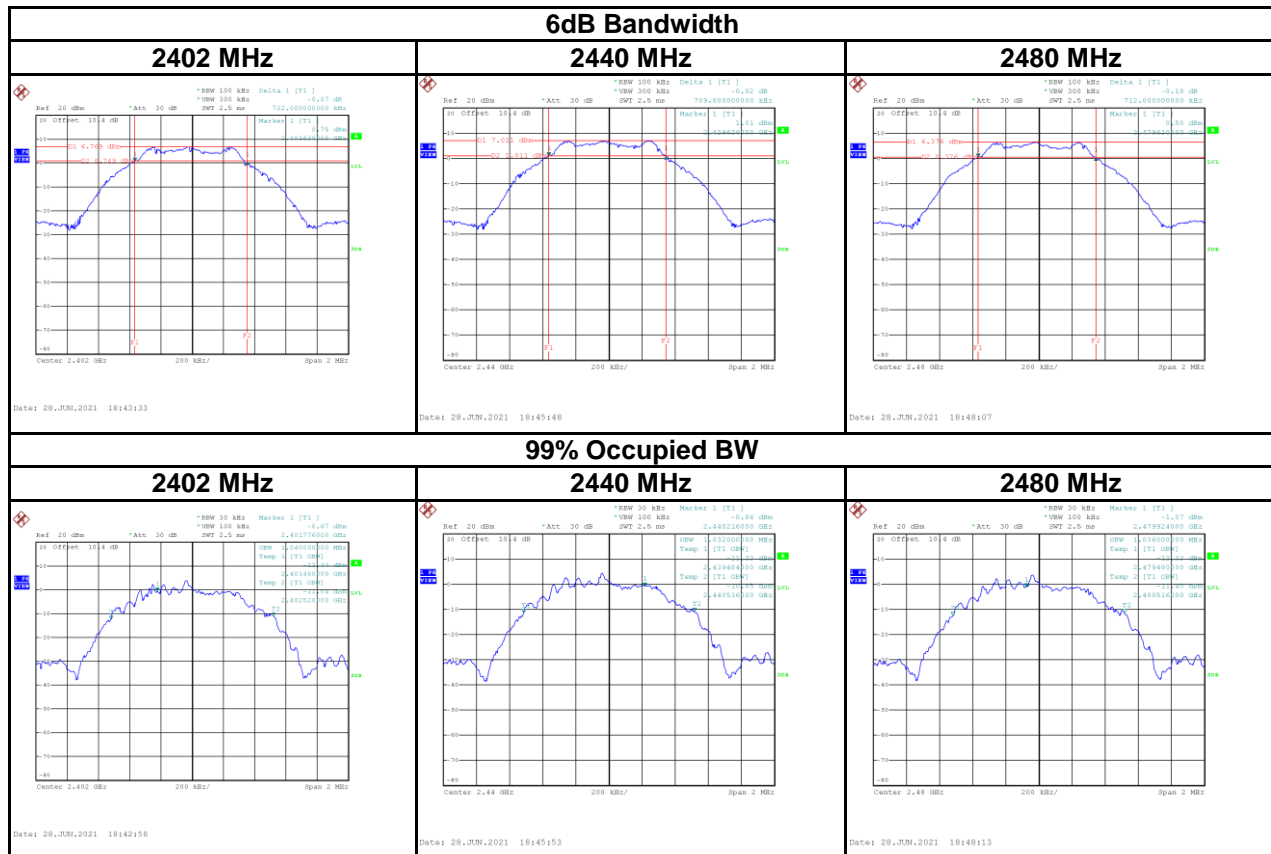
(1) Measurement Value = Reading Level + Correct Factor.

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

APPENDIX C BANDWIDTH

| | |
|------------|-------|
| Test Mode: | 1Mbps |
|------------|-------|

| Frequency (MHz) | 6dB Bandwidth (MHz) | 99% Occupied BW (MHz) | Min. Limit (kHz) | Test Result |
|-----------------|---------------------|-----------------------|------------------|-------------|
| 2402 | 0.72 | 1.04 | 500 | Pass |
| 2440 | 0.71 | 1.03 | 500 | Pass |
| 2480 | 0.71 | 1.04 | 500 | Pass |



APPENDIX D OUTPUT POWER

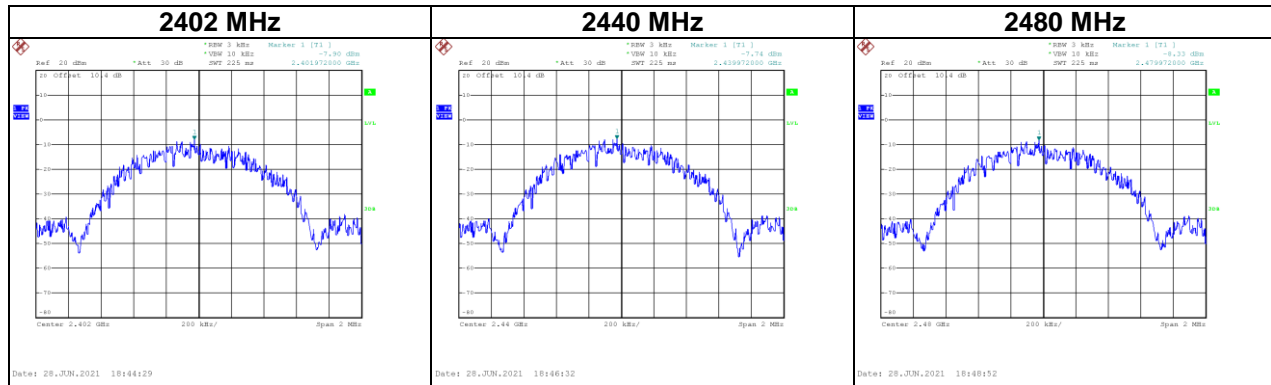
| | | | |
|-------------|-------|-------------|-----------|
| Test Mode : | 1Mbps | Tested Date | 2021/6/30 |
|-------------|-------|-------------|-----------|

| Frequency (MHz) | Conducted Power (dBm) | Conducted Power (W) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|-----------------|-----------------------|---------------------|------------------|----------------|-------------|
| 2402 | 1.82 | 0.0015 | 30.00 | 1.0000 | Pass |
| 2440 | 2.03 | 0.0016 | 30.00 | 1.0000 | Pass |
| 2480 | 1.59 | 0.0014 | 30.00 | 1.0000 | Pass |

APPENDIX E POWER SPECTRAL DENSITY TEST

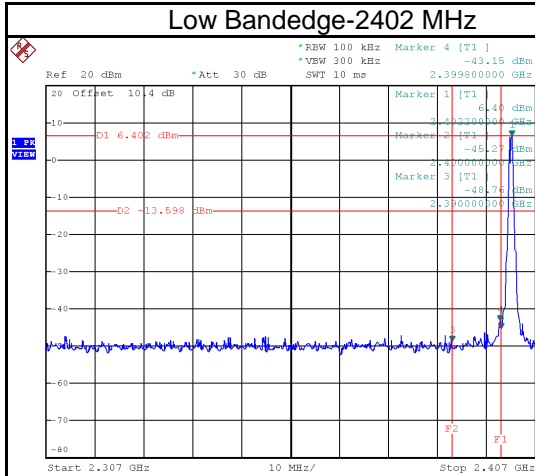
| | |
|-------------|-------|
| Test Mode : | 1Mbps |
|-------------|-------|

| Frequency (MHz) | Power Density (dBm/3kHz) | Max. Limit (dBm/3kHz) | Test Result |
|-----------------|--------------------------|-----------------------|-------------|
| 2402 | -7.90 | 8 | Pass |
| 2440 | -7.74 | 8 | Pass |
| 2480 | -8.33 | 8 | Pass |

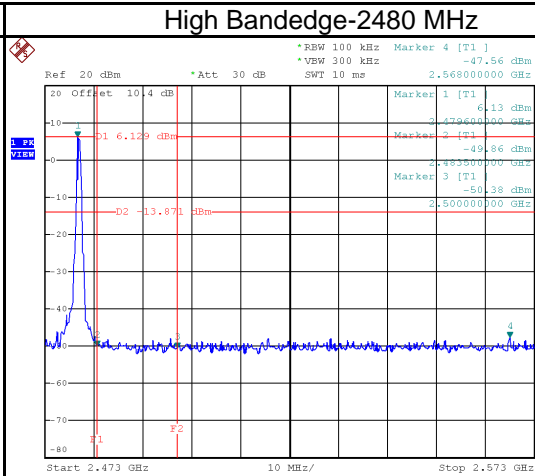


APPENDIX F ANTENNA CONDUCTED SPURIOUS EMISSION

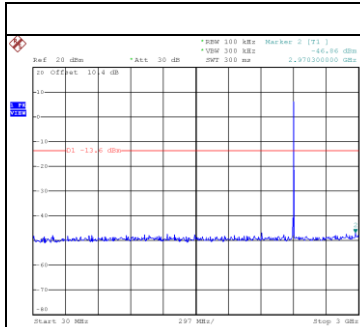
Test Mode : 1Mbps



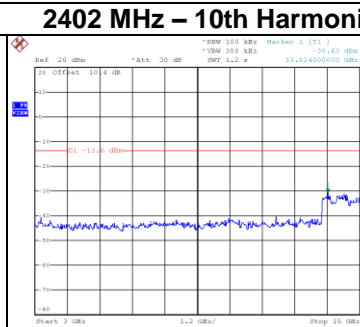
Date: 28.JUN.2021 18:43:57



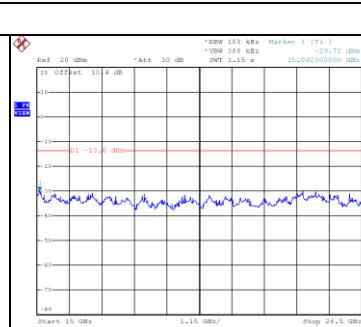
Date: 28.JUN.2021 18:48:20



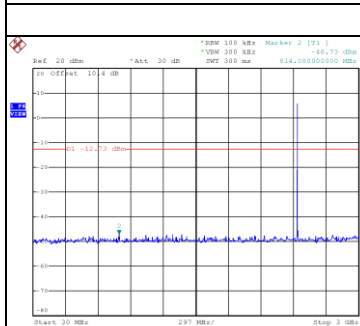
Date: 28.JUN.2021 18:44:10



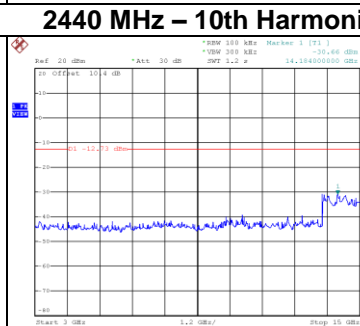
Date: 28.JUN.2021 18:44:17



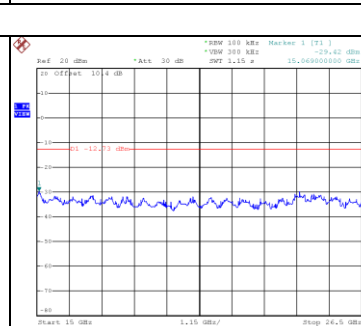
Date: 28.JUN.2021 18:44:24



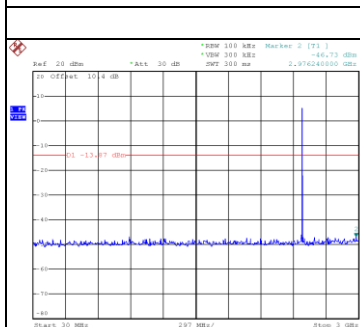
Date: 28.JUN.2021 18:46:13



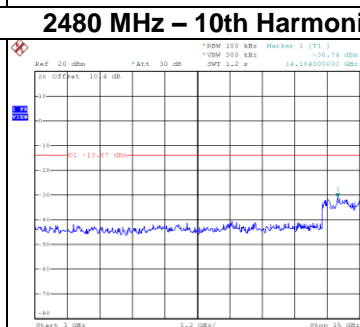
Date: 28.JUN.2021 18:46:20



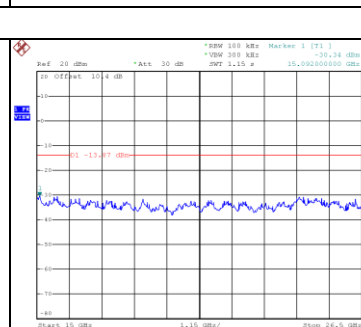
Date: 28.JUN.2021 18:46:27



Date: 28.JUN.2021 18:46:33



Date: 28.JUN.2021 18:46:40



Date: 28.JUN.2021 18:46:46

End of Test Report