

FCC Radio Test Report

FCC ID: 2A4G9-005

The report concerns: Original Grant

Report Reference No..... : 22EFS06096 06371
Date Sample(s) Received..... : 2022-07-18
Date of Tested..... : From 2022-07-19 to 2022-08-02
Date of issue..... : 2022-08-02
Testing Laboratory..... : DongGuanShuoXin Electronic Technology Co., Ltd.
Address..... : Zone A, 1F, No. 6, XinGang Road YuanGang Street, XinAn District, ChangAn Town, DongGuan City, GuangDong, China

Applicant's name..... : ZHENGZHOU DI YUN WANG LUO KE JI YOU XIAN GONG SI
Address..... : No.2602, 26th Floor, Block B, Dongfang Building No. 198-19 Songshan South Road, Erqi District,Zhengzhou, Henan, China
Manufacturer..... : TDC Power Products Co., Ltd.

Equipment..... : Wi-Fi Low Voltage Landscape Transformer
Trade Mark..... : 1)  ; 2) 
Model..... : TLA-120-12W-1 WiFi 2Gen; TLA-200-12W-1 WiFi 2Gen; TLA-300-12WA2-1 WiFi 2Gen.
Ratings..... : Input: 120V~60Hz 1.2A For TLA-120-12W-1 WiFi 2Gen; 120V~60Hz 2A For TLA-200-12W-1 WiFi 2Gen; 120V~60Hz 3A For TLA-300-12WA2-1 WiFi 2Gen.
Output: 12V~ 120W max For TLA-120-12W-1 WiFi 2Gen; 12V~ 200W max For TLA-200-12W-1 WiFi 2Gen; 12V~ or 14V~ 300W max For TLA-300-12WA2-1 WiFi 2Gen.

Test Engineer:


Blue Qiu

Responsible Engineer :


Smile Wang

Authorized Signatory:


King Wang

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1TEST REPORT DECLARE

| | |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Applicant | ZHENGZHOU DI YUN WANG LUO KE JI YOU XIAN GONG SI |
| Address | No.2602, 26th Floor, Block B, Dongfang Building No. 198-19 Songshan South Road, Erqi District,Zhengzhou, Henan, China |
| Manufacturer | TDC Power Products Co., Ltd. |
| Address | Dong Hang 3rd. Industrial District, Dong Hang, Dong Guan City, Guang dong Province, China |
| Factory | TDC Power Products Co., Ltd. |
| Address | Dong Hang 3rd. Industrial District, Dong Hang, Dong Guan City, Guang dong Province, China |
| Equipment | Wi-Fi Low Voltage Landscape Transformer |
| Model No. | TLA-120-12W-1 WiFi 2Gen; TLA-200-12W-1 WiFi 2Gen; TLA-300-12WA2-1 WiFi 2Gen. |
| Trade Mark | 1)  ; 2)  |
| Standard | FCC Part15, Subpart C (15.247) ANSI C63.10-2013 |

We Declare:

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd(ATT). and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd.(ATT) is assumed of full responsibility for the accuracy and completeness of these tests.

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

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

2 SUMMARY OF TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

| Standard(s) Section | | Test Item | Judgment | Remark |
|-------------------------------------|------|-----------------------------------|----------|---------|
| FCC | ISED | | | |
| 15.207 | - | AC Power Line Conducted Emissions | PASS | ----- |
| 15.247(d) 15.205(a) 15.209(a) | - | Radiated Emissions | PASS | ----- |
| 15.247(a)(2) | - | Bandwidth | PASS | ----- |
| 15.247(b)(3) | - | Maximum Output Power | PASS | ----- |
| 15.247(d) | - | Conducted Spurious Emission | PASS | ----- |
| 15.247(e) | - | Power Spectral Density | PASS | ----- |
| 15.203 | - | Antenna Requirement | PASS | Note(2) |

Note:

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

2.1 MEASUREMENT UNCERTAINTY

| Test Item | Uncertainty |
|---------------------------------------------------------|-----------------------|
| Uncertainty for Conduction emission test (9kHz-150kHz) | 3.7 dB |
| Uncertainty for Conduction emission test (150kHz-30MHz) | 3.3 dB |
| Uncertainty for Radiation Emission test (30MHz-200MHz) | 4.60 dB (Polarize: V) |
| | 4.60 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (200MHz-1GHz) | 6.10 dB (Polarize: V) |
| | 5.08 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (1GHz-6GHz) | 5.01 dB (Polarize: V) |
| | 5.01 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (6GHz-18GHz) | 5.26 dB (Polarize: V) |
| | 5.26 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (18GHz-40GHz) | 5.06 dB (Polarize: V) |
| | 5.06 dB (Polarize: H) |
| Uncertainty for radio frequency | $\pm 0.048\text{kHz}$ |
| Uncertainty for conducted RF Power | $\pm 0.32\text{dB}$ |

Note:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Test Facility:



The Test site used by DongGuan ShuoXin Electronic Technology Co., Ltd. to collect test data is located on the Zone A, 1F, No. 6, XinGang Road YuanGang Street, XinAn District, ChangAn Town, DongGuan City, GuangDong, China

The test facility is recognized, certified, or accredited by the following organizations:

| Item | Registration No. | Expiration Date |
|---------------------------------------------------------------|-----------------------------------|-----------------|
| CNAS | L3098 | 2024-08-27 |
| A2LA | 4893.01 | 2022-08-31 |
| Innovation, Science and Economic Development Canada (ISED) | 11033A CAB identifier: CN0083 | 2022-08-31 |
| Federal Communications Commission (FCC) | 171688 Designation No.: CN1235 | 2022-08-31 |

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | | |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Equipment | Wi-Fi Low Voltage Landscape Transformer | |
| Brand Name | 1)  ; 2)  | |
| Test Model | TLA-120-12W-1 WiFi 2Gen | |
| Series Model | TLA-120-12W-1 WiFi 2Gen; TLA-200-12W-1 WiFi 2Gen; TLA-300-12WA2-1 WiFi 2Gen. | |
| Model Difference(s) | The differences between models are the same except for the differences in model name and output rating. | |
| Hardware Version | V1.0 | |
| Software Version | V1.0 | |
| Power Source | Supplied from AC power network. | |
| Power Rating | 120V~60Hz 1.2A For TLA-120-12W-1 WiFi 2Gen; 120V~60Hz 2A For TLA-200-12W-1 WiFi 2Gen; 120V~60Hz 3A For TLA-300-12WA2-1 WiFi 2Gen. | |
| Operation Frequency | 2402 MHz ~ 2480 MHz | |
| Modulation Technology | GFSK | |
| Bit Rate of Transmitter | 1Mbps | |
| Antenna Information | Antenna Type: Dipole Antenna | Maximum Peak Gain: 1.5dBi |
| Max. Output Power | -0.497dBm(0.000892W)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 |

3.2 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 | BLE 1M TX Mode NOTE (1) |
| Mode 2 | BLE 1M TX Mode Channel 00 |
| | |

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 | BLE 1M TX Mode Channel 00 |

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

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

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

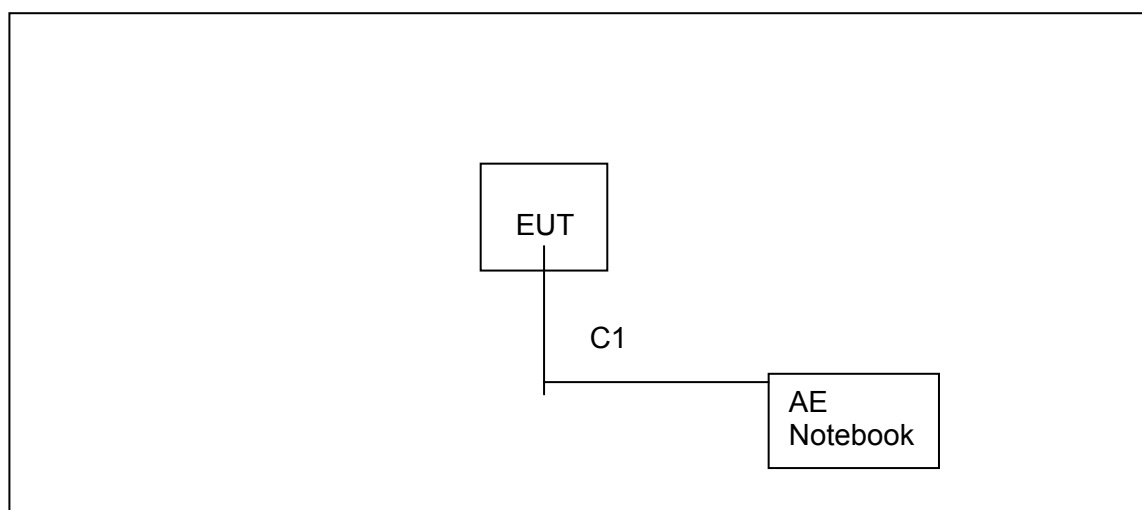
Note:

(1) The measurements are performed at the high, middle, low available channels.

3.3 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 | Beken Wi-Fi Test Tool V1.9.0 | | |
|------------------|------------------------------|---------|---------|
| Frequency (MHz) | 2402 | 2440 | 2480 |
| Parameters-1Mbps | Default | Default | Default |
| | | | |

3.4 BLOCK DIAGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED**3.5 SUPPORT UNITS**

| Item | Equipment | Brand | Model No. | Series No. |
|------|-----------|--------|-----------|------------|
| AE | Notebook | Lenovo | / | / |

| Item | Cable Type | Shielded Type | Ferrite Core | Length |
|------|------------|---------------|--------------|--------|
| C1 | DC Cable | NO | NO | 0.8m |

3.6 TEST ENVIRONMENT CONDITIONS

| Test Item | Temperature | Humidity | Test Voltage |
|-----------------------------------|-------------|----------|--------------|
| AC Power Line Conducted Emissions | 22.6°C | 53% | AC 120V/60Hz |
| Radiated Emissions-9K-30MHz | 23.5°C | 61% | AC 120V/60Hz |
| Radiated Emissions-30 MHz to 1GHz | 23.6°C | 62% | AC 120V/60Hz |
| Radiated Emissions-Above 1000 MHz | 23.6°C | 62% | AC 120V/60Hz |
| Bandwidth | 23.6°C | 61% | AC 120V/60Hz |
| Maximum Output Power | 23.6°C | 61% | AC 120V/60Hz |
| Conducted Spurious Emission | 23.6°C | 61% | AC 120V/60Hz |
| Power Spectral Density | 23.6°C | 61% | AC 120V/60Hz |

4AC POWER LINE CONDUCTED EMISSIONS TEST**4.1LIMIT**

| Frequency of Emission (MHz) | Limit (dB μ V) | |
|-----------------------------|--------------------|-----------|
| | Quasi-peak | Average |
| 0.15 -0.50 | 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 |

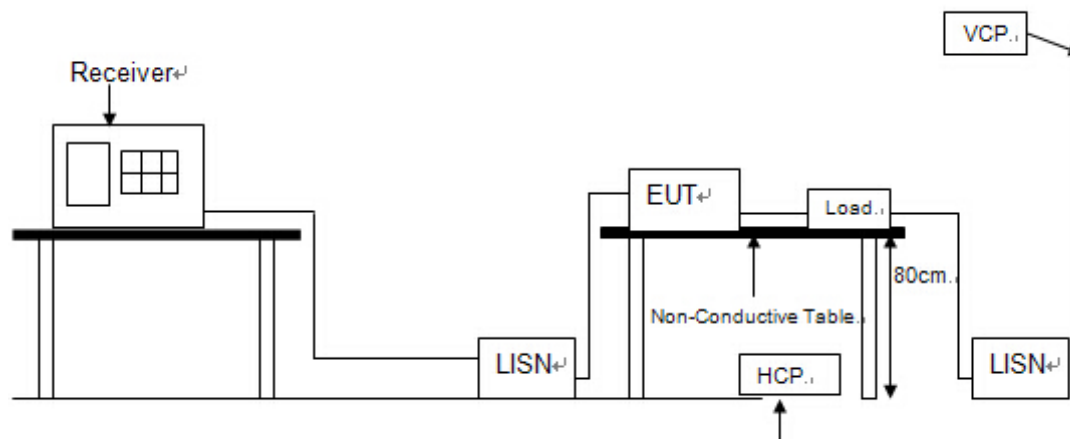
4.2TEST PROCEDURE

- 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 groundplane 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.

4.3MEASUREMENT INSTRUMENTS LIST

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|----------------------|-------------------|----------------------|-----------------|------------------|
| 1 | Pulse Limiter | MTS-systemtechnik | MTS-IMP-136 | 261115-010-0024 | 12/19/2022 |
| 2 | EMI Test Receiver | R&S | ESCI | 101308 | 12/17/2022 |
| 3 | LISN | AFJ | LS16 | 16011103219 | 05/26/2023 |
| 4 | LISN | Schwarzbeck | NSLK 8127 | 8127-432 | 12/17/2022 |
| 5 | Measurement Software | Farad | EZ-EMC (Ver.ATT-03A) | N/A | N/A |

4.4 TEST SETUP

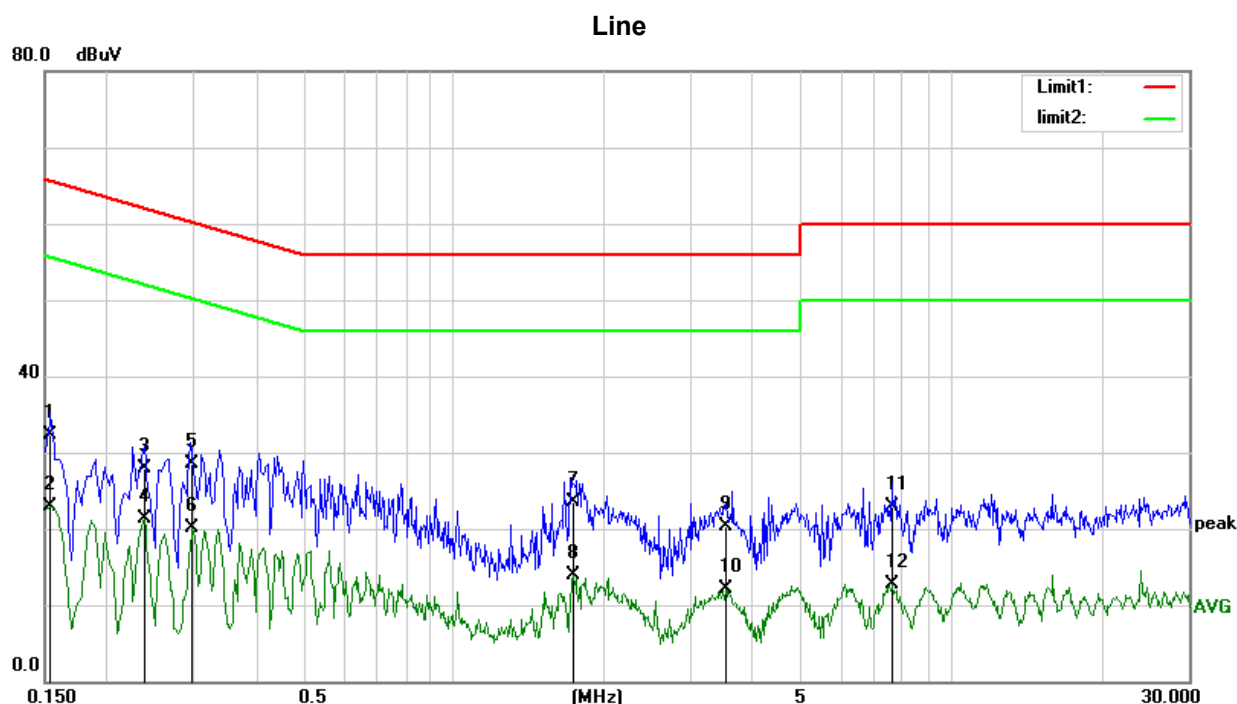


4.5 EUT OPERATING CONDITIONS

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.

4.6 TEST RESULTS

Test Mode: BLE 1Mbps TX Mode Channel 00, AC 120V/60Hz



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | | |
|-----|-----|--------|---------------|----------------|-------------|-------|--------|----------|---------|
| | | MHz | dBuV | dB | dBuV | dB | dB | Detector | Comment |
| 1 | | 0.1539 | 23.06 | 9.17 | 32.23 | 65.78 | -33.55 | QP | |
| 2 | | 0.1539 | 13.78 | 9.17 | 22.95 | 55.78 | -32.83 | AVG | |
| 3 | | 0.2380 | 18.24 | 9.59 | 27.83 | 62.16 | -34.33 | QP | |
| 4 | | 0.2380 | 11.80 | 9.59 | 21.39 | 52.16 | -30.77 | AVG | |
| 5 | | 0.2980 | 19.04 | 9.55 | 28.59 | 60.30 | -31.71 | QP | |
| 6 | * | 0.2980 | 10.53 | 9.55 | 20.08 | 50.30 | -30.22 | AVG | |
| 7 | | 1.7420 | 13.84 | 9.62 | 23.46 | 56.00 | -32.54 | QP | |
| 8 | | 1.7420 | 4.34 | 9.62 | 13.96 | 46.00 | -32.04 | AVG | |
| 9 | | 3.5140 | 10.63 | 9.77 | 20.40 | 56.00 | -35.60 | QP | |
| 10 | | 3.5140 | 2.27 | 9.77 | 12.04 | 46.00 | -33.96 | AVG | |
| 11 | | 7.6219 | 13.19 | 9.75 | 22.94 | 60.00 | -37.06 | QP | |
| 12 | | 7.6219 | 2.87 | 9.75 | 12.62 | 50.00 | -37.38 | AVG | |

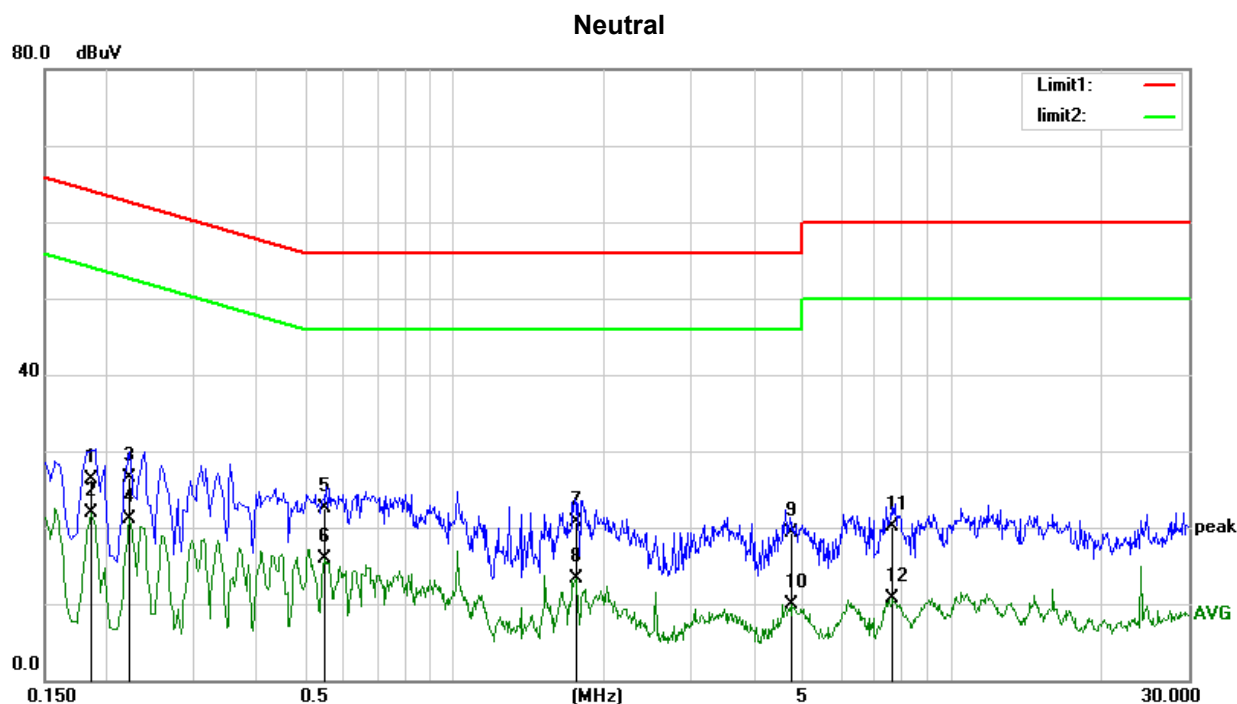
*:Maximum data x:Over limit !:over margin

Remarks:

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

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

Test Mode: BLE 1Mbps TX Mode Channel 00, AC 120V/60Hz



| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB | Measure- ment dBuV | Limit dB | Over dB | Detector | Comment |
|-----|-----|--------------|--------------------------|-------------------------|--------------------------|-------------|------------|----------|---------|
| 1 | | 0.1860 | 16.81 | 9.41 | 26.22 | 64.21 | -37.99 | QP | |
| 2 | | 0.1860 | 12.45 | 9.41 | 21.86 | 54.21 | -32.35 | AVG | |
| 3 | | 0.2220 | 16.98 | 9.58 | 26.56 | 62.74 | -36.18 | QP | |
| 4 | | 0.2220 | 11.60 | 9.58 | 21.18 | 52.74 | -31.56 | AVG | |
| 5 | | 0.5500 | 12.86 | 9.64 | 22.50 | 56.00 | -33.50 | QP | |
| 6 | * | 0.5500 | 6.30 | 9.64 | 15.94 | 46.00 | -30.06 | AVG | |
| 7 | | 1.7580 | 11.02 | 9.63 | 20.65 | 56.00 | -35.35 | QP | |
| 8 | | 1.7580 | 3.72 | 9.63 | 13.35 | 46.00 | -32.65 | AVG | |
| 9 | | 4.7738 | 9.71 | 9.69 | 19.40 | 56.00 | -36.60 | QP | |
| 10 | | 4.7738 | 0.14 | 9.69 | 9.83 | 46.00 | -36.17 | AVG | |
| 11 | | 7.6219 | 10.28 | 9.75 | 20.03 | 60.00 | -39.97 | QP | |
| 12 | | 7.6219 | 0.87 | 9.75 | 10.62 | 50.00 | -39.38 | AVG | |

*:Maximum data x:Over limit !:over margin

Remarks:

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

5 RADIATED EMISSION TEST

5.1 LIMIT

In case the emission fall within the restricted band specified on 15.205(a) and RSS-Gen 8.10, then the 15.209(a) and RSS-Gen 8.9 limit in the table below has to be followed.

LIMITS OF RADIATED EMISSION MEASUREMENT (9 kHz-1000MHz)

| 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 (9 kHz-30 MHz)

| Frequency (MHz) | Magnetic field strength (H-Field) (μ A/m) | Measurement Distance (meters) |
|--------------------|---------------------------------------------------|----------------------------------|
| 0.009-0.490 | 6.37/F(kHz) | 300 |
| 0.490-1.705 | 6.37/F(kHz) | 30 |
| 1.705-30.0 | 0.08 | 30 |

LIMITS OF RADIATED EMISSION MEASUREMENT (30 MHz-1000MHz)

| Frequency (MHz) | Field Strength (μ V/m at 3m) |
|--------------------|--------------------------------------|
| 30-88 | 100 |
| 88-216 | 150 |
| 216-960 | 200 |
| Above 960 | 500 |

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| 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 and RSS-247.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (μ V/m).

5.2 TEST PROCEDURE

- a. The measuring distance of 3 m shall be used for measurements. The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(below 1GHz)
- b. The measuring distance of 3 m or 1.5m shall be used for measurements. The EUT was placed on the top of a rotating table 1.5 meter above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.(above 1GHz)
- c. The height of the equipment or of the substitution antenna shall be 0.8m 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 1GHz.
- f. The initial step in collecting radiated emission data is a receiver peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- g. All readings are Peak unless otherwise stated QP in column of Note. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform.
(below 1GHz)
- h. All readings are Peak Mode value unless otherwise stated AVG in column of Note. If the Peak Mode Measured value compliance with the Peak Limits and lower than AVG Limits, the EUT shall be deemed to meet both Peak & AVG Limits and then only Peak Mode was measured, but AVG Mode didn't perform. (above 1GHz)
- i. The test result is calculated as the following:
 - (1) Result = Reading + Correct Factor
 - (2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
 - (3) Margin = Result - Limit

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

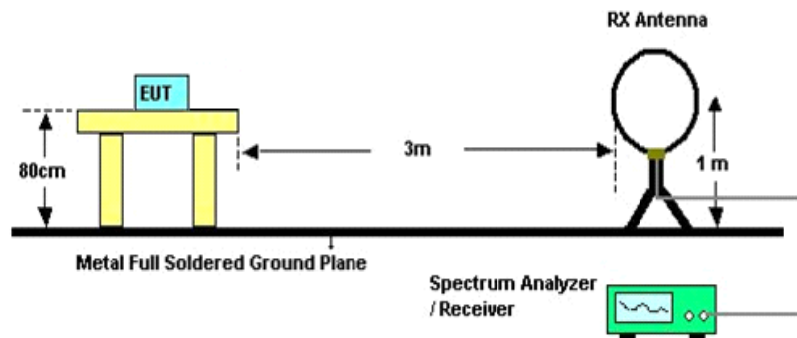
| Receiver Parameter | Setting |
|------------------------|-------------------------------------|
| Attenuation | Auto |
| Start ~ Stop Frequency | 9 kHz~90 kHz for PK/AVG detector |
| Start ~ Stop Frequency | 90 kHz~110 kHz for QP detector |
| Start ~ Stop Frequency | 110 kHz~490 kHz for PK/AVG detector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

5.3 MEASUREMENT INSTRUMENTS LIST

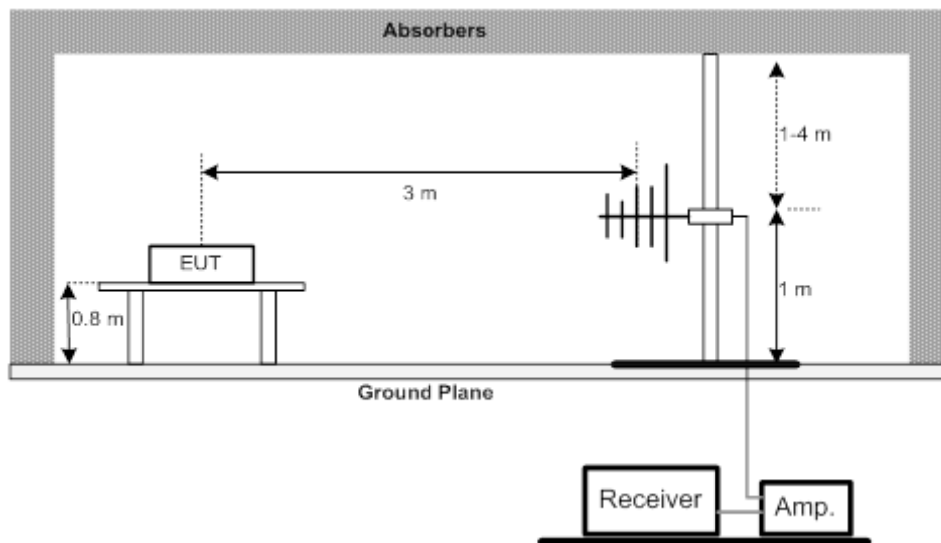
| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until |
|------|------------------------|--------------|----------------------|--------------|------------------|
| 1 | EMI Test Receiver | R&S | ESCI | 101307 | 12/17/2022 |
| 2 | Spectrum Analyzer | Agilent | E4407B | US40240708 | 11/16/2022 |
| 3 | Loop antenna | SCHWARZBECK | FMZB1519 | 1519-062 | 12/17/2022 |
| 4 | Broadband antenna | SCHWARZBECK | VULB9168 | VULB9168-192 | 08/05/2022 |
| 5 | HORN ANTENNA | SCHWARZBECK | BBHA9120D | 9120D 1065 | 04/18/2023 |
| 6 | Preamplifier Amplifier | HP | 8447F | 3113A05680 | 12/19/2022 |
| 7 | Pre-Amplifier | EMEC | EM01G26G | 60679 | 04/18/2023 |
| 8 | RF Cable | R&S | Test Cable 4 | 4 | 12/19/2022 |
| 9 | RF Cable | R&S | Test Cable 5 | 5 | 12/19/2022 |
| 10 | RF Cable | R&S | Test Cable 9 | 9 | 04/18/2023 |
| 11 | RF Cable | R&S | Test Cable 10 | 10 | 12/19/2022 |
| 12 | Measurement Software | Farad | EZ-EMC (Ver.ATT-03A) | N/A | N/A |

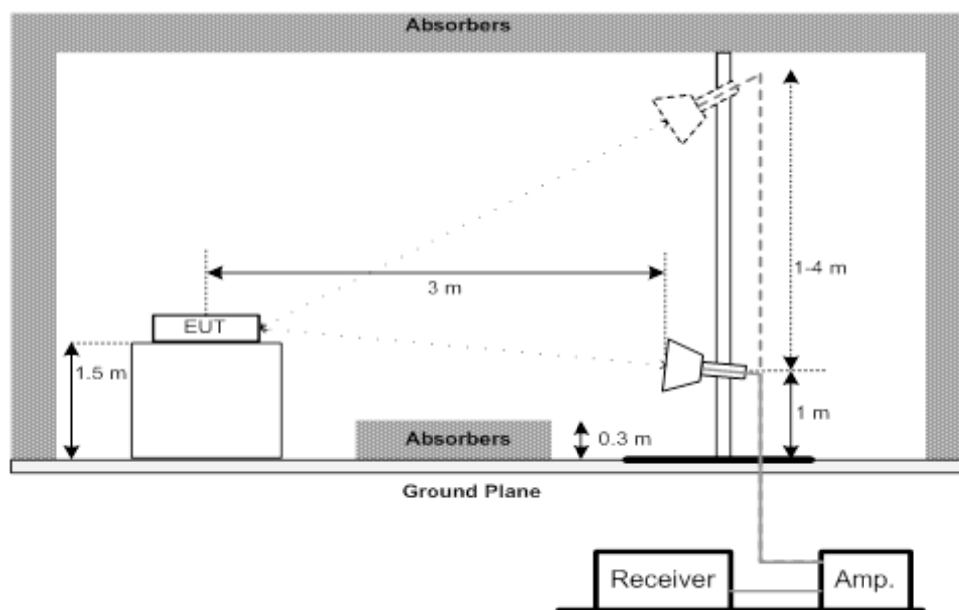
5.4 TEST SETUP

9 kHz-30 MHz



30 MHz to 1 GHz



Above 1 GHz**5.5 EUT OPERATING CONDITIONS**

The EUT was programmed to be in continuously transmitting mode.

5.6 TEST RESULT- 9kHz TO 30MHz

| | |
|------------|---------------------------|
| Test Mode: | BLE 1M TX Mode Channel 00 |
|------------|---------------------------|

| Freq. | Reading | Limit | Margin | State |
|-------|----------|----------|--------|-------|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | P |
| -- | -- | -- | -- | P |

Note:

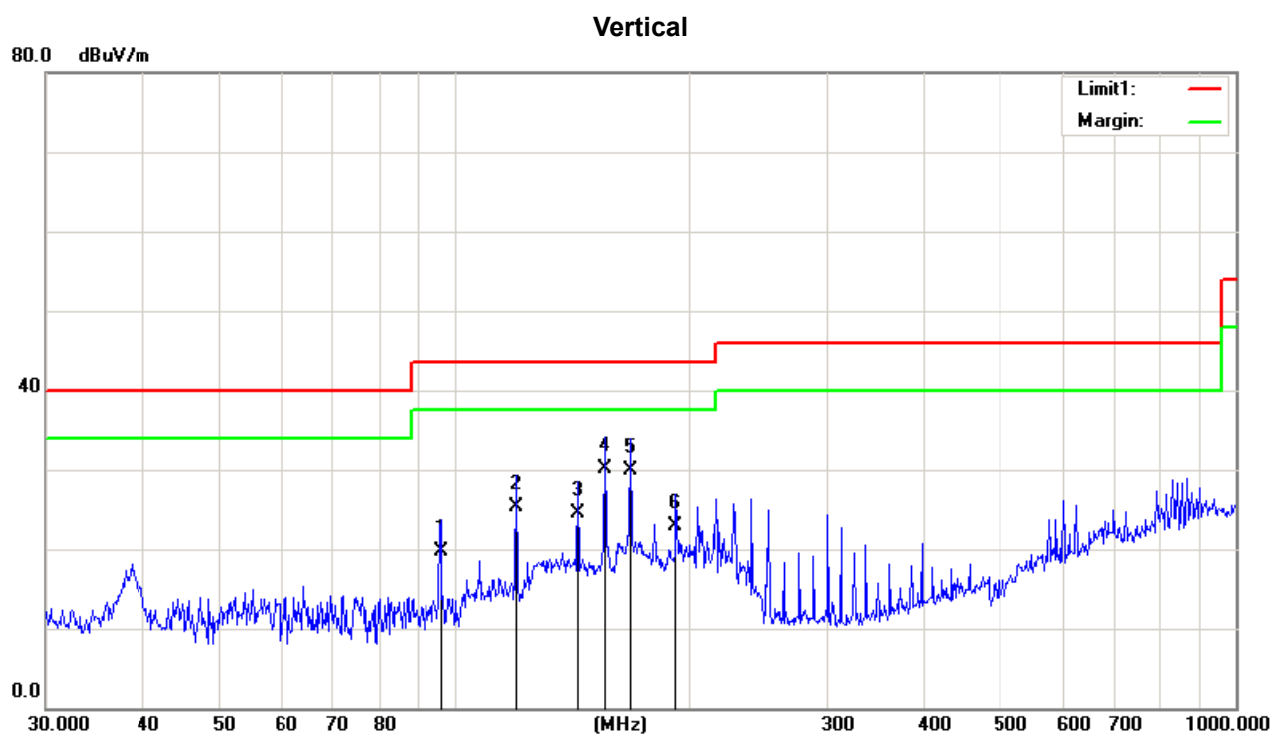
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor = $20 \log (\text{specific distance/test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor

5.7 TEST RESULT- 30MHz TO 1000MHz

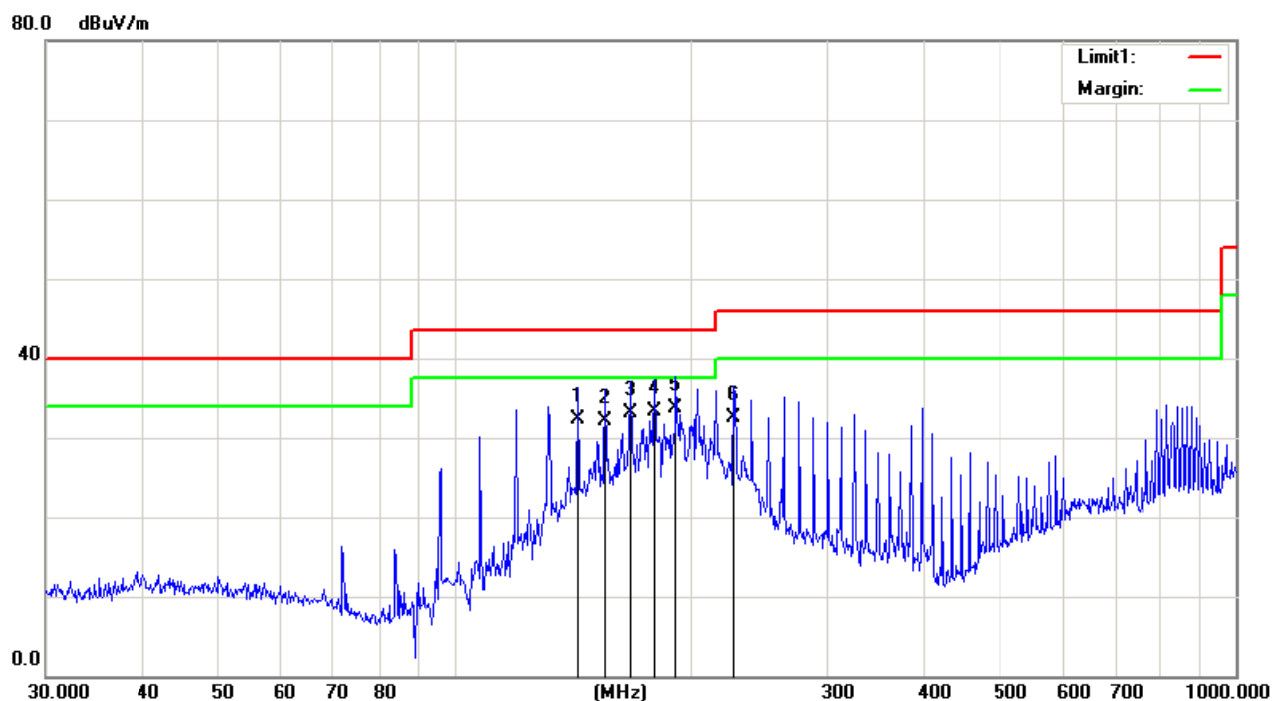
Test Mode : BLE 2M TX Mode Channel 19



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark |
|-----|-----------|----------|--------------|----------|----------|--------|--------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | |
| 1 | 96.0986 | 36.68 | -17.05 | 19.63 | 43.50 | -23.87 | QP |
| 2 | 119.8555 | 39.69 | -14.38 | 25.31 | 43.50 | -18.19 | QP |
| 3 | 143.8291 | 37.68 | -13.16 | 24.52 | 43.50 | -18.98 | QP |
| 4 | 155.9096 | 43.48 | -13.31 | 30.17 | 43.50 | -13.33 | QP |
| 5 | 167.8240 | 43.72 | -13.85 | 29.87 | 43.50 | -13.63 | QP |
| 6 | 191.7450 | 38.42 | -15.46 | 22.96 | 43.50 | -20.54 | QP |

Test Mode : BLE 2M TX Mode Channel 19

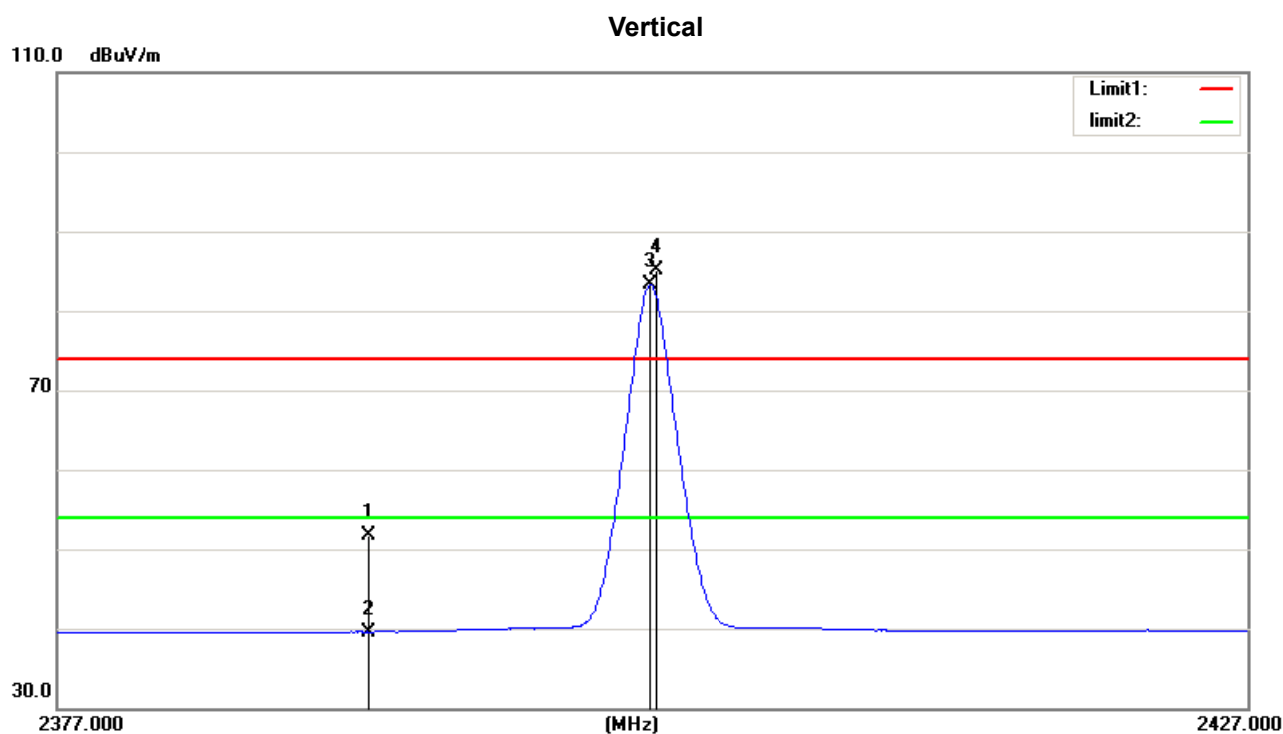
Horizontal



| No. | Frequency (MHz) | Reading (dBuV/m) | Correct Factor(dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|-----|--------------------|---------------------|-------------------------|--------------------|-------------------|----------------|--------|
| 1 | 143.8291 | 45.50 | -13.16 | 32.34 | 43.50 | -11.16 | QP |
| 2 | 155.9096 | 45.37 | -13.31 | 32.06 | 43.50 | -11.44 | QP |
| 3 | 167.8240 | 47.00 | -13.85 | 33.15 | 43.50 | -10.35 | QP |
| 4 | 180.0165 | 47.85 | -14.62 | 33.23 | 43.50 | -10.27 | QP |
| 5 | 191.7450 | 49.10 | -15.46 | 33.64 | 43.50 | -9.86 | QP |
| 6 | 227.6904 | 47.53 | -15.06 | 32.47 | 46.00 | -13.53 | QP |

5.8 TEST RESULT- ABOVE 1000MHz(BAND EDGE)

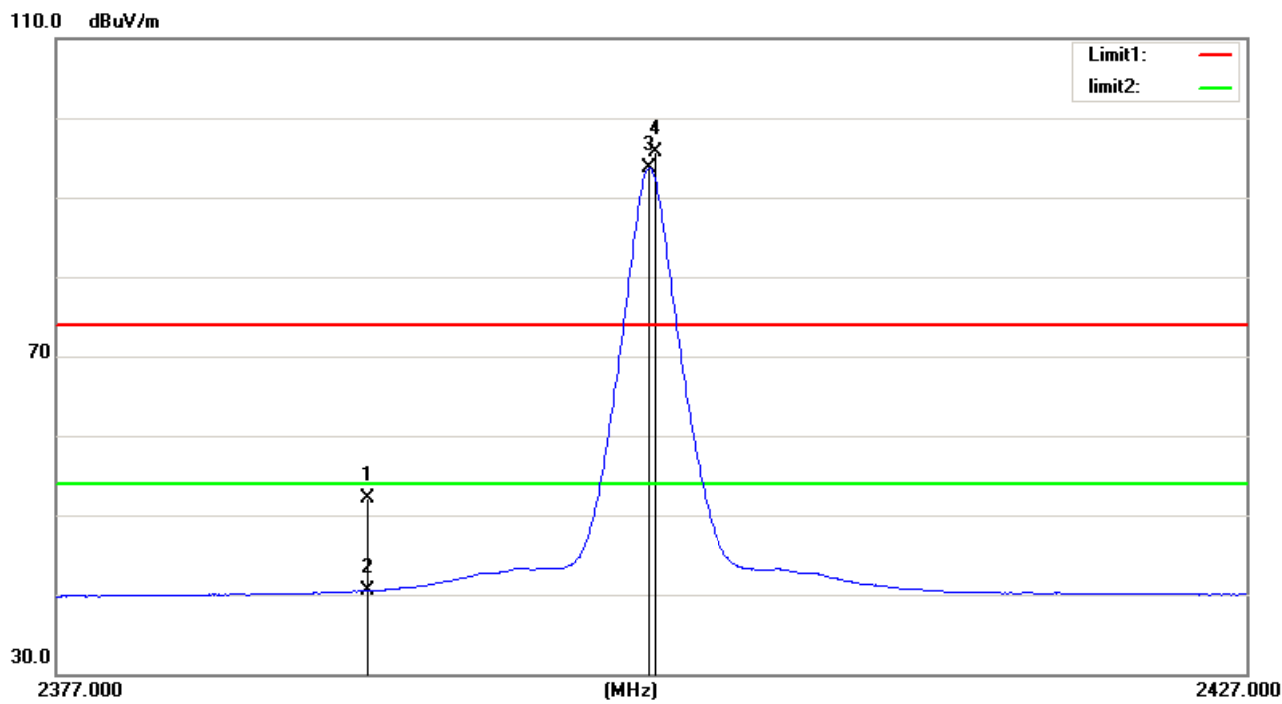
| | |
|------------|------------------------|
| Test Mode: | TX 2402 MHz_CH00_1Mbps |
|------------|------------------------|



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 2390.000 | 22.29 | 29.47 | 51.76 | 74.00 | -22.24 | peak | 150 | 190 |
| 2 | 2390.000 | 10.11 | 29.47 | 39.58 | 54.00 | -14.42 | AVG | 150 | 190 |
| 3 | 2401.800 | 53.76 | 29.50 | 83.26 | / | / | AVG | 150 | 190 |
| 4 | 2402.050 | 55.65 | 29.51 | 85.16 | / | / | peak | 150 | 190 |

Test Mode: TX 2402 MHz_CH00_1Mbps

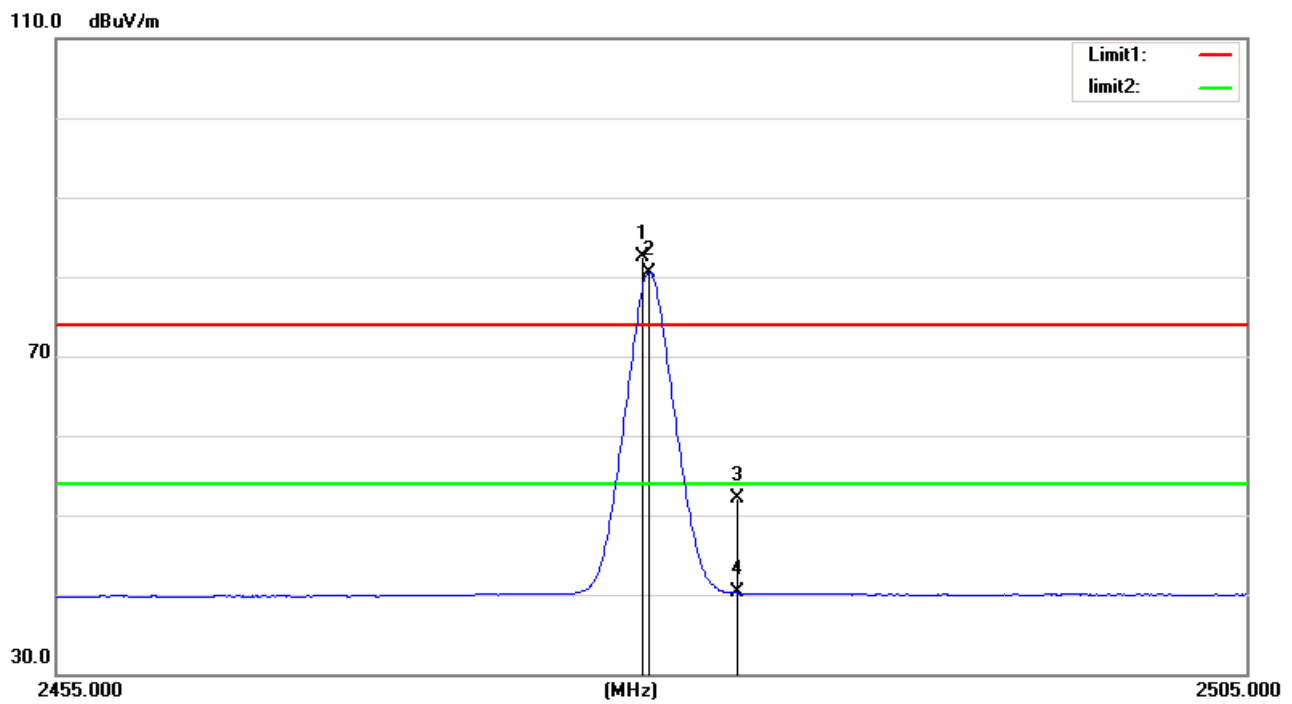
Horizontal



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 2390.000 | 22.56 | 29.47 | 52.03 | 74.00 | -21.97 | peak | 150 | 280 |
| 2 | 2390.000 | 10.98 | 29.47 | 40.45 | 54.00 | -13.55 | AVG | 150 | 280 |
| 3 | 2401.800 | 64.18 | 29.50 | 93.68 | / | / | AVG | 150 | 280 |
| 4 | 2402.050 | 66.16 | 29.51 | 95.67 | / | / | peak | 150 | 280 |

Test Mode: TX 2480 MHz_CH39_1Mbps

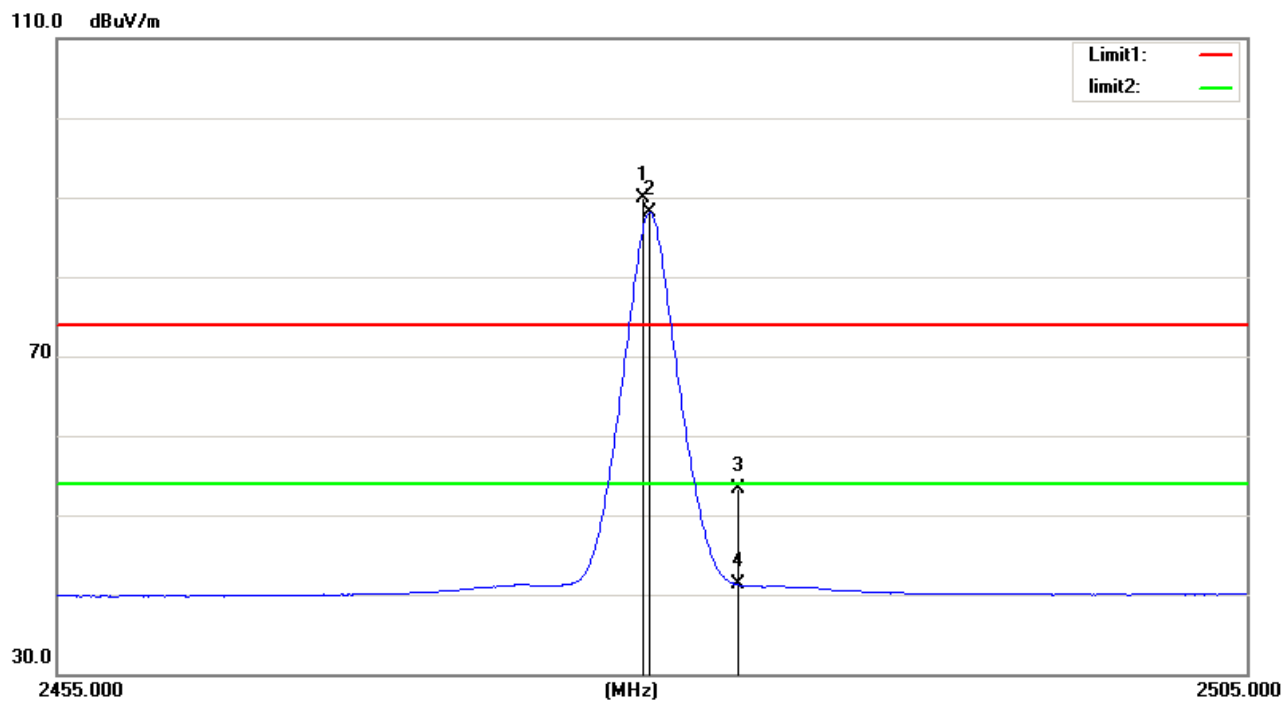
Vertical



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 2479.550 | 52.88 | 29.72 | 82.60 | / | / | peak | 150 | 196 |
| 2 | 2479.800 | 50.87 | 29.72 | 80.59 | / | / | AVG | 150 | 196 |
| 3 | 2483.500 | 22.32 | 29.73 | 52.05 | 74.00 | -21.95 | peak | 150 | 196 |
| 4 | 2483.500 | 10.48 | 29.73 | 40.21 | 54.00 | -13.79 | AVG | 150 | 196 |

Test Mode: TX 2480 MHz_CH39_1Mbps

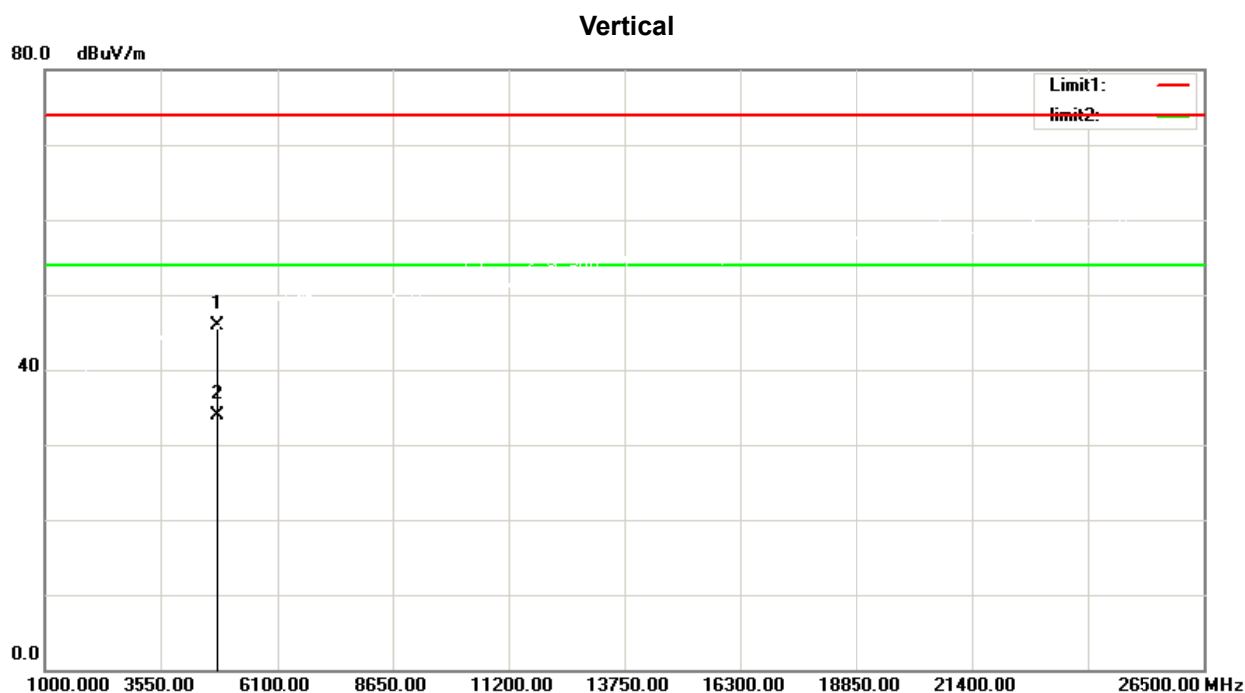
Horizontal



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 2479.550 | 60.21 | 29.72 | 89.93 | / | / | peak | 150 | 275 |
| 2 | 2479.800 | 58.34 | 29.72 | 88.06 | / | / | AVG | 150 | 275 |
| 3 | 2483.500 | 23.47 | 29.73 | 53.20 | 74.00 | -20.80 | peak | 150 | 275 |
| 4 | 2483.500 | 11.50 | 29.73 | 41.23 | 54.00 | -12.77 | AVG | 150 | 275 |

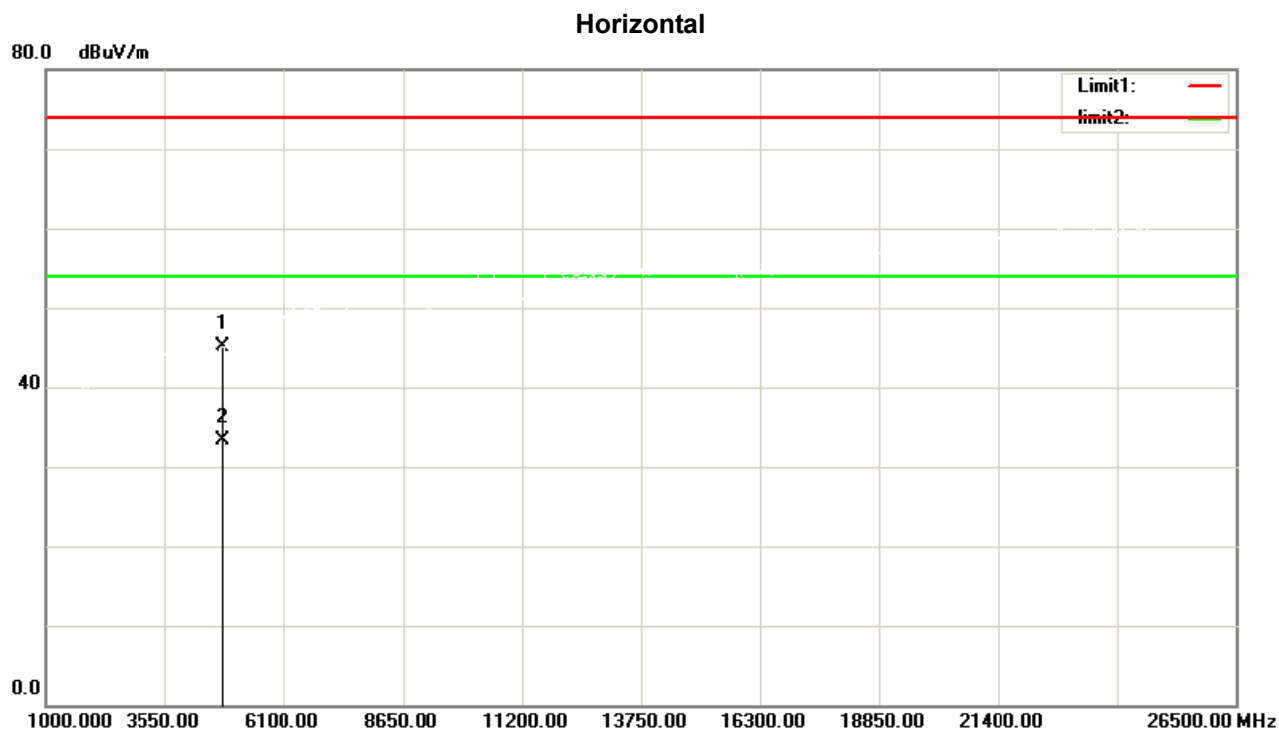
5.9 TEST RESULTS - ABOVE 1000MHz(HARMONIC)

| | |
|------------|------------------------|
| Test Mode: | TX 2402 MHz_CH00_1Mbps |
|------------|------------------------|



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4804.000 | 53.88 | -8.03 | 45.85 | 74.00 | -28.15 | peak | 150 | 191 |
| 2 | 4804.000 | 42.00 | -8.03 | 33.97 | 54.00 | -20.03 | AVG | 150 | 191 |

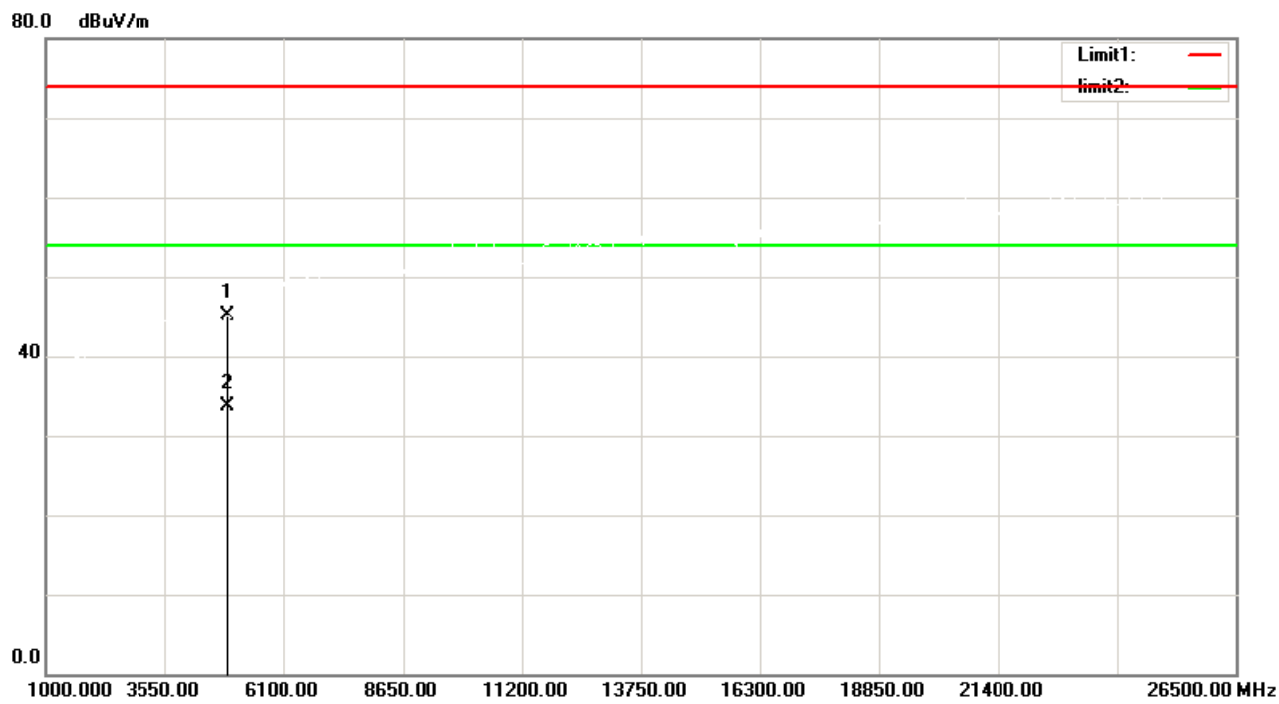
Test Mode: TX 2402 MHz_CH00_1Mbps



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4804.000 | 53.06 | -8.03 | 45.03 | 74.00 | -28.97 | peak | 150 | 284 |
| 2 | 4804.000 | 41.40 | -8.03 | 33.37 | 54.00 | -20.63 | AVG | 150 | 284 |

Test Mode: TX 2440 MHz_CH19_1Mbps

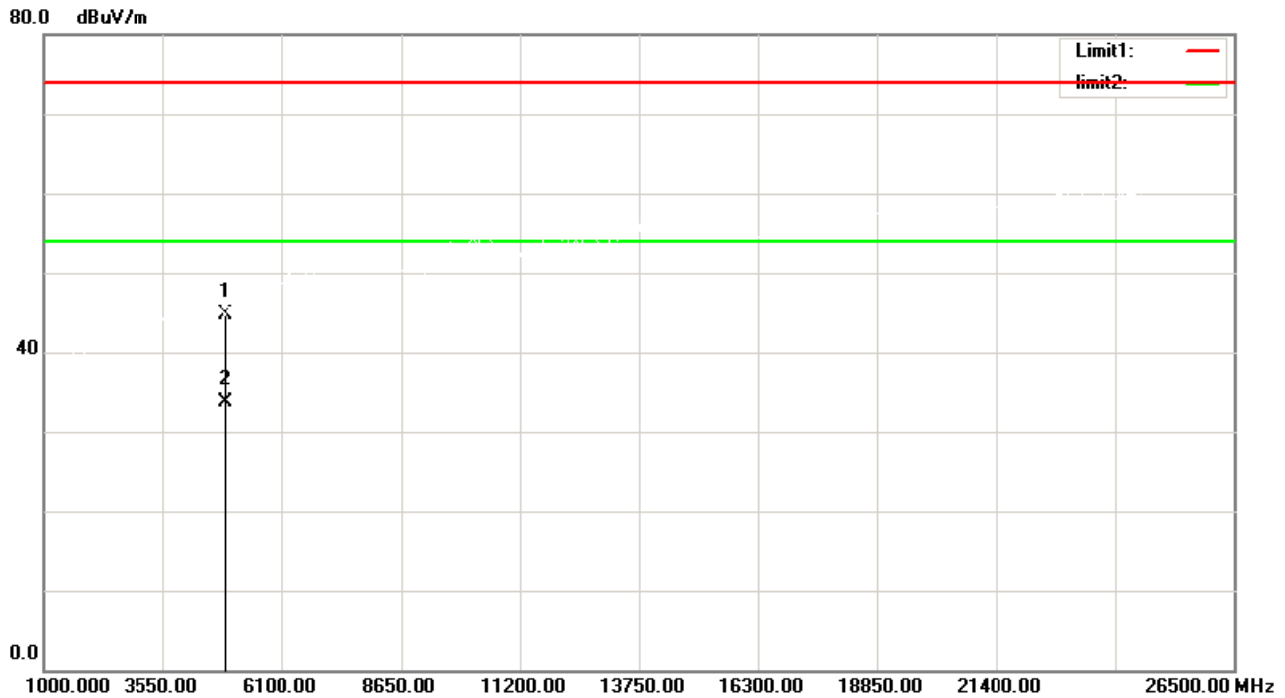
Vertical



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4880.000 | 52.89 | -7.87 | 45.02 | 74.00 | -28.98 | peak | 150 | 193 |
| 2 | 4880.000 | 41.56 | -7.87 | 33.69 | 54.00 | -20.31 | AVG | 150 | 193 |

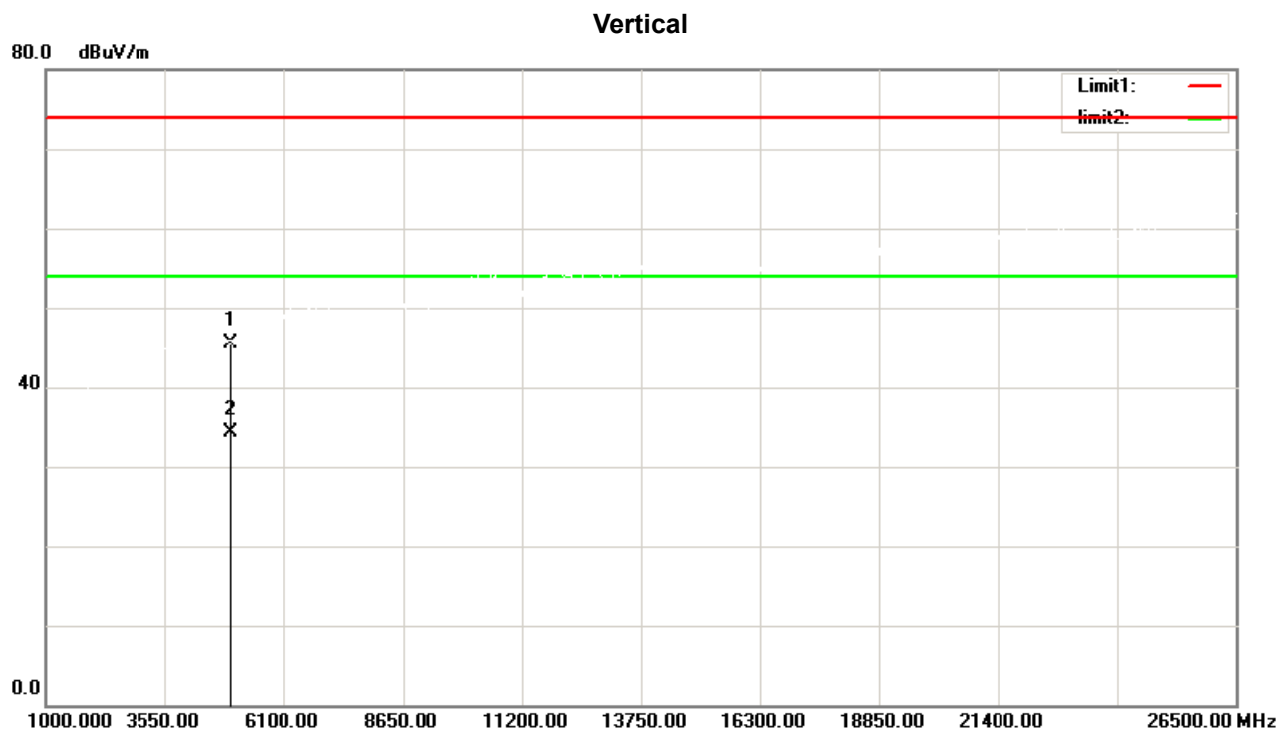
Test Mode: TX 2440 MHz_CH19_1Mbps

Horizontal



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4880.000 | 52.66 | -7.87 | 44.79 | 74.00 | -29.21 | peak | 150 | 274 |
| 2 | 4880.000 | 41.52 | -7.87 | 33.65 | 54.00 | -20.35 | AVG | 150 | 274 |

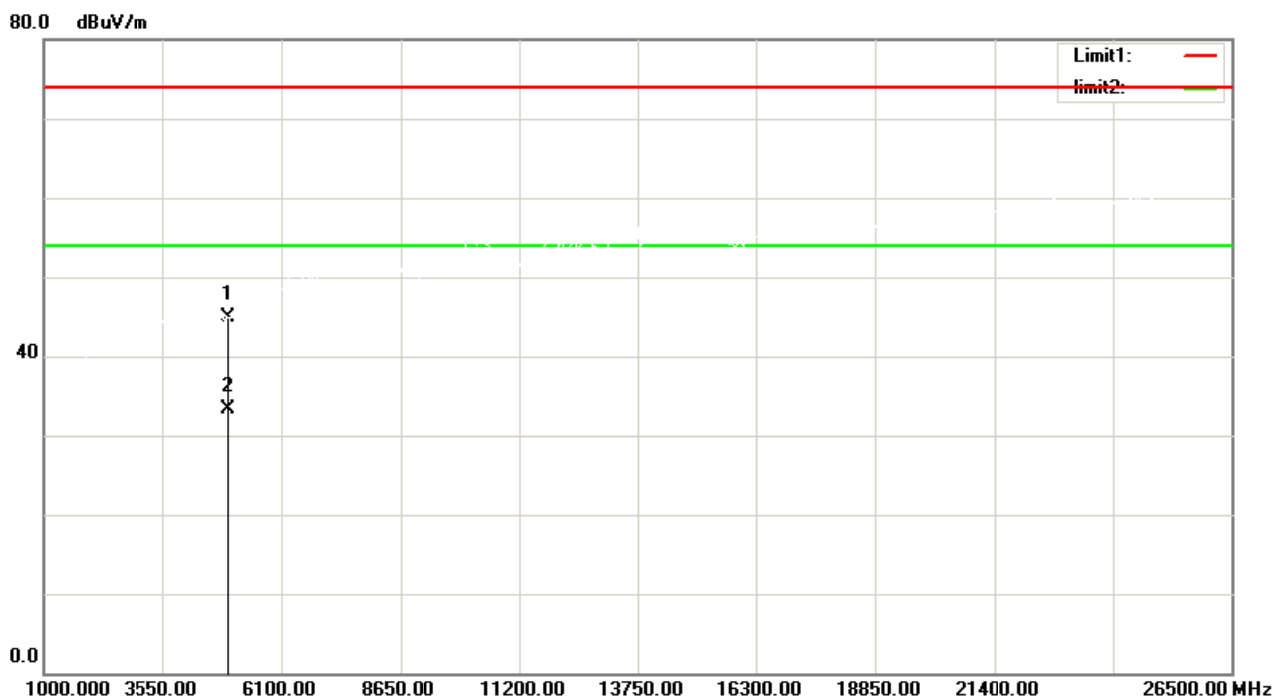
Test Mode: TX 2480 MHz_CH39_1Mbps



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4960.000 | 53.31 | -7.71 | 45.60 | 74.00 | -28.40 | peak | 150 | 185 |
| 2 | 4960.000 | 41.97 | -7.71 | 34.26 | 54.00 | -19.74 | AVG | 150 | 185 |

| | |
|------------|------------------------|
| Test Mode: | TX 2480 MHz_CH39_1Mbps |
|------------|------------------------|

Horizontal



| No. | Frequency | Reading | Correct | Result | Limit | Margin | Remark | Antenna Height | Table Degree |
|-----|-----------|----------|--------------|----------|----------|--------|--------|----------------|--------------|
| | (MHz) | (dBuV/m) | Factor(dB/m) | (dBuV/m) | (dBuV/m) | (dB) | | cm | Degree |
| 1 | 4960.000 | 52.65 | -7.71 | 44.94 | 74.00 | -29.06 | peak | 150 | 277 |
| 2 | 4960.000 | 40.98 | -7.71 | 33.27 | 54.00 | -20.73 | AVG | 150 | 277 |

6BANDWIDTH TEST**6.1LIMIT**

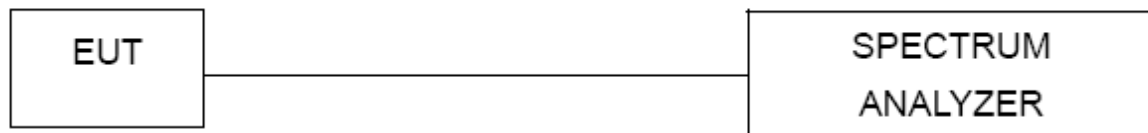
| FCC Part15, Subpart C (15.247)& RSS-Gen/ RSS-247 | | |
|--------------------------------------------------|-----------|-----------------------------------|
| Section | Test Item | Limit |
| 15.247(a)(2) RSS-Gen6.7 RSS-247 5.2 (a) | Bandwidth | ≥ 500 kHz (6dB bandwidth) |

6.2TEST PROCEDURE AND SETTING

- a. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below.
- b. Spectrum Setting:
 For 6dB Bandwidth RBW= 100 kHz, VBW=300 kHz, Sweep time =Auto.
 For 99% Bandwidth RBW=30kHz, VBW=100kHz, Sweep time =Auto for 1Mbps.
 RBW=100kHz, VBW=300kHz, Sweep time =Auto for 2Mbps.

6.3MEASUREMENT INSTRUMENTS LIST

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|---------------|-------------|------------|------------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2023/05/26 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | N/A |
| 3 | RF Cable | Mi-cable | C10-01-01-1 | 100309 | N/A |

6.4TEST SETUP**6.5EUT OPERATION CONDITIONS**

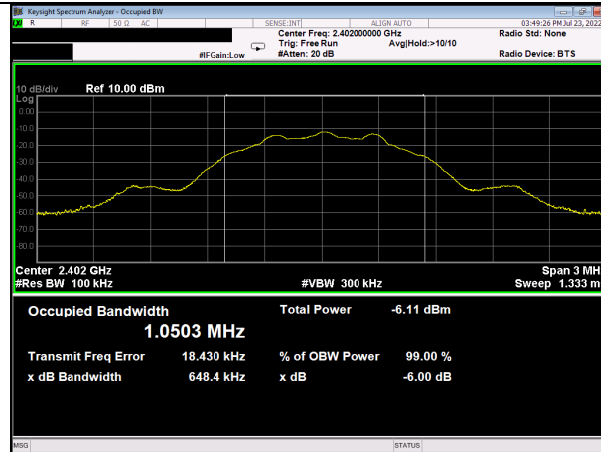
The EUT tested system was configured as the statements of 4.5 unless otherwise a special operating condition is specified in the follows during the testing.

6.6 TEST RESULTS

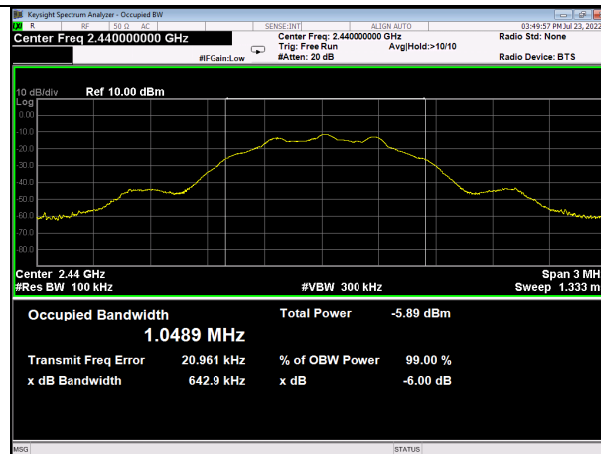
| TX Mode_1Mbps | | | | |
|---------------|-----------------|----------------------|--------------|--------|
| Channel | Frequency (MHz) | 6 dB bandwidth (MHz) | 99%OBW (MHz) | Result |
| CH00 | 2402 | 0.6484 | 1.0148 | PASS |
| CH19 | 2440 | 0.6429 | 1.0128 | PASS |
| CH39 | 2480 | 0.6450 | 1.0155 | PASS |

6dB

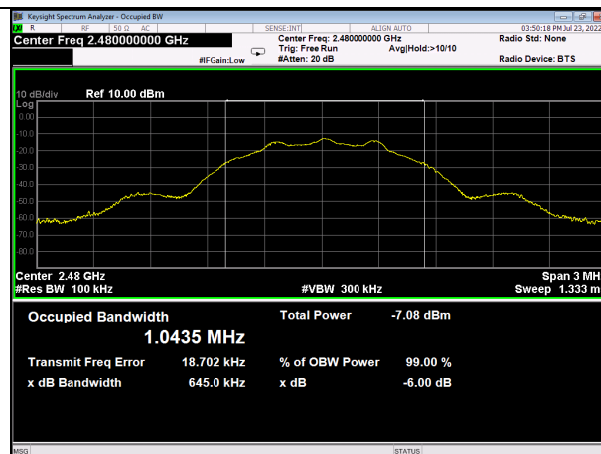
2402MHz



2440MHz

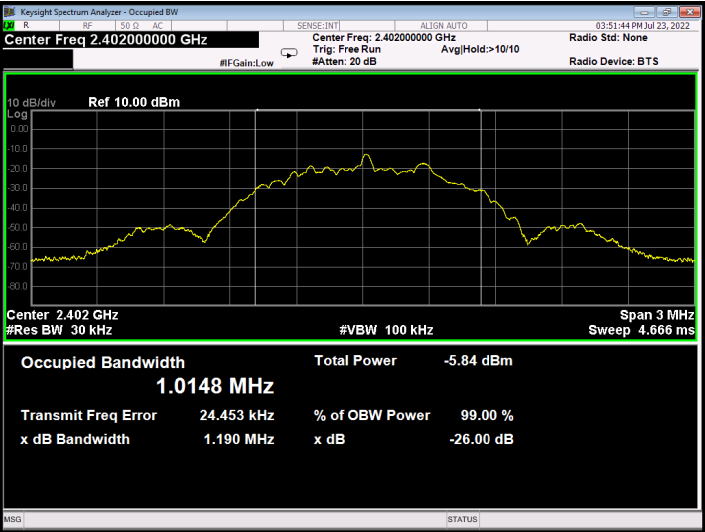


2480MHz

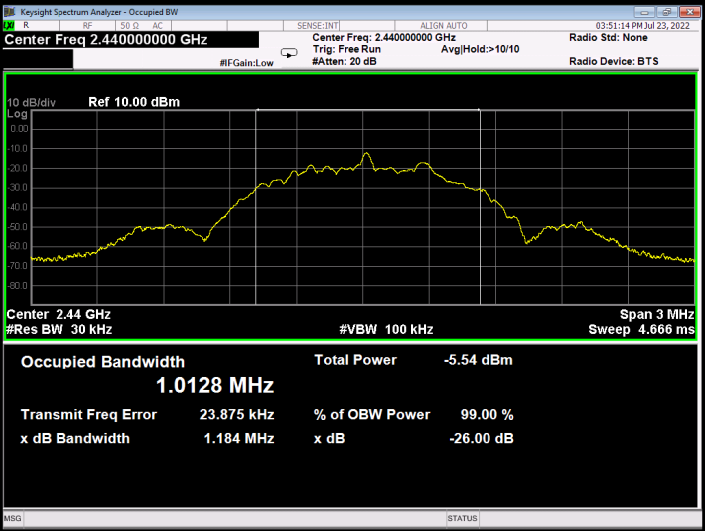


99%

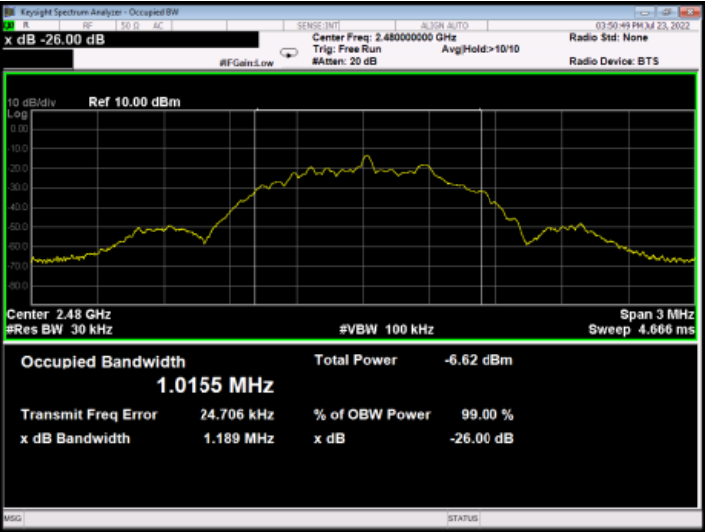
2402MHz



2440MHz



2480MHz



7 MAXIMUM OUTPUT POWER**7.1 LIMIT**

| FCC Part15, Subpart C (15.247)&RSS-247 | | |
|----------------------------------------|----------------------|-----------------|
| Section | Test Item | Limit |
| 15.247(b)(3) RSS-247.4 (d) | Maximum Output Power | 1 watt or 30dBm |

7.2 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 11.9.1.3(for peak power)ofANSI C63.10-2013.

7.3 MEASUREMENT INSTRUMENTS LIST


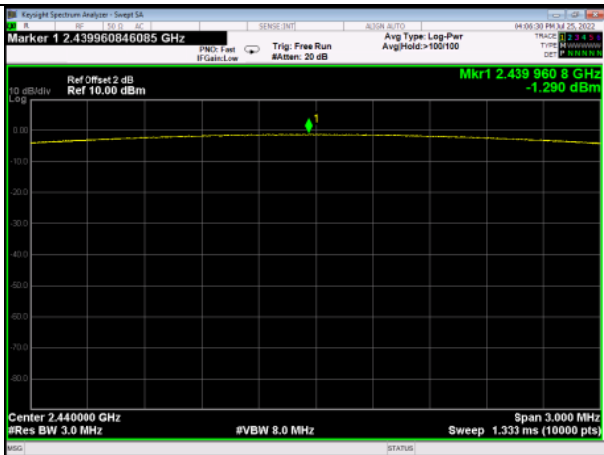
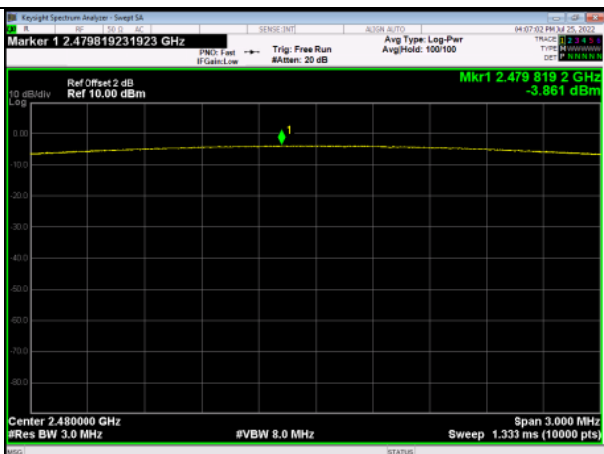
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|---------------|-------------|------------|------------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2023/05/26 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | N/A |
| 3 | RF Cable | Mi-cable | C10-01-01-1 | 100309 | N/A |

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

| TX Mode_1Mbps | | | | |
|---------------|-----------------|--------------------|------------------|--------|
| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (W) | Result |
| CH00 | 2402 | -0.497 | 0.000892 | PASS |
| CH19 | 2440 | -1.290 | 0.000743 | PASS |
| CH39 | 2480 | -3.861 | 0.000411 | PASS |
| Limit | 30dBm / 1W | | | |

| | |
|---------|--------------------------------------------------------------------------------------|
| 2402MHz |  |
| 2440MHz |  |
| 2480MHz |  |

8 CONDUCTED SPURIOUS EMISSION

8.1 LIMIT

For FCC

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.

For ISCED

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak Output Power limits. If the transmitter complies with the Output Power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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= 100 kHz, VBW=300 kHz, Sweep time = Auto.

8.3 MEASUREMENT INSTRUMENTS LIST

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|---------------|-------------|------------|------------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2023/05/26 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | N/A |
| 3 | RF Cable | Mi-cable | C10-01-01-1 | 100309 | N/A |

8.4 TEST SETUP



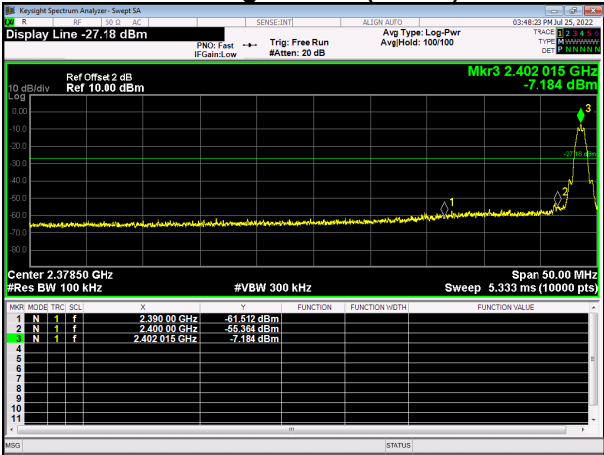
8.5 EUT OPERATION CONDITIONS

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.

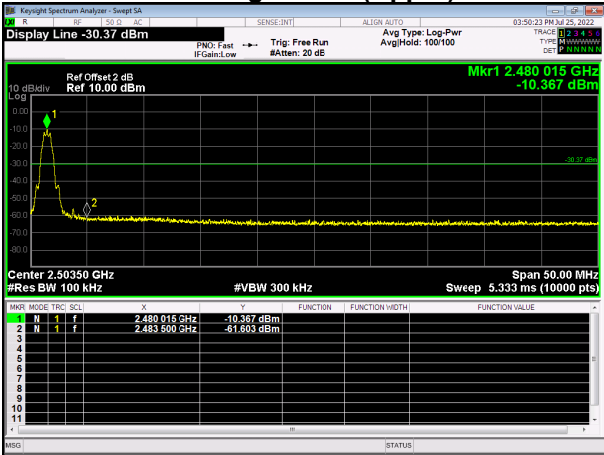
8.6 TEST RESULTS

TX Mode_1Mbps

Bandedge- CH00 (Lower)

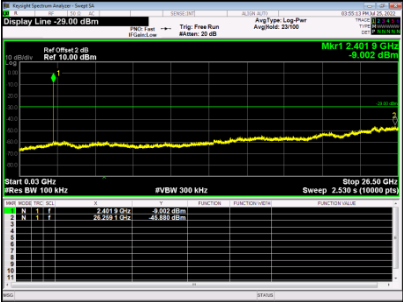


Bandedge CH39 (Upper)

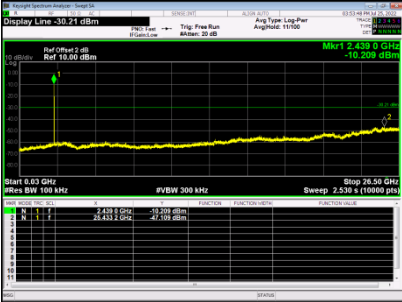


CH00 – 10th Harmonic of the fundamental frequency

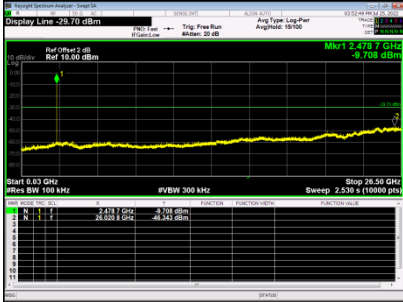
2402MHz



2440MHz



2480MHz



9. POWER SPECTRAL DENSITY TEST**9.1 LIMIT**

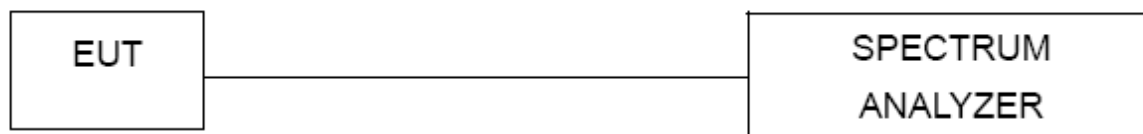
| FCC Part15, Subpart C (15.247)&RSS-247 | | |
|----------------------------------------|------------------------|-------------------------|
| Section | Test Item | Limit |
| 15.247(e) RSS-247.2 (b) | Power Spectral Density | 8 dBm (in any 3 kHz) |

9.2 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=10kHz, Sweep time = auto.

9.3 MEASUREMENT INSTRUMENTS LIST

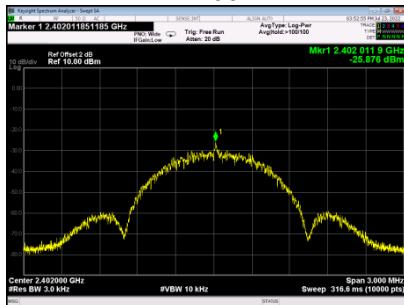
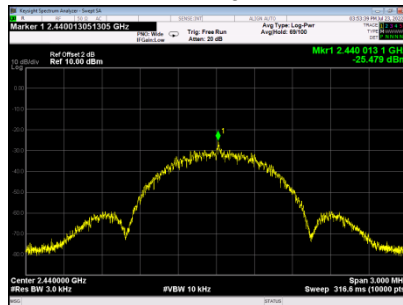
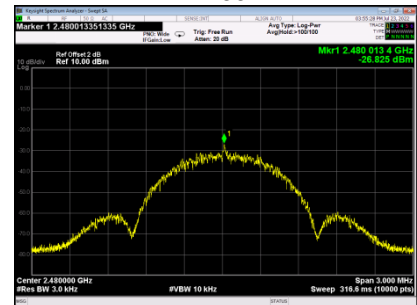
| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|------|-------------------|---------------|-------------|------------|------------------|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 2023/05/26 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | N/A |
| 3 | RF Cable | Mi-cable | C10-01-01-1 | 100309 | N/A |

9.4 TEST SETUP**9.5 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.

9.6 TEST RESULTS

| TX Mode_1Mbps | | | | |
|---------------|-----------------|-----------------------------------|------------------|--------|
| Channel | Frequency (MHz) | Power SpectralDensity (dBm/3 kHz) | Limit: <dBm/3KHz | Result |
| CH00 | 2402 | -25.876 | 8 | PASS |
| CH19 | 2440 | -25.479 | 8 | PASS |
| CH39 | 2480 | -26.825 | 8 | PASS |

CH00**CH19****CH39****END OF TEST REPORT**