

FCC Radio Test Report

FCC ID: I4L-RF1430

This report concerns: Original Grant

Project No. : 2011C072
Equipment : Wireless Keyboard
Brand Name : MSI
Test Model : RF1430
Series Model : N/A
Applicant : Micro-Star Int'l Co.,Ltd.
Address : No.69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan
Manufacturer : Micro-Star Int'l Co.,Ltd.
Address : No.69, Lide St., Zhonghe Dist., New Taipei City 235, Taiwan
Factory : Dong Guan You Hong Plastic & Electric Co.,Ltd
Address : Zhen Hua Road, Tie Lu Keng Village, Qi Shi Town, DongGuan city
Date of Receipt : Nov. 11, 2020
Date of Test : Nov. 13, 2020 ~ Dec. 01, 2020
Issued Date : Jan. 06, 2021
Report Version : R02
Test Sample : Engineering Sample No.: DG2020111158 for conducted, DG2020111159 for radiated.
Standard(s) : FCC Part15, Subpart C (15.247)
 ANSI C63.10-2013
 FCC KDB 558074 D01 15.247 Meas Guidance V05r02

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

Vincent Tan

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Declaration

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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.

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REPORT ISSUED HISTORY

| Report Version | Description | Issued Date |
|----------------|--|---------------|
| R00 | Original Issue. | Dec. 14, 2020 |
| R01 | Only updated the applicant and manufacturer information. | Dec. 25, 2020 |
| R02 | Updated the test software setting. | Jan. 06, 2021 |

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

| FCC Part15, Subpart C (15.247) | | | | |
|-------------------------------------|-----------------------------------|--|----------|---------|
| Standard(s) Section | Test Item | Test Result | Judgment | Remark |
| 15.207 | AC Power Line Conducted Emissions | ----- | N/A | ----- |
| 15.247(d) 15.205(a) 15.209(a) | Radiated Emissions | APPENDIX A APPENDIX B APPENDIX C | PASS | ----- |
| 15.247(a)(2) | Bandwidth | APPENDIX D | PASS | ----- |
| 15.247(b)(3) | Maximum Output Power | APPENDIX E | PASS | ----- |
| 15.247(d) | Conducted Spurious Emission | APPENDIX F | PASS | ----- |
| 15.247(e) | Power Spectral Density | APPENDIX G | PASS | ----- |
| 15.203 | Antenna Requirement | ----- | PASS | Note(2) |

Note:

- (1) "N/A" denotes test is not applicable to this device.
- (2) The device what use a permanently attached antenna were considered sufficient to comply with the provisions of 15.203.

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. Radiated emissions Measurement:

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U, (dB) |
|-----------|--------|-----------------------------|---------------|---------|
| DG-CB03 | CISPR | 9kHz ~ 30MHz | - | 3.02 |
| | | 30MHz ~ 200MHz | V | 4.26 |
| | | 30MHz ~ 200MHz | H | 3.38 |
| | | 200MHz ~ 1,000MHz | V | 3.98 |
| | | 200MHz ~ 1,000MHz | H | 3.94 |
| | | 1GHz ~ 6GHz | - | 3.96 |
| | | 6GHz ~ 18GHz | - | 5.24 |
| | | 18GHz ~ 26.5GHz | - | 3.62 |
| | | 26.5GHz ~ 40GHz | - | 4.00 |

B. Other Measurement:

| Test Item | Uncertainty |
|-----------------------------|-------------|
| Bandwidth | ±3.8 % |
| Maximum Output Power | ±0.95 dB |
| Conducted Spurious Emission | ±2.71 dB |
| Power Spectral Density | ±0.86 dB |
| Temperature | ±0.08 °C |
| Humidity | ±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 |
|-----------------------------------|-------------|----------|--------------|------------|
| Radiated Emissions-9K-30MHz | 25°C | 60% | DC 3V | Kwok Guo |
| Radiated Emissions-30 MHz to 1GHz | 26°C | 52% | DC 3V | Kwok Guo |
| Radiated Emissions-Above 1000 MHz | 26°C | 52% | DC 3V | Kwok Guo |
| Bandwidth | 24°C | 52% | DC 3V | Jesse Wang |
| Maximum Output Power | 24°C | 52% | DC 3V | Hand Huang |
| Conducted Spurious Emission | 24°C | 52% | DC 3V | Jesse Wang |
| Power Spectral Density | 24°C | 52% | DC 3V | Jesse Wang |

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | |
|-------------------------|--|
| Equipment | Wireless Keyboard |
| Brand Name | MSI |
| Test Model | RF1430 |
| Series Model | N/A |
| Model Difference(s) | N/A |
| Power Source | Supplied from battery. |
| Power Rating | 3V  5mA |
| Operation Frequency | 2402 MHz ~ 2480 MHz |
| Modulation Technology | GFSK |
| Bit Rate of Transmitter | 2 Mbps |
| Max. Output Power | -5.07 dBm (0.0003 W) |

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) |
|---------|-----------------|---------|-----------------|
| 01 | 2402 | 21 | 2442 |
| 02 | 2404 | 22 | 2444 |
| 03 | 2406 | 23 | 2446 |
| 04 | 2408 | 24 | 2448 |
| 05 | 2410 | 25 | 2450 |
| 06 | 2412 | 26 | 2452 |
| 07 | 2414 | 27 | 2454 |
| 08 | 2416 | 28 | 2456 |
| 09 | 2418 | 29 | 2458 |
| 10 | 2420 | 30 | 2460 |
| 11 | 2422 | 31 | 2462 |
| 12 | 2424 | 32 | 2464 |
| 13 | 2426 | 33 | 2466 |
| 14 | 2428 | 34 | 2468 |
| 15 | 2430 | 35 | 2470 |
| 16 | 2432 | 36 | 2472 |
| 17 | 2434 | 37 | 2474 |
| 18 | 2436 | 38 | 2476 |
| 19 | 2438 | 39 | 2478 |
| 20 | 2440 | 40 | 2480 |

3. Table for Filed Antenna:

| Ant. | Brand | Model Name | Antenna Type | Connector | Gain (dBi) |
|------|-------|-------------|--------------|-----------|------------|
| 1 | N/A | IBM 2.4 GHz | Internal | N/A | -1.52 |

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 NOTE (1) |
| Mode 2 | TX Mode Channel 01 |

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

| Radiated emissions test - Below 1GHz | |
|--------------------------------------|--------------------|
| Final Test Mode | Description |
| Mode 2 | TX Mode Channel 01 |

| Radiated emissions test - Above 1GHz | |
|--------------------------------------|-------------------------|
| Final Test Mode | Description |
| Mode 1 | TX Mode NOTE (1) |

| Conducted test | |
|-----------------|-------------------------|
| Final Test Mode | Description |
| Mode 1 | TX Mode NOTE (1) |

Note:

- (1) The measurements are performed at the high, middle, low available channels.
- (2) For radiated emission above 1 GHz test, 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.
- (3) For radiated emission below 1 GHz test, the channel 01 is found to be the worst case and recorded.

2.3 PARAMETERS OF TEST SOFTWARE

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters.

| Test Software | N/A | | |
|-----------------|------|------|------|
| Frequency (MHz) | 2402 | 2440 | 2480 |
| 2Mbps | 0 | 0 | 0 |

Note: The operating channel is fixed by pressing the button of the keyboard. No used the power controlling software to control the operating channel.

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 |
|------|------------|---------------|--------------|--------|
| - | - | - | - | - |

3. RADIATED EMISSION TEST

3.1 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 (9 kHz-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 |
| Above 960 | 500 | 3 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000 MHz)

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

Note:

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

| Spectrum Parameter | Setting |
|--|---|
| Attenuation | Auto |
| Start Frequency | 1000 MHz |
| Stop Frequency | 10th carrier harmonic |
| RBW / VBW (Emission in restricted band) | RBW 1 MHz VBW 3 MHz peak detector for Pk value RMS detector for AV value |

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

3.2 TEST PROCEDURE

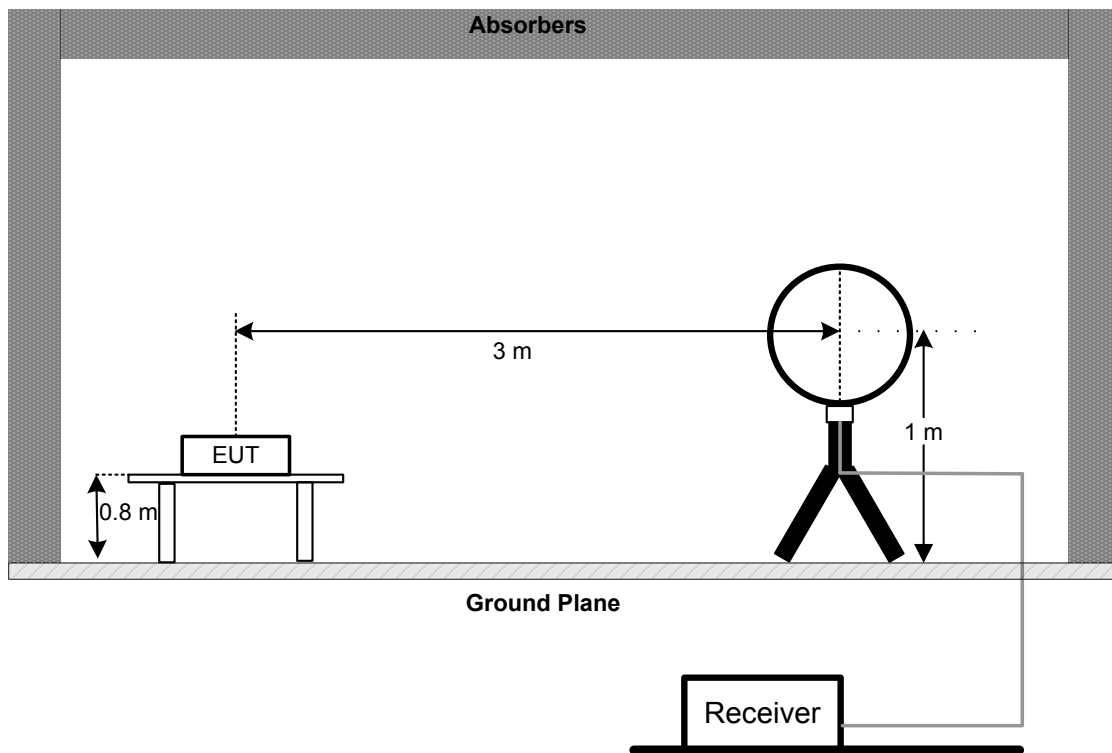
- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
- b. The measuring distance 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 1 GHz)
- c. 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.
- 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 1 GHz.
- 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 1 GHz)
- 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 1 GHz)
- i. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.3 DEVIATION FROM TEST STANDARD

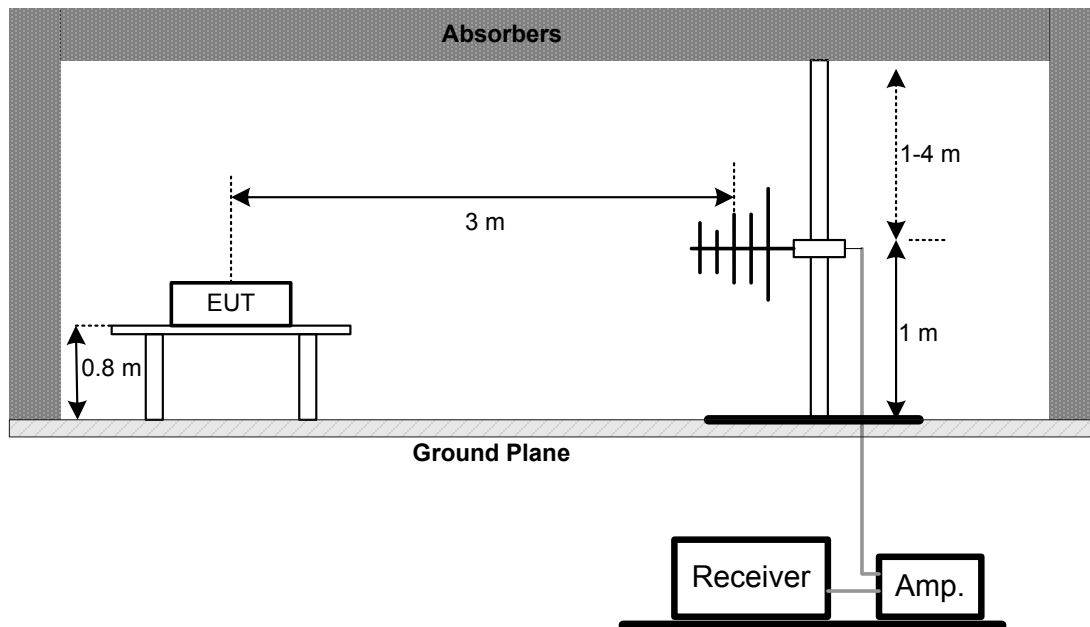
No deviation

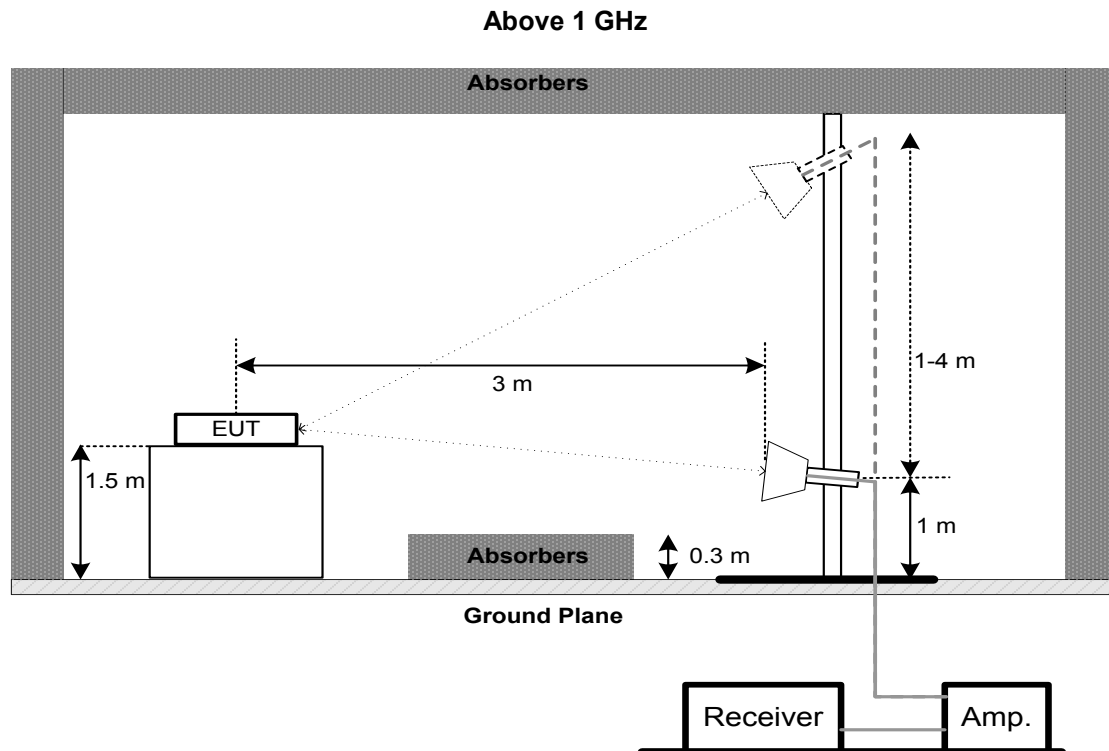
3.4 TEST SETUP

9 kHz-30 MHz



30 MHz to 1 GHz





3.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

3.6 TEST RESULT - 9 kHz TO 30 MHz

Please refer to the APPENDIX A.

Remark:

- (1) Distance extrapolation factor = $40 \log (\text{specific distance} / \text{test distance})$ (dB).
- (2) Limit line = specific limits (dBuV) + distance extrapolation factor.

3.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX B.

3.8 TEST RESULT - ABOVE 1000 MHz

Please refer to the APPENDIX C.

Remark:

- (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 LIMIT

| FCC Part15, Subpart C (15.247) | | |
|--------------------------------|------------------------|-----------------|
| Section | Test Item | Limit |
| 15.247(a)(2) | 6 dB Bandwidth | Minimum 500 kHz |
| | 99% Emission Bandwidth | - |

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= 100 kHz, VBW=300 kHz, 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 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

4.6 TEST RESULTS

Please refer to the APPENDIX D.

5. MAXIMUM OUTPUT POWER

5.1 LIMIT

| FCC Part15, Subpart C (15.247) | | |
|--------------------------------|----------------------|------------------|
| Section | Test Item | Limit |
| 15.247(b)(3) | Maximum Output Power | 1 watt or 30 dBm |

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 maximum conducted output power was performed in accordance with method 11.9.1.1 of ANSI C63.10-2013.

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 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

5.6 TEST RESULTS

Please refer to the APPENDIX E.

6. CONDUCTED SPURIOUS EMISSION

6.1 LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required.

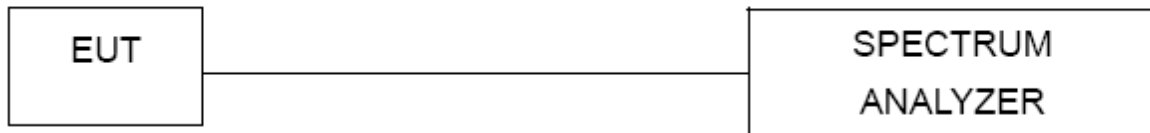
6.2 TEST PROCEDURE

- The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- Spectrum Setting: RBW= 100 kHz, VBW=300 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 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

Please refer to the APPENDIX F.

7. POWER SPECTRAL DENSITY TEST

7.1 LIMIT

| FCC Part15, Subpart C (15.247) | | |
|--------------------------------|------------------------|-------------------------|
| Section | Test Item | Limit |
| 15.247(e) | Power Spectral Density | 8 dBm (in any 3 kHz) |

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=3 kHz, VBW=10 kHz, Sweep time = auto.

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 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

7.6 TEST RESULTS

Please refer to the APPENDIX G.

8. MEASUREMENT INSTRUMENTS LIST

| Radiated Emissions - 9 kHz to 30 MHz | | | | | |
|--------------------------------------|----------------------|--------------|--------------------------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Antenna | EM | EM-6876-1 | 230 | Apr. 16, 2021 |
| 2 | Cable | N/A | RG 213/U | N/A | May 29, 2021 |
| 3 | EMI Test Receiver | R&S | ESCI | 100895 | Feb. 28, 2021 |
| 4 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 5 | 966 Chambe Room | RM | 9*6*6m | N/A | Jul. 25, 2021 |

| Radiated Emissions - 30 MHz to 1 GHz | | | | | |
|--------------------------------------|----------------------|--------------|-----------------------------|-------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Antenna | Schwarzbeck | VULB9160 | 9160-3232 | Mar. 09, 2021 |
| 2* | Amplifier | HP | 8447D | 2944A09673 | Aug. 11, 2021 |
| 3 | Receiver | Agilent | N9038A | MY52130039 | Jul. 25, 2021 |
| 4 | Cable | emci | LMR-400(30MHz-1 GHz)(8m+5m) | N/A | May 22, 2021 |
| 5 | Controller | CT | SC100 | N/A | N/A |
| 6 | Controller | MF | MF-7802 | MF780208416 | N/A |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 8 | 966 Chambe Room | RM | 9*6*6m | N/A | Jul. 25, 2021 |

| 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 | 3008A02333 | Mar. 01, 2021 |
| 4 | Microwave Preamplifier With Adaptor | EMC INSTRUMENT | EMC2654045 | 980039 & HA01 | Mar. 07, 2021 |
| 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 | May 09, 2021 |
| 9 | Measurement Software | Farad | EZ-EMC 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 |

| Bandwidth & Maximum Output Power & Power Spectral Density & Conducted Spurious Emission | | | | | |
|---|-------------------|--------------|----------|------------|------------------|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP40 | 100185 | Jul. 25, 2021 |
| 2 | DC Block | Mini | N/A | N/A | N/A |
| 3 | RF Cable | Tongkaichuan | N/A | N/A | N/A |

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

"*" calibration period of equipment list is three year.

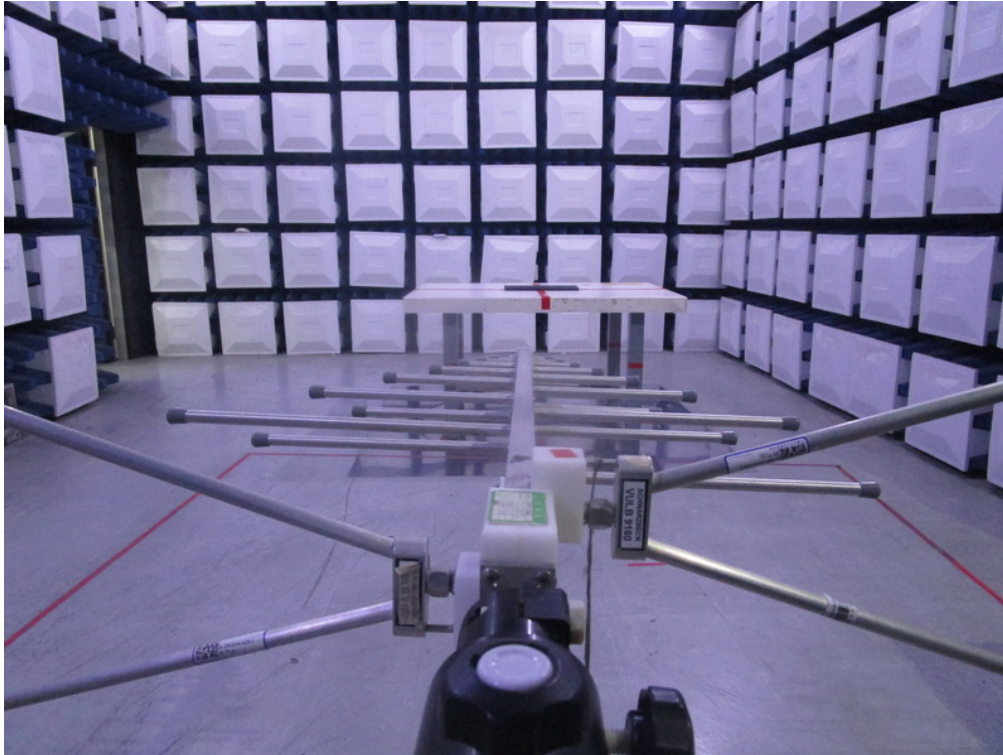
Except * item, all calibration period of equipment list is one year.

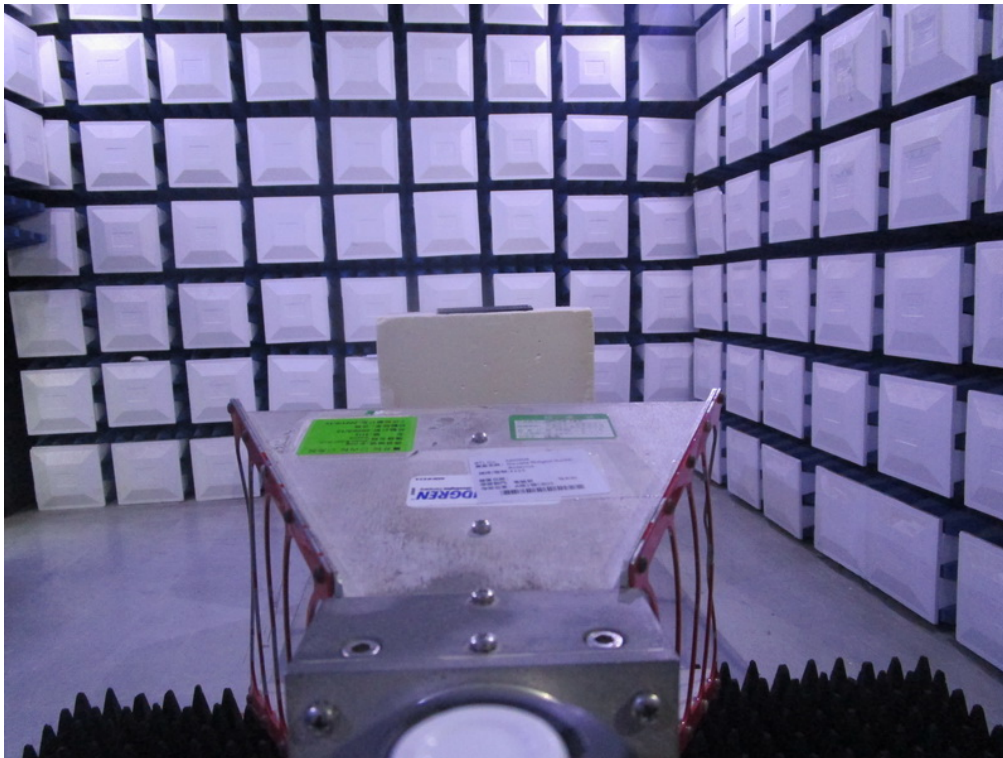
9. EUT TEST PHOTO

Radiated Emissions Test Photos

9 kHz to 30 MHz



Radiated Emissions Test Photos**30 MHz to 1000 MHz**

Radiated Emissions Test Photos**Above 1 GHz**

APPENDIX A - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Test Mode: TX Mode Channel 01

Ant 0°

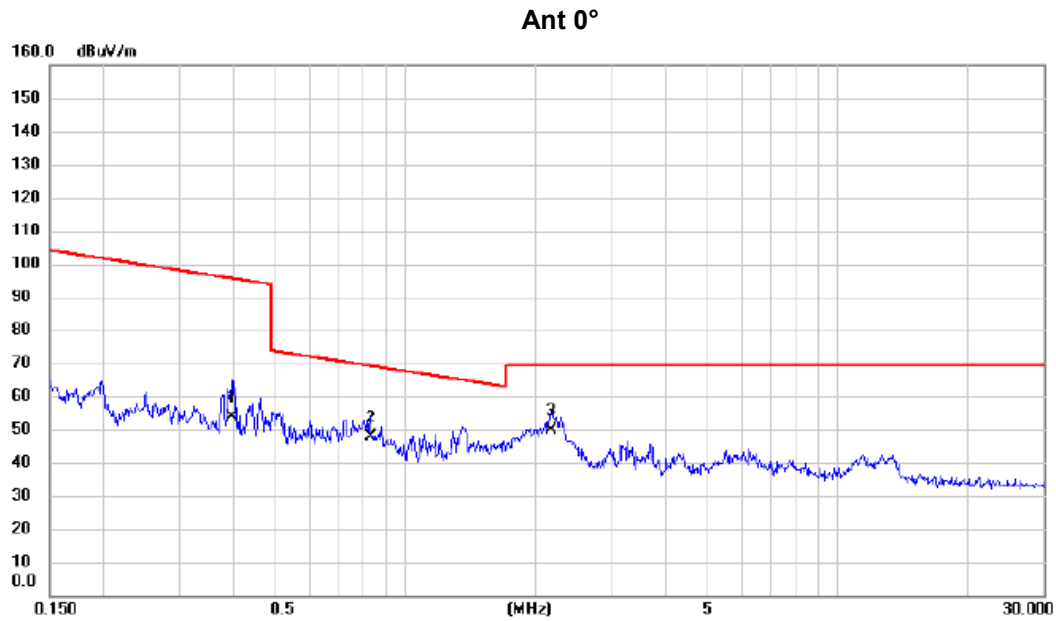


| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|--------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 0.0180 | 55.75 | 13.84 | 69.59 | 122.50 | -52.91 | AVG | |
| 2 | | 0.0360 | 42.08 | 12.79 | 54.87 | 116.48 | -61.61 | AVG | |
| 3 | | 0.0724 | 30.99 | 12.55 | 43.54 | 110.41 | -66.87 | AVG | |

REMARKS:

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

Test Mode: TX Mode Channel 01



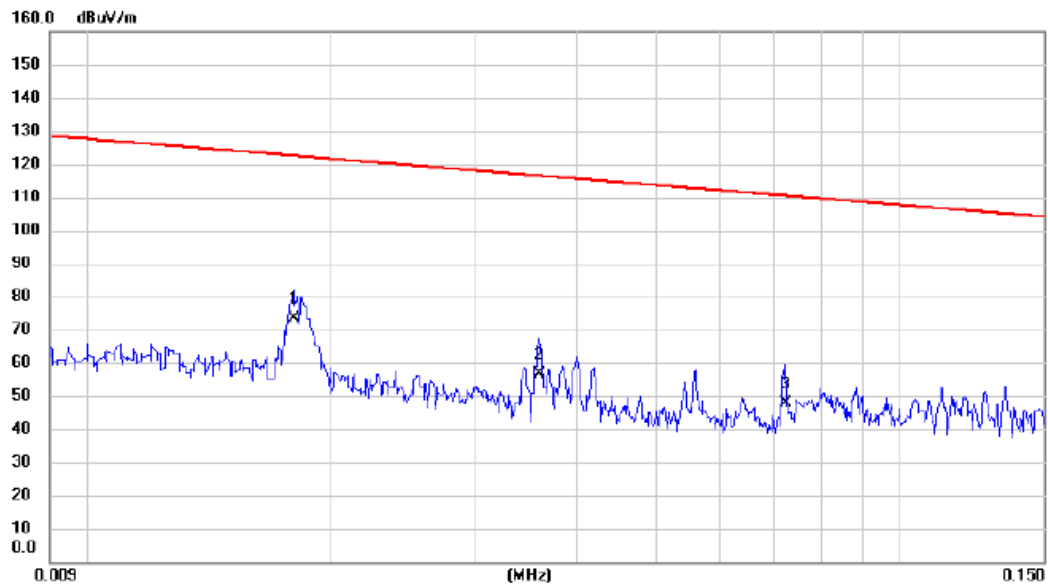
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|-----|-----|--------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 0.3976 | 41.57 | 12.27 | 53.84 | 95.62 | -41.78 | AVG | |
| 2 | | 0.8305 | 35.95 | 11.87 | 47.82 | 69.22 | -21.40 | QP | |
| 3 | * | 2.1783 | 38.67 | 11.21 | 49.88 | 69.54 | -19.66 | QP | |

REMARKS:

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

Test Mode: TX Mode Channel 01

Ant 90°



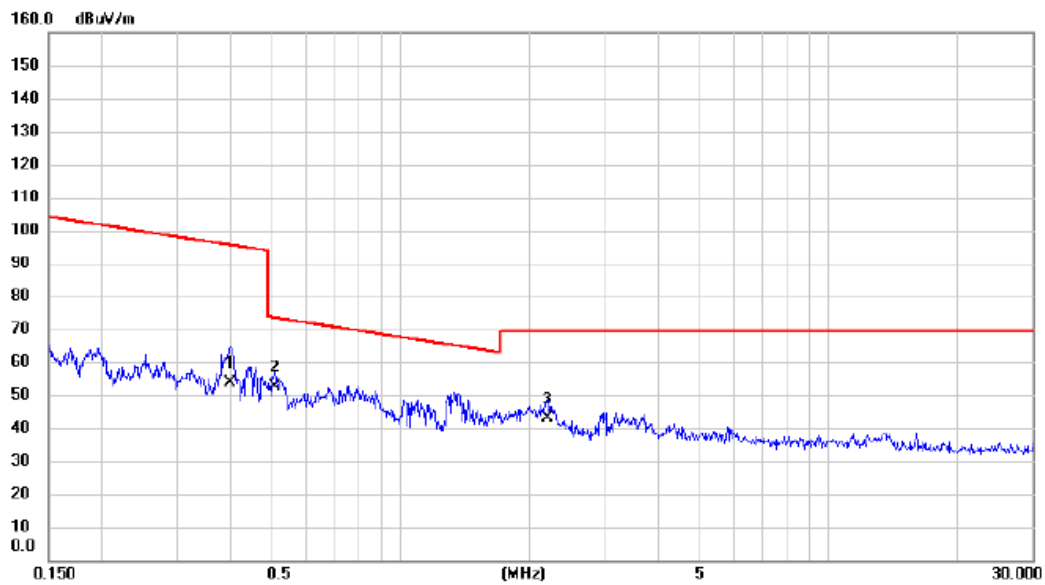
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|--------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 0.0180 | 59.37 | 13.84 | 73.21 | 122.50 | -49.29 | AVG | |
| 2 | | 0.0360 | 43.85 | 12.79 | 56.64 | 116.48 | -59.84 | AVG | |
| 3 | | 0.0722 | 35.18 | 12.55 | 47.73 | 110.43 | -62.70 | AVG | |

REMARKS:

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

Test Mode: TX Mode Channel 01

Ant 90°



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1 | | 0.3997 | 41.59 | 12.26 | 53.85 | 95.57 | -41.72 | AVG | |
| 2 | * | 0.5074 | 40.55 | 12.01 | 52.56 | 73.50 | -20.94 | QP | |
| 3 | | 2.2015 | 31.95 | 11.20 | 43.15 | 69.54 | -26.39 | QP | |

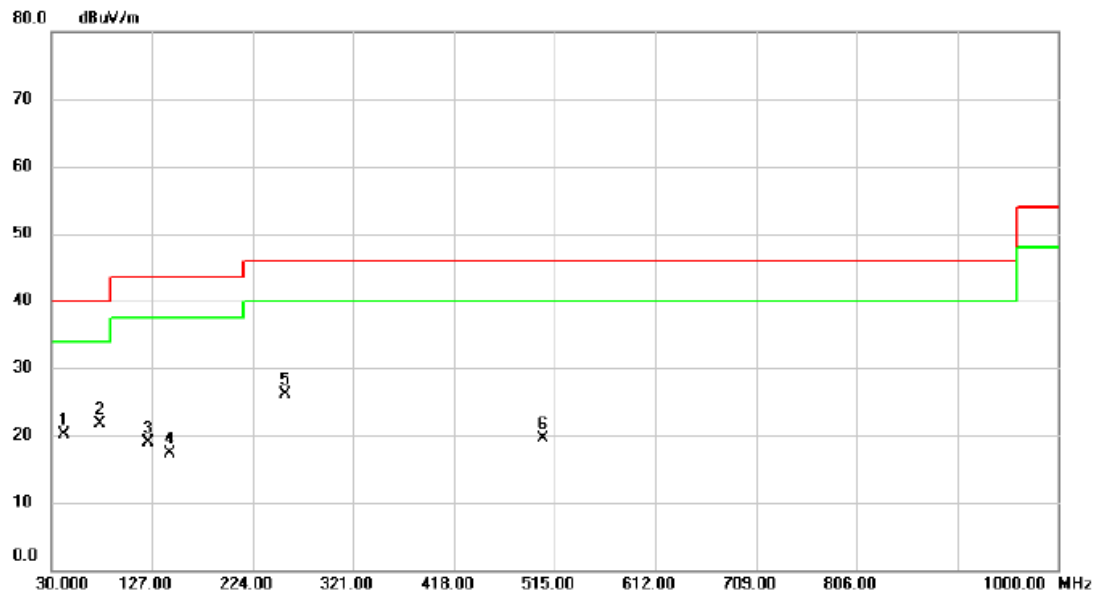
REMARKS:

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

APPENDIX B - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

Test Mode: TX Mode Channel 01

Vertical

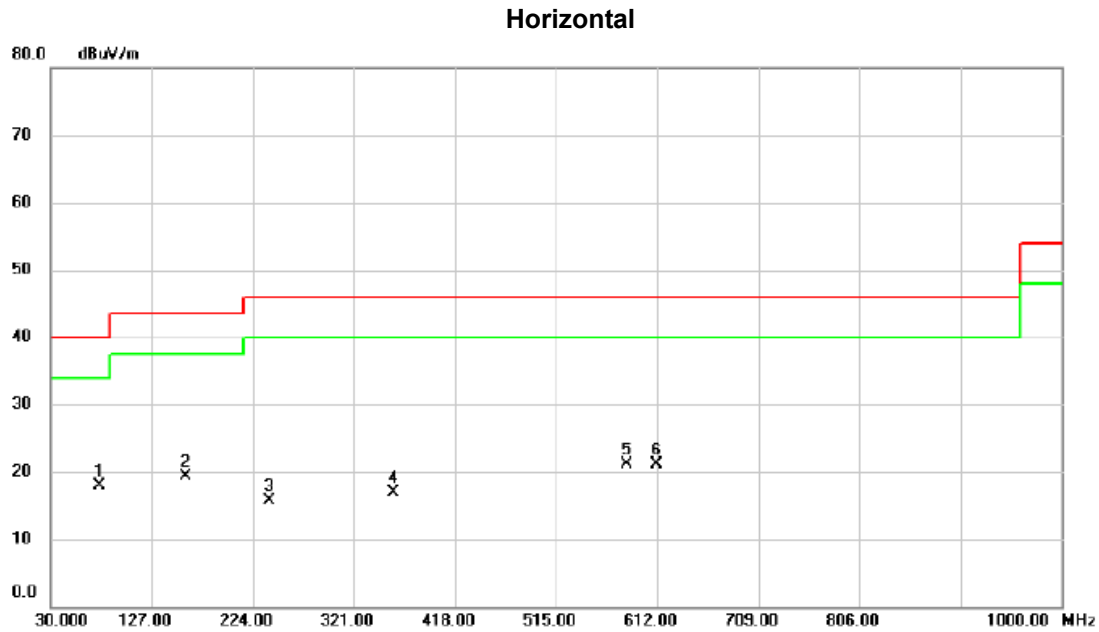


| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1 | | 42.610 | 35.15 | -15.10 | 20.05 | 40.00 | -19.95 | peak | |
| 2 | * | 77.530 | 40.27 | -18.54 | 21.73 | 40.00 | -18.27 | peak | |
| 3 | | 123.120 | 33.15 | -14.30 | 18.85 | 43.50 | -24.65 | peak | |
| 4 | | 144.460 | 31.26 | -13.98 | 17.28 | 43.50 | -26.22 | peak | |
| 5 | | 255.040 | 41.25 | -15.07 | 26.18 | 46.00 | -19.82 | peak | |
| 6 | | 504.330 | 30.21 | -10.62 | 19.59 | 46.00 | -26.41 | peak | |

REMARKS:

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

| | |
|------------|--------------------|
| Test Mode: | TX Mode Channel 01 |
|------------|--------------------|



| No. Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|---------|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1 * | 77.530 | 36.38 | -18.54 | 17.84 | 40.00 | -22.16 | peak | |
| 2 | 159.980 | 31.81 | -12.46 | 19.35 | 43.50 | -24.15 | peak | |
| 3 | 240.490 | 31.41 | -15.80 | 15.61 | 46.00 | -30.39 | peak | |
| 4 | 358.830 | 29.75 | -12.79 | 16.96 | 46.00 | -29.04 | peak | |
| 5 | 582.900 | 30.54 | -9.53 | 21.01 | 46.00 | -24.99 | peak | |
| 6 | 611.030 | 29.97 | -8.90 | 21.07 | 46.00 | -24.93 | peak | |

REMARKS:

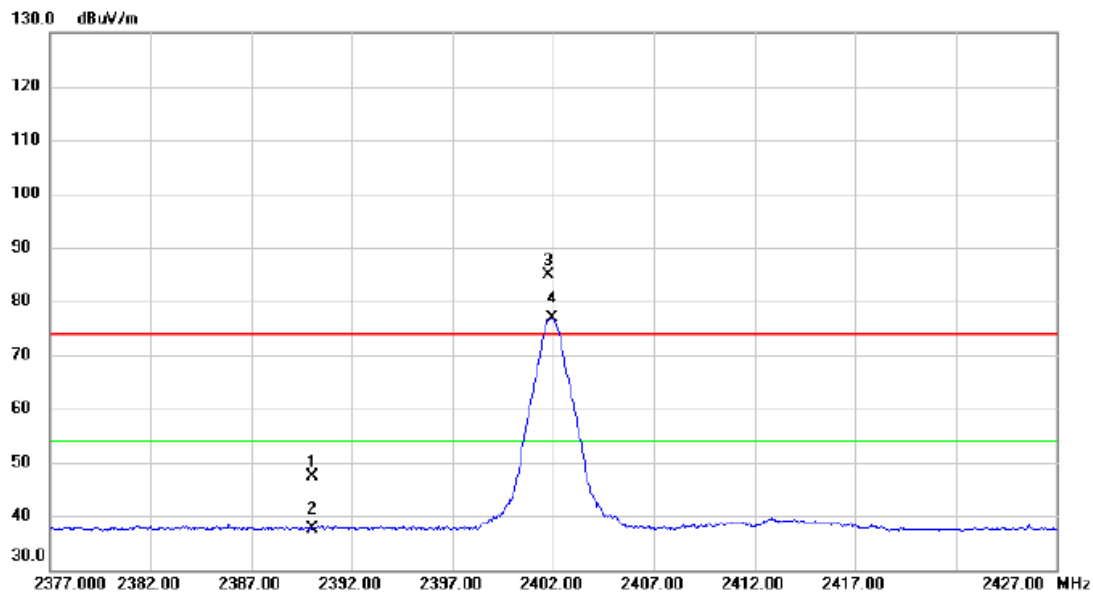
(1) Measurement Value = Reading Level + Correct Factor.

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

APPENDIX C - RADIATED EMISSION - ABOVE 1000 MHZ

Test Mode : TX Mode_ 2402 MHz _CH01

Vertical



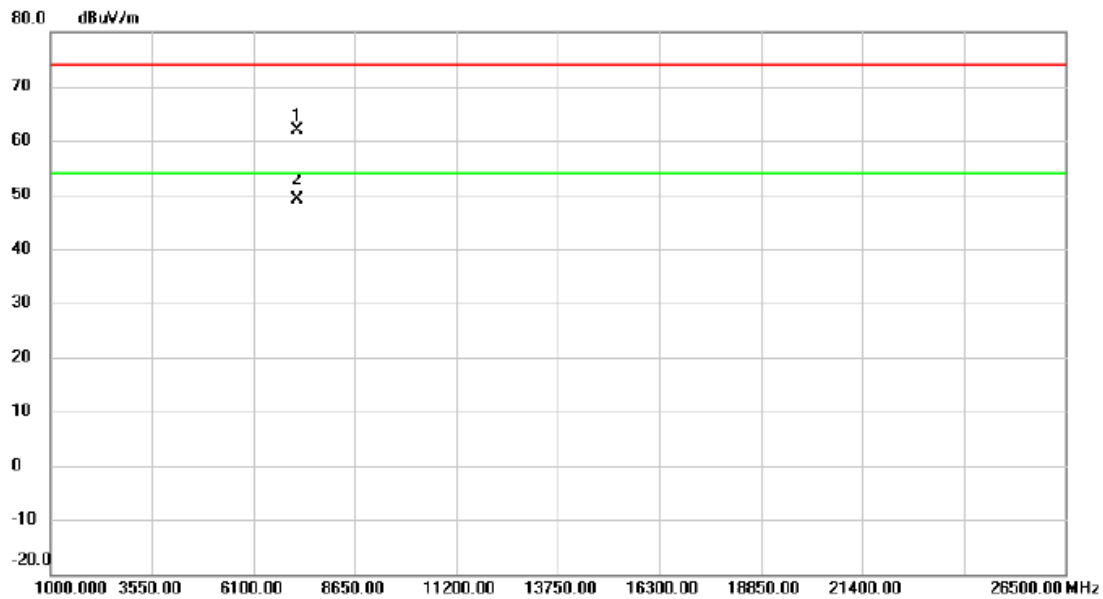
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|----------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2390.000 | 40.03 | 7.26 | 47.29 | 74.00 | -26.71 | peak | |
| 2 | | 2390.000 | 30.36 | 7.26 | 37.62 | 54.00 | -16.38 | AVG | |
| 3 | X | 2401.750 | 77.71 | 7.26 | 84.97 | 74.00 | 10.97 | peak | No Limit |
| 4 | * | 2401.950 | 69.63 | 7.26 | 76.89 | 54.00 | 22.89 | AVG | No Limit |

REMARKS:

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

Test Mode : TX Mode_ 2402 MHz _CH01

Vertical



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|---------|
| 1 | | 7205.038 | 51.68 | 10.14 | 61.82 | 74.00 | -12.18 | peak | |
| 2 | * | 7205.110 | 39.10 | 10.14 | 49.24 | 54.00 | -4.76 | AVG | |

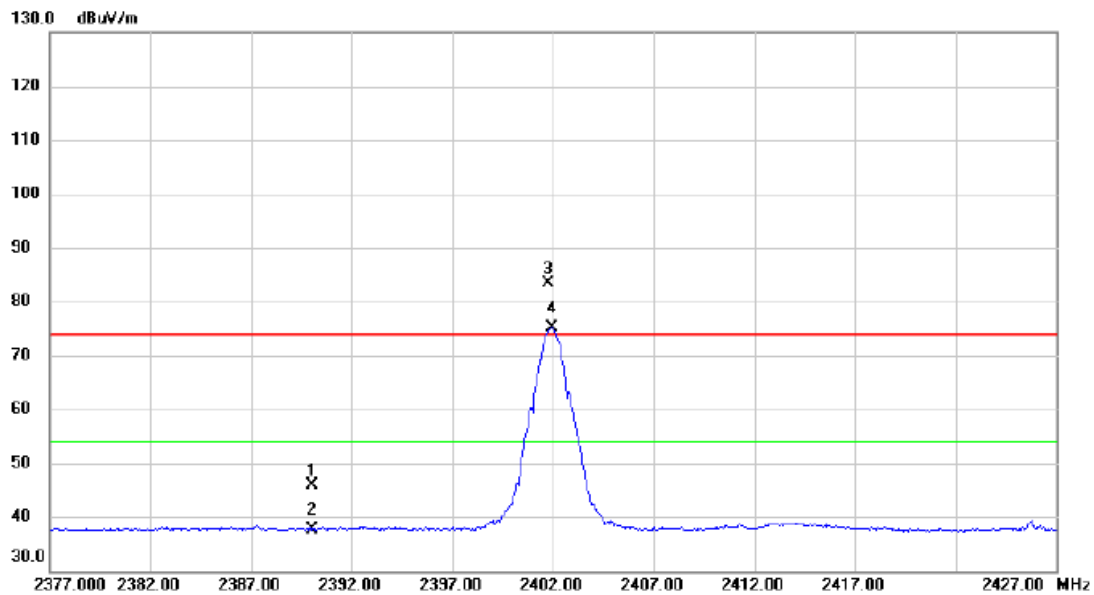
REMARKS:

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

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

Test Mode : TX Mode_ 2402 MHz _CH01

Horizontal



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1 | | 2390.000 | 38.72 | 7.26 | 45.98 | 74.00 | -28.02 | peak | |
| 2 | | 2390.000 | 30.44 | 7.26 | 37.70 | 54.00 | -16.30 | AVG | |
| 3 | X | 2401.750 | 76.11 | 7.26 | 83.37 | 74.00 | 9.37 | peak | No Limit |
| 4 | * | 2401.950 | 67.88 | 7.26 | 75.14 | 54.00 | 21.14 | AVG | No Limit |

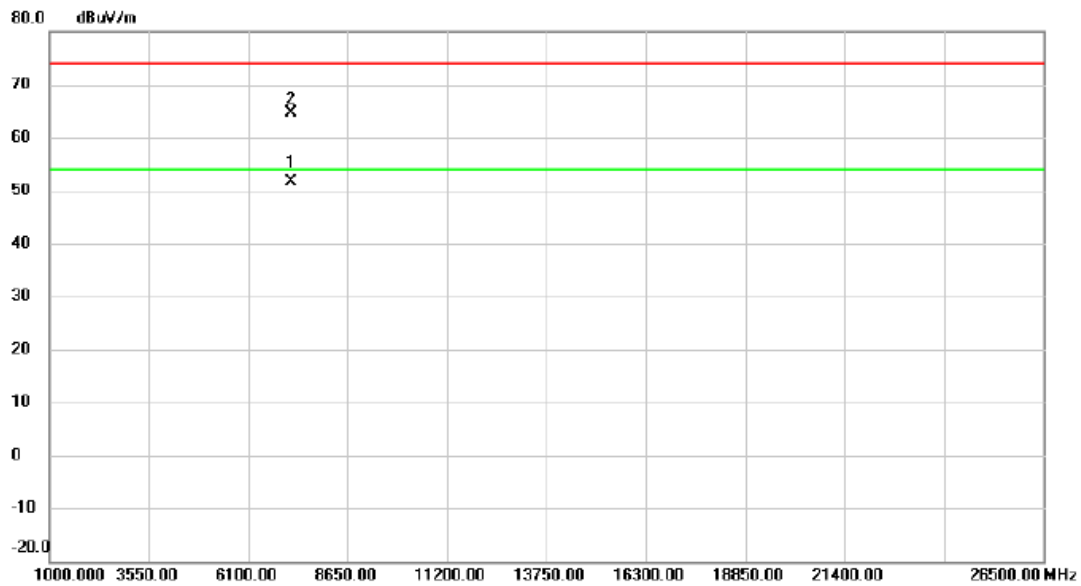
REMARKS:

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

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

Test Mode : TX Mode_ 2402 MHz _CH01

Horizontal



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 7205.100 | 41.47 | 10.14 | 51.61 | 54.00 | -2.39 | AVG | |
| 2 | | 7205.160 | 54.39 | 10.14 | 64.53 | 74.00 | -9.47 | peak | |

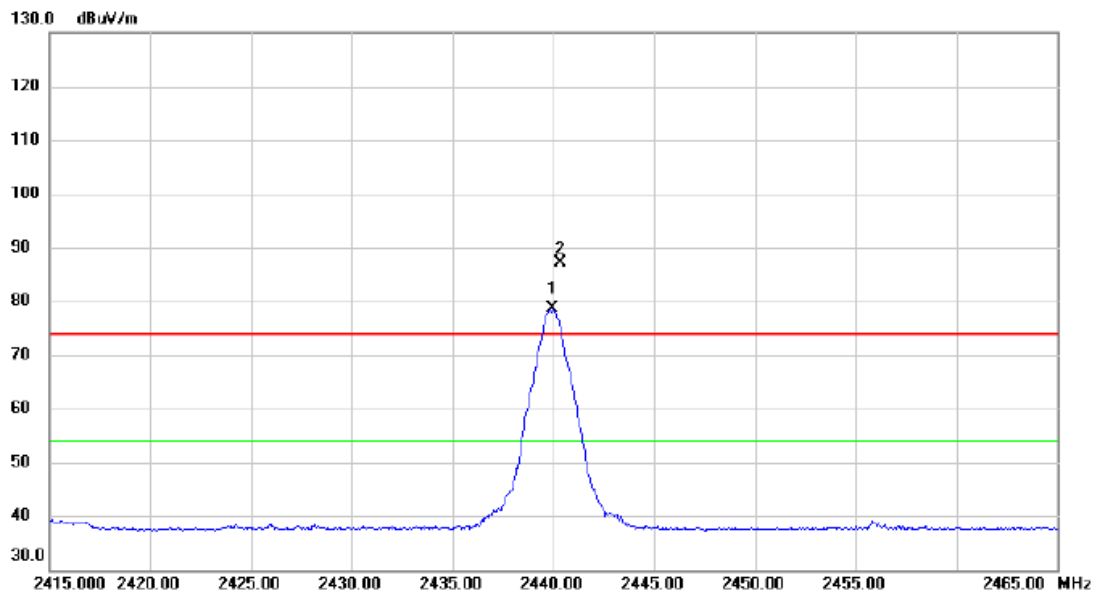
REMARKS:

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

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

Test Mode : TX Mode_ 2440 MHz _CH20

Vertical



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1 | * | 2439.950 | 71.39 | 7.25 | 78.64 | 54.00 | 24.64 | AVG | No Limit |
| 2 | X | 2440.350 | 79.76 | 7.25 | 87.01 | 74.00 | 13.01 | peak | No Limit |

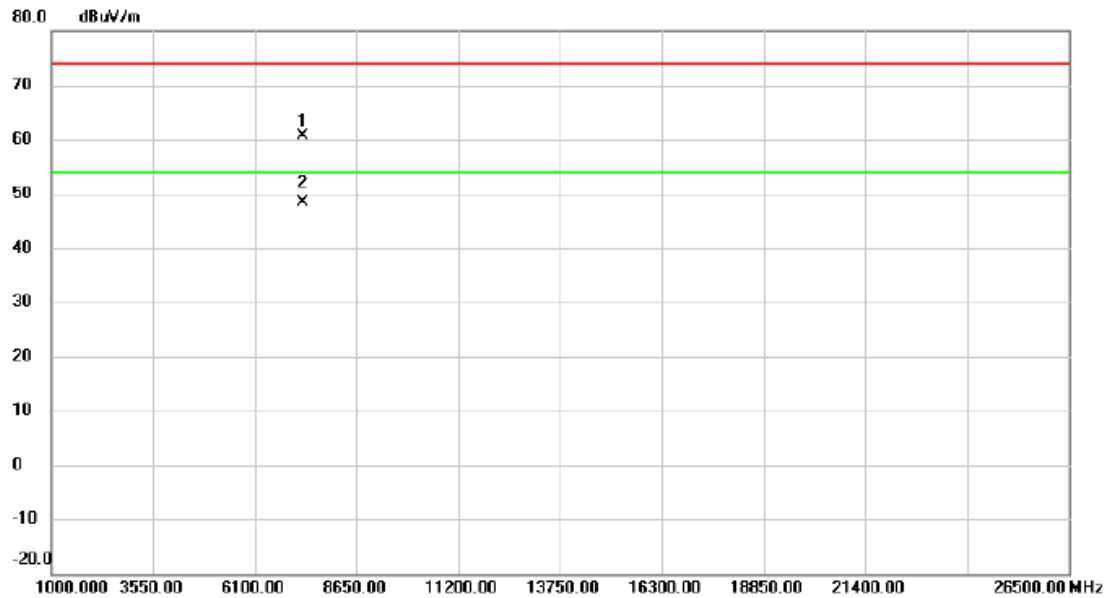
REMARKS:

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

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

Test Mode : TX Mode_ 2440 MHz _CH20

Vertical



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 7319.025 | 50.34 | 10.33 | 60.67 | 74.00 | -13.33 | peak | |
| 2 | * | 7319.035 | 38.03 | 10.33 | 48.36 | 54.00 | -5.64 | AVG | |

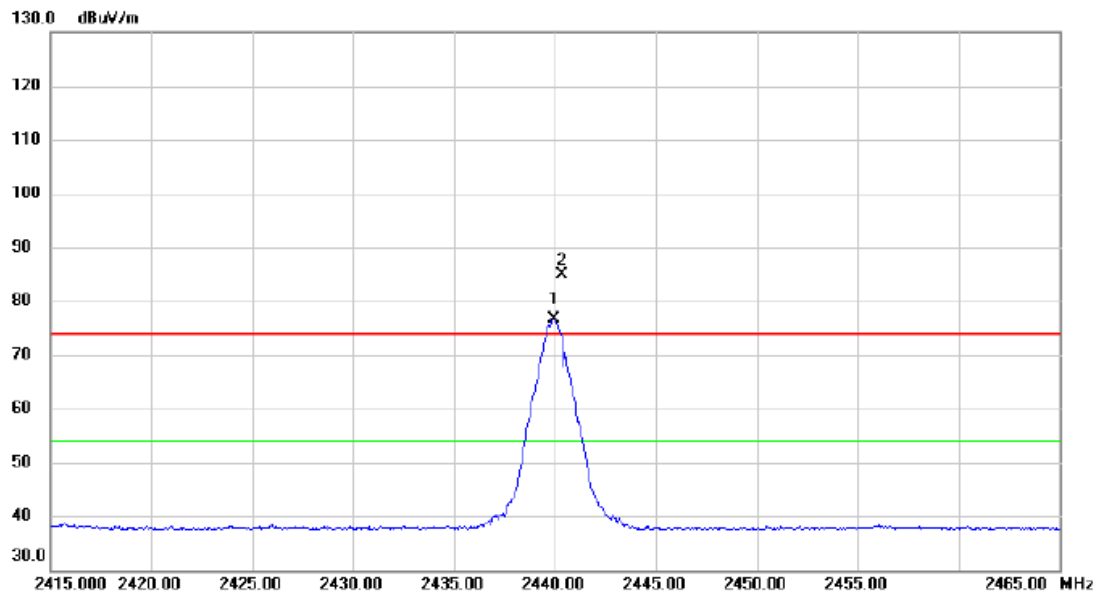
REMARKS:

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

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

Test Mode : TX Mode_ 2440 MHz _CH20

Horizontal



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1 | * | 2439.950 | 69.27 | 7.25 | 76.52 | 54.00 | 22.52 | AVG | No Limit |
| 2 | X | 2440.350 | 77.57 | 7.25 | 84.82 | 74.00 | 10.82 | peak | No Limit |

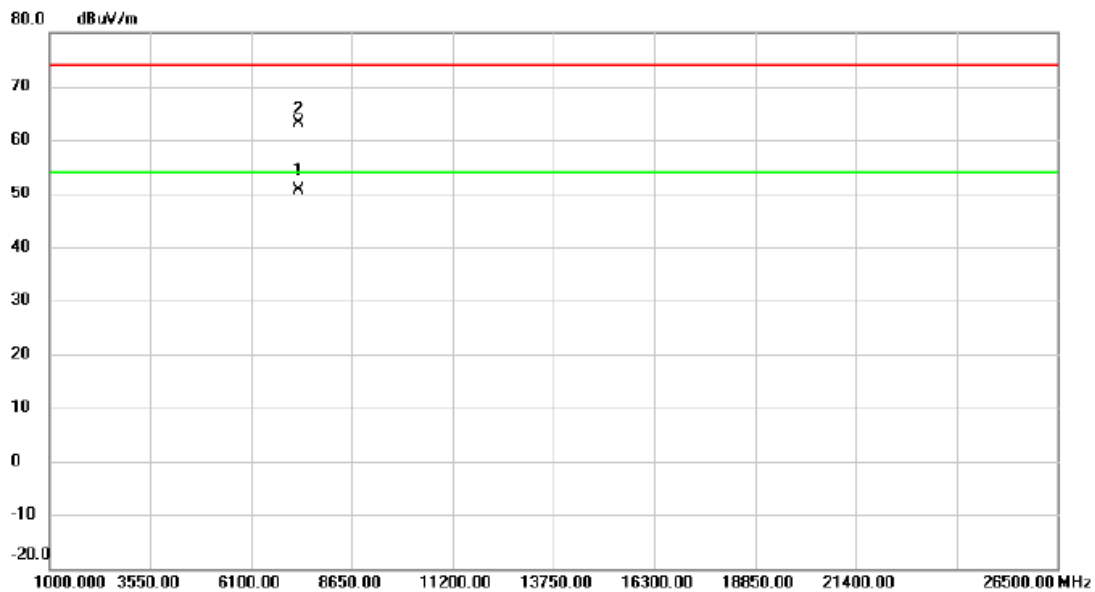
REMARKS:

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

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

Test Mode : TX Mode_ 2440 MHz _CH20

Horizontal



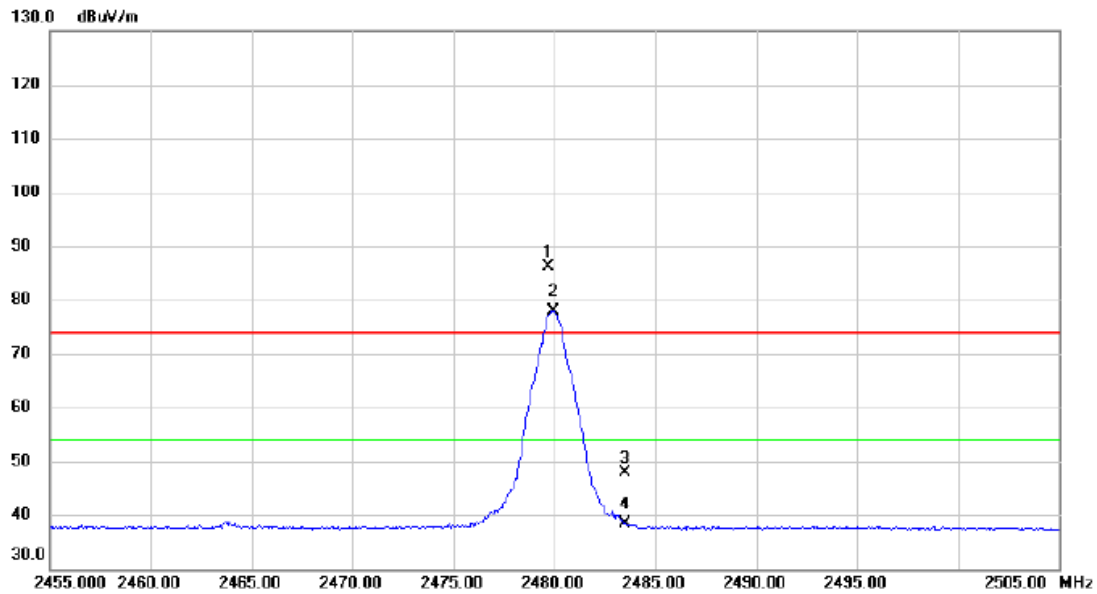
| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|--------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 7319.038 | 40.22 | 10.33 | 50.55 | 54.00 | -3.45 | AVG | |
| 2 | | 7320.945 | 52.80 | 10.33 | 63.13 | 74.00 | -10.87 | peak | |

REMARKS:

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

Test Mode : TX Mode_ 2480 MHz _CH40

Vertical



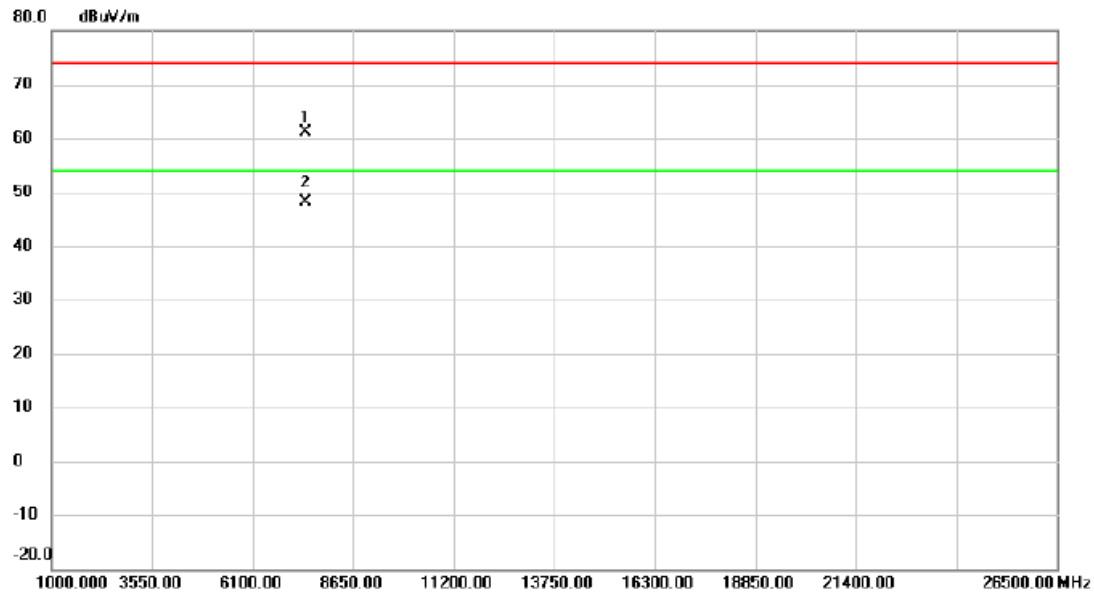
| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1 | X | 2479.700 | 79.00 | 7.25 | 86.25 | 74.00 | 12.25 | peak | No Limit |
| 2 | * | 2479.950 | 70.69 | 7.25 | 77.94 | 54.00 | 23.94 | AVG | No Limit |
| 3 | | 2483.500 | 40.52 | 7.25 | 47.77 | 74.00 | -26.23 | peak | |
| 4 | | 2483.500 | 31.16 | 7.25 | 38.41 | 54.00 | -15.59 | AVG | |

REMARKS:

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

Test Mode : TX Mode_ 2480 MHz _CH40

Vertical



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 7439.052 | 50.49 | 10.53 | 61.02 | 74.00 | -12.98 | peak | |
| 2 | * | 7439.073 | 37.69 | 10.53 | 48.22 | 54.00 | -5.78 | AVG | |

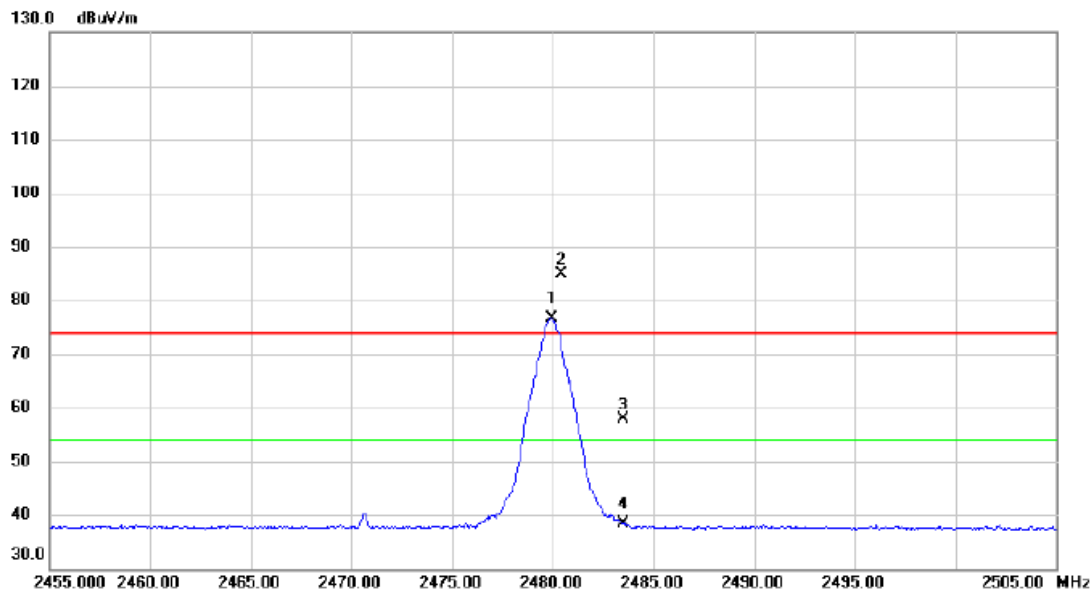
REMARKS:

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

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

Test Mode : TX Mode_ 2480 MHz _CH40

Horizontal



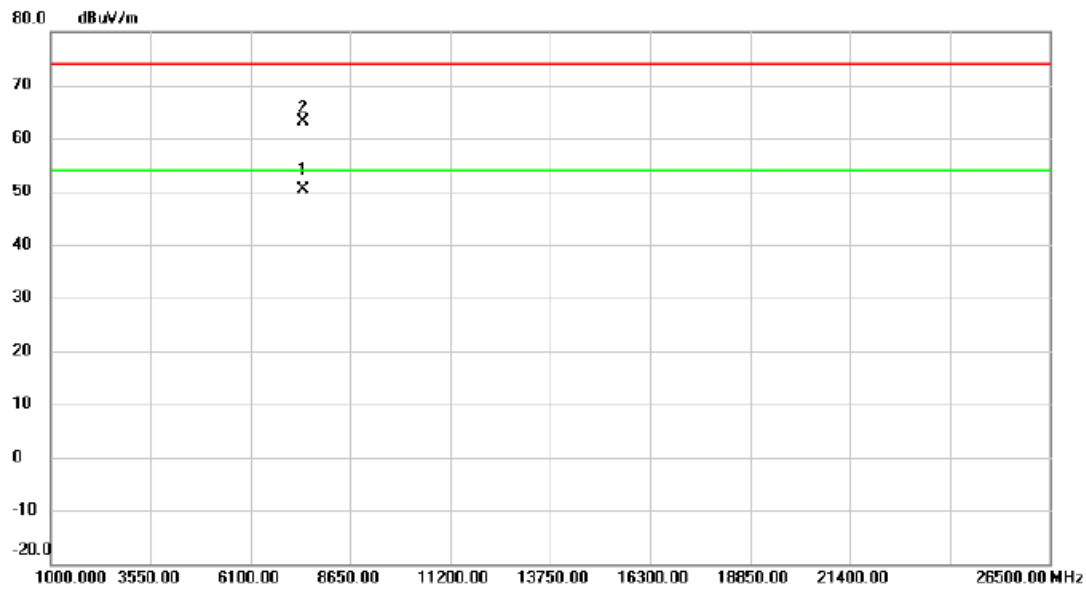
| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV/m | Limit dBuV/m | Margin dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|----------------------------|-----------------|--------------|----------|----------|
| 1 | * | 2479.950 | 69.34 | 7.25 | 76.59 | 54.00 | 22.59 | AVG | No Limit |
| 2 | X | 2480.400 | 77.67 | 7.25 | 84.92 | 74.00 | 10.92 | peak | No Limit |
| 3 | | 2483.500 | 50.54 | 7.25 | 57.79 | 74.00 | -16.21 | peak | |
| 4 | | 2483.500 | 31.11 | 7.25 | 38.36 | 54.00 | -15.64 | AVG | |

REMARKS:

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

Test Mode : TX Mode_ 2480 MHz _CH40

Horizontal



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Margin | | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | * | 7439.012 | 39.73 | 10.53 | 50.26 | 54.00 | -3.74 | AVG | |
| 2 | | 7440.998 | 52.56 | 10.54 | 63.10 | 74.00 | -10.90 | peak | |

REMARKS:

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

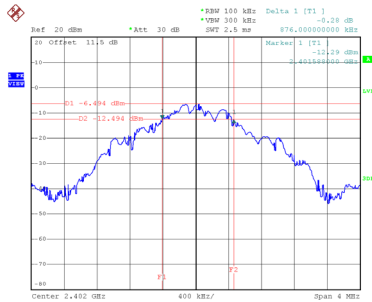
(2) Margin Level = Measurement Value - Limit Value.

APPENDIX D - BANDWIDTH

| | |
|------------|-------------------|
| Test Mode: | CH01, CH20 , CH40 |
|------------|-------------------|

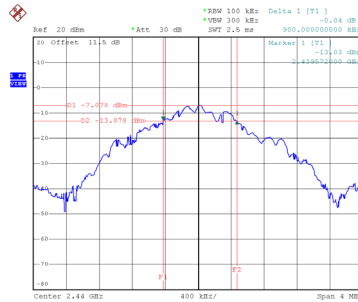
| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | 99 % Emission Bandwidth (MHz) | 6 dB Bandwidth Min. Limit (kHz) | Test Result |
|---------|-----------------|----------------------|-------------------------------|---------------------------------|-------------|
| 01 | 2402 | 0.876 | 2.048 | 500 | Pass |
| 20 | 2440 | 0.900 | 2.072 | 500 | Pass |
| 40 | 2480 | 0.896 | 2.112 | 500 | Pass |

CH01



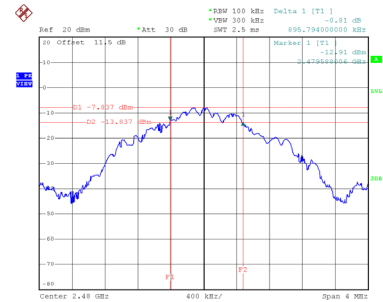
Date: 24.NOV.2020 09:59:12

6 dB Bandwidth
CH20



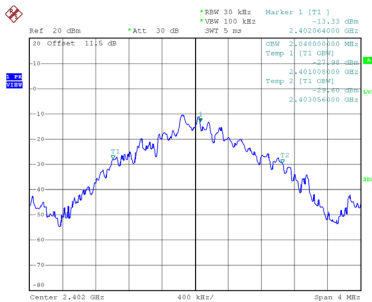
Date: 24.NOV.2020 10:07:45

CH40

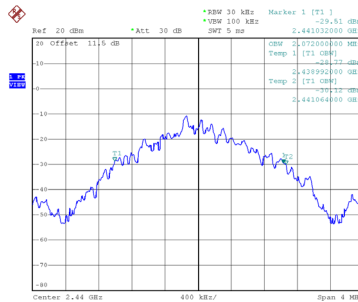


Date: 24.NOV.2020 09:46:33

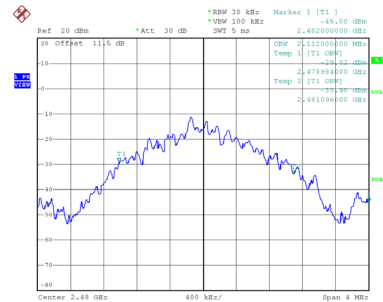
99 % Emission Bandwidth



Date: 24.NOV.2020 09:57:44



Date: 24.NOV.2020 10:08:22



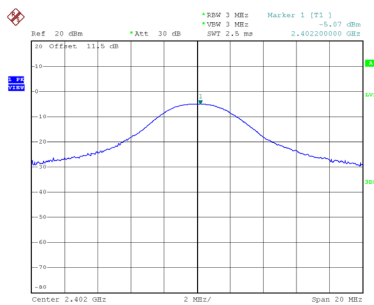
Date: 24.NOV.2020 09:47:47

APPENDIX E - MAXIMUM OUTPUT POWER

| | |
|------------|------------------|
| Test Mode: | CH00, CH20, CH40 |
|------------|------------------|

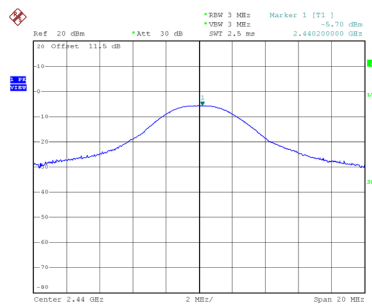
| Frequency (MHz) | Output Power (dBm) | Output Power (W) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|-----------------|--------------------|------------------|------------------|----------------|-------------|
| 2402 | -5.07 | 0.0003 | 30.00 | 1.00 | Pass |
| 2440 | -5.70 | 0.0003 | 30.00 | 1.00 | Pass |
| 2480 | -6.10 | 0.0002 | 30.00 | 1.00 | Pass |

CH01



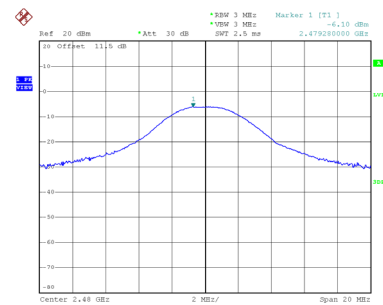
Date: 24.NOV.2020 10:05:05

CH20



Date: 24.NOV.2020 10:14:15

CH40

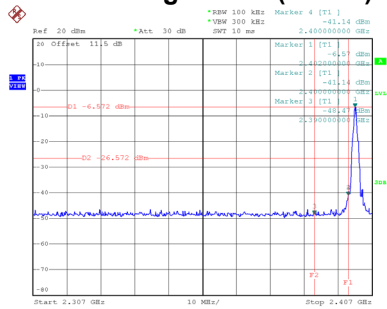


Date: 24.NOV.2020 09:55:54

APPENDIX F - CONDUCTED SPURIOUS EMISSION

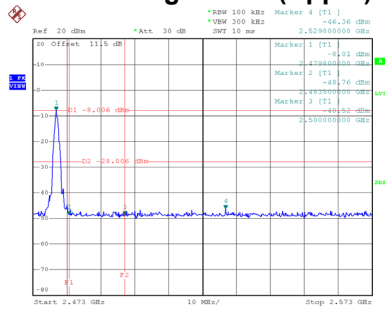
Test Mode: CH01, CH20, CH40

Bandedge CH01 (Lower)



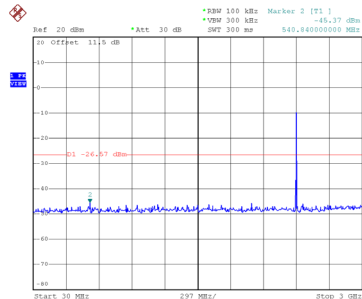
Date: 24.NOV.2020 09:59:50

Bandedge CH40 (Upper)

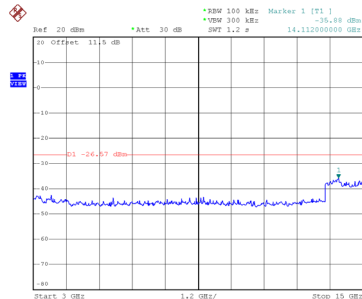


Date: 24.NOV.2020 09:48:43

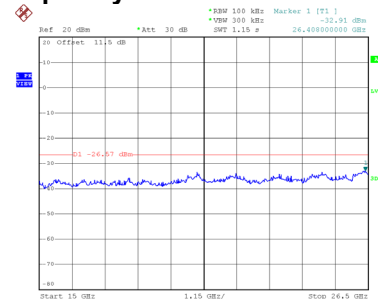
CH01 – 10th Harmonic of the fundamental frequency



Date: 24.NOV.2020 10:00:34

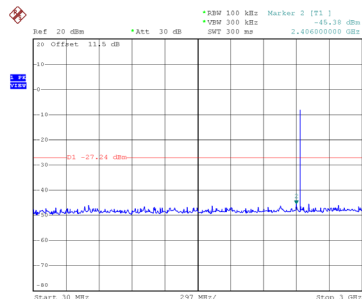


Date: 24.NOV.2020 10:01:13

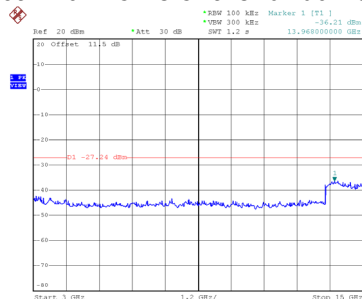


Date: 24.NOV.2020 10:01:52

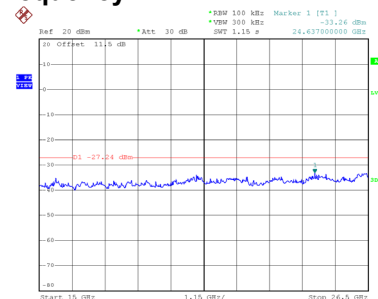
CH20 – 10th Harmonic of the fundamental frequency



Date: 24.NOV.2020 10:09:44

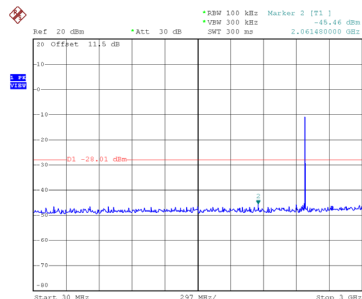


Date: 24.NOV.2020 10:10:23

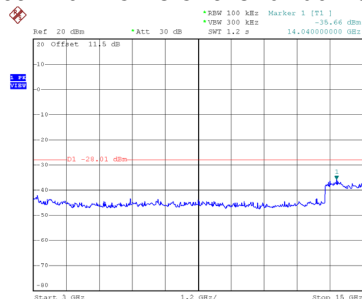


Date: 24.NOV.2020 10:11:02

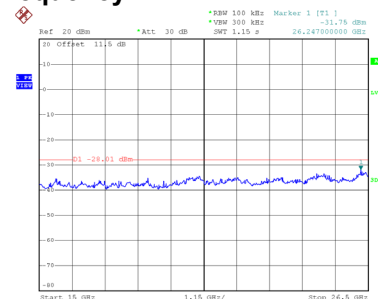
CH40 – 10th Harmonic of the fundamental frequency



Date: 24.NOV.2020 09:49:45



Date: 24.NOV.2020 09:50:24

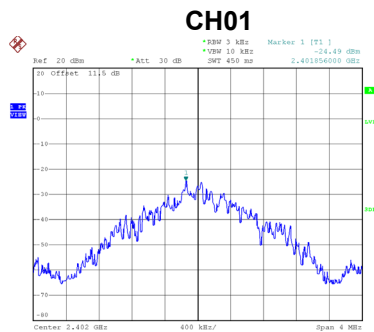


Date: 24.NOV.2020 09:51:02

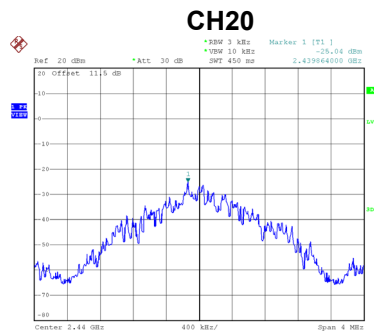
APPENDIX G - POWER SPECTRAL DENSITY

| | |
|------------|-------------------|
| Test Mode: | CH01, CH20 , CH40 |
|------------|-------------------|

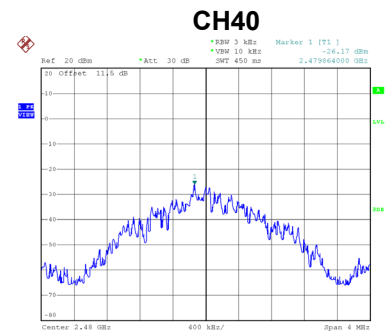
| Channel | Frequency (MHz) | Power Spectral Density (dBm/3 kHz) | Max. Limit (dBm/3 kHz) | Test Result |
|---------|-----------------|------------------------------------|------------------------|-------------|
| 01 | 2402 | -24.49 | 8.00 | Pass |
| 20 | 2440 | -25.04 | 8.00 | Pass |
| 40 | 2480 | -26.17 | 8.00 | Pass |



Date: 24.NOV.2020 10:02:59



Date: 24.NOV.2020 10:12:08



Date: 24.NOV.2020 09:51:39

End of Test Report