# FCC TEST REPORT

# FCC ID: 2BLQ7-GL02

| | | |
|---|---|---|
| Product | : | Gaming PC |
| Model Name | : | GL02, X1/M50/MTX240 |
| Brand | : | AOACE |
| Report No. | : | PTC24090210203E-FC02 |

**Prepared for**

Shenzhen Zhuangji Master Electronic Commerce Co., Ltd.

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**Prepared by**

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# 1 TEST RESULT CERTIFICATION

| | | |
|---|---|---|
| Applicant's name | : | Shenzhen Zhuangji Master Electronic Commerce Co., Ltd. |
| Address | : | 3rd Floor, Building B, Innovation Silicon Valley Industrial Park, Jingtian Road, Laocun Community, Guanhu Street, Longhua District, Shenzhen |
| Manufacture's name | : | Shenzhen Zhuangji Master Electronic Commerce Co., Ltd. |
| Address | : | 3rd Floor, Building B, Innovation Silicon Valley Industrial Park, Jingtian Road, Laocun Community, Guanhu Street, Longhua District, Shenzhen |
| Product name | : | Gaming PC |
| Model name | : | GL02, X1/M50/MTX240 |
| Standards | : | FCC CFR47 Part 15 Section 15.247 |
| Test procedure | : | ANSI C63.10:2013 |
| Test Date | : | Sep. 11, 2024 to Oct. 08, 2024 |
| Date of Issue | : | Oct. 08, 2024 |
| Test Result | : | Pass |

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Test Engineer:

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## 2 Test Summary

| Test Items | Test Requirement | Result |
|---|---|---|
| Conduct Emission | 15.207 | PASS |
| Radiated Spurious Emissions | 15.205(a)<br>15.209<br>15.247(d) | PASS |
| Conducted Spurious Emission | 15.247(d) | PASS |
| Band edge | 15.247(d)<br>15.205(a) | PASS |
| 6dB Bandwidth | 15.247(a)(2) | PASS |
| Maximum Peak Output Power | 15.247(b)(3) | PASS |
| Power Spectral Density | 15.247(e) | PASS |
| Antenna Requirement | 15.203 | PASS |

## 2.1 Test Site

Precise Testing & Certification Co., Ltd

Address: Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A

FCC Designation Number: CN1219

# 3 General Information

## 3.1 General Description of E.U.T.

| | | |
|---|---|---|
| Product Name | : | Gaming PC |
| Model Name | : | GL02 |
| Additional model name | : | X1/M50/MTX240 |
| Bluetooth Version | : | 5.0 |
| Operating frequency | : | 2402-2480MHz |
| Number of Channels | : | 40 channels For DTS |
| Type of Modulation | : | GFSK, For DTS |
| Antenna installation | : | External Antenna |
| Antenna Gain | : | 1.95 dBi |
| Power supply | : | Input voltage:100VAC~240V~<br>Input current:8-4A Frequency:60-50Hz<br>Maximum output wattage: 550W |
| Hardware Version | : | N/A |
| Software Version | : | N/A |
| Test sample No. | : | PTC24090210203E-1/2,PTC24090210203E-2/2. |

## 3.2 Channel List

The EUT has been tested under its typical operating condition. Pre-defined engineering program for regulatory testing used to control the EUT for staying in continuous transmitting. Only the worst case data were reported.

The EUT has been associated with peripherals pursuant to ANSI C63.10-2013 and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation (9 KHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The details of test channels and bandwidth were for RF conductive measurement.

Channel List:

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

Note:

1. Test of channel was included the lowest 2402MHz, middle 2440MHz and highest frequency 2480MHz in highest data rate and to perform the test, then record on this report.

# 4 Equipment During Test

## 4.1 Equipments List

RF Conducted Test

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Last Calibration | Calibration Interval |
|---|---|---|---|---|---|---|
| MXG Signal Analyzer | Agilent | N9020A | SER MY5111038 | 10Hz-26.5GHz | Aug.15, 2024 | 1 Year |
| Coaxial Cable | CDS | 79254 | 46107086 | 10Hz-30GHz | Aug.15, 2024 | 1 Year |
| Power Meter | Anritsu | ML2495A | 0949003 | 300MHz-40GHz | Aug.15, 2024 | 1 Year |
| Power Sensor | Anritsu | MA2411B | 0917017 | 300MHz-40GHz | Aug.15, 2024 | 1 Year |
| Test S/W | Tonscend | JS1120-3 | / | / | / | / |

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Last Calibration | Calibration Interval |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESPI7 | 101671 | 9KHz-7GHz | Aug.15, 2024 | 1 Year |
| Loop Antenna | Schwarzbeck | FMZB 1519 | 192 | 9 KHz -30MHz | Aug.15, 2024 | 1 Year |
| Bilog Antenna | SCHWARZBECK | VULB9160 | 9160-3355 | 25MHz-2GHz | Aug.15, 2024 | 1 Year |
| Preamplifier (low frequency) | SCHWARZBECK | BBV 9475 | 9745-0013 | 1MHz-1GHz | Aug.15, 2024 | 1 Year |
| Cable | IMRO | AK-9515E(9m) | Cable-L | 9KHz-3GHz | Aug.15, 2024 | 1 Year |
| Spectrum Analyzer | Rohde&Schwarz | FSV40 | 6625-01-588-5515 | 9KHz-40GHz | Aug.15, 2024 | 1 Year |
| Horn Antenna | SCHWARZBECK | 9120D | 9120D-1246 | 1GHz-18GHz | Aug.15, 2024 | 1 Year |
| Power Amplifier | ZHINAN | ZN3380C | 15002 | 1GHz-26.5GHz | Aug.15, 2024 | 1 Year |

| | | | | | | |
|---|---|---|---|---|---|---|
| Horn Antenna | SCHWARZBECK | BBHA 9170 | 9170-1066 | 15GHz-40GHz | Jul. 19, 2024 | 1 Year |
| Amplifier | SCHWARZBECK | BBV 9721 | 9721-205 | 18GHz-40GHz | Jul. 19, 2024 | 1 Year |
| Cable | H+S | CBL-26 | N/A | 1GHz-26.5GHz | Aug.15, 2024 | 1 Year |
| RF Cable | R&S | R204 | R21X | 1GHz-40GHz | Aug.15, 2024 | 1 Year |
| Test S/W | Tonscend | TS+ | / | / | / | / |

Conducted Emissions

| Name of Equipment | Manufacturer | Model | Serial No. | Characteristics | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|---|
| EMI Test Receiver | Rohde&Schwarz | ESCI | 101417 | 9KHz-3GHz | Aug.15, 2024 | 1 Year |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 102453 | 9KHz-300MHz | Aug.15, 2024 | 1 Year |
| Artificial Mains Network | Rohde&Schwarz | ENV216 | 101342 | 9KHz-300MHz | Aug.15, 2024 | 1 Year |
| Limiter | R&S | ESH3-Z2 | 0357.8810.54-102808-NB | 0Hz-30MHz | Aug.15, 2024 | 1 Year |
| RF Switch | DIAMOND ANTENNA | CX-210 | / | 9kHz-6GHz | Mar. 22,2024 | 1 Year |
| Test S/W | Tonscend | JS32-CE | / | / | / | / |

## 4.2 Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| RF output power, conducted | ±1.0dB |
| Power Spectral Density, conducted | ±2.2dB |
| Radio Frequency | ± 1 x $10^{-6}$ |
| Bandwidth | ± 1.5 x $10^{-6}$ |
| Time | ±2% |
| Duty Cycle | ±2% |
| Temperature | ±1°C |
| Humidity | ±5% |
| DC and low frequency voltages | ±3% |
| Conducted Emissions (150kHz~30MHz) | ±3.64dB |
| Radiated Emission(9kHz~30MHz) | ±3.15dB |
| Radiated Emission(30MHz~1GHz) | ±5.03dB |
| Radiated Emission(1GHz~25GHz) | ±4.74dB |

Note:
1.The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%.
2. The Ulab is less than Ucispr, compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit; non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
3. For conducted emission test of laboratory have a measurement uncertainty greater than
that specified in harmonized standard, this equipment can still be used provided that an adjustment is made follows: any additional uncertainty in the test system over and above that specified in harmonized standard should be used to tighter the test.

## 4.3 Description of Support Units

| Equipment | Model No. | Series No. | Parameters |
|---|---|---|---|
| LCD | HU20270FB0 | 1S6S39BCS4L EGK1P3809 | N/A |
| Mouse | OP-300 | SA8177323 | N/A |
| Keyboard | G2 | SA8173709103 | N/A |

# 5 Conducted Emission

| | | |
|---|---|---|
| Test Requirement | : | FCC CFR 47 Part 15 Section 15.207 |
| Test Method | : | ANSI C63.10: 2013 |
| Test Result | : | PASS |
| Frequency Range | : | 150kHz to 30MHz |
| Class/Severity | : | Class B |

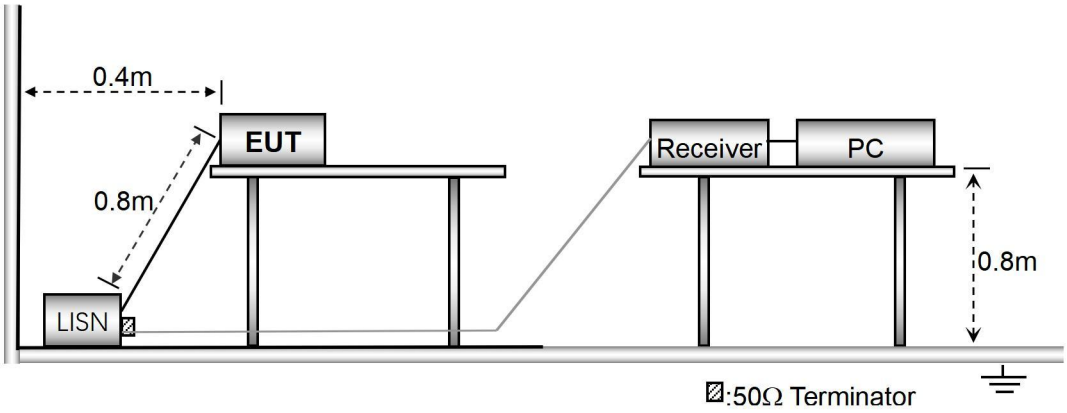
## 5.1 E.U.T. Operation

Operating Environment :

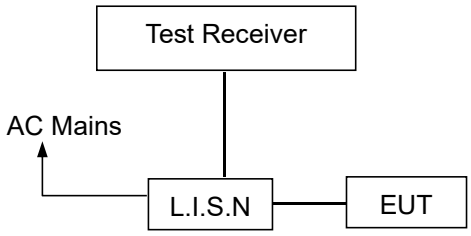
| | | |
|---|---|---|
| Temperature | : | 25.5 °C |
| Humidity | : | 51 % RH |
| Atmospheric Pressure | : | 101.2kPa |

## 5.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10:2013



## 5.3 Test SET-UP (Block Diagram of Configuration)




### 5.4 Measurement Procedure

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

### 5.5 Conducted Emission Limit

**Conducted Emission**

| Frequency(MHz) | Quasi-peak | Average |
|---|---|---|
| 0.15-0.5 | 66-56 | 56-46 |
| 0.5-5.0 | 56 | 46 |
| 5.0-30.0 | 60 | 50 |

**Note:**

1. The lower limit shall apply at the transition frequencies

2.The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

## 5.6 Measurement Description

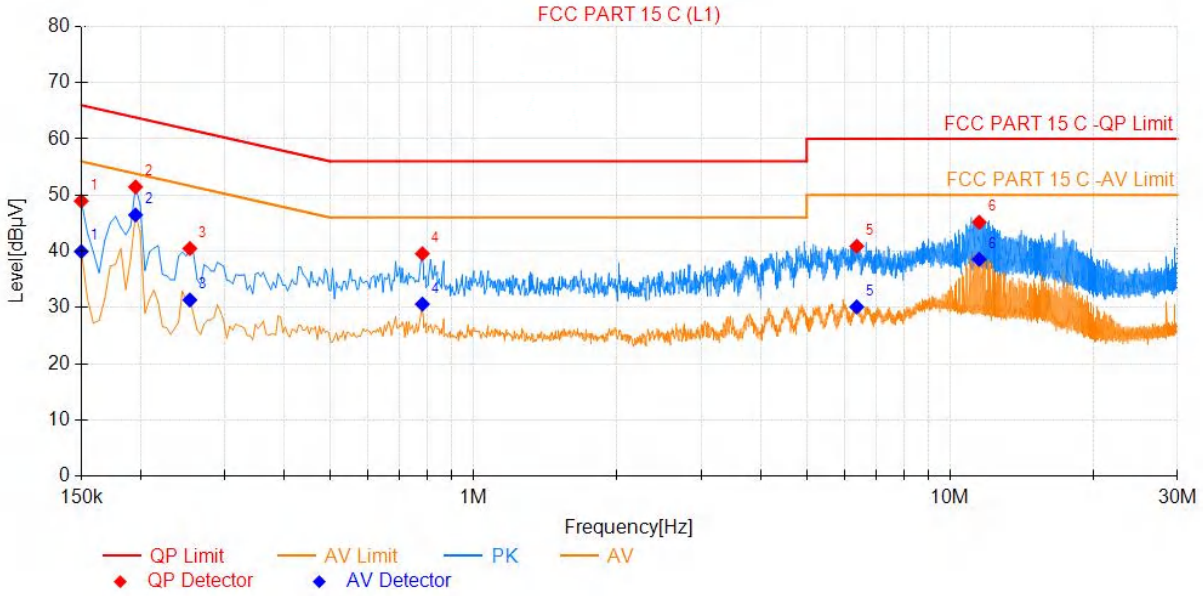
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

## 5.7 Conducted Emission Test Result

Pass.

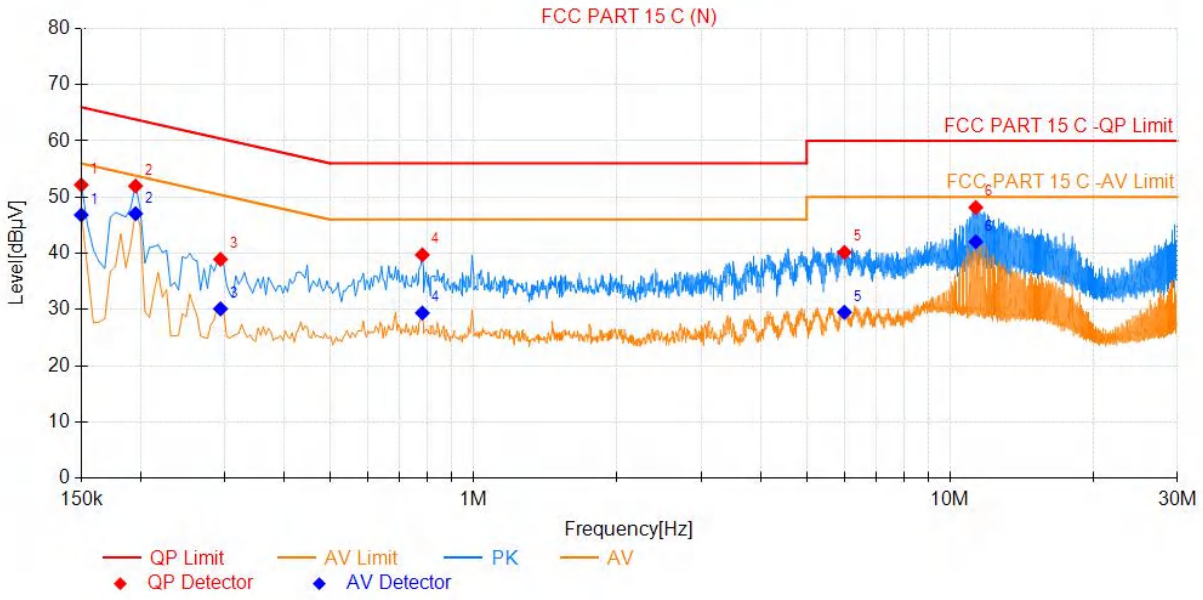
All the modulation modes were tested the data of the worst mode (AC 120V/60Hz, GFSK TX 2402MHz) are recorded in the following pages and the others modulation methods do not exceed the limits.

Line-AC 120V/60Hz




| Final Data List | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
| 1 | 0.150 | 29.75 | 19.19 | 48.94 | 66.00 | 17.06 | 20.77 | 39.96 | 56.00 | 16.04 | PASS |
| 2 | 0.195 | 32.32 | 19.14 | 51.46 | 63.82 | 12.36 | 27.33 | 46.47 | 53.82 | 7.35 | PASS |
| 3 | 0.254 | 21.40 | 19.09 | 40.49 | 61.64 | 21.15 | 12.24 | 31.33 | 51.64 | 20.31 | PASS |
| 4 | 0.780 | 20.37 | 19.21 | 39.58 | 56.00 | 16.42 | 11.39 | 30.60 | 46.00 | 15.40 | PASS |
| 5 | 6.369 | 21.63 | 19.27 | 40.90 | 60.00 | 19.10 | 10.83 | 30.10 | 50.00 | 19.90 | PASS |
| 6 | 11.513 | 25.42 | 19.75 | 45.17 | 60.00 | 14.83 | 18.82 | 38.57 | 50.00 | 11.43 | PASS |

Neutral-AC 120V/60Hz




## Final Data List

| NO. | Freq. [MHz] | QP Reading [dBµV] | Factor [dB] | QP Value [dBµV] | QP Limit [dBµV] | QP Margin [dB] | AV Reading [dBµV] | AV Value [dBµV] | AV Limit [dBµV] | AV Margin [dB] | Verdict |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.150 | 33.22 | 18.96 | 52.18 | 66.00 | 13.82 | 27.86 | 46.82 | 56.00 | 9.18 | PASS |
| 2 | 0.195 | 32.92 | 19.06 | 51.98 | 63.82 | 11.84 | 27.99 | 47.05 | 53.82 | 6.77 | PASS |
| 3 | 0.294 | 19.84 | 19.09 | 38.93 | 60.41 | 21.48 | 11.02 | 30.11 | 50.41 | 20.30 | PASS |
| 4 | 0.780 | 20.53 | 19.19 | 39.72 | 56.00 | 16.28 | 10.19 | 29.38 | 46.00 | 16.62 | PASS |
| 5 | 6.000 | 20.95 | 19.20 | 40.15 | 60.00 | 19.85 | 10.30 | 29.50 | 50.00 | 20.50 | PASS |
| 6 | 11.324 | 28.51 | 19.64 | 48.15 | 60.00 | 11.85 | 22.41 | 42.05 | 50.00 | 7.95 | PASS |

Note:QP Margin[dB]= QP Limit[dBµV]- QP Value[dBµV], AV Margin[dB]= AV Limit[dBµV]- AV Value[dBµV].

# 6 Radiated Spurious Emissions

Test Requirement : FCC CFR47 Part 15 Section 15.209 & 15.247

Test Method : ANSI C63.10:2013

Test Result : PASS

Measurement Distance : 3m

Limit : See the follow table

| Frequency (MHz) | Field Strength | | Field Strength Limit at 3m Measurement Dist | |
|---|---|---|---|---|
| | uV/m | Distance (m) | uV/m | dBuV/m |
| 0.009 ~ 0.490 | 2400/F(kHz) | 300 | 10000 * 2400/F(kHz) | $20\log^{(2400/F(kHz))} + 80$ |
| 0.490 ~ 1.705 | 24000/F(kHz) | 30 | 100 * 24000/F(kHz) | $20\log^{(24000/F(kHz))} + 40$ |
| 1.705 ~ 30 | 30 | 30 | 100 * 30 | $20\log^{(30)} + 40$ |
| 30 ~ 88 | 100 | 3 | 100 | $20\log^{(100)}$ |
| 88 ~ 216 | 150 | 3 | 150 | $20\log^{(150)}$ |
| 216 ~ 960 | 200 | 3 | 200 | $20\log^{(200)}$ |
| Above 960 | 500 | 3 | 500 | $20\log^{(500)}$ |

## 6.1 EUT Operation

Operating Environment :

Temperature : 23.5 °C

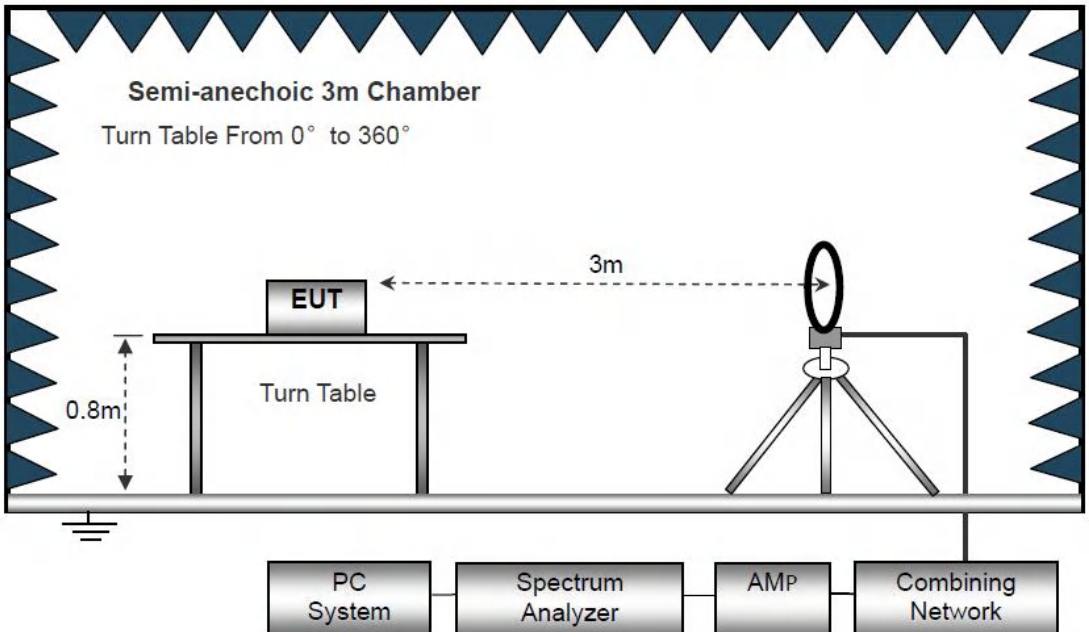
Humidity : 51.1 % RH

Atmospheric Pressure : 101.2kPa

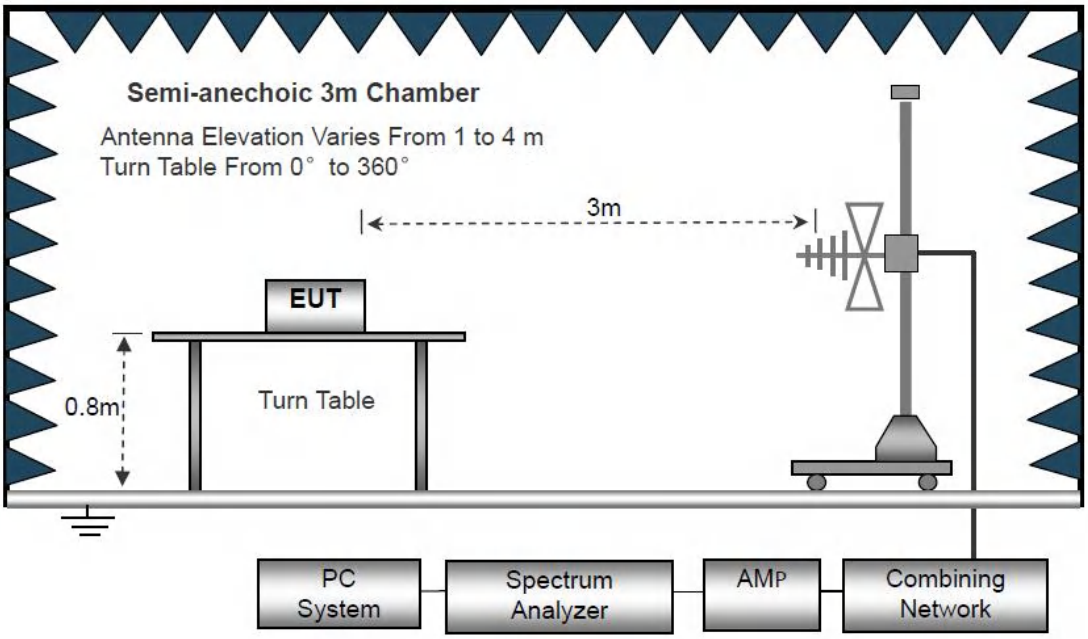
## 6.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

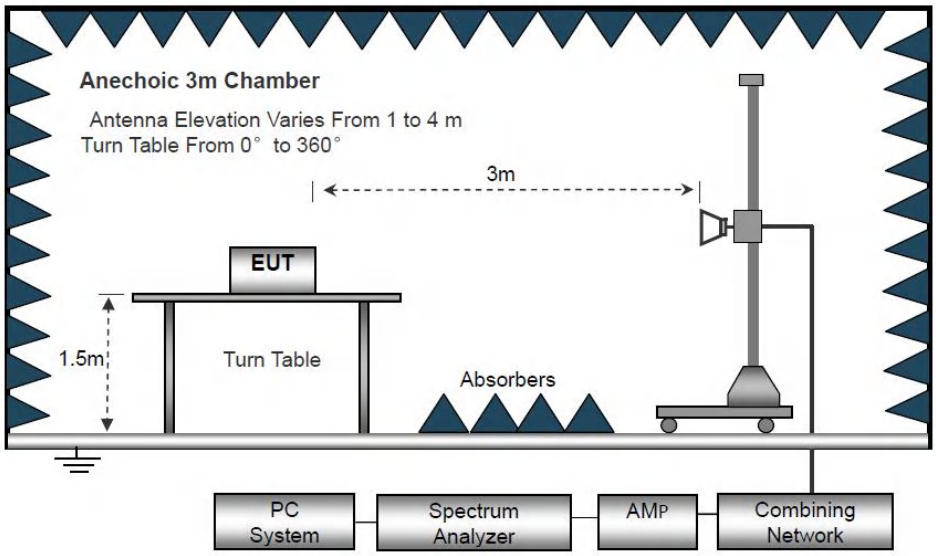
The test setup for emission measurement below 30MHz




The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz




## 6.3 Spectrum Analyzer Setup

| | Frequency | Detector | RBW | VBW | Remark |
|---|---|---|---|---|---|
| Receiver Setup | Below 30MHz | -- | 10kHz | 10kHz | -- |
| | 30MHz ~ 1GHz | Quasi-peak | 120kHz | 300kHz | Quasi-peak Value |
| | Above 1GHz | Peak | 1MHz | 3MHz | Peak Value |
| | | RMS | 1MHz | 3MHz | Average Value |

## 6.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.

2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.

3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.

5. Set to the maximum power setting and enable the EUT transmit continuously.

6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.

7. Test Procedure of measurement (For Above 1GHz):

1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).

2) Change the antenna polarization and repeat 1) with vertical polarization.

3) Make a hardcopy of the spectrum.

4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.

5) Change the analyser mode to Clear/ Write and found the cone of emission.

6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.

7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.

8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.

8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

For Average Measurement:

VBW=10Hz, when duty cycle is no less than 98 percent.

VBW≥1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

| Band | Duty Cycle(%) | T(μs) | 1/T(KHz) | Average Correction Factor | VBW Setting |
|---|---|---|---|---|---|
| 2402-2480 | 100 | - | - | 0 | 10Hz |

## 6.5 Summary of Test Results

**Test Frequency: 9KHz-30MHz**

Note:

The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

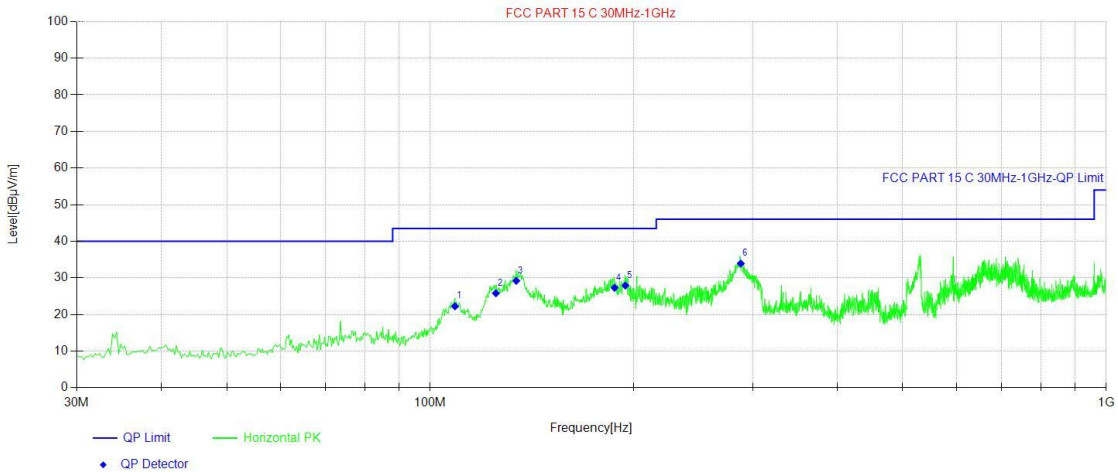
Distance extrapolation factor =40log(Specific distance/ test distance)( dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.

**Test Frequency: 30MHz ~ 1GHz**

Pass.

Please refer to the following test plots for the worst test mode (GFSK (CH00: 2402MHz)).

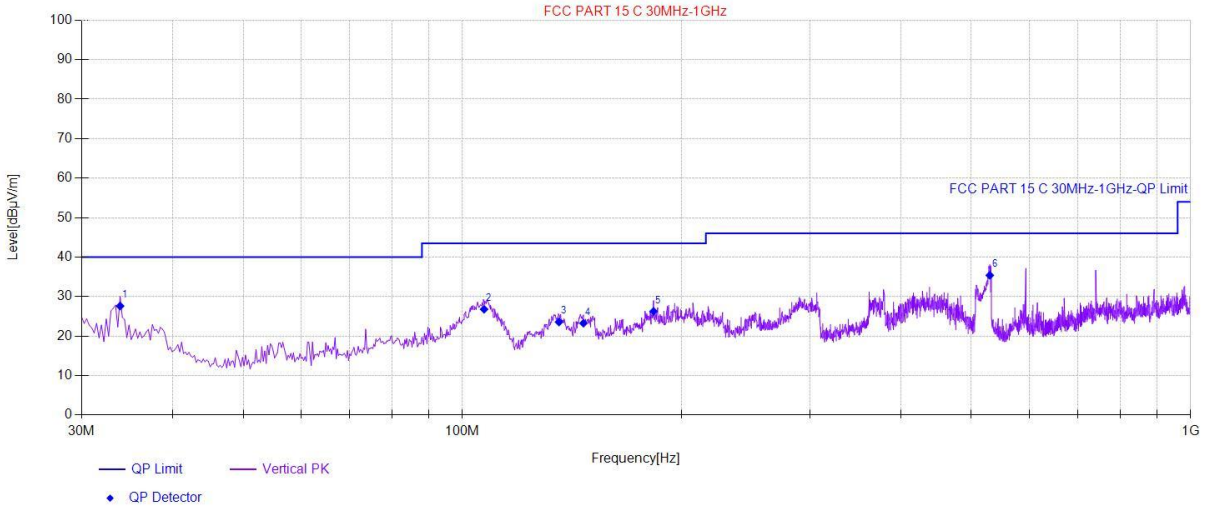
Antenna Polarization: Horizontal GFSK(CH00: 2402MHz)




| Final Data List[QP] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Polarity | Verdict |
| 1 | 108.81 | 40.82 | -18.56 | 22.26 | 43.50 | 21.24 | Horizontal | PASS |
| 2 | 125.06 | 42.68 | -16.87 | 25.81 | 43.50 | 17.69 | Horizontal | PASS |
| 3 | 134.03 | 45.32 | -16.10 | 29.22 | 43.50 | 14.28 | Horizontal | PASS |
| 4 | 187.38 | 44.64 | -17.32 | 27.32 | 43.50 | 16.18 | Horizontal | PASS |
| 5 | 194.42 | 45.94 | -18.01 | 27.93 | 43.50 | 15.57 | Horizontal | PASS |
| 6 | 288.02 | 48.87 | -14.96 | 33.91 | 46.00 | 12.09 | Horizontal | PASS |

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

Antenna Polarization: Vertical GFSK(CH00: 2402MHz)




| Final Data List[QP] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| NO. | Freq. [MHz] | QP Reading [dBµV/m] | Factor [dB] | QP Value [dBµV/m] | QP Limit [dBµV/m] | QP Margin [dB] | Polarity | Verdict |
| 1 | 33.88 | 45.37 | -17.75 | 27.62 | 40.00 | 12.38 | Vertical | PASS |
| 2 | 107.12 | 45.54 | -18.74 | 26.80 | 43.50 | 16.70 | Vertical | PASS |
| 3 | 135.73 | 39.5 | -15.93 | 23.57 | 43.50 | 19.93 | Vertical | PASS |
| 4 | 146.64 | 38.69 | -15.43 | 23.26 | 43.50 | 20.24 | Vertical | PASS |
| 5 | 183.02 | 43.24 | -16.98 | 26.26 | 43.50 | 17.24 | Vertical | PASS |
| 6 | 530.04 | 45.32 | -9.92 | 35.40 | 46.00 | 10.60 | Vertical | PASS |

Remark:Emission Level=Reading+Cable Loss+ANT Factor-AMP Factor

## Test Frequency 1GHz-25GHz:

| Test Mode: CH00 GFSK | | | | | Test channel:Low Channel (2402MHz) | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4804 | 45.41 | 30.16 | 6.58 | 34.09 | 48.06 | 74 | -25.94 | V |
| 7206 | 42.01 | 37.11 | 7.73 | 34.5 | 52.35 | 74 | -21.65 | V |
| 9608 | 37.56 | 39.31 | 9.23 | 34.79 | 51.31 | 74 | -22.69 | V |
| 4804 | 45.69 | 34.04 | 6.58 | 34.09 | 52.22 | 74 | -21.78 | H |
| 7206 | 37.28 | 37.11 | 7.73 | 34.5 | 47.62 | 74 | -26.38 | H |
| 9608 | 39.88 | 39.31 | 9.23 | 34.79 | 53.63 | 74 | -20.37 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4804 | 33.84 | 34.04 | 6.58 | 34.09 | 40.37 | 54 | -13.63 | V |
| 7206 | 28.89 | 37.11 | 7.73 | 34.5 | 39.23 | 54 | -14.77 | V |
| 9608 | 24.59 | 39.31 | 9.23 | 34.79 | 38.34 | 54 | -15.66 | V |
| 4804 | 33.52 | 34.04 | 6.58 | 34.09 | 40.05 | 54 | -13.95 | H |
| 7206 | 27.73 | 37.11 | 7.73 | 34.5 | 38.07 | 54 | -15.93 | H |
| 9608 | 26.24 | 39.31 | 9.23 | 34.79 | 39.99 | 54 | -14.01 | H |

| Test Mode: CH19 GFSK | | | | | Test channel:Middle Channel (2440MHz) | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4880 | 42.47 | 34.38 | 6.69 | 34.09 | 49.45 | 74 | -24.55 | V |
| 7320 | 40.79 | 37.22 | 7.78 | 34.53 | 51.26 | 74 | -22.74 | V |
| 9760 | 34.65 | 39.46 | 9.35 | 34.8 | 48.66 | 74 | -25.34 | V |
| 4880 | 41.02 | 34.38 | 6.69 | 34.09 | 48.00 | 74 | -26.00 | H |
| 7320 | 38.49 | 37.22 | 7.78 | 34.53 | 48.96 | 74 | -25.04 | H |
| 9760 | 37.42 | 39.46 | 9.35 | 34.8 | 51.43 | 74 | -22.57 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4880 | 33.01 | 34.38 | 6.69 | 34.09 | 39.99 | 54 | -14.01 | V |
| 7320 | 27.70 | 37.22 | 7.78 | 34.53 | 38.17 | 54 | -15.83 | V |
| 9760 | 24.26 | 39.46 | 9.35 | 34.8 | 38.27 | 54 | -15.73 | V |
| 4880 | 31.97 | 34.38 | 6.69 | 34.09 | 38.95 | 54 | -15.05 | H |
| 7320 | 27.79 | 37.22 | 7.78 | 34.53 | 38.26 | 54 | -15.74 | H |
| 9760 | 24.98 | 39.46 | 9.35 | 34.8 | 38.99 | 54 | -15.01 | H |

| Test Mode: CH39 GFSK | | | | | Test channel:High Channel (2480MHz) | | | |
|---|---|---|---|---|---|---|---|---|
| Peak Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4960 | 42.29 | 34.72 | 6.68 | 34.09 | 49.60 | 74 | -24.40 | V |
| 7440 | 39.62 | 37.34 | 6.73 | 34.57 | 49.12 | 74 | -24.88 | V |
| 9920 | 33.81 | 39.62 | 6.81 | 34.81 | 45.43 | 74 | -28.57 | V |
| 4960 | 40.76 | 34.72 | 6.68 | 34.09 | 48.07 | 74 | -25.93 | H |
| 7440 | 38.18 | 37.34 | 6.73 | 34.57 | 47.68 | 74 | -26.32 | H |
| 9920 | 36.68 | 39.62 | 6.81 | 34.81 | 48.30 | 74 | -25.70 | H |
| Average Value | | | | | | | | |
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Pol. |
| 4960 | 32.37 | 34.72 | 6.68 | 34.09 | 39.68 | 54 | -14.32 | V |
| 7440 | 27.41 | 37.34 | 6.73 | 34.57 | 36.91 | 54 | -17.09 | V |
| 9920 | 25.27 | 39.62 | 6.81 | 34.81 | 36.89 | 54 | -17.11 | V |
| 4960 | 31.99 | 34.72 | 6.68 | 34.09 | 39.30 | 54 | -14.70 | H |
| 7440 | 29.36 | 37.34 | 6.73 | 34.57 | 38.86 | 54 | -15.14 | H |
| 9920 | 25.42 | 39.62 | 6.81 | 34.81 | 37.04 | 54 | -16.96 | H |

Note: 1. The testing has been conformed to 10*2480MHz=24800MHz.

2. All other emissions more than 30dB below the limit.

3. Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Emission Level = Reading + Factor
Margin=Emission Level-Limit

## Spurious Emission in Restricted Band 2310-2390MHz and 2483.5-2500MHz

| Test Mode: BLE Low Channel 2402MHz | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over (dB) | Polarity H/V | Test Value |
| 2390.00 | 56.00 | 28.08 | 6.81 | 37.12 | 53.77 | 74 | -20.23 | H | Peak |
| 2390.00 | 33.85 | 28.08 | 6.81 | 37.12 | 31.62 | 54 | -22.38 | H | Average |
| 2390.00 | 56.88 | 28.67 | 6.72 | 37.26 | 55.01 | 74 | -18.99 | V | Peak |
| 2390.00 | 37.48 | 28.67 | 6.72 | 37.26 | 35.61 | 54 | -18.39 | V | Average |

| Test Mode: BLE High Channel 2480MHz | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit (dBuV/m) | Over (dB) | Polarity H/V | Test Value |
| 2483.50 | 54.27 | 27.38 | 6.15 | 36.29 | 51.51 | 74 | -22.49 | H | Peak |
| 2483.50 | 36.92 | 27.38 | 6.15 | 36.29 | 34.16 | 54 | -19.84 | H | Average |
| 2483.50 | 55.09 | 27.43 | 6.68 | 36.79 | 52.41 | 74 | -21.59 | V | Peak |
| 2483.50 | 37.85 | 27.43 | 6.68 | 36.79 | 35.17 | 54 | -18.83 | V | Average |

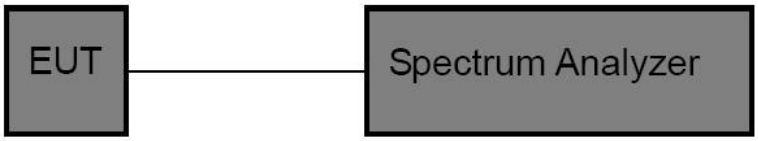
# 7 Conduct Band Edge And Spurious Emissions Measurement

| | | |
|---|---|---|
| Test Requirement | : | Section 15.247(d) In addition, radiated emissions which fall in the restricted bands. as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)). |
| Test Method | : | ANSI C63.10:2013 |
| Test Limit | : | Regulation 15.247 (d),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 conducted power limits. If the transmitter complies with the conducted 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 §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)). |

## 7.1 Test Procedure

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold

## 7.2 Test Setup

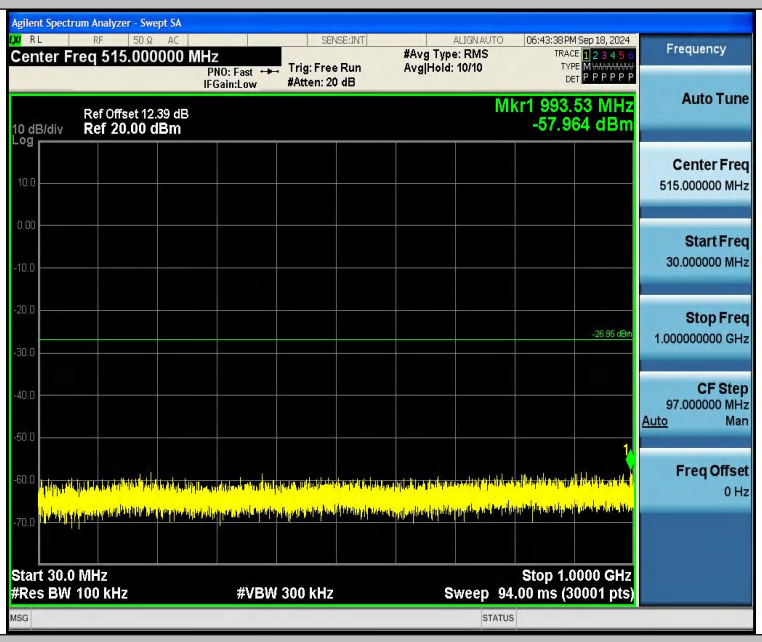


## 7.3 Test Result

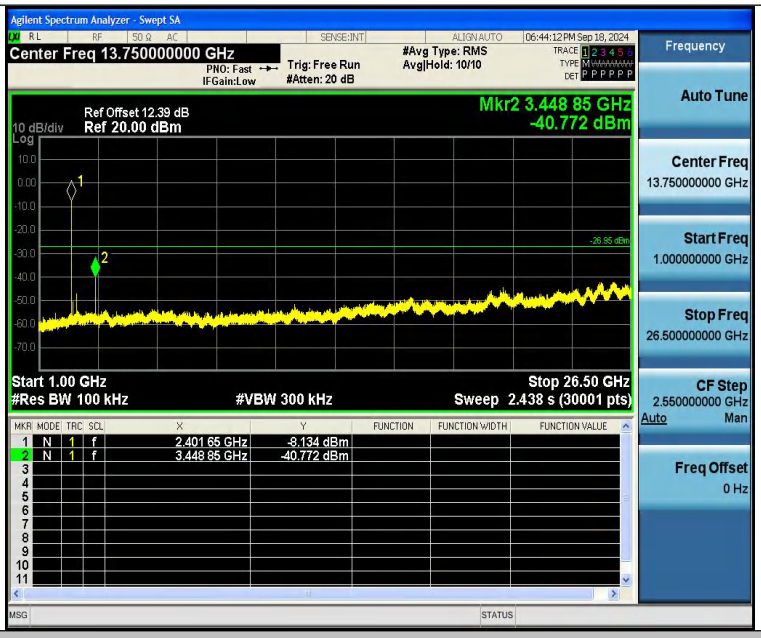
| TestMode | Antenna | Frequency[MHz] | FreqRange [MHz] | RefLevel [dBm] | Result[dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | 2402 | 0~Reference | -6.95 | -6.95 | --- | PASS |
| BLE_1M | Ant1 | 2402 | 30~1000 | -6.95 | -57.96 | ≤-26.95 | PASS |
| BLE_1M | Ant1 | 2402 | 1000~26500 | -6.95 | -40.77 | ≤-26.95 | PASS |
| BLE_1M | Ant1 | 2440 | 0~Reference | -6.74 | -6.74 | --- | PASS |
| BLE_1M | Ant1 | 2440 | 30~1000 | -6.74 | -58.27 | ≤-26.74 | PASS |
| BLE_1M | Ant1 | 2440 | 1000~26500 | -6.74 | -40.74 | ≤-26.74 | PASS |
| BLE_1M | Ant1 | 2480 | 0~Reference | -7.95 | -7.95 | --- | PASS |
| BLE_1M | Ant1 | 2480 | 30~1000 | -7.95 | -58.2 | ≤-27.95 | PASS |
| BLE_1M | Ant1 | 2480 | 1000~26500 | -7.95 | -41.8 | ≤-27.95 | PASS |
| BLE_2M | Ant1 | 2402 | 0~Reference | -9.19 | -9.19 | --- | PASS |
| BLE_2M | Ant1 | 2402 | 30~1000 | -9.19 | -57.28 | ≤-29.19 | PASS |
| BLE_2M | Ant1 | 2402 | 1000~26500 | -9.19 | -41.53 | ≤-29.19 | PASS |
| BLE_2M | Ant1 | 2440 | 0~Reference | -8.41 | -8.41 | --- | PASS |
| BLE_2M | Ant1 | 2440 | 30~1000 | -8.41 | -56.11 | ≤-28.41 | PASS |
| BLE_2M | Ant1 | 2440 | 1000~26500 | -8.41 | -41.62 | ≤-28.41 | PASS |
| BLE_2M | Ant1 | 2480 | 0~Reference | -10.22 | -10.22 | --- | PASS |
| BLE_2M | Ant1 | 2480 | 30~1000 | -10.22 | -57.84 | ≤-30.22 | PASS |
| BLE_2M | Ant1 | 2480 | 1000~26500 | -10.22 | -41.37 | ≤-30.22 | PASS |

**Test Graphs：**

BLE_1M-Ant1-2402-0~Reference-PASS

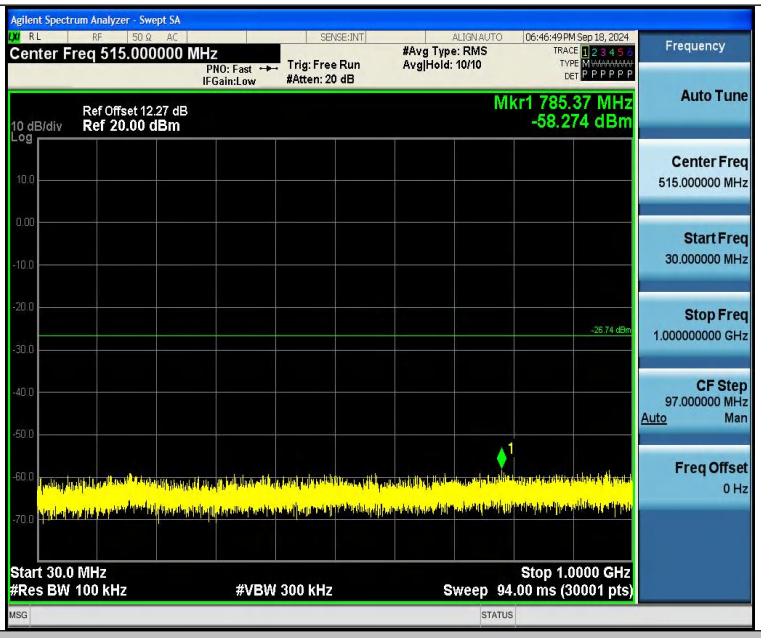



BLE_1M-Ant1-2402-30~1000-PASS

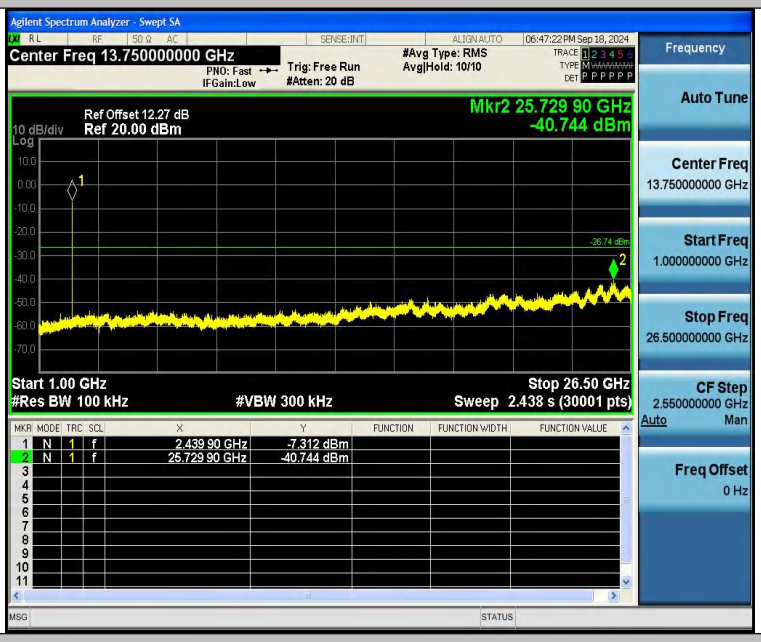



BLE_1M-Ant1-2402-1000~26500-PASS

BLE_1M-Ant1-2440-0~Reference-PASS

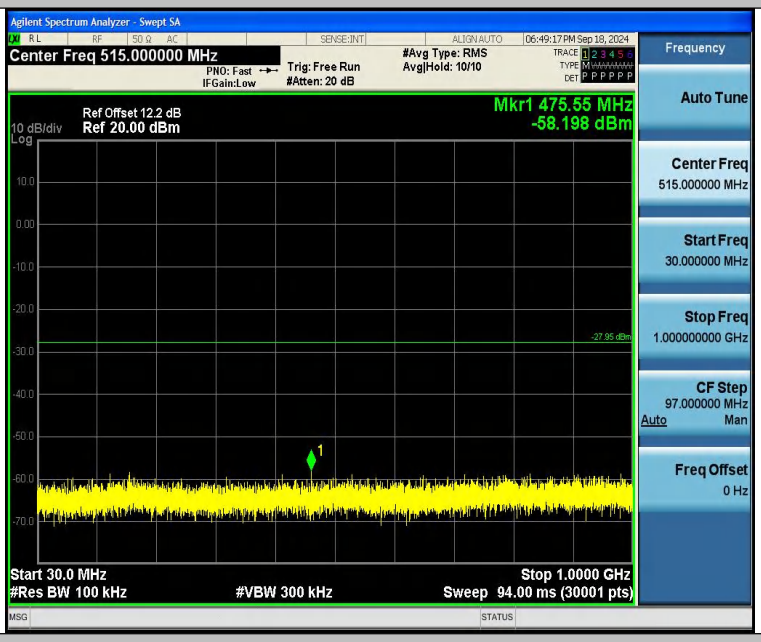



BLE_1M-Ant1-2440-30~1000-PASS

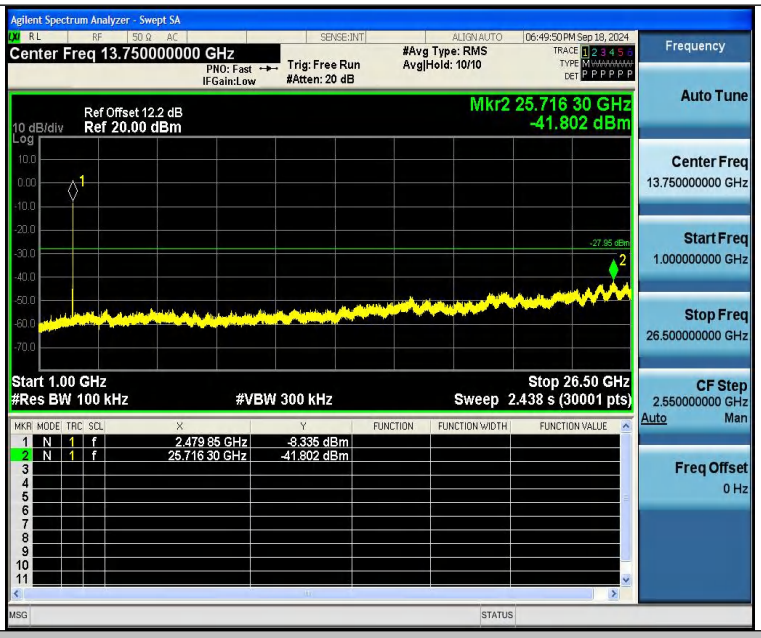



BLE_1M-Ant1-2440-1000~26500-PASS

BLE_1M-Ant1-2480-0~Reference-PASS

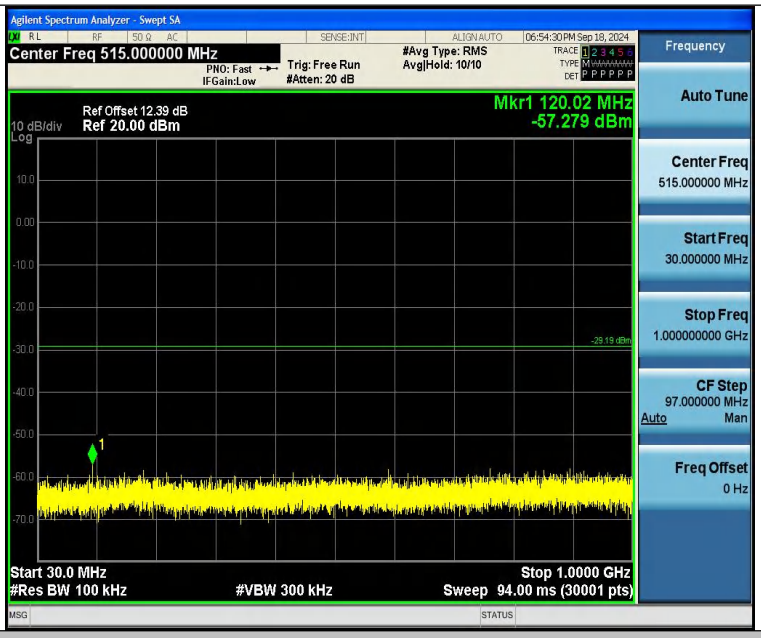



BLE_1M-Ant1-2480-30~1000-PASS

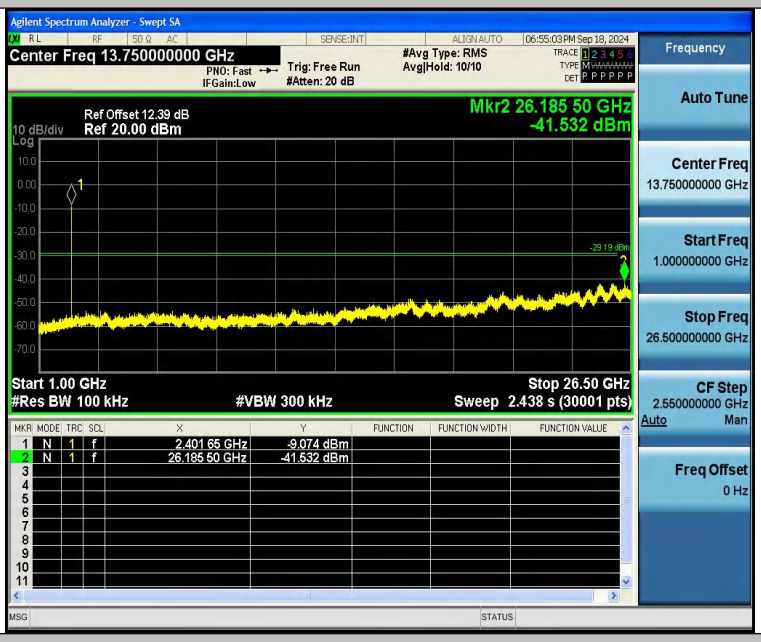



BLE_1M-Ant1-2480-1000~26500-PASS

BLE_2M-Ant1-2402-0~Reference-PASS

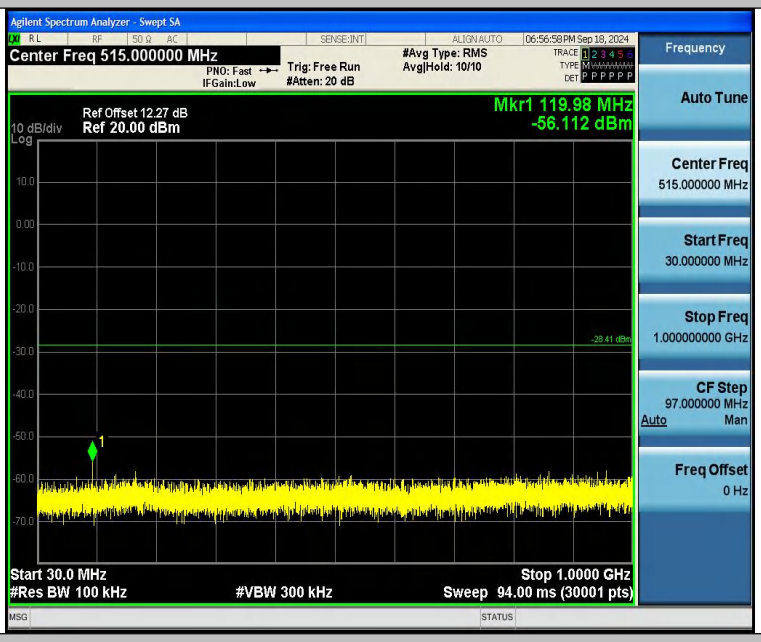



BLE_2M-Ant1-2402-30~1000-PASS

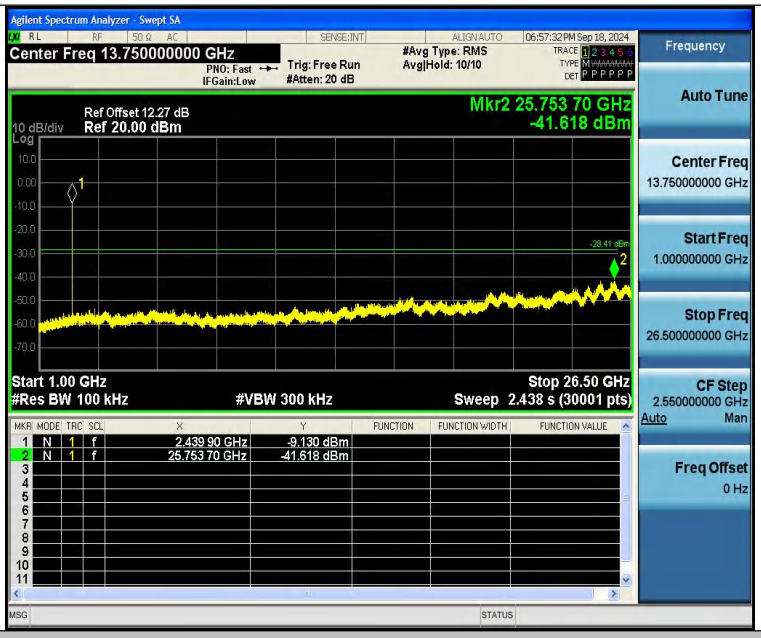



BLE_2M-Ant1-2402-1000~26500-PASS

BLE_2M-Ant1-2440-0~Reference-PASS

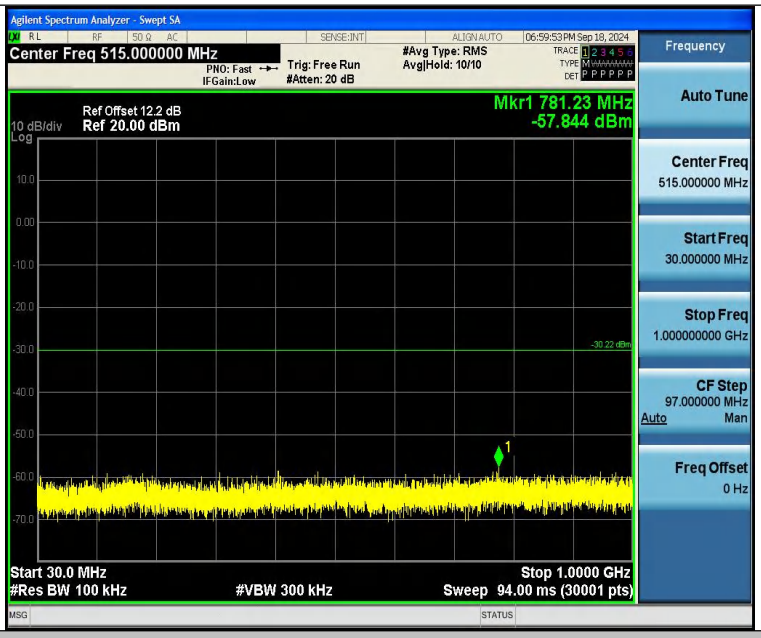



BLE_2M-Ant1-2440-30~1000-PASS

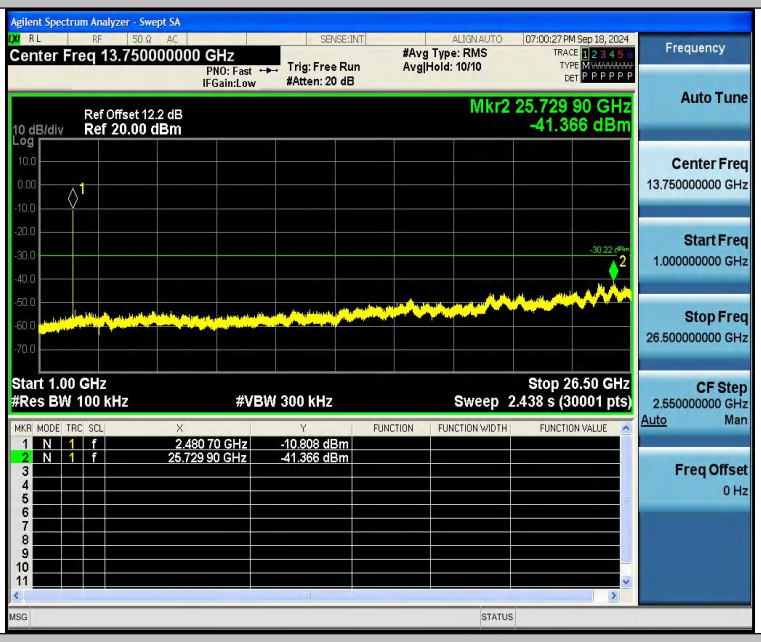



BLE_2M-Ant1-2440-1000~26500-PASS

BLE_2M-Ant1-2480-0~Reference-PASS



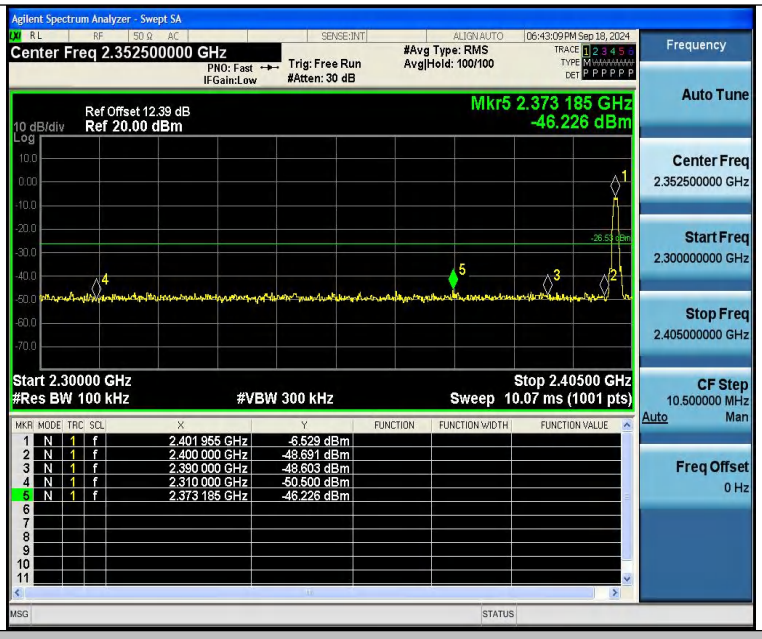

BLE_2M-Ant1-2480-30~1000-PASS



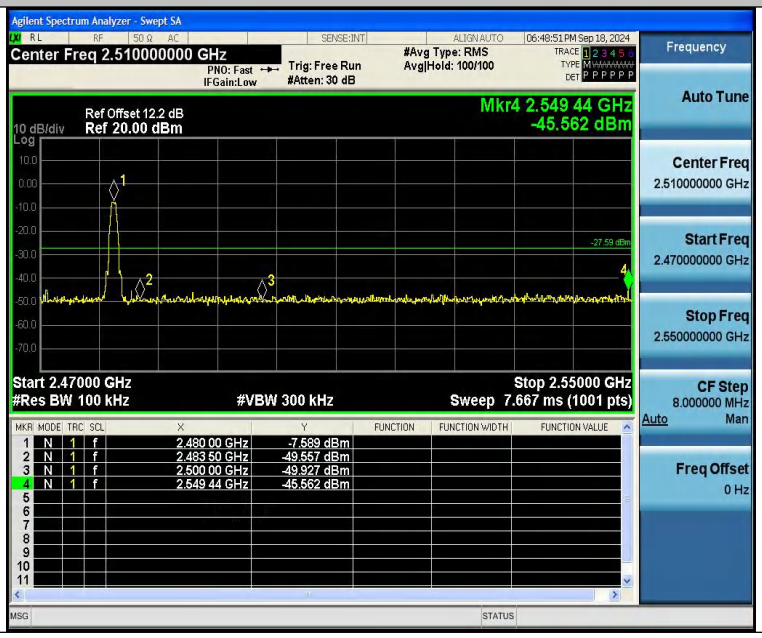

BLE_2M-Ant1-2480-1000~26500-PASS

**Band edge:**

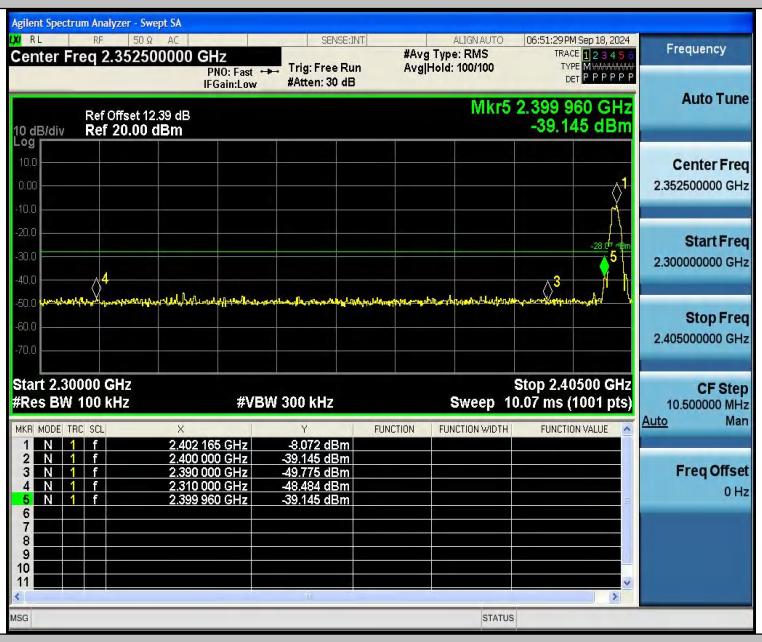
| TestMode | Antenna | ChName | Frequency[MHz] | RefLevel[dBm] | Result[dBm] | Limit[dBm] | Verdict |
|---|---|---|---|---|---|---|---|
| BLE_1M | Ant1 | Low | 2402 | -6.53 | -46.23 | ≤-26.53 | PASS |
| BLE_1M | Ant1 | High | 2480 | -7.59 | -45.56 | ≤-27.59 | PASS |
| BLE_2M | Ant1 | Low | 2402 | -8.07 | -39.15 | ≤-28.07 | PASS |
| BLE_2M | Ant1 | High | 2480 | -8.96 | -45.98 | ≤-28.96 | PASS |



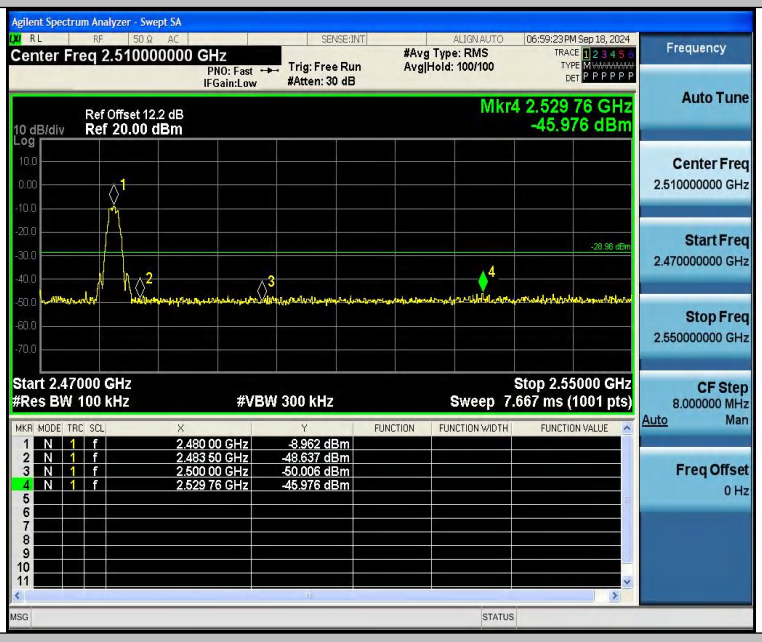

BLE_1M-Ant1-2402-PASS



BLE_1M-Ant1-2480-PASS




BLE_2M-Ant1-2402-PASS




BLE_2M-Ant1-2480-PASS