# FCC Radio Test Report

## FCC ID: KA2CHS162A1

**This report concerns: Original Grant**

| | | |
|---|---|---|
| **Project No.** | : | 2009H044 |
| **Equipment** | : | DCH-S162 A1 |
| **Brand Name** | : | D-Link |
| **Test Model** | : | DCH-S162 A1 |
| **Series Model** | : | N/A |
| **Applicant** | : | D-Link Corporation |
| **Address** | : | 17595 Mt. Herrmann，Fountain Valley,California United State 92708 |
| **Manufacturer** | : | D-Link Corporation |
| **Address** | : | 17595 Mt. Herrmann，Fountain Valley,California United State 92708 |
| **Factory** | : | LEEDARSON LIGHTING CO., LTD. |
| **Address** | : | Xingtai Industrial Zone,Economic Development Zone, Changtai County,Zhangzhou City, Fujian Province, P.R.China |
| **Date of Receipt** | : | Oct. 23, 2020 |
| **Date of Test** | : | Oct. 23, 2020~Dec. 02, 2020 |
| **Issued Date** | : | Dec. 14, 2020 |
| **Report Version** | : | R00 |
| **Test Sample** | : | Engineering Sample No.: SH2020111669/SH2020111670 |
| **Standard(s)** | : | FCC Part15, Subpart C (15.247)<br>ANSI C63.10-2013<br>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.

Maker Qi

**Prepared by :** Maker Qi

Ryan. Wang

**Approved by :** Ryan Wang

Certificate # 5123.03

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**Declaration**

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

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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 |

## 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 | APPENDIX A | PASS | ------ |
| 15.247(d)<br>15.205(a)<br>15.209(a) | Radiated Emissions | APPENDIX B<br>APPENDIX C<br>APPENDIX D | PASS | ------ |
| 15.247(a)(2) | Bandwidth | APPENDIX E | PASS | ------ |
| 15.247(b)(3) | Maximum Output Power | APPENDIX F | PASS | ------ |
| 15.247(d) | Conducted Spurious Emission | APPENDIX G | PASS | ------ |
| 15.247(e) | Power Spectral Density | APPENDIX H | PASS | ------ |
| 15.203 | Antenna Requirement | ------ | PASS | ------ |

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. 29, Jintang Road, Tangzhen Industry Park, Pudong New Area, Shanghai 201210,China
BTL's Test Firm Registration Number for FCC: 476765
BTL's Designation Number for FCC: CN1241

## 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 test:

| Test Site | Method | Measurement Frequency Range | Ant. H / V | U, (dB) |
|---|---|---|---|---|
| SH-CB01 | CISPR | 9 KHz~30 MHz | V | 3.79 |
| | | 9 KHz~30 MHz | H | 3.57 |
| | | 30 MHz~200 MHz | V | 4.04 |
| | | 30 MHz~200 MHz | H | 3.76 |
| | | 200 MHz~1,000 MHz | V | 4.24 |
| | | 200 MHz~1,000 MHz | H | 3.84 |
| | | 1 GHz~18 GHz | V | 4.46 |
| | | 1 GHz~18 GHz | H | 4.40 |
| | | 18 GHz~40 GHz | V | 3.95 |
| | | 18 GHz~40 GHz | H | 3.95 |

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

## 1.3 TEST ENVIRONMENT CONDITIONS

| Test Item | Temperature | Humidity | Test Voltage | Tested By |
|---|---|---|---|---|
| AC Power Line Conducted Emissions | 25°C | 54% | AC 120V/60Hz | Joven Xiong |
| Radiated Emissions-9K-30MHz | 24°C | 58% | AC 120V/60Hz | Forest Li |
| Radiated Emissions-30 MHz to 1GHz | 24°C | 58% | AC 120V/60Hz | Forest Li |
| Radiated Emissions-Above 1000 MHz | 24°C | 58% | AC 120V/60Hz | Forest Li |
| Bandwidth | 23°C | 62% | AC 120V/60Hz | Danny Dang |
| Maximum Output Power & e.i.r.p. | 23°C | 62% | AC 120V/60Hz | Danny Dang |
| Conducted Spurious Emission | 23°C | 62% | AC 120V/60Hz | Danny Dang |
| Power Spectral Density | 23°C | 62% | AC 120V/60Hz | Danny Dang |

# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF EUT

| | |
|---|---|
| Equipment | DCH-S162 A1 |
| Brand Name | D-Link |
| Test Model | DCH-S162 A1 |
| Series Model | N/A |
| Model Difference(s) | N/A |
| Software Version | V1.00.07 |
| Hardware Version | V2.0 |
| Power Source | AC Power supplied. |
| Power Rating | AC100~240V 50/60Hz |
| Operation Frequency | 2402 MHz ~ 2480 MHz |
| Modulation Technology | GFSK |
| Bit Rate of Transmitter | 1Mbps |
| Max. Output Power | 4.74 dBm (0.0030 W) For 1Mbps |

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 | Model Name | Antenna Type | Connector | Gain (dBi) |
|---|---|---|---|---|---|
| 1 | N/A | N/A | Loop | N/A | 1.86 |

Note:

The antenna gain is provided by the manufacturer.

## 2.2 DESCRIPTION OF TEST MODES

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

| Pretest Mode | Description |
|---|---|
| Mode 1 | TX Mode NOTE (1) |
| Mode 2 | TX Mode Channel 00 _1Mbps |

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

| **AC power line conducted emissions test** | |
|---|---|
| Final Test Mode | Description |
| Mode 2 | TX Mode Channel 00 _1Mbps |

| **Radiated emissions test - Below 1GHz** | |
|---|---|
| Final Test Mode | Description |
| Mode 2 | TX Mode Channel 00 _1Mbps |

| **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.

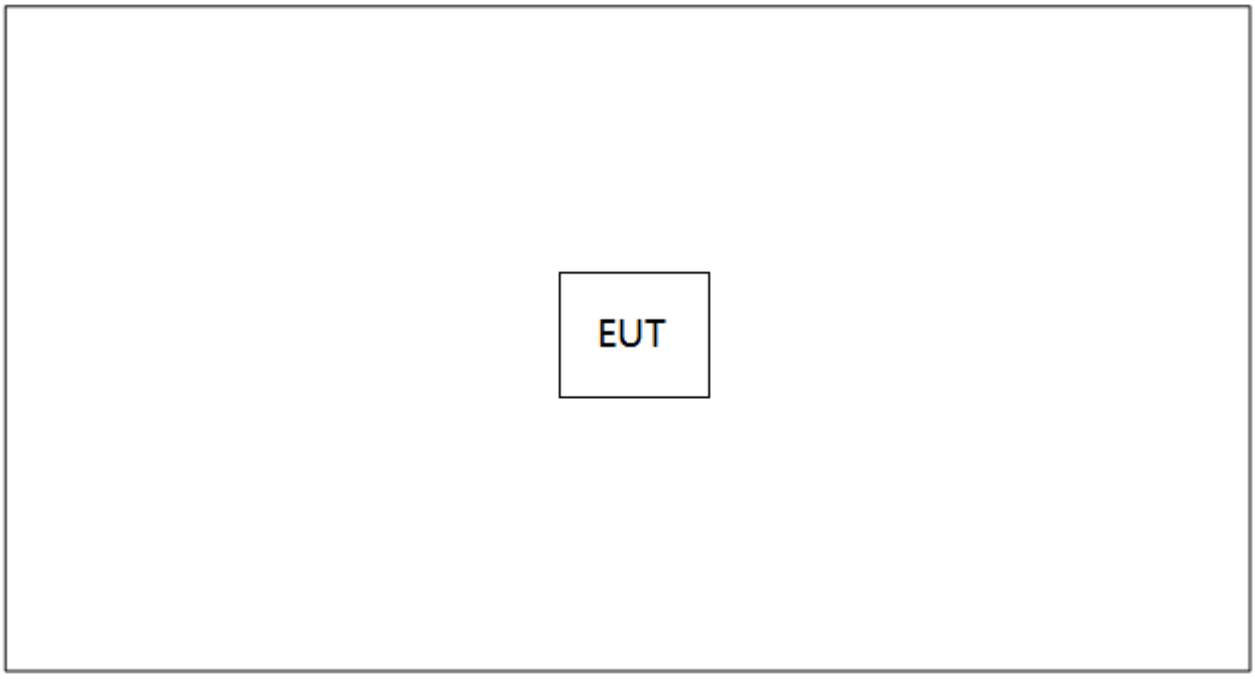
(2) For radiated emission above 1 GHz test, 1GHz~26.5GHz have been pre-tested and in this report only recorded the worst case. The remaining spurious points are all below the limit value of 20dB.

## 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 of BT LE

| Test Software | RTLBTAPP-5.2.2.27 | | |
|---|---|---|---|
| Frequency (MHz) | 2402 | 2440 | 2480 |
| Parameters(1Mbps) | default | default | default |

## 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. AC POWER LINE CONDUCTED EMISSIONS TEST

### 3.1 LIMIT

| Frequency of Emission (MHz) | Limit (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 to 56* | 56 to 46* |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note:

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

The following table is the setting of the receiver

| Receiver Parameters | Setting |
|---|---|
| Attenuation | 10 dB |
| Start Frequency | 0.15 MHz |
| Stop Frequency | 30 MHz |
| IF Bandwidth | 9 kHz |

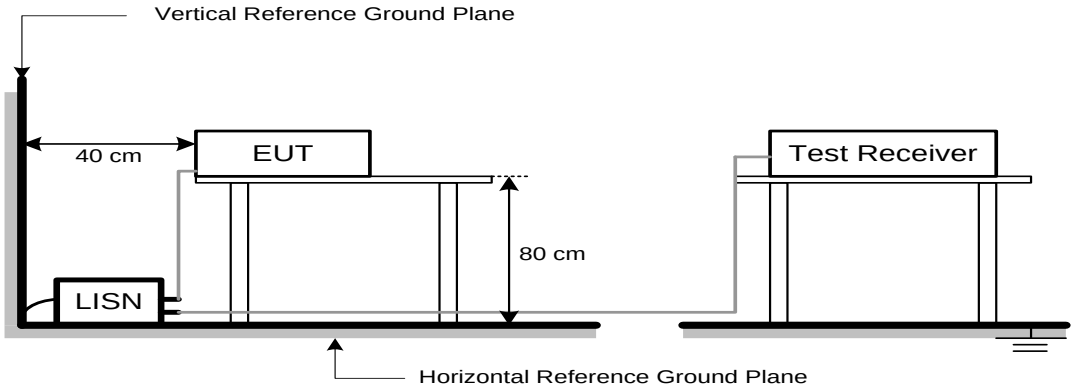
### 3.2 TEST PROCEDURE

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

### 3.3 DEVIATION FROM TEST STANDARD

No deviation

## 3.4 TEST SETUP




## 3.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

## 3.6 TEST RESULTS

Please refer to the APPENDIX A.

Remark:

(1) All readings are QP Mode value unless otherwise stated AVG in column of『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemed to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform.In this case, a " * " marked in AVG Mode column of Interference Voltage Measured.

(2) Measuring frequency range from 150 kHz to 30 MHz.

## 4. RADIATED EMISSION TEST

### 4.1 LIMIT

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

LIMITS OF RADIATED EMISSION MEASUREMENT (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).

(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

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

## 4.2 TEST PROCEDURE

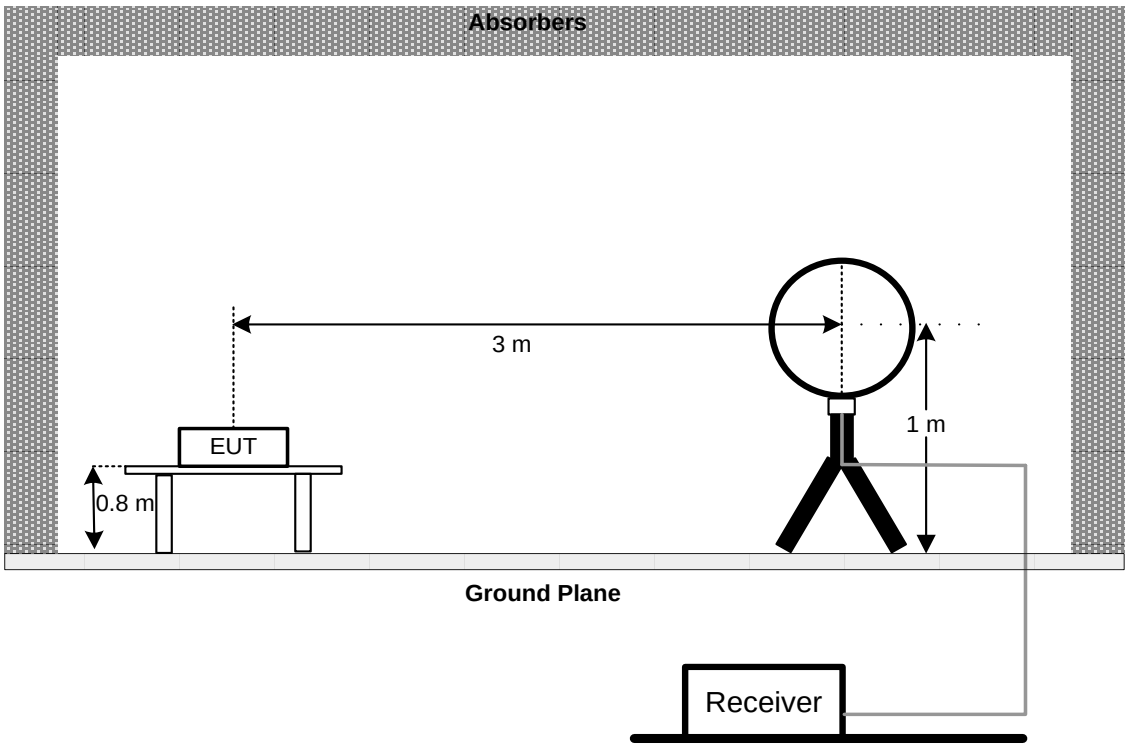
a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1 GHz)
b. The measuring distance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

## 4.3 DEVIATION FROM TEST STANDARD

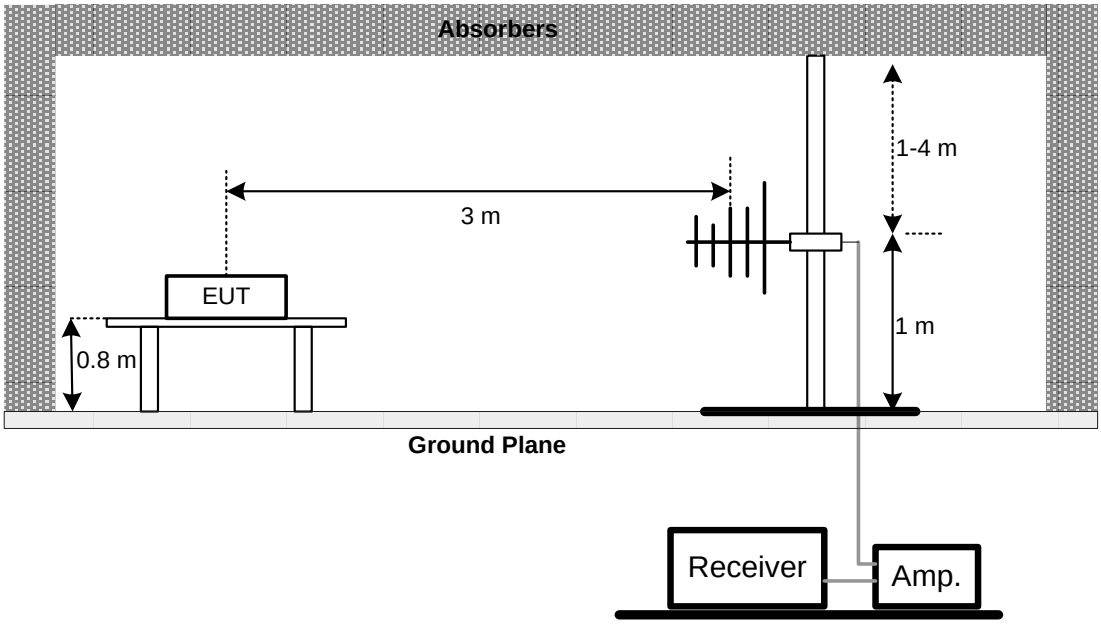
No deviation

## 4.4 TEST SETUP

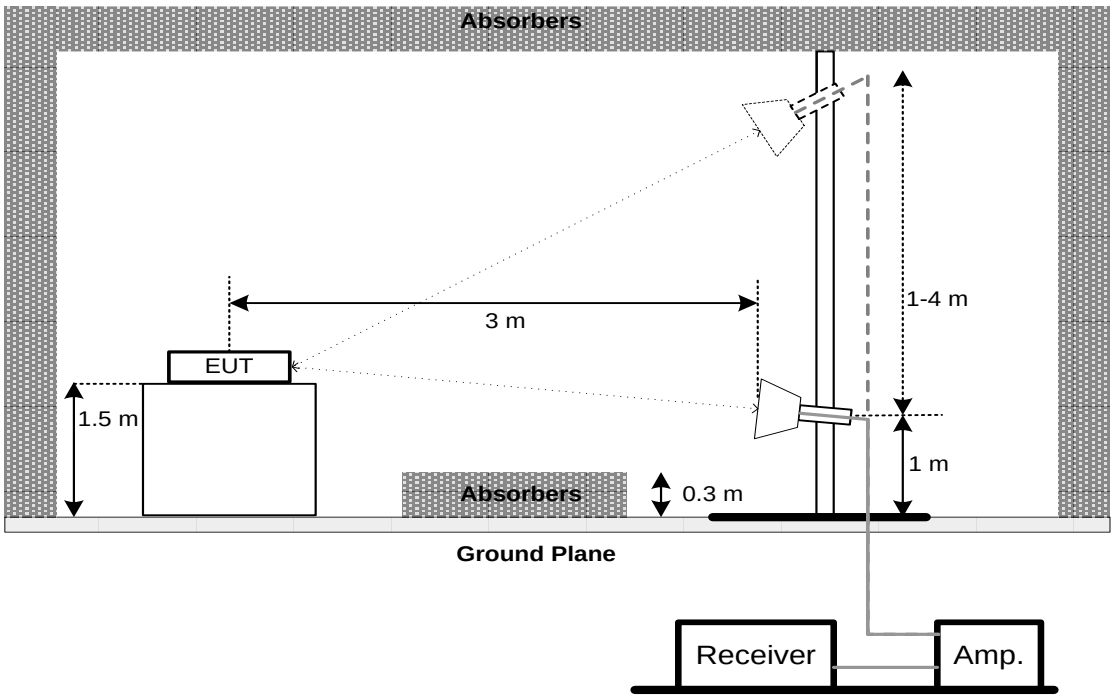
**9 kHz-30 MHz**




**30 MHz to 1 GHz**



**Above 1 GHz**


Absorbers
3 m
1-4 m
EUT
1.5 m
Absorbers
0.3 m
1 m
Ground Plane


Receiver
Amp.

## 4.5 EUT OPERATING CONDITIONS

The EUT was programmed to be in continuously transmitting mode.

## 4.6 TEST RESULT - 9 kHz TO 30 MHz

Please refer to the APPENDIX B

Remark:

(1) Distance extrapolation factor = 40 log (specific distance / test distance) (dB).
(2) Limit line = specific limits (dBuV) + distance extrapolation factor.

## 4.7 TEST RESULT - 30 MHz TO 1000 MHz

Please refer to the APPENDIX C.

## 4.8 TEST RESULT - ABOVE 1000 MHz

Please refer to the APPENDIX D.

Remark:

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

## 5. BANDWIDTH TEST

### 5.1 LIMIT

| FCC Part15, Subpart C (15.247) | | |
|---|---|---|
| Section | Test Item | Limit |
| 15.247(a)(2) | Bandwidth | >= 500 kHz<br>(6 dB bandwidth) |

### 5.2 TEST PROCEDURE

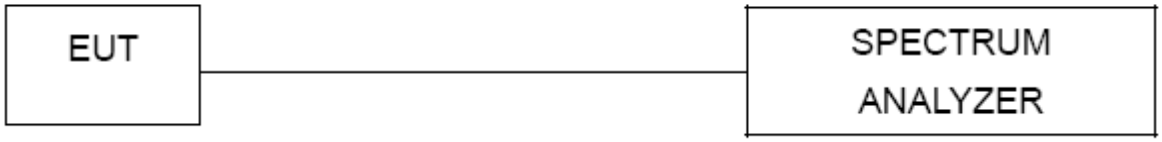
a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.

b. Spectrum Setting : RBW= 100 kHz, VBW=300 kHz, Sweep time = 2.5 ms.

### 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 E.

## 6. MAXIMUM OUTPUT POWER

### 6.1 LIMIT

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

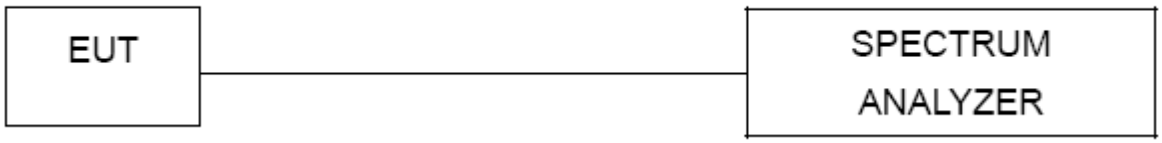
### 6.2 TEST PROCEDURE

a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
b. The maximum conducted output power was performed in accordance with method 11.9.1.1 (for peak power) or 11.9.2.2 (for AVG power) of ANSI C63.10-2013.

### 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 F.

# 7. CONDUCTED SPURIOUS EMISSION

## 7.1 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.

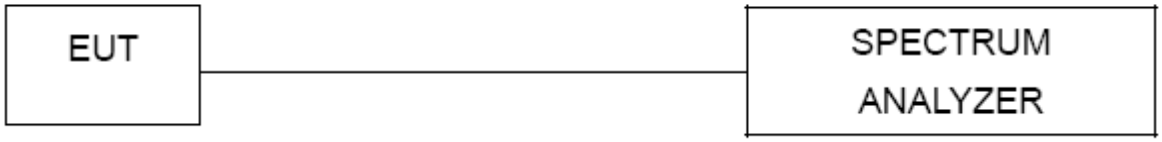
## 7.2 TEST PROCEDURE

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= 100 kHz, VBW=300 kHz, 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 G.

# 8. POWER SPECTRAL DENSITY TEST

## 8.1 LIMIT

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

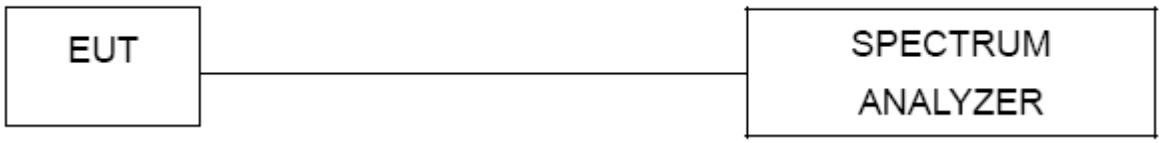
## 8.2 TEST PROCEDURE

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

## 8.3 DEVIATION FROM STANDARD

No deviation.

## 8.4 TEST SETUP




## 8.5 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.

## 8.6 TEST RESULTS

Please refer to the APPENDIX H.

## 9. MEASUREMENT INSTRUMENTS LIST

| AC Power Line Conducted Emissions | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Line Impedance Stabilisation Network | Schwarzbeck | NNLK 8121 | 8121-822 | Mar. 21, 2021 |
| 2 | TWO-LINE V-NETWORK | R&S | ENV216 | 101340 | Aug. 23, 2021 |
| 3 | Test Cable | emci | EMCRG400-BM-NM-10000 | 170628 | Jul. 15, 2021 |
| 4 | EMI Test Receiver | R&S | ESCI | 100082 | Mar. 21, 2021 |
| 5 | 50Ω Terminator | SHX | TF2-1G-A | 17051602 | Mar. 21, 2021 |
| 6 | 50Ω coaxial switch | Anritsu | MP59B | 6201750902 | Mar. 21, 2021 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |

| Radiated Emissions - 30 MHz to 1 GHz | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | TRILOG Broadband Antenna | Schwarzbeck | VULB 9168 | 719 | Apr. 02, 2021 |
| 2 | Pre-Amplifier | emci | EMC9135 | 980400 | Mar. 21, 2021 |
| 3 | MXE EMI Receiver | Keysight | N9038A | MY57150106 | Mar. 21, 2021 |
| 4 | Test Cable | emci | EMC104-SM-SM-7000 | 170330 | Apr. 13, 2021 |
| 5 | Test Cable | emci | EMC104-SM-SM-1000 | 170331 | Apr. 13, 2021 |
| 6 | Test Cable | emci | EMC104-SM-NM-3500 | 170621 | Apr. 13, 2021 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |

| Radiated Emissions - Above 1 GHz | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Double-Ridged Waveguide Horn Antenna | ETS-Lindgren | 9120D | 00206960 | Apr. 02, 2021 |
| 2 | Pre-Amplifier | emci | EMC012645SE | 980421 | May. 11, 2021 |
| 3 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480545 | Mar. 21, 2021 |
| 4 | Test Cable | emci | EMC104-SM-SM-7000 | 170330 | Apr. 13, 2021 |
| 5 | Test Cable | emci | EMC104-SM-SM-1000 | 170331 | Apr. 13, 2021 |
| 6 | Test Cable | emci | EMC104-SM-NM-3500 | 170621 | Apr. 13, 2021 |
| 7 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |
| 8 | MXE EMI Receiver | Keysight | N9038A | MY57150106 | May. 06, 2021 |
| 9 | Double-Ridged Waveguide Horn Antenna | ETS-Lindgren | 3116C | 00203919 | Jul. 20, 2021 |
| 10 | Pre-Amplifier | emci | EMC184045SE | 980409 | Mar. 21, 2021 |
| 11 | EXA Spectrum Analyzer | Keysight | N9010A | MY56480579 | Mar. 21, 2021 |
| 12 | Test Cable | emci | EMC102-KM-KM-800 | 170654 | Apr. 13, 2021 |
| 13 | Test Cable | emci | Super Reliable-40G-SS11-7000 | W0030860001 | Apr. 13, 2021 |
| 14 | Measurement Software | Farad | EZ-EMC Ver.NB-03A1-01 | N/A | N/A |

| Bandwidth | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP40 | 100626 | May. 06, 2021 |

| Maximum Output Power | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Peak Power Analyze | Keysight | 8990B | MY51000507 | Mar. 21, 2021 |
| 2 | Wideband Power Sensor | Keysight | N9123A | MY58310003 | Mar. 21, 2021 |

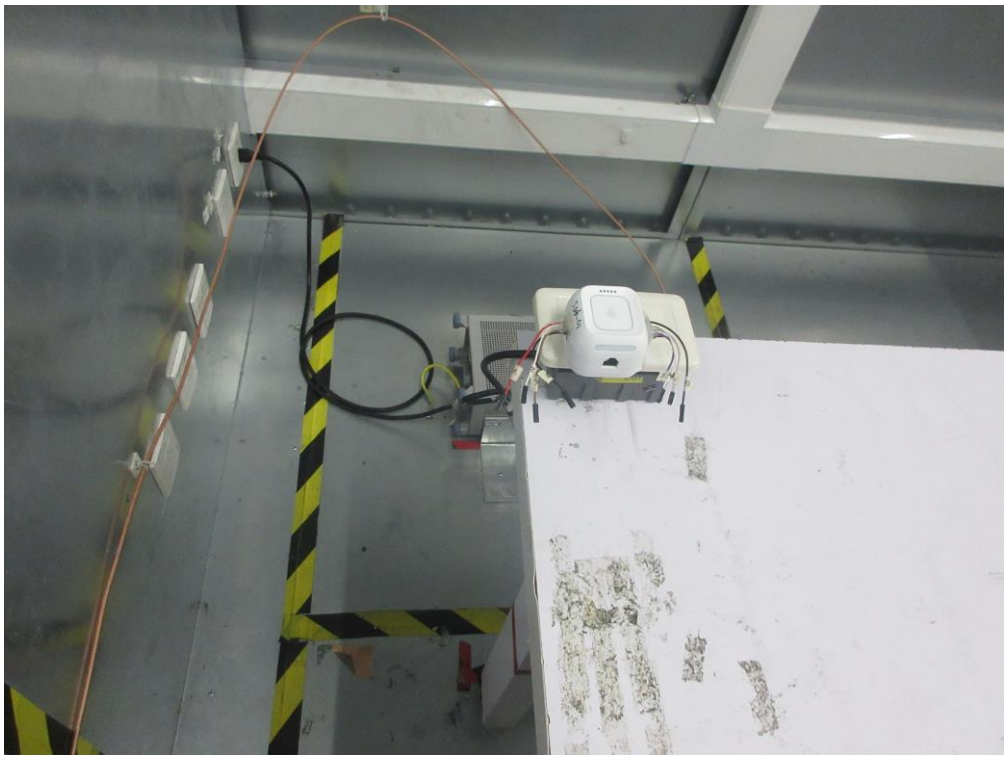
| Antenna Conducted Spurious Emissions | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP40 | 100626 | May. 06, 2021 |

| Power Spectral Density | | | | | |
|---|---|---|---|---|---|
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
| 1 | Spectrum Analyzer | R&S | FSP40 | 100626 | May. 06, 2021 |

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

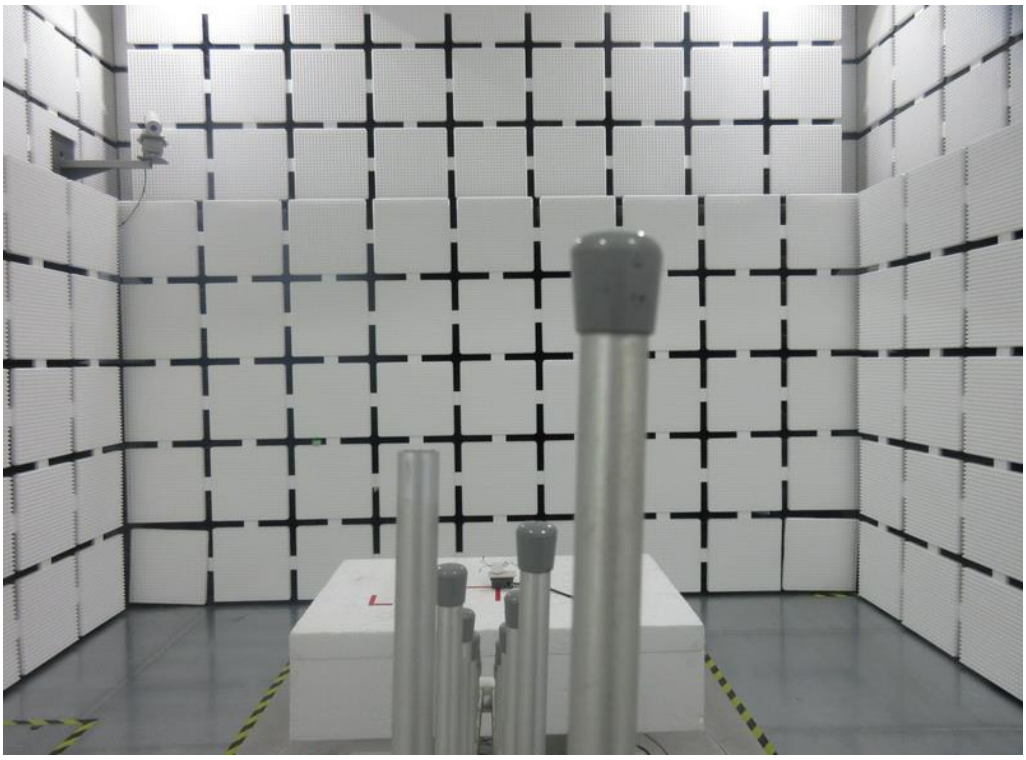
## 10. EUT TEST PHOTO

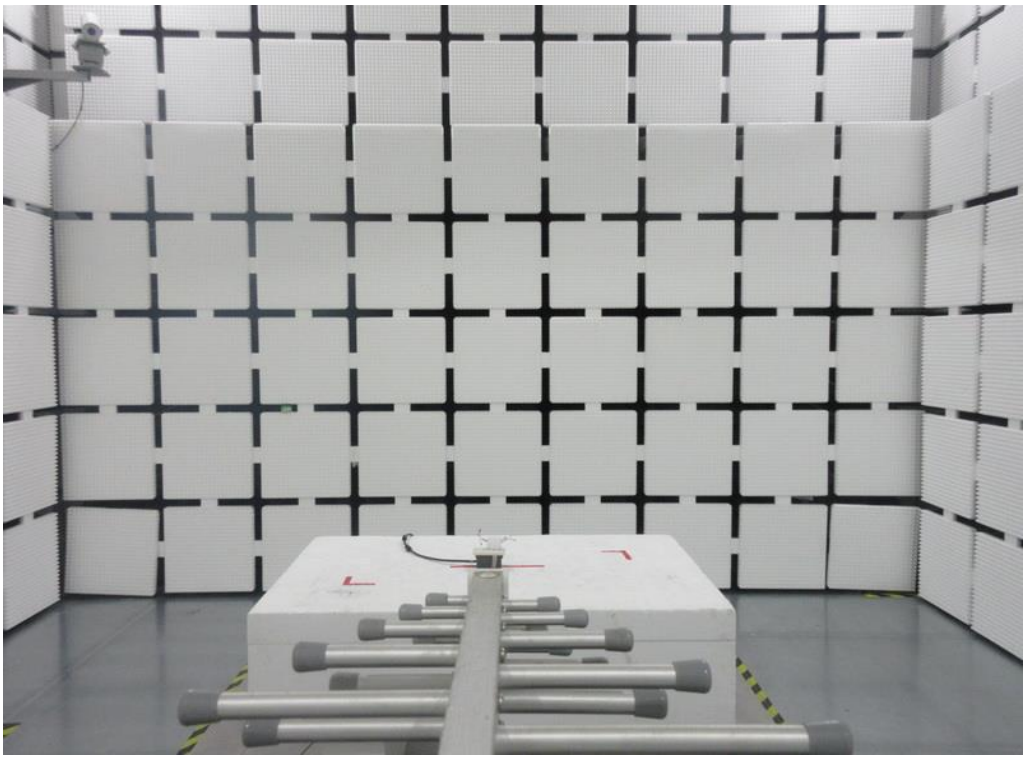
**Conducted Emissions Test Photos**



**Radiated Emissions Test Photos**

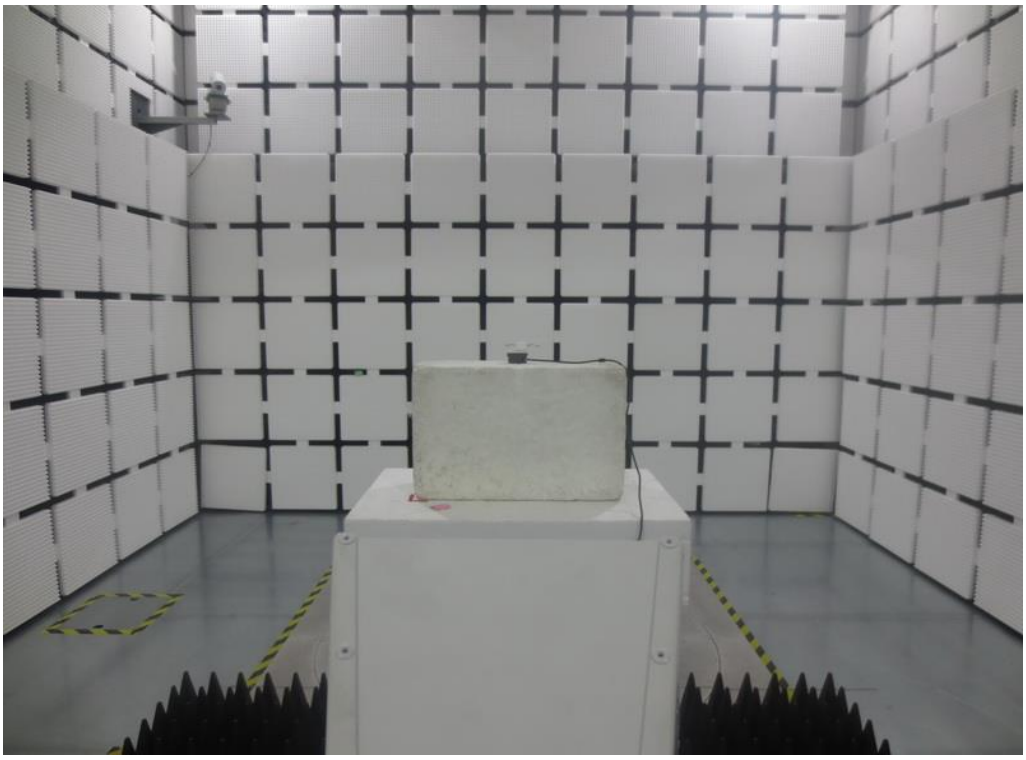
**30 MHz to 1000 MHz**

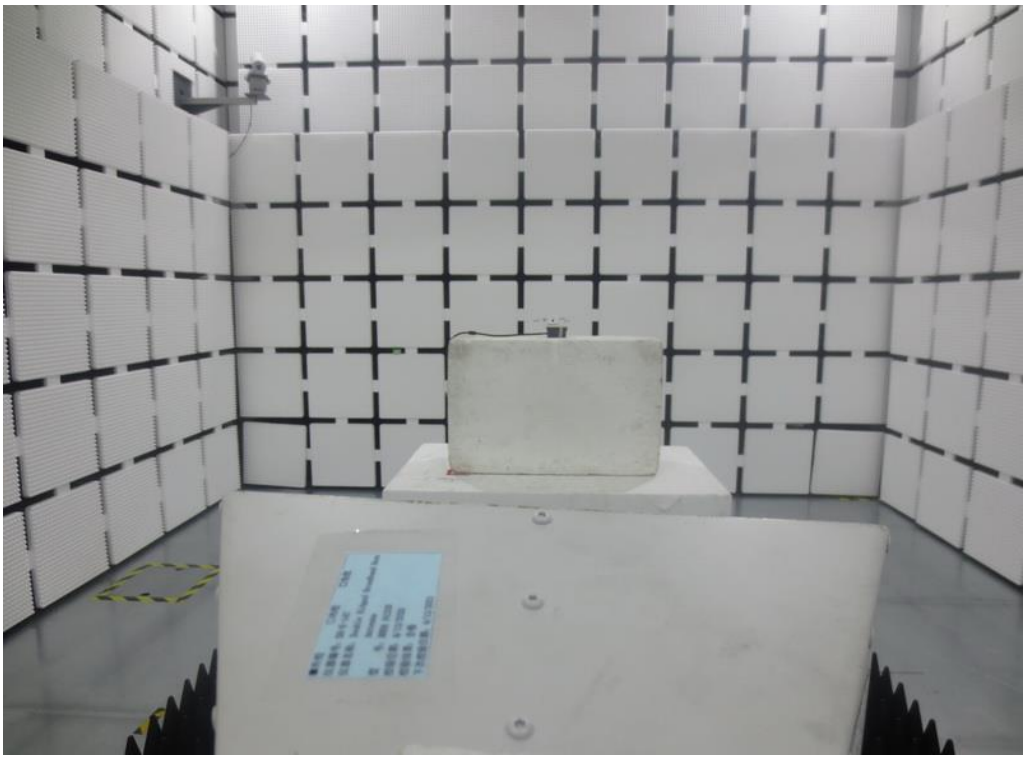




**Radiated Emissions Test Photos**

**Above 1 GHz**

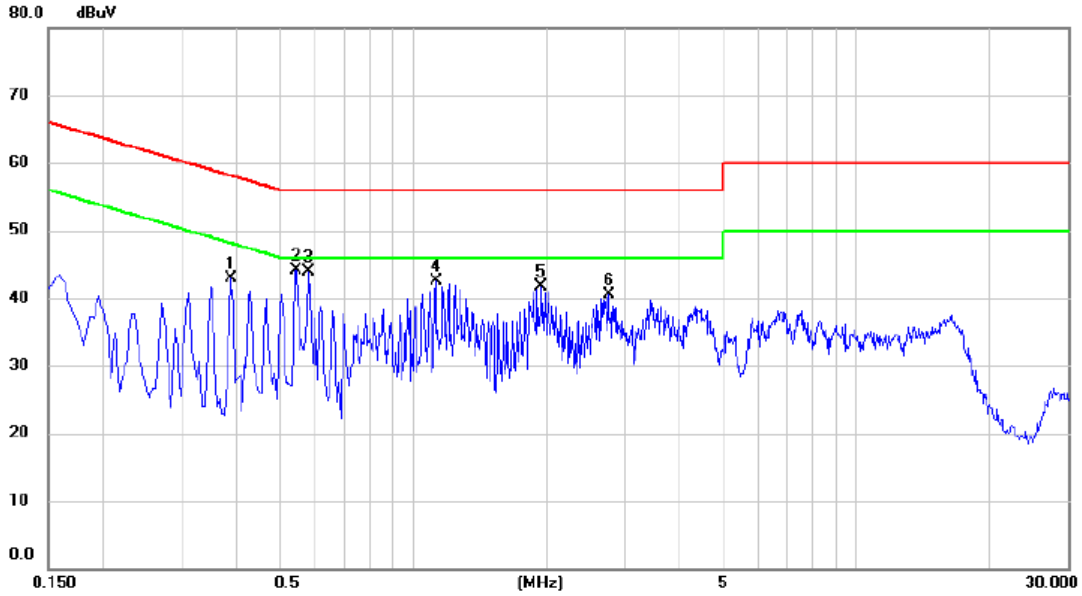




# APPENDIX A - AC POWER LINE CONDUCTED EMISSIONS

| Test Mode: | TX Mode Channel 00 _1Mbps |
|---|---|

**Line**

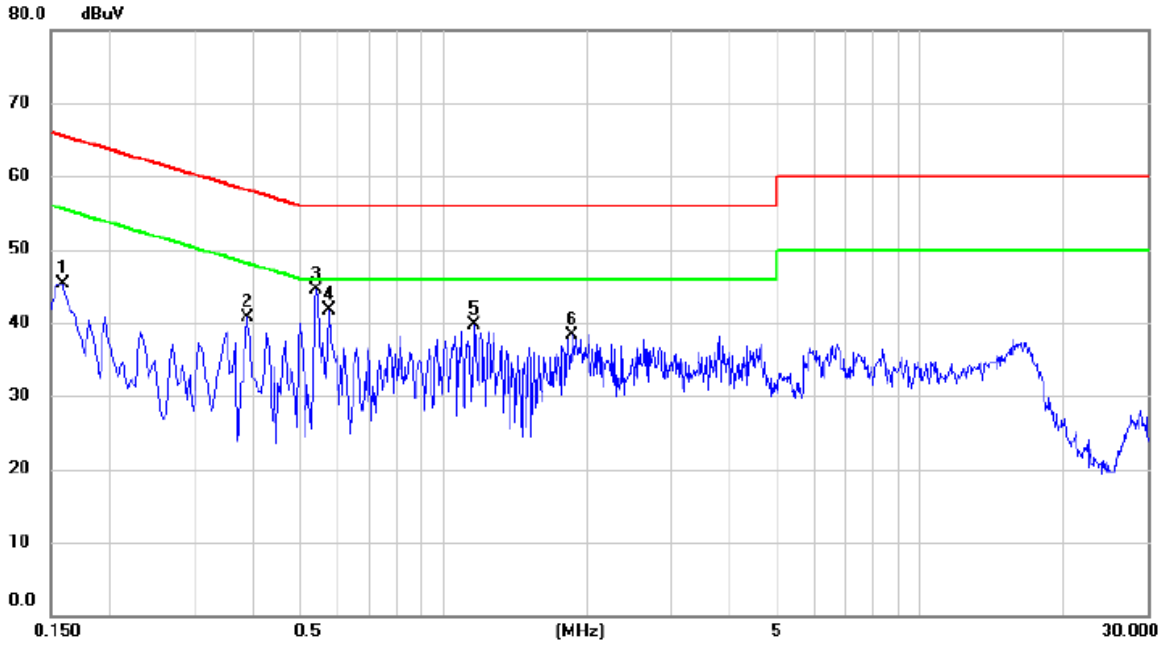



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.3885 | 33.11 | 9.78 | 42.89 | 58.10 | -15.21 | peak | |
| 2 | * | 0.5460 | 34.37 | 9.80 | 44.17 | 56.00 | -11.83 | peak | |
| 3 | | 0.5820 | 34.13 | 9.81 | 43.94 | 56.00 | -12.06 | peak | |
| 4 | | 1.1265 | 32.68 | 9.85 | 42.53 | 56.00 | -13.47 | peak | |
| 5 | | 1.9410 | 31.84 | 9.90 | 41.74 | 56.00 | -14.26 | peak | |
| 6 | | 2.7645 | 30.53 | 9.95 | 40.48 | 56.00 | -15.52 | peak | |

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

| Test Mode: | TX Mode Channel 00 _1Mbps |
|---|---|

**Neutral**




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector | Comment |
| 1 | | 0.1590 | 35.70 | 9.69 | 45.39 | 65.52 | -20.13 | peak | |
| 2 | | 0.3885 | 30.98 | 9.76 | 40.74 | 58.10 | -17.36 | peak | |
| 3 | * | 0.5415 | 34.80 | 9.78 | 44.58 | 56.00 | -11.42 | peak | |
| 4 | | 0.5775 | 31.96 | 9.79 | 41.75 | 56.00 | -14.25 | peak | |
| 5 | | 1.1625 | 29.94 | 9.83 | 39.77 | 56.00 | -16.23 | peak | |
| 6 | | 1.8645 | 28.45 | 9.87 | 38.32 | 56.00 | -17.68 | peak | |

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

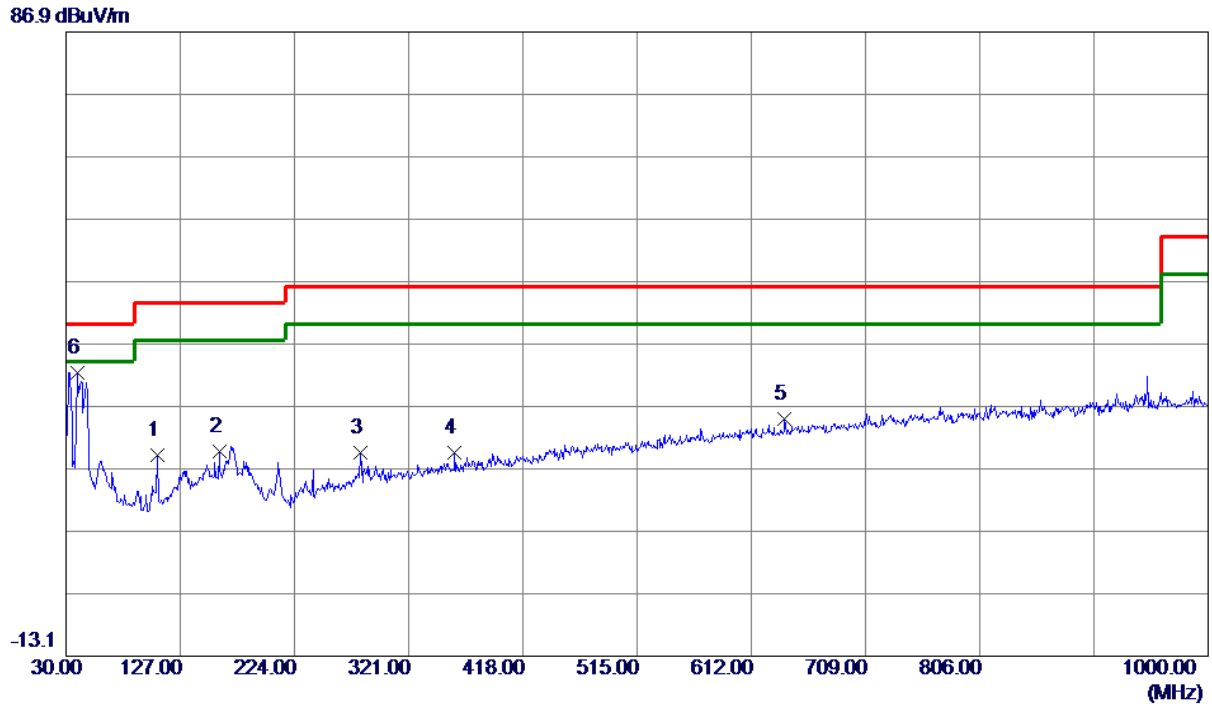
# APPENDIX B - RADIATED EMISSION - 9 KHZ TO 30 MHZ

Note: The measured value have enough margin over 20dB than the limit, therefore they are not reported.

# APPENDIX C - RADIATED EMISSION - 30 MHZ TO 1000 MHZ

| Test Mode: | TX Mode Channel 00 _1Mbps |
|---|---|

**Vertical**

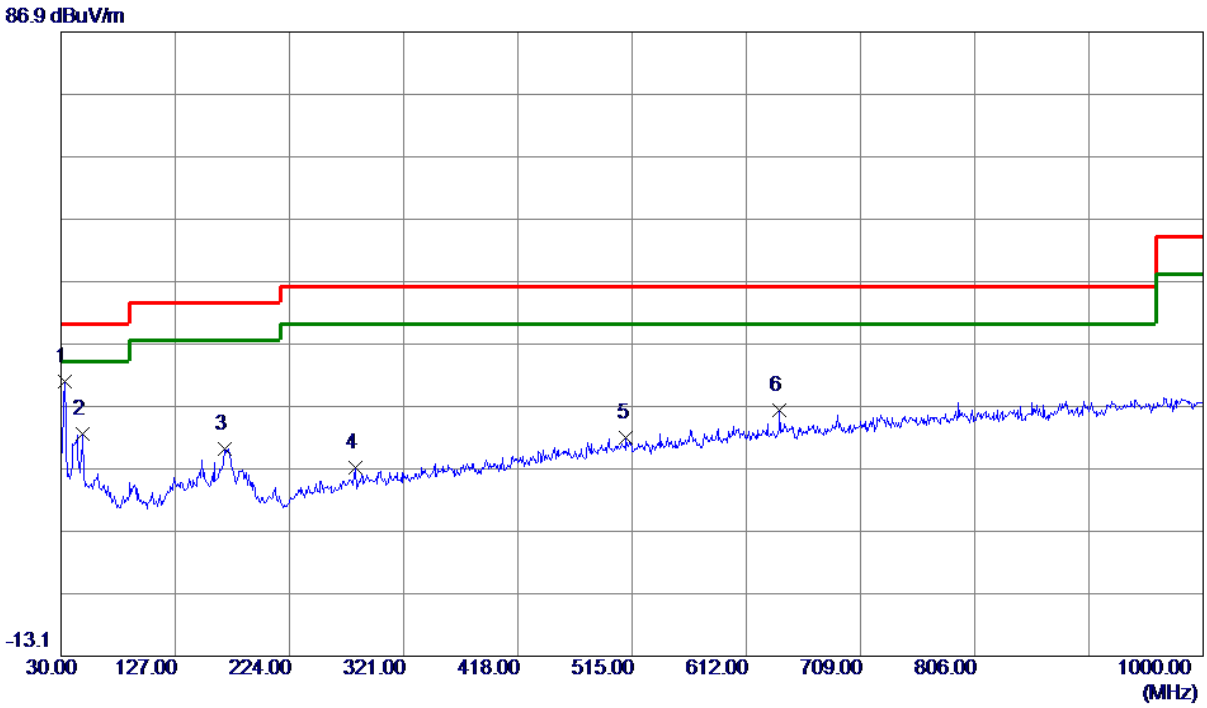



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 107.6000 | 39.12 | -20.06 | 19.06 | 43.50 | -24.44 | Peak | |
| 2 | 159.9800 | 35.71 | -16.05 | 19.66 | 43.50 | -23.84 | Peak | |
| 3 | 280.2600 | 35.66 | -16.08 | 19.58 | 46.00 | -26.42 | Peak | |
| 4 | 359.8000 | 33.96 | -14.37 | 19.59 | 46.00 | -26.41 | Peak | |
| 5 | 640.1300 | 33.50 | -8.67 | 24.83 | 46.00 | -21.17 | Peak | |
| 6 * | 39.2150 | 49.85 | -17.49 | 32.36 | 40.00 | -7.64 | Peak | |

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

| Test Mode: | TX Mode Channel 00 _1Mbps |
|---|---|

**Horizontal**



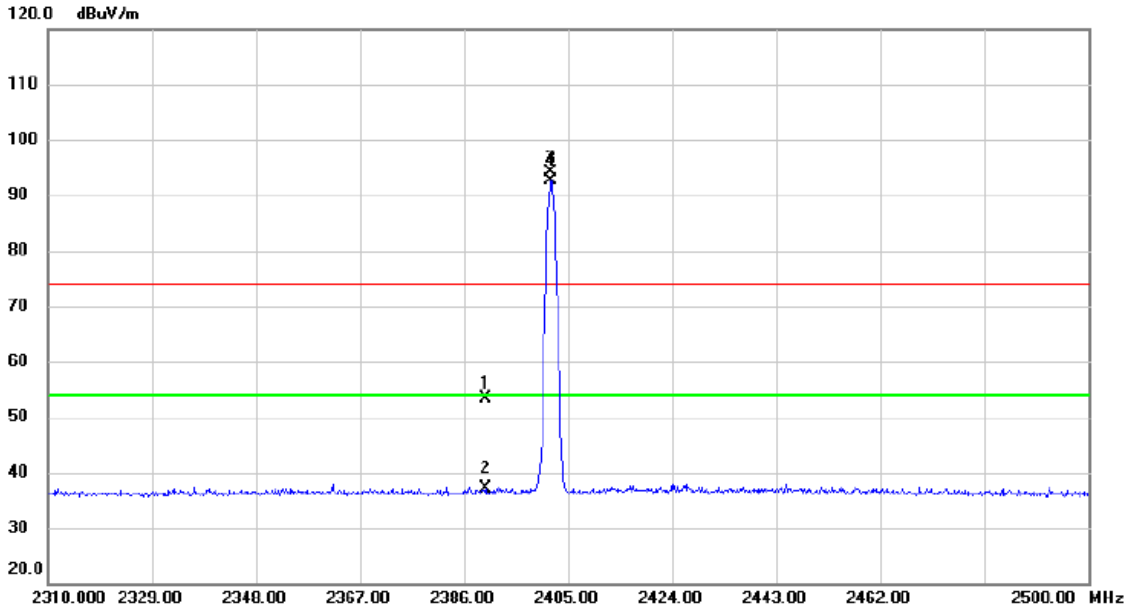

| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 32.9100 | 49.21 | -18.28 | 30.93 | 40.00 | -9.07 | Peak | |
| 2 | 48.4300 | 39.36 | -16.80 | 22.56 | 40.00 | -17.44 | Peak | |
| 3 | 169.1950 | 36.50 | -16.32 | 20.18 | 43.50 | -23.32 | Peak | |
| 4 | 279.7750 | 33.29 | -16.10 | 17.19 | 46.00 | -28.81 | Peak | |
| 5 | 510.1500 | 32.90 | -11.05 | 21.85 | 46.00 | -24.15 | Peak | |
| 6 | 640.1300 | 35.01 | -8.67 | 26.34 | 46.00 | -19.66 | Peak | |

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

# APPENDIX D - RADIATED EMISSION - ABOVE 1000 MHZ

| Test Mode : | TX 2402 MHz _CH00_1Mbps |
|---|---|

**Vertical**

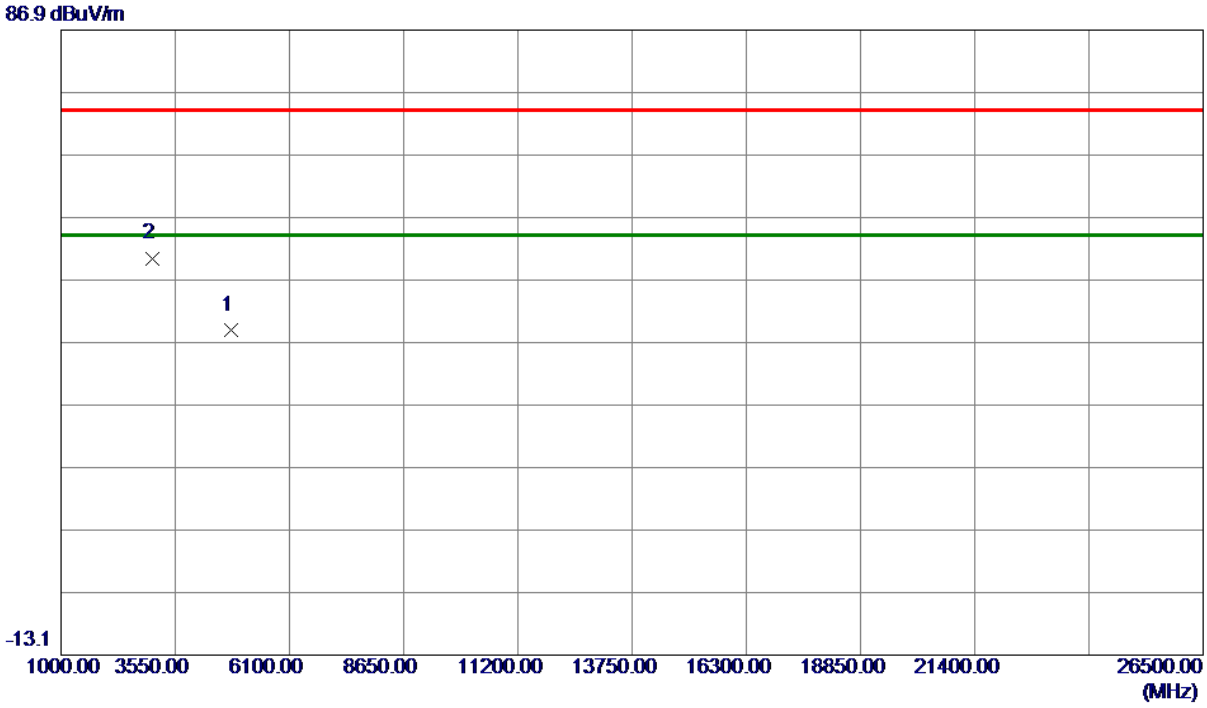



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2390.000 | 21.55 | 31.74 | 53.29 | 74.00 | -20.71 | peak | |
| 2 | | 2390.000 | 5.45 | 31.74 | 37.19 | 54.00 | -16.81 | AVG | |
| 3 | X | 2401.950 | 62.47 | 31.72 | 94.19 | 74.00 | 20.19 | peak | |
| 4 | * | 2401.950 | 60.90 | 31.72 | 92.62 | 54.00 | 38.62 | AVG | |

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

| Test Mode : | TX 2402 MHz _CH00_1Mbps |
|---|---|

**Vertical**

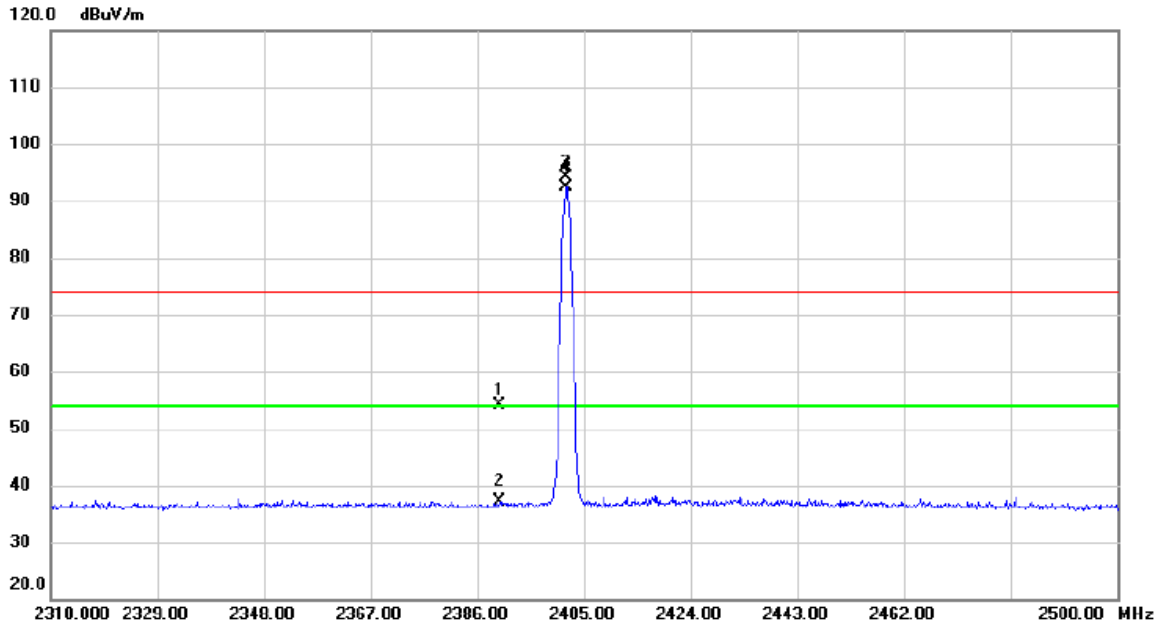



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 4804.0000 | 49.91 | -10.95 | 38.96 | 74.00 | -35.04 | Peak | |
| 2 * | 3025.9750 | 65.87 | -15.47 | 50.40 | 74.00 | -23.60 | Peak | |

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

| Test Mode : | TX 2402 MHz _CH00_1Mbps |
|---|---|

**Horizontal**

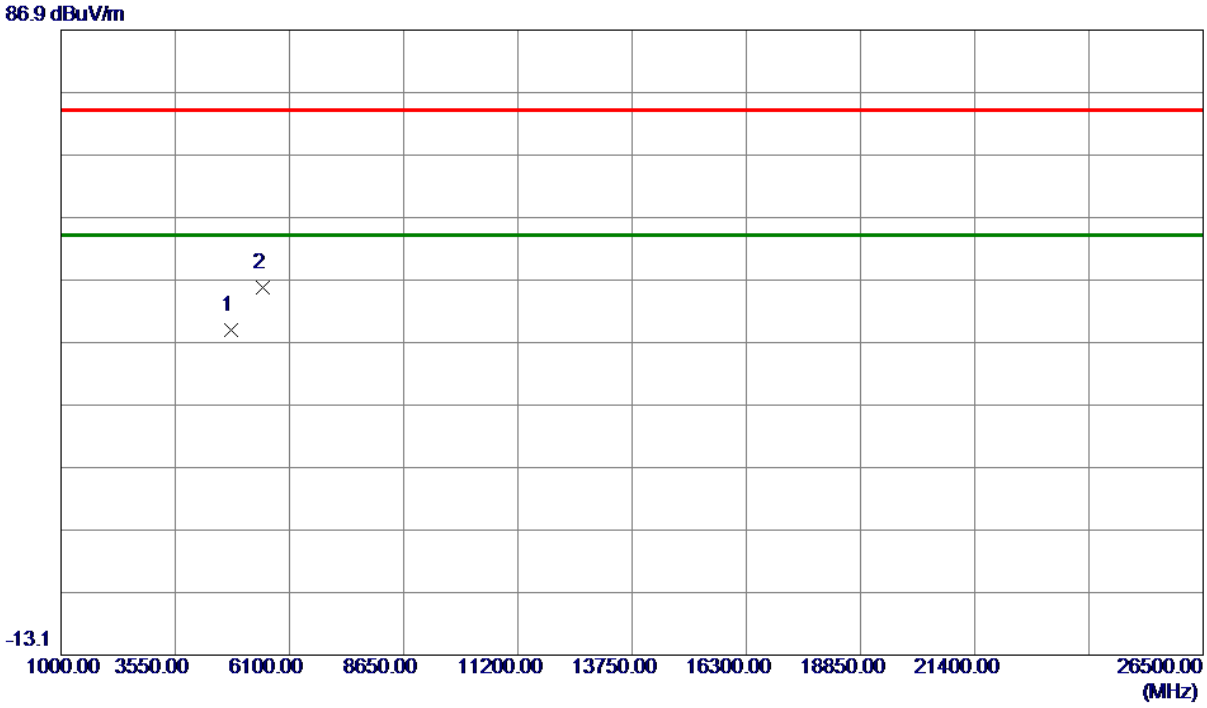



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2390.000 | 22.33 | 31.74 | 54.07 | 74.00 | -19.93 | peak | |
| 2 | | 2390.000 | 5.35 | 31.74 | 37.09 | 54.00 | -16.91 | AVG | |
| 3 | X | 2401.903 | 62.46 | 31.72 | 94.18 | 74.00 | 20.18 | peak | |
| 4 | * | 2401.903 | 60.75 | 31.72 | 92.47 | 54.00 | 38.47 | AVG | |

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

| Test Mode : | TX 2402 MHz _CH00_1Mbps |
|---|---|

**Horizontal**

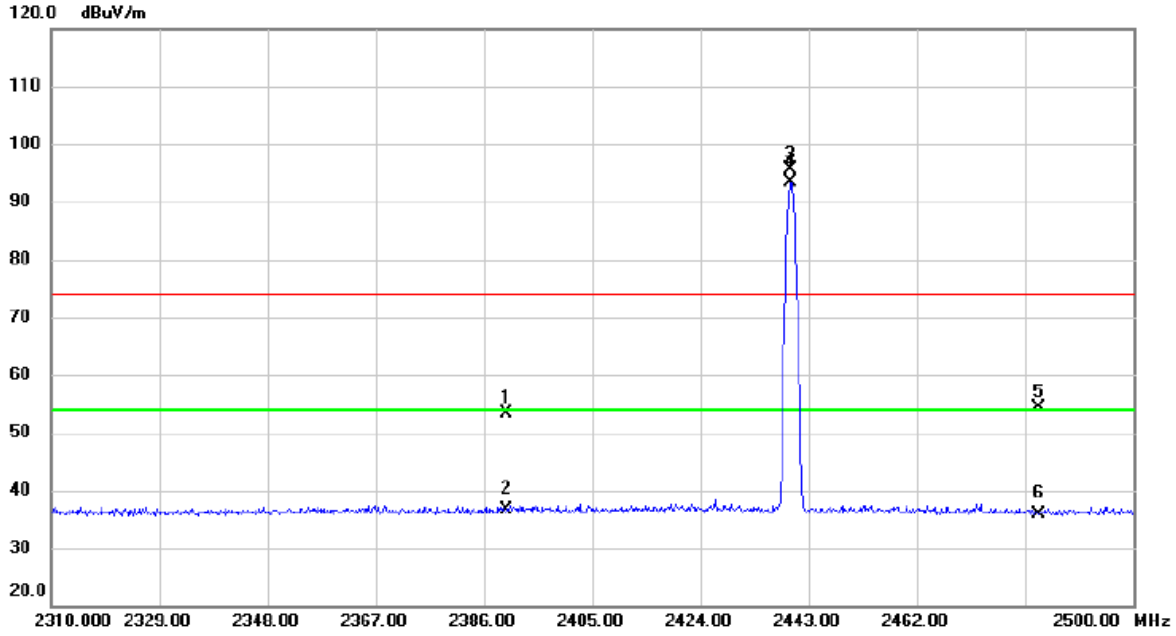



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | 4804.0000 | 49.93 | -10.95 | 38.98 | 74.00 | -35.02 | Peak | |
| 2 * | 5494.3750 | 55.35 | -9.61 | 45.74 | 74.00 | -28.26 | Peak | |

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

| Test Mode : | TX 2440 MHz _CH19_1Mbps |
|---|---|

**Vertical**

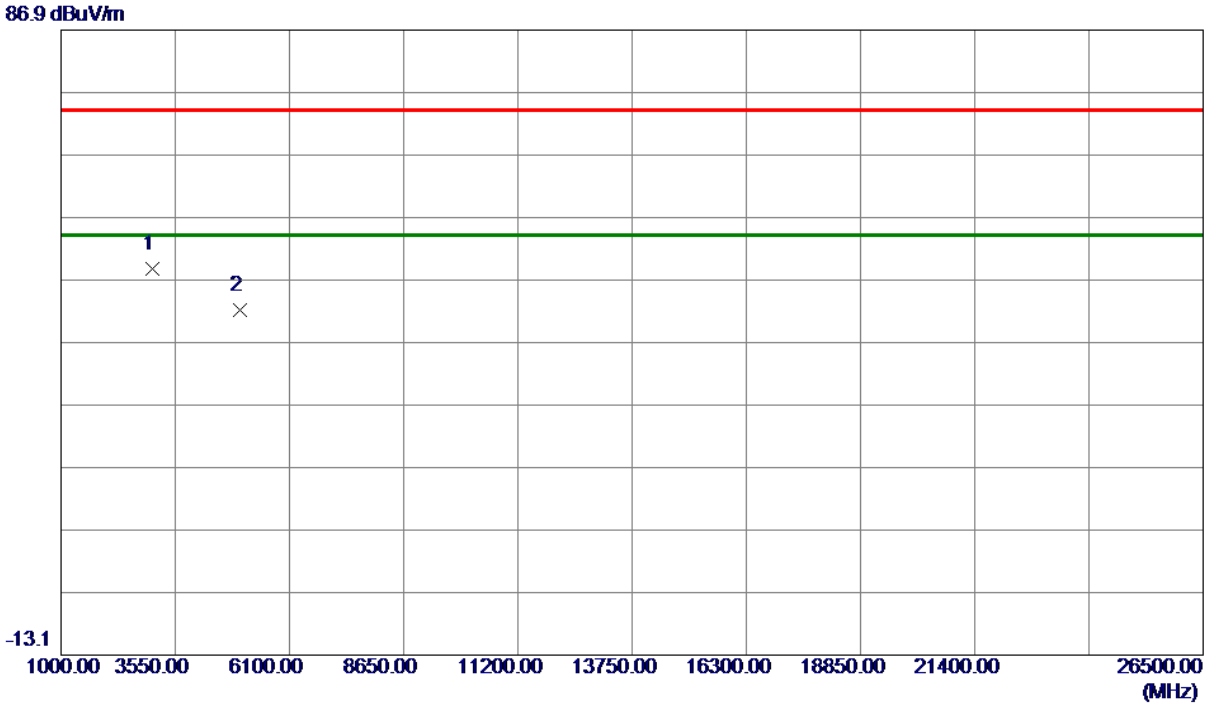



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2390.000 | 21.75 | 31.74 | 53.49 | 74.00 | -20.51 | peak | |
| 2 | | 2390.000 | 4.77 | 31.74 | 36.51 | 54.00 | -17.49 | AVG | |
| 3 | X | 2439.950 | 63.82 | 31.72 | 95.54 | 74.00 | 21.54 | peak | |
| 4 | * | 2439.950 | 61.73 | 31.72 | 93.45 | 54.00 | 39.45 | AVG | |
| 5 | | 2483.500 | 22.77 | 31.72 | 54.49 | 74.00 | -19.51 | peak | |
| 6 | | 2483.500 | 4.16 | 31.72 | 35.88 | 54.00 | -18.12 | AVG | |

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

| Test Mode : | TX 2440 MHz _CH19_1Mbps |
|---|---|

**Vertical**

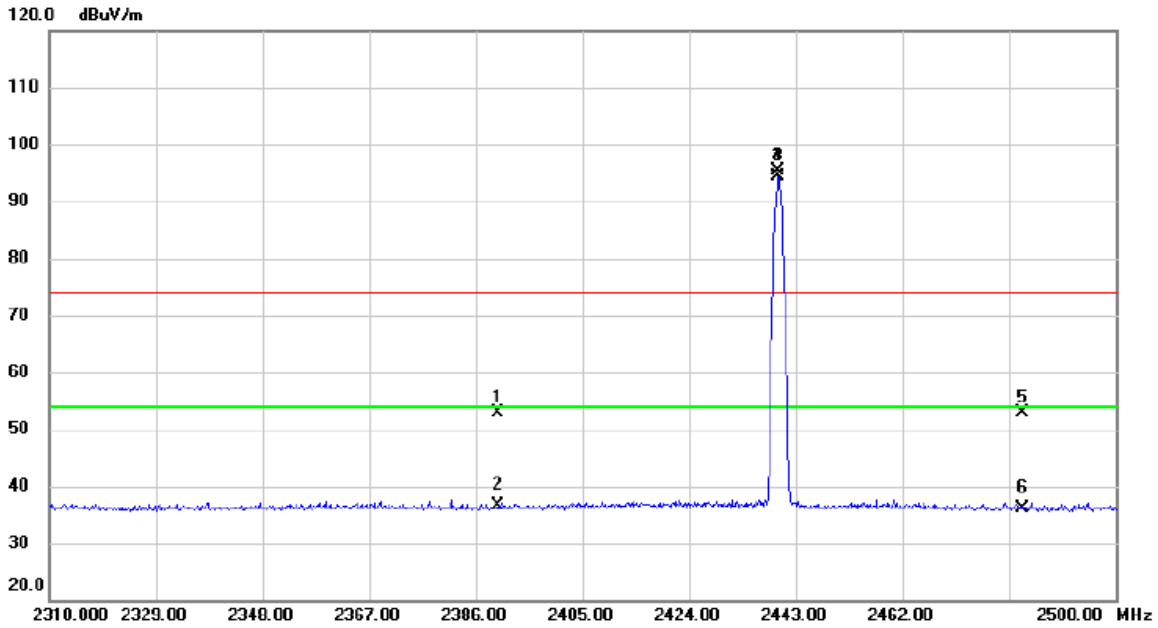



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 3033.6250 | 64.18 | -15.44 | 48.74 | 74.00 | -25.26 | Peak | |
| 2 | 4989.4750 | 52.34 | -10.33 | 42.01 | 74.00 | -31.99 | Peak | |

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

| Test Mode : | TX 2440 MHz _CH19_1Mbps |
|---|---|

**Horizontal**

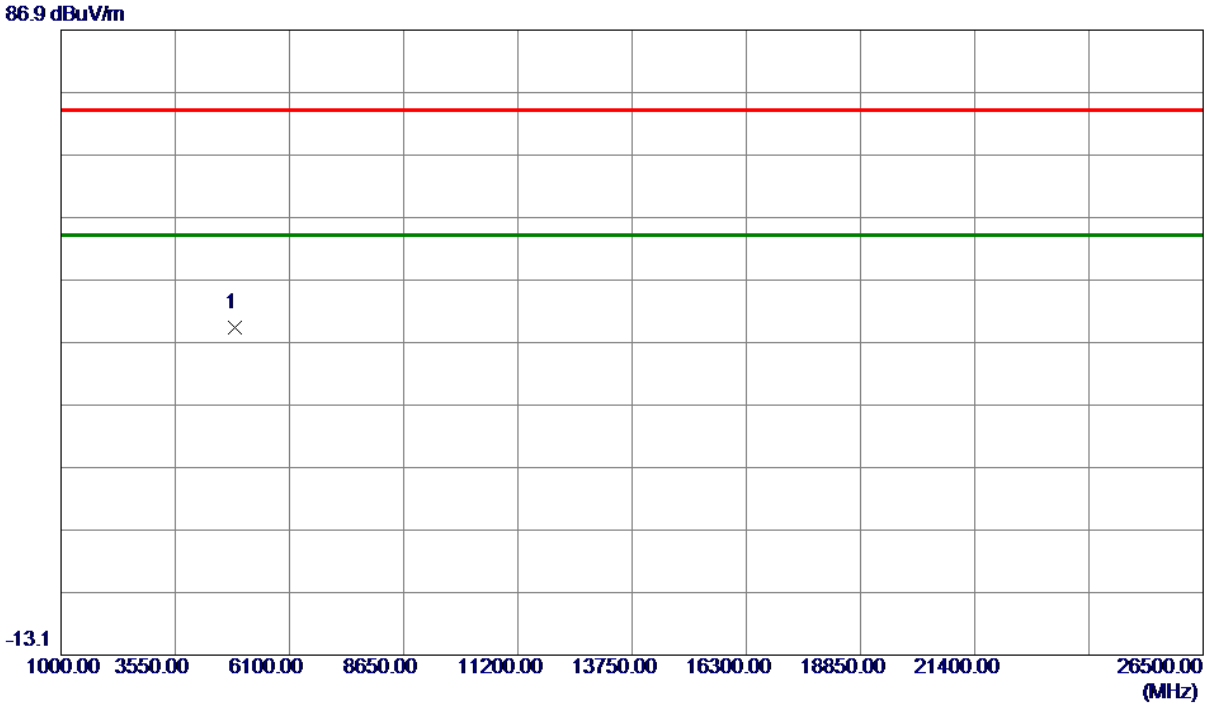



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | | 2390.000 | 21.23 | 31.74 | 52.97 | 74.00 | -21.03 | peak | |
| 2 | | 2390.000 | 4.83 | 31.74 | 36.57 | 54.00 | -17.43 | AVG | |
| 3 | X | 2439.941 | 63.73 | 31.72 | 95.45 | 74.00 | 21.45 | peak | |
| 4 | * | 2439.941 | 62.63 | 31.72 | 94.35 | 54.00 | 40.35 | AVG | |
| 5 | | 2483.500 | 21.14 | 31.72 | 52.86 | 74.00 | -21.14 | peak | |
| 6 | | 2483.500 | 4.38 | 31.72 | 36.10 | 54.00 | -17.90 | AVG | |

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

| Test Mode : | TX 2440 MHz _CH19_1Mbps |
|---|---|

**Horizontal**

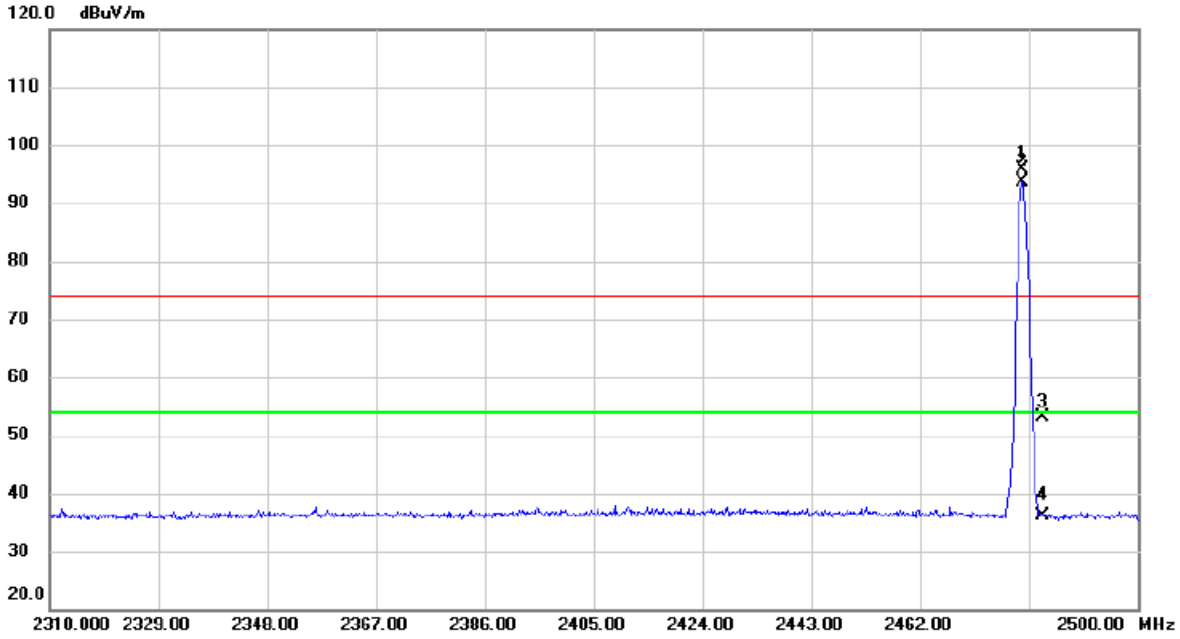



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 4880.0000 | 49.99 | -10.78 | 39.21 | 74.00 | -34.79 | Peak | |

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

| Test Mode : | TX 2480 MHz _CH39_1Mbps |
|---|---|

**Vertical**

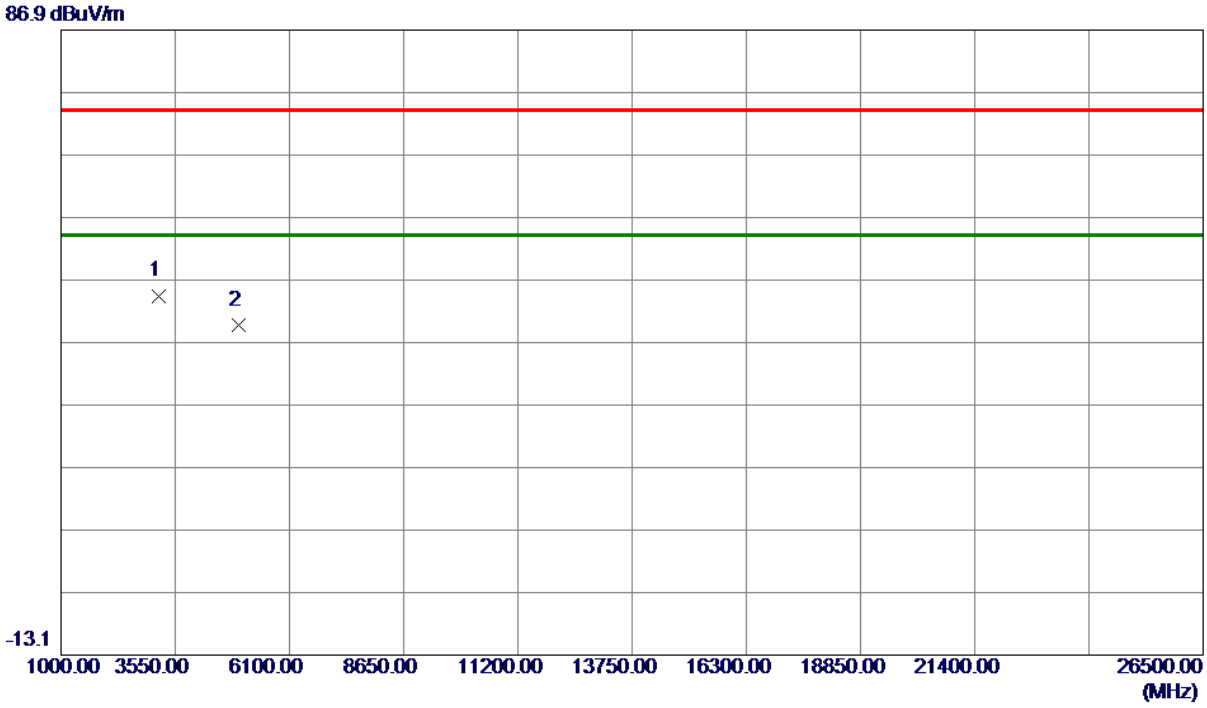



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | X | 2479.917 | 64.22 | 31.71 | 95.93 | 74.00 | 21.93 | peak | |
| 2 | * | 2479.917 | 62.04 | 31.71 | 93.75 | 54.00 | 39.75 | AVG | |
| 3 | | 2483.500 | 21.45 | 31.72 | 53.17 | 74.00 | -20.83 | peak | |
| 4 | | 2483.500 | 4.39 | 31.72 | 36.11 | 54.00 | -17.89 | AVG | |

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

| Test Mode : | TX 2480 MHz _CH39_1Mbps |
|---|---|

**Vertical**

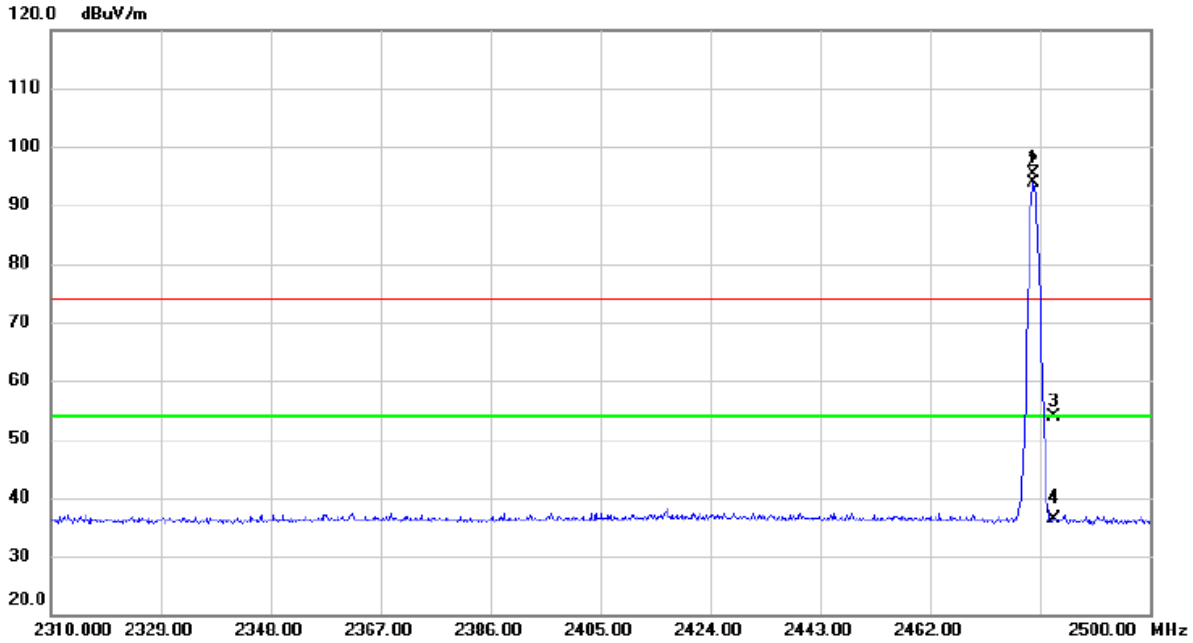



| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 3195.5500 | 59.47 | -15.07 | 44.40 | 74.00 | -29.60 | Peak | |
| 2 | 4960.0000 | 50.17 | -10.46 | 39.71 | 74.00 | -34.29 | Peak | |

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

| Test Mode : | TX 2480 MHz _CH39_1Mbps |
|---|---|

**Horizontal**

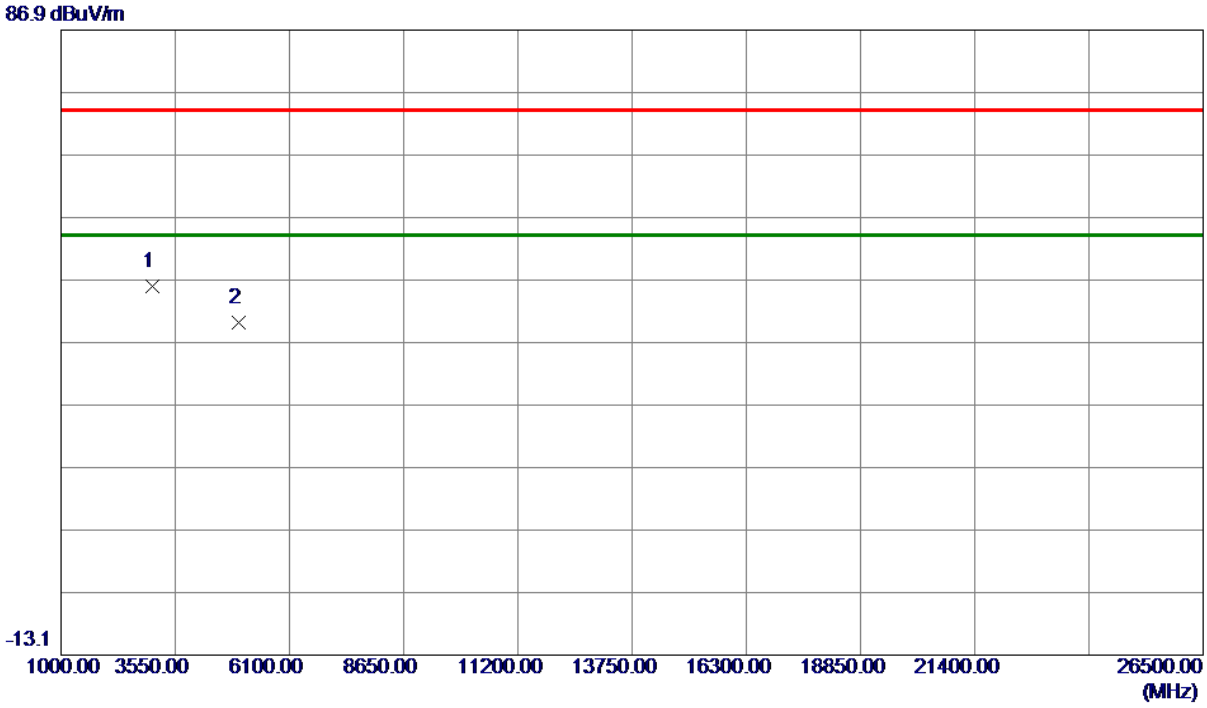



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 | X | 2479.955 | 63.68 | 31.71 | 95.39 | 74.00 | 21.39 | peak | |
| 2 | * | 2479.955 | 62.12 | 31.71 | 93.83 | 54.00 | 39.83 | AVG | |
| 3 | | 2483.500 | 22.05 | 31.72 | 53.77 | 74.00 | -20.23 | peak | |
| 4 | | 2483.500 | 4.62 | 31.72 | 36.34 | 54.00 | -17.66 | AVG | |

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

| Test Mode : | TX 2480 MHz _CH39_1Mbps |
|---|---|

**Horizontal**




| No. | Freq. | Reading Level | Correct Factor | Measure ment | Limit | Margin | | |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV/m | dB | Detector | Comment |
| 1 * | 3036.1750 | 61.38 | -15.43 | 45.95 | 74.00 | -28.05 | Peak | |
| 2 | 4960.0000 | 50.51 | -10.46 | 40.05 | 74.00 | -33.95 | Peak | |

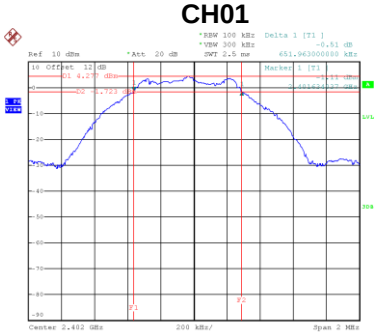
REMARKS:
(1) Measurement Value = Reading Level + Correct Factor.
(2) Margin Level = Measurement Value - Limit Value.

# APPENDIX E - BANDWIDTH

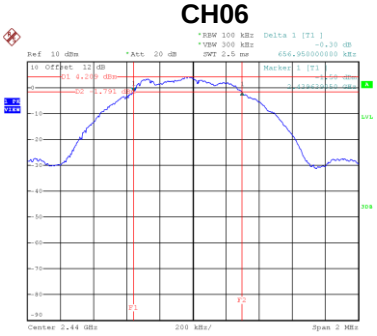
| Test Mode: | CH00, CH19 , CH39 - 1Mbps |
|---|---|

| Channel | Frequency (MHz) | 6 dB Bandwidth (MHz) | 6 dB Bandwidth Min. Limit (kHz) | Result |
|---|---|---|---|---|
| 01 | 2402 | 0.652 | 500 | Complies |
| 06 | 2440 | 0.657 | 500 | Complies |
| 11 | 2480 | 0.655 | 500 | Complies |

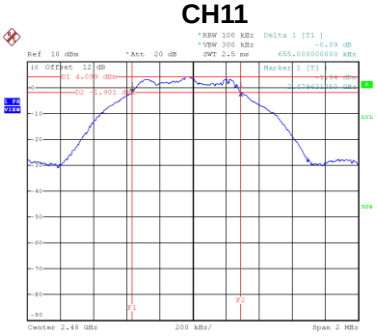
**CH01**



**CH06**

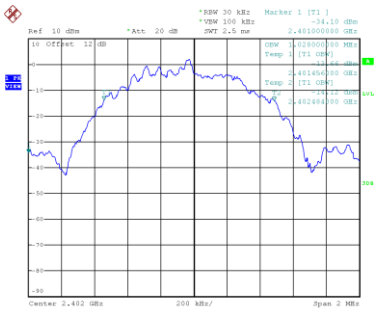


**CH11**

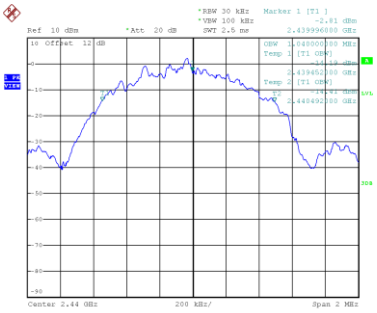


| Channel | Frequency (MHz) | 99 % Emission Bandwidth (MHz) | Result |
|---|---|---|---|
| 01 | 2402 | 1.028 | Complies |
| 06 | 2440 | 1.040 | Complies |
| 11 | 2480 | 1.028 | Complies |

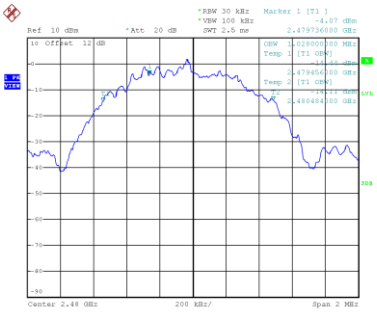
**CH01**



**CH06**



**CH11**



# APPENDIX F - MAXIMUM OUTPUT POWER & E.I.R.P.

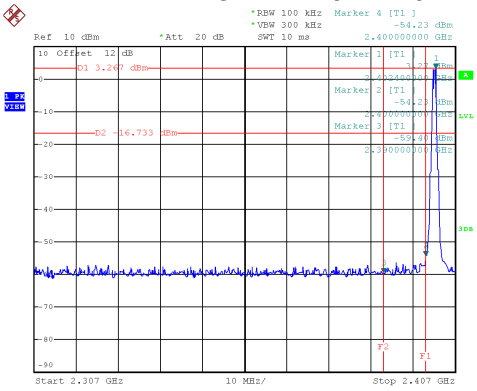
| Test Mode : | CH00, CH19 , CH39 - 1Mbps |
|---|---|

| Frequency (MHz) | Output Power (dBm) | Output Power (W) | Max. Limit (dBm) | Max. Limit (W) | Test Result |
|---|---|---|---|---|---|
| 2402 | 4.74 | 0.0030 | 30.00 | 1.00 | Pass |
| 2440 | 4.66 | 0.0029 | 30.00 | 1.00 | Pass |
| 2480 | 4.53 | 0.0028 | 30.00 | 1.00 | Pass |

# APPENDIX G - CONDUCTED SPURIOUS EMISSION

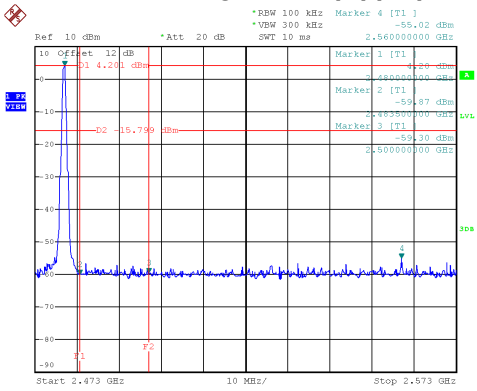
| Test Mode : | CH00, CH19 , CH39 - 1Mbps |
|---|---|

### Bandedge CH00 (Lower)



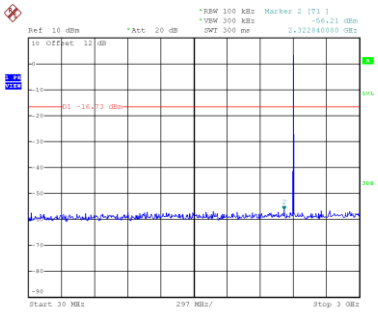

Date: 27.NOV.2020 14:14:08

### Bandedge CH39 (Upper)

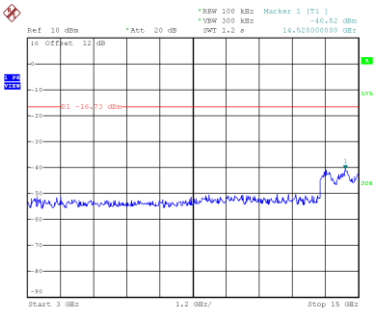



Date: 27.NOV.2020 14:18:32

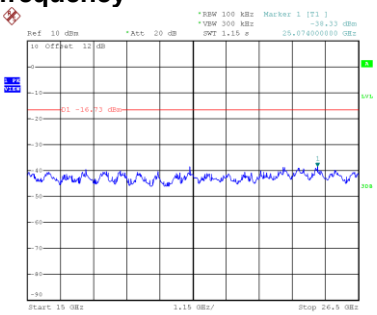
### CH00 – 10th Harmonic of the fundamental frequency



Date: 27.NOV.2020 14:14:21

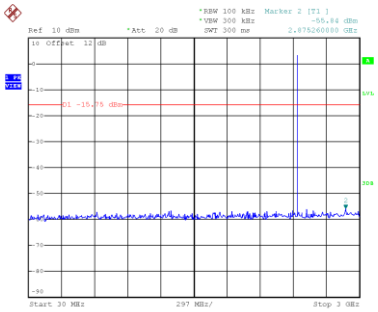


Date: 27.NOV.2020 14:14:29

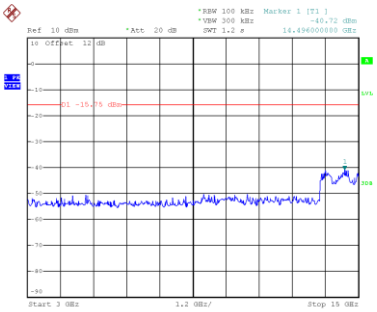


Date: 27.NOV.2020 14:14:37

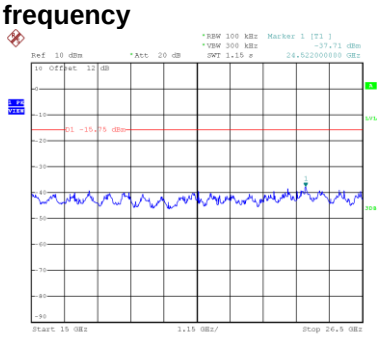
### CH19 – 10th Harmonic of the fundamental frequency



Date: 27.NOV.2020 14:16:43

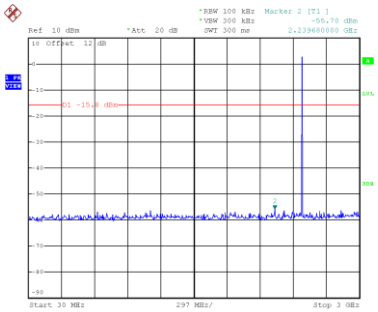


Date: 27.NOV.2020 14:16:50

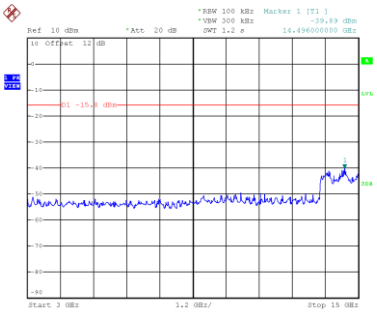


Date: 27.NOV.2020 14:16:58

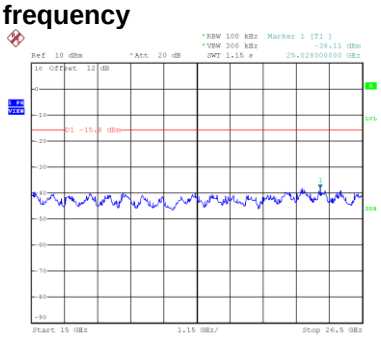
### CH39 – 10th Harmonic of the fundamental frequency



Date: 27.NOV.2020 14:18:46



Date: 27.NOV.2020 14:18:54



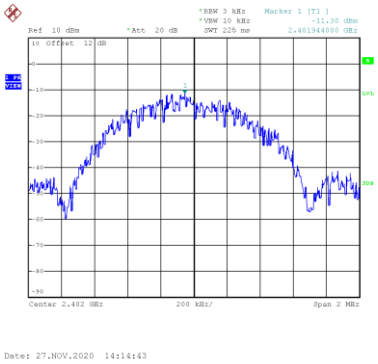
Date: 27.NOV.2020 14:19:02

# APPENDIX H - POWER SPECTRAL DENSITY

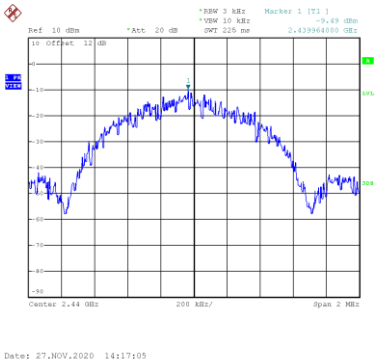
| Test Mode: | CH00, CH19 , CH39 - 1Mbps |
|---|---|

| Channel | Frequency (MHz) | Power Spectral Density (dBm/3kHz) | Max. Limit (dBm/3kHz) | Result |
|---|---|---|---|---|
| 00 | 2402 | -11.30 | 8 | Complies |
| 19 | 2440 | -9.49 | 8 | Complies |
| 39 | 2480 | -11.50 | 8 | Complies |

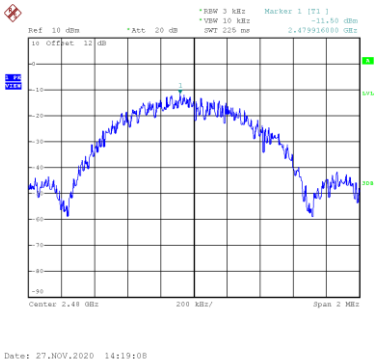
**CH00**



**CH19**



**CH39**



**End of Test Report**